

Special Issue Reprint

Education Improvement Promoting Human Capabilities Development in Post-Neoliberal Period

Edited by
Edward P. St. John, Luxi Chen, Zachary Taylor, Lijing Yang and Chen Wang

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About the Editors

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Preface

The topic “educational development and social justice” is profound. Our focus on this topic dates back to 2010. It was in that year, at the Center for the Study of Higher and Postsecondary Education (CSHPE), University of Michigan, that Professor Edward St. John, Professor Wang Chen, Dr. Li Xu, and Dr. Yang Lijing jointly discussed how to explore the subject of education promoting social justice in the context of globalization and under the framework of international comparison, as well as their collaborative research plans. The program has carried out several activities with funding from the International Cooperative Research Project of the Faculty of Education of Beijing Normal University (FOE, BNU), including Professor St. John’s lecture series titled “Education and Social Justice in the Global Period” (2012), the workshop on “Actionable Research for Education Equity and Social Justice” (2015), and the book *Actionable Research for Educational Equity and Social Justice: Higher Education Reform in China and Beyond* (Routledge, 2018).

Around the same time, the Huiyan Education Fund provided a grant to the FOE for the research and development of international education, with which the FOE established the International Joint Research Project. Our research program “Educational Development and Social Justice” was awarded a three-year grant in 2019 (2019–2022) after a rigorous application process.

The “Education Development and Social Justice” project and the Center for Educational Development and Social Justice focus on structural educational inequalities in the international community. We explore the application of cross-border comparative research in studying global educational development models and look into the experiences, processes, and problems faced in educational equity. The project brings together international and Chinese experiences, working with scholars, students, and members of society concerned about educational equity to ponder issues related to educational development and social justice, and jointly explore the best way to achieve educational equity and social justice. At the same time, special attention is paid to educational opportunities for children from low-income families in rural and urban areas and marginalized groups, as well as social work in higher education. We actively participate in the reform and practice of promoting adequate educational opportunities and better educational resources for disadvantaged groups. We cooperate with social groups and actors that care about educational equity (such as the Yidan Education Foundation) to jointly promote educational equity.

During the three-year project, even with the disruption of the pandemic, we overcame various difficulties and we used available domestic and foreign resources to carry out a series of courses on educational development and social justice, actionable research to promote equity in education in the country, and international seminars, all of which led to fruitful results and established extensive cooperation.

In the fall semester of 2019–2020, the program invited over Professor Edward St. John (Chief-Expert International) and Dr. Daun-Barnett from the State University of New York at Buffalo. Professor Edward St. John gave a lecture entitled “Global Contexts for Promoting Education Equity: International Agenda for the BNU Center for Education Development and Social Justice”, and Dr. Daun-Barnett gave a talk on “Collective Impact in Buffalo NY: Educational Equity Through Community Collaboration”. We offered two international courses in the spring and fall semesters of 2020–2021 and the fall semester of 2021–2022. The first course was History of American Education, taught by Professor Kate Rousmaniere of the University of Miami; the second was American Education and Higher Education: 1810–1960, led by Professor Adam R. Nelson and Associate Professor Walter Stern of the University of Wisconsin-Madison. In the spring semester of 2022–2023, we invited Professor Yang Lijing of Ohio University to shed light on the latest theories

and applications of international comparative education research to graduate students of the Institute of Educational History and Culture.

From its inception, the Center for Educational Development and Social Justice planned to publish its excellent research results in journals. In the summer of 2022, an email from one Education Sciences Special Issue editor made the plan a reality. After a discussion, we set the theme of the Special Issue of Education Sciences as “Education Improvement Promoting Human Capabilities Development in Post-Neoliberal Period”. The research focused on addressing contemporary educational improvement challenges and promoting the capacity development of people from diverse backgrounds. We invited Dr. Luxi Chen, Dr. Zachary Taylor, and Dr. Lijing Yang to form the editorial board. We asked Dr. Xu Li, Dr. Nathan J. Daun-Barnett, and Dr. Cliona Hannon to write research articles. These articles discuss the challenges faced by China, the European Union, the United Kingdom, and the United States in developing competencies for vulnerable groups, compare the connections and differences between developed and developing countries, and examine policies and programs to expand access to education to jointly explore more humanistic solutions for educational equity and social justice in the new era. While planning and writing the Special Issue, an author, Professor Patricia Somers, passed away due to illness, and we would like to express our deepest condolences.

During the three-year project, we received strong support from Professor Zhang Binxian and Associate Professor Sun Yi from the Institute of Education History and Culture of Beijing Normal University; Su Sanna, Director of Scientific Research of the Faculty of Education; Wang Hejia, Coordinator; Li Mingmei, Liu Min, and Hong Xiaohan, doctoral students of the Faculty of Education; and Luo Qiubai, a master’s student. We express our gratitude to these personnel.

Edward P. St. John, Luxi Chen, Zachary Taylor, Lijing Yang, and Chen Wang

Editors

Editorial

Human Capabilities in this Post-Neoliberal Period: A Summative Editorial

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As Professor Wang Chen noted in the introduction, this Special Issue was conceptualized after conversations concerning the prospect of an international center focused on “education development and social justice.” Our first book provided comparative cases of using action research to promote social justice within nations through education reforms. The chapters provided examples from Brazil, England, China, and the US [1]. As international exchange became more strained during the COVID crisis and the Russian-Ukrainian War, it was apparent that the concept of “social justice” was controversial, given the growing US–China conflict. In the webinars leading to this volume, we realized that focusing on “human capabilities development” provided a workable approach to promoting educational opportunity in support of economic development and social wellbeing within nations that are democratic and authoritarian. Subsequently, this summative editorial compares contexts for human capabilities development, examines findings of policy developments and outcomes across contexts, and proposes university practices and partnerships for promoting capabilities development through policy and practice.

For more than a century, human capital theory has provided governments with frameworks for expanding educational opportunities to promote economic development. By the 1960s, nations measured the returns from public investment in education by gains in education attainment and economic growth. The US and Western European nations used student grants as strategic investments to reduce inequality in college access as they moved toward mass access to higher education during the Cold War. After the Cold War, the “Washington Consensus” promoted student loans to expand access in developing countries. A capabilities approach digs deeper, engaging universities, schools, and governments in partnerships that build the knowledge and skills of students in low-income families in rural communities and urban neighborhoods with few examples of college success. Even after decades of privatization, it is evident that public investment in education is necessary for nations to improve college attainment rates and promote social wellbeing, evidenced by student loan crises in several developed nations.

Extending educational opportunities to marginalized populations with a limited family history of college success has become an increasingly important policy issue in developing economies. The human-capabilities framework started in Ireland with the successful Trinity Access Program (TAP) in Dublin, where Trinity College Dublin built university partnerships with low-income-serving high schools in the city. Over a decade, the partnership model extended across the nation, and Ireland rose among European Union nations in the college enrollment rate. Cambridge and Oxford recently adapted the TAP process in England. In a larger country with a more complex education system and greater population diversity, there is reason to question whether taking a successful practice from a small island to its larger neighbor will have similar success nationally in England. Nevertheless, this cross-nation movement of innovation informed our dialogue regarding international collaboration on research promoting equity. Cliona Hannon led the efforts to develop TAP, piloted the method in England, and formulated the human-capabilities framework used in this volume.

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The theory of human capabilities emerged in studies of developing nations as an alternative to using human capital theory as a basis for public decisions regarding education investment. Our Chinese colleagues reexamined the origins of human capital and used it to examine the history and future of China's investment in education. As a still developing nation with one of the world's largest economies, China is now moving to universal K-12 education and continuing the development of the mass higher education system. Adding human capabilities into the planning models used in China can reduce inequalities as the nation moves forward. These papers illustrate the potential of human capabilities as a framework for improving educational opportunities and an alternative basis for the exchange of research. Not necessarily a substitute for thinking about education as a public investment in education, the human-capabilities approach provides a framework that can inform policy and practice, promoting the educational opportunities supporting the public good and community wellbeing and expanding the aims for public investment from the narrower notion of economic gains.

The authors also explore the prospects of building and using databases to inform better policy development in promoting human capabilities. Developing high-quality databases for analyses informing policy relating to capabilities remains challenging globally in both developed and less-developed nations. Collecting information that includes the data elements and covers the population needed to consider inequalities at the level of capabilities is no easy task. Liu, Gao, and Chen illustrate that regional data collected in Beijing province have utility for informing policymakers and educators about student outcomes. Yang and St. John use international data to compare developed and less-developed nations' investment in postsecondary vocational education, a policy issue that links to creating and maintaining a working middle class in both countries. Another lesson from this analysis reminds readers that even developed nations are always dependable in providing data for comparative studies of capabilities development within nations and across regional economic networks, like the European and South Asian nations.

The final set of papers returns to the core issue of the practice of promoting human-capabilities development. An engaged scholar over decades, Nate Daun-Barnett uses local databases to examine the impact of university-based outreach programs in Buffalo, New York. In a city ravaged by American rust belt and the export of industry, inner-city Buffalo schools continue to serve students who are among the state's least-advantaged populations. Much like Trinity University's TAP, Nate documents the impact of these bold, local partnerships, further illustrating the potential of international exchange. In contrast, Xu Li and Yaun Li review an initiative in a provincial Chinese university to enhance world-class STEM education, emphasizing liberal arts education. Their essay gets close to the core issues by focusing on capabilities in science education rather than overly narrow economic and managerial conceptions of the value of science education. Finally, Zach Taylor and colleagues return to the question of equitable data collection and database development. Data and data analysis are not the only issues facing educational researchers and policymakers, as data analysis is only as useful as the equity and quality of the data. Nor is data analysis the most important element of educational research. Without concerted efforts to improve databases through equitable data collection in nations and regions, it will be much more difficult to address the human and environmental issues challenging our collective global and local communities.

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2. Hannon, C. A Human Capability Perspective on the Progression of Low-SES Students to Higher Education in Ireland and the UK. *Educ. Sci.* **2023**, *13*, 409. <https://doi.org/10.3390/educsci13040409>.
3. Li, M.; Liu, M.; Wang, H.; Hong, X.; Wang, C. Research on the Development of Equitable Education in China from the Human Capability Perspective. *Educ. Sci.* **2023**, *13*, 738. <https://doi.org/10.3390/educsci13070738>.
4. Taylor, Z.W.; Charran, C.; Childs, J. Using Big Data for Educational Decisions: Lessons from the Literature for Developing Nations. *Educ. Sci.* **2023**, *13*, 439. <https://doi.org/10.3390/educsci13050439>.
5. Liu, X.; Gao, W.; Chen, L. Does Pre-Service Teacher Preparation Affect Students' Academic Performance? Evidence from China. *Educ. Sci.* **2023**, *13*, 69. <https://doi.org/10.3390/educsci13010069>.
6. Yang, L.; St. John, E.P. Public Investment in Short-Cycle Tertiary Vocational Education: Historical, Longitudinal, and Fixed-Effects Analyses of Developed and Less-Developed Countries. *Educ. Sci.* **2023**, *13*, 573. <https://doi.org/10.3390/educsci13060573>.
7. Daun-Barnett, N.J. Say Yes to Education—Buffalo: A Human Capabilities Approach to College Access and Local Economic Development. *Educ. Sci.* **2023**, *13*, 472. <https://doi.org/10.3390/educsci13050472>.
8. Li, X.; Li, Y. Individualized and Innovation-Centered General Education in a Chinese STEM University. *Educ. Sci.* **2023**, *13*, 846. <https://doi.org/10.3390/educsci13080846>.
9. Taylor, Z.W.; Kugiya, J.; Charran, C.; Childs, J. Building Equitable Education Datasets for Developing Nations: Equity-Minded Data Collection and Disaggregation to Improve Schools, Districts, and Communities. *Educ. Sci.* **2023**, *13*, 348. <https://doi.org/10.3390/educsci13040348>.

References

1. Chen, W.; St. John, E.P.; Hannon, C.; Li, X. *Actionable Research for Education Equity and Social Justice: Higher Education Reform in China and Beyond*; Routledge: New York, NY, USA, 2018.

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Essay

Higher Education in Post-Neoliberal Times: Building Human Capabilities in the Emergent Period of Uncertainty

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Abstract: This paper argues that the neoliberal consensus about education finance has broken down due to growing economic inequality. First, I use a comparative historical analysis of political alliances to examine patterns of world trade and nations' policies for economic and educational development since World War II. The United States emphasized STEM-collegiate preparation for all students, while most countries continued the dual emphasis on technical-tertiary and higher education. Educational policy in the US and Pacific region also shifted towards a reliance on markets and student loans resulting in worsening economic inequality in access. Nations with dual technical and academic pathways in secondary and postsecondary education systems expand college enrollment rates more rapidly than the US. They also experience class conflict between the working-middle class and the new technological elite. Next, I examine how education policy shifted from national planning aligned with public funding to market-based incentives for institutional development, further exposing gaps in opportunity within nations. Finally, recognizing the variations in systemic causes of inequality, I argue that governments, education agencies, and civic activists can best promote equity by organizing to address barriers to opportunity for groups left behind in the wake of withering neoliberal education policy.

Keywords: neoliberalism; education development; trade alliances; economic development; human capital; cultural capital; social capital; human capabilities; social action

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1. Introduction

Massification of higher education was integral to economic development before economic globalization surged in the 1980s [1]. Neoliberal education finance policies accelerated economic and social inequalities as economic globalization progressed. The new conflict between social democratic systems and nationalistic totalitarianism illustrates a breakdown in the withering neoliberal consensus that emerged in the 1980s. Community-based initiatives that build students' capabilities and families are increasingly necessary to address rising inequalities.

This paper examines the new uncertainties created by the withering consensus about education finance. First, I review historical transitions in alliances among nations to distinguish the regional contexts for future education policy development. Next, I examine government policies promoting education development across global regions, focusing on the US, Europe, and Asia. I conclude with a framework for building capabilities to address attainment gaps accelerated by the COVID-19 pandemic.

2. Global Transitions Affecting Education Development

The breakdown of the quasi-consensus on economic and educational development was the driving force in neoliberal globalization, but now adds to the international chaos. The COVID-19 pandemic coincided with a slowdown in international academic exchange and exposed weaknesses in the global supply chain between the US, European Union (EU), and China. The Russian invasion of Ukraine also adds to the emerging international

tensions but is not the cause of global uncertainty. I briefly review historical transitions in international alliances (Table 1) before discussing forces influencing education development and social stratification.

Table 1. Global transitions: shifting political ideologies, international alliances, educational development strategies, and social capital formation for cross-generation uplift.

Transitions	Political Ideologies	International Alliances	Education Development	Social Capital Formation
<i>Colonial: Pre-World War II</i> (European nations and Turkey build wealth through colonial empires)	Colonies aligned with colonizing nation; the US in the Americas; Western influences in China	International corporations within empires; trade across empires benefits colonizing nations; China open to trade	Education institutions forms adapted by colonies; humanities emphasis; China open to Western missionaries	Social elite with cross-generation college degrees; economic elite from colonies educated in the colonizing nations
<i>Cold War: 1945–1980</i> (Soviet–Western competition on education, science, and trade)	Capitalist democratic vs. communist systems; space race influenced defense and education	Western capitalism v. state-owned enterprises; international corporations constrained in Soviet nations	Advanced nations with universal K-12 and mass college; developing countries lack K-12 for all	Family cross-generation uplift in the Western and Eastern Europe; poverty in developing nations
<i>Global: 1980–2015</i> (Neoliberal “Washington Consensus” frames economic and education development)	Autocracies followed post-Soviet Eastern European democratization; Chinese economic reform	Global trade and corporations; EU, China and US major forces in trade; US exports working class; global supply chain develops	Expanding education through global marketization; technology competition and cooperation; student mobility	Vocational and academic secondary and collegiate pathways in EU and China; US collegiate prep for all students
<i>Post-Neoliberal Transition: 2015–present</i> (Authoritarianism v. democracy)	Brexit, Trump and COVID-19; Russia-Ukraine War; Chinese rises in Asia	New trade wars and reemergence of nationalism undermine neoliberalism	Uncertainty about future w/ COVID-19 pandemic; more distance learning	Reconstruction of the middle class; technical vs. academic paths uncertain

Education systems developed within international alliances during the imperial period. Education institutions in most developing nations adapted models from colonizing countries, a systemic difference too frequently overlooked in a rush to globalize universities [2]. Both global rankings for universities and national histories influence how countries engage in education exchange and create opportunities for their citizens [3].

2.1. International Alliances Influencing Education Development

The legacies of the nineteenth-century empires continue to influence economic and social development across the globe. The democratic revolutions in the US and France did not substantially change the overarching narrative of economic development portrayed by Adam Smith [4]. However, the Russian revolution during World War I brought the political dialectic into international politics. The British Empire transitioned to the industrial age faster than the global Spanish and Ottoman empires. Serious problems within the Ottoman economy influenced their engagement in WWI [5,6]. WWI brought British hegemony into dominance in the Middle East.

2.1.1. Transformations Influencing Economic and Education Development

Transformations in prevailing political ideologies, political alliances, and nations’ strategies for education development influenced social capital development in countries. These legacies of past global periods affect contemporary social stratification and the prospects for reducing opportunity gaps accelerated by the global COVID-19 pandemic.

The multinational return of authoritarianism is symptomatic of profound social and cultural tensions [7]. In some Latin American countries, the rise of autocratic leftist politicians has been characterized as a “post-neoliberal” ideology [8]. Distinguishing the forces at work in economic and educational development during the current period starts with examining historical transitions. These periods stand out as distinctive as concerns economic development, trade across nations, and educational development within them:

- *The Empires.* European wars were waged over colonies, trade, and religion. South Asian nations adopted educational forms from their respective colonial power. For example, the British education and trade models dominated India, Hong Kong, Malaysia, Singapore, Pakistan, etc. China’s trade and education were open to Western nations and missionaries, including the development of educational institutions. Japan evolved aspirations to build an empire, expanding into Korea and China before WWII.

- *The Cold War.* The centuries of empires came to an end after World War II, as global conflicts emerged from conflicting ideologies. Nationalized economies in Soviet nations competed and conflicted with capitalist expansion in the West. Western democracies and Eastern European countries in the Soviet sphere expanded K-12 and higher education, moving toward mass access in the US and Europe, with enrollment tracked by the Organization for Economic Cooperation and Development (OECD). China developed policies of centralized education and economic planning consonant with those of the Soviet model. The US trade agreements and tax policies favored global corporations and ignited the nascent global supply chain, with American goods supplying the rebuilding of European nations after WWII.
- *Neoliberal Globalization.* The first wave resulted in the democratization of post-Soviet Eastern Europe, but was resisted by China [9]. China embraced the second wave, emphasizing global production, trade, and international corporations. The European Union (EU) emerged, facilitating intra-European trade, travel, educational exchange, and EU engagement in world trade. The internationalization of higher education increased student and career mobility as economic globalization accelerated. China globalized its universities, started joint campuses with Western universities, and saw many students studying abroad.
- *The New Uncertainty.* As the neoliberal global consensus withered, a new set of circumstances emerged by 2015, when the Republican US Senate did not consider Obama's Supreme Court nomination and the United Kingdom (UK) voted for Brexit. The West had lost an early information war aimed at increasing divisions within Western democracies [10]. The breakdown of democratic institutions in the US accelerated during Trump's presidency, as the US Cold Civil War emerged and the US broke trade agreements [11]. As the COVID-19 pandemic wanes, democratic and authoritarian ideologies within and across nations seem locked in conflict about education and trade. The new "hot war" in Eastern Europe raises the fear that a world war is possible.

Understanding the possible meanings of the current global transition for social change requires careful thought about conflicting political ideologies, shifting international alliances, educational development within and across nations, and patterns of social capital formation. The global supply chain created by neoliberal economics reversed the flow of goods in the US from outgoing to incoming.

2.1.2. Breakdown of "Washington Consensus" on Education Development

An international aid strategy emphasizing capitalism in aid to developing nations was the alternative to communism advocated as a global strategy by Harvard social scientists, e.g., [12], and gained momentum during the 1960s under the Presidential administrations of Kennedy and Johnson. At the end of the Cold War, some economists argued that capitalism, rather than democratic institutions, had caused the demise of the Soviet Union, e.g., [13].

The "Washington Consensus" was a strategy for international development created by the World Bank and the International Monetary Fund (IMF) in the late 1980s [14,15]. It is perhaps most easily understood as a tacit agreement among neoliberal economists about the role of international capitalism in developing South American, Asian Pacific, and African nations [13,14]. The ideas persisted through most of the neoliberal period of globalization.

While the IMF is mainly concerned with lending and the repayment of loans for development, the restructuring of world trade is the haunting legacy inhibiting cross-generation uplift, at least for the US [16]. The export of US jobs was only part of the problem. The debt accrued by developing nations ensured a legacy of poverty in many countries, especially in Latin America, where debt-to-tax ratios were excessive [17].

The Cold War's communist-capitalist dialectic disguised the deeper social conflict between racism within nations as empires crumbled. Racism morphed across global transitions into the contemporary conflict between authoritarian rule and democratic institutions. Democratic institutions are more likely to embrace and facilitate diversity within countries,

while autocratic leaders appeal to powerful economic elites and populists [18]. These forces have resurfaced in Trumpism in the US, Brexit in the UK, and Russian claims of Nazism in Ukraine before the invasion. Conflicts between racist nationalism and internationalism linger within nations across the globe.

2.2. Transforming Patterns of Education Development

The American colonies appealed to English philanthropists for college funding, usually claiming they would educate native people, but expanding the opportunities available for colonists was an underlying aim [19]. The University of London first offered distance degrees for children across the British Empire in 1858 (https://www.newworldencyclopedia.org/entry/Distance_education accessed on 2 February 2023). As schools and universities expanded globally, colonizing nations disseminated national models and languages [20]. These early arrangements set in motion the diaspora of institutional forms within empires, easing the international exchange of students within these networks.

German universities were the first to establish doctoral education on a large scale, as Germany became the center of scientific discovery in the nineteenth century. In the late nineteenth and early twentieth centuries, German universities enjoyed extensive graduate enrollment, as universities in the US and other nations developed graduate programs organized at first by Germany's Ph.D. graduates. International study proceeded within and across alliances through World War II and the Cold War. American universities enjoyed the most extensive international enrollment, in part because the Carnegie credit hours made credit transfer easier than was possible in most other nations. There has always been international study, however. After high school, students might choose to attend college in another country.

Germany was the center of scientific discourse in physics before WWII, but the migration of top Jewish physicists due to Nazi oppression began before the war [21]. This drain of physicists influenced the competition to build an atomic bomb during the war. The migration of German physicists to Russia and the West influenced the competition to produce bigger and better bombs throughout the Cold War. It also influenced the space race. Responding to this sinister form of international competition, Western democracies and Russia expanded funding for science during the Cold War.

The end of the Cold War accelerated cooperation in science, further breaking down East–West barriers to academic exchange. International collaboration in science accelerated throughout the global period. For example, the International Space Station, a joint venture involving the United States, Russia, Canada, Japan, and countries in the European Space Agency, illustrated cooperation in space [22]. However, the rekindled Cold War now emerging in this new period of uncertainty has dampened academic exchange, even as international corporations function as mechanisms for technology transfer through the still-evolving supply chain and organizational partnerships between the US and China [23].

2.2.1. Social Sciences in the Cold War and Beyond

The migration of German social scientists added divisiveness and fragmented international exchange during and after WWII. During the Cold War, in 1963, mainstream US social scientists conferred to frame a middle course between the far right and the socialist frame marginalized by McCarthyism [24]. The next year, Marcuse [25] severely criticized this approach. A Jewish scholar who had been part of the Frankfurt School, Marcuse became one of the few left-leaning US social scientists during the Cold War. On the other extreme, Leo Strauss, a noted German philosopher, became the thought leader of the new conservative right [26]. Strauss criticized liberal democracy because the German democratic system made it possible for Hitler to seize power, giving rise to the Nazi regime [27].

Almost as echoes of this anti-democratic social thinking, right-leaning scholars advocated for a return to Western civilizations as foundations for collegiate undergraduate education in the US, e.g., [28,29]. They advocated restructuring the high school curriculum to emphasize a college preparatory curriculum for all students [30]. The political left in the

US also promoted this strategy for preparing all students with advanced courses in math and science previously necessary for entry to collegiate Engineering programs. Liberal scholars advocated for preparing all students for Science, Technology, Engineering, and Math (STEM) fields because of the history of tracking minorities into vocational education into vocational high school programs [31–33]. Rather than updating and modernizing vocational education, the path chosen by the EU, the US marginalized technical for working class families.

These contrasting arguments in academic discourse come into question as nationalism reemerges as a fragmenting force. For example, Brexit ushered in a reconstruction of trade agreements in the EU. European nations have benefited from trade and economic exchange within the EU—the flow of labor and products—but the UK’s financial future is now uncertain [34]. Given China’s ascent in world trade and strong relationships with the EU, Trump’s agenda on global and Pacific trade agreements has left the US more isolated in international trade, at least before Biden’s election. Biden’s alliance-building with Europe during Russia’s invasion of Ukraine may reshape these trade alliances, depending on China’s support for Russia. Claims thrown back and forth about Nazi nationalism underlie this contemporary rhetorical battle, further accelerated by the Ukraine war.

The global appeal of the US university model further complicates the post-neoliberal political shifts [35]. Trump’s criticisms of China created reluctance among Chinese students to study in the US even before COVID-19 [36]. Israeli universities have benefited from the shift in students’ interests [37], illustrating that international economic and political alliances impact educational exchange.

2.2.2. Expanding College Opportunities

Most developed nations have moved towards universal preparation for tertiary education with collegiate and technical pathways [38]. The US STEM strategy constrained the opportunities available for high school students, emphasizing the STEM pipeline to jobs for the high-tech economy [39]. In contrast, most European nations maintained technical pathways and strengthened vocational and technical options at tertiary institutions, promoting working-class employment and high-tech opportunities [39–41]. In contrast, many less-developed countries, including China, have sought to move to mass higher education, yet many still do not provide K-12 for all students.

The Bologna agreement and process started a new wave of international exchange in education by moving toward common credit mechanisms and opportunities to enroll in institutions across Europe. This process increased the appeal of EU universities to Chinese students as well. The high cost of American higher education has become a barrier for some international students. Ireland and most other Western European countries have maintained college affordability [42–44]. Declining college affordability is an additional factor in the US regression in access ranking compared to other OECD nations [45]. The narrowing of the high school curriculum to marginalize technical preparation has also influenced the reduction in the US in the percentage of high school graduates enrolling in college.

Ensuring socioeconomic and racial diversity in elite universities is a critical issue related to economic competitiveness and social mobility in the EU and the US. These aims influenced the exchange of Chinese college students to prepare coming generations of for engagement in a global economy [46]. Economic inequality within nations has been a motivating factor for reshaping university outreach to low-income students in developed countries throughout the global period [47,48]. Educational inequality between the northern and southern hemispheres continues to be challenging, especially for underdeveloped African countries [49].

2.3. Educational Policy, Social Stratification, and Educational Uplift

Nations’ policies on education and economic development routinely make assumptions about social structure and the capacity of families to acquire cultural capital for college.

In Europe, higher education offers postsecondary pathways for the working class that are no longer evident in the US. These divergent policy pathways may rest on different assumptions about social class as nations progress from empires to the breakdown of the neoliberal consensus. The shift to using debt as the low-cost mechanism for expanding access raises issues about cultural and social class differences across nations.

2.3.1. Social Class and Capital Formation across Generations

During the Cold War, the movement toward mass higher education in Western democracies was informed by a social theory of class structures. Talcott Parsons's [50] theory on social forces in economic development evolved into a social system theory [51] that was foundational to the logics underlying America's move to mass higher education [1]. Class structure was more rigid in Western Europe than in the US, where sociologists focused on social mobilities within nations [52] as a cross-generational issue of uplift and social class transitions [53]. Europe retained dual technical and academic pathways, an approach that reinforced class inequalities. In contrast, the US narrowed the K-12 curriculum, marginalizing the nation's working class, who were once vital in supplying the European rebuilding process. The social research informing policy development also differed in the US and Western Europe.

Structural social theories of uplift had informed US policy. James Coleman [54] was the first researchers to study white flight from cities to suburbs after the court-mandated desegregation of urban school systems, leaving many inner-city schools predominantly Black. Later, he theorized that social capital in families was central to building social capital for cross-generation uplift. Later, he argued that moving to locales with stronger social cohesion was the primary mechanism for uplift [55]. US education policy began to focus on the improvement of urban schools, but the new policies were largely ineffectual because of the increasing concentration of poverty [56,57]. Neoliberals argued that the marketization of urban schools would improve quality and reduce inequality [58–60]. Instead, these mechanisms accelerated gentrification in some urban neighborhoods and reproduced poverty in others [61,62].

Critical social theories focusing on class reproduction had more influence on post-secondary policy in Western Europe than in the US. Pierre Bourdieu's cultural capital theory [63–65] focused on education knowledge transmitted in families as a force in class reproduction. He argued that cultural transmission was more potent than educational content as an underlying force in inequality. These arguments informed activist research on student outreach in US high schools [66–68]. Adapted in Ireland, this community-based approach has had documented success across international contexts [44,69].

2.3.2. Emerging Inequalities in the Post-Neoliberal Period

Arguments about the role of social capital in educational uplift can provide insight into neoliberalism's impact on economic wellbeing across generations. Breen and Müller [70] found that Americans and Europeans born before 1950 had upward economic mobility, while those born afterward experienced downward economic mobility across generations. Specifically, the education gains across Western democracies did not improve the financial wellbeing of families, a reality facing most people in the workforce in these nations.

Amartya Sen [71] proposed a theory of human capabilities as educational and cultural support for wellbeing as an alternative to the human capital theory that has driven nations' economic and education planning since the Cold War. He based this idea on a comparison of states in India, where some regions were more resilient than others, a probable artifact of education [72]. Capabilities development was a guiding theory for Irish successes in low-income schools [48]. The capabilities approach merits consideration as governments and communities organize to overcome education gaps left in the aftermath of COVID-19.

3. Education Policies in Globalizing Nations

Expanding college opportunities beyond mass higher education poses new challenges for developing countries, especially given the growing inequalities within and across nations. The uncertainty recently infused into international trade and education alliances complicates but does not substantially alter available choices of financing strategies. Instead, awareness of shifting cultures within nations, their social structures, and their investments in K-12 and higher education affect the capacity to expand and equalize opportunities.

Historical and current practices of education finance across nations suggest four logical frames—socially progressive, strategic investment, privatized markets, and human capabilities (Table 2). National economic and education development policies usually demonstrate one or more of these frames in uniquely crafted national frameworks.

Table 2. Frames guiding in policy on economic and education development: social progress, strategic efficiency, privatized markets, and human capabilities.

Frames/Policy Aims	Economic Development	Education Development
<i>Social Progressive</i>	Educated public drives economic development; progressive taxes for social and economic development	Public systems expand opportunity; focus on cross-generation uplift
<i>Strategic Investment</i>	Public investments to address inequalities and promote nations' economic development agendas	Need- or merit-based programs support national aims; national K-12 and higher education policies
<i>Privatized Markets</i>	It relies on corporations, corporatization of the public sector, and reduced taxes for the elite class	Shifts costs of education from taxpayers to students and families; student loans and reduced need-based aid
<i>Human Capabilities</i>	Focusing on building human capabilities is more productive than treating people as "capital."	Using social networks with both public and private investment to address inequalities

A comparison of OECD nations reveals that Canada and Mexico had not followed the US model toward privatization of higher education by the early 2000s, but many other Pacific region nations had chosen this path [73]. Before examining other regions, I review the historical transition in the federated US system and explain how marketization occurred.

While the globalization of universities uses indicators for comparing universities, the transitions in international alliances have illuminated the challenges facing institutions in the post-neoliberal transition. I use these frames to examine policy transitions that have affected economic and educational systems in nations engaged in the global economy: the US, the EU, South Asia, and post-Soviet countries, explicitly considering China within Central Asia.

3.1. Transitions in the US Decentralized Market System

The US is a federation of 50 state public education systems with independent colleges and proprietary postsecondary institutions. The colonies developed education as faith-based before federal involvement began with land grant colleges during the Civil War. By the 1870s, all states had "free schools" using the cross-sectorial Protestant model, an approach resisted by Catholics [74]. Thus, when states began funding public schools in the late nineteenth century, Catholic schools remained "private" without public funding.

From the late seventeenth through the early twentieth century in the US, public colleges evolved as mostly independent campuses that lobbied state governments for funding. States developed higher education systems in the late 20th century, exemplified by California's master plan in 1960 [75]. Most states used *social progressive* educational and economic development concepts when developing their state systems from the 1950s through the 1970s [76].

The federal government began funding public education systems by making *strategic investments*, with the GI Bill supporting college education for returning veterans after WWII. In response to challenges facing the nation and states after desegregation of schools

began, federal initiatives intended to promote equity through supplemental programs for low-income children in K-12 schools and need-based aid for low-income college students were developed. During the height of this strategy in the 1970s, states peaked in race equity in college enrollment and high school graduation rates [39]. The neoliberal shift in federal policy in the 1980s eventually transformed states' regulation of K-12 education and their financing of public higher education, moving many states toward *privatized markets*.

First, the federal government shifted federal K-12 policy from emphasizing supplemental education for high-need students to mandating STEM pre-collegiate programs for all students, based on *A Nation At Risk*. The STEM agenda emphasized raising math and science requirements for all high school students, using tests to track school performance, and markets to promote excellence through school-wide programs and charters. High school graduation rates dropped in most states for a few years after math requirements were raised [38].

Second, the Reagan administration shifted the emphasis from need-based grants to loans. The decline in federal grants corresponded with rising tuition as students amassed excessive debt. Many states responded to cuts in federal need-based aid by letting institutions raise student aid so that they could replace those students lost when the federal government cut need-based grants. These practices could not offset high student debt [38,77].

There is substantial variability in the extent to which states maintained progressive social finance policies for education. In the 1980s, Minnesota adopted a progressive strategic model to emphasize higher tuition and higher need-based grants, optimizing Pell revenue and ensuring more equity in college access [78,79]. Indiana balanced public finance strategies to improve college enrollment in the 1990s, as did North Carolina in the early 2000s [80]. The episodic nature of state financing is an artifact of shifts in the policy in state legislatures and alliances between policymakers and engaged scholars.

A *human capabilities* frame emerged as a response to inequalities created by rising college costs and the decline in federal grants. The State of Indiana combined social support and grant aid in the Twenty-First Century Scholars (TFCS) program, as did the Gates Foundation's scholarships for low-income minorities and funding for school reforms student grants in Washington. The social support provided by these programs positively influenced the formation of social and cultural capital, empowering students to make choices in their interests instead of responding to social or family expectations [38]. TFCS was the model for GEAR UP, a federal program providing social support for students in low-income schools. There were also numerous community-based nonprofit programs providing student support. Targeted programs provided advantages, compared to those communities and schools that did not have them. In the same period, states' education requirements and college finance strategies constrained high school graduation and college enrollment rates.

3.2. From the Marshal Plan to European Community

A comparison of OECD nations on enrollment percent in higher education and the extent of public student subsidies showed that, by 2005, most European nations resisted privatization [73]. The progressive social frameworks adopted after WWII had maintained most EU countries' commitment to low tuition through funding institutions and providing subsidies to students based on financial need. Resistance to privatization was rooted in strategies set in motion by the process of rebuilding through the Marshall Plan and political values within nations [81]. The Marshall Plan brought the ideals of Roosevelt's New Deal to Europe as the core of the rebuilding strategy after the war.

Scandinavian nations have maintained progressive education finance and social policies—investing in education and social programs with progressive taxation—better than nations in any other subregion globally [41,42]. In the early 2000s, Sweden, Finland, Denmark, Iceland, and Belgium were nations with high collegiate access and high support for postsecondary institutions and students [73]. They are part of the EU, but Sweden and Finland are only now seriously considering joining NATO because of the Ukraine War [82].

Greece was among the nations with the highest in college access and highest subsidies for postsecondary students in the 2000s [73], but is facing new challenges. The Truman Doctrine and the Marshall Plan influenced reforms in Greece after WWII [83]. However, after financial restructuring to pay off debts, Greek higher education has confronted neoliberal laws and “free-market tricks” [84] (p. 277). These shifts came at a time when Greece had more college demand from Syrian immigrants than other European nations [85].

Not all European nations adhered to progressive social ideals, however. France, Germany, and the UK were nations with lower-than-average access [73]. France faced cultural conflicts with immigrants. Germany underwent a merger of the eastern and western parts after the wall fell. The UK has been a leader in neoliberal globalization, symbolized by Brexit and the withdrawal from the EU. These cases illustrate that national identities, cultures, and educational histories play a substantial role in shaping competitiveness in college access.

Among nations internationally, Ireland stands out as a nation that has used the *human capabilities* approach to expand access, rising to the top of the OECD by 2019 [45,62]. Building on the successful outreach to low-income-serving schools by Trinity College Dublin, e.g., [48], Ireland funded outreach to and social support of students in low-income schools through university partnerships across the nation. Ireland maintained college affordability for low-income students, creating financial access for prepared low-income students. Most EU nations used a combination of grants and low college costs to reinforce a social structure that included academic pathways into the elite class and technical pathways strengthening and sustaining the working middle class.

3.3. South Asia and the Pacific Region

The public finance strategies used in the developed countries in the Pacific region are part of the context for developing privatized financing strategies, shifting the cost of higher education from taxpayers to students. Other nations in the region have moved cautiously toward loans. They use research to inform strategic plans and government investment to develop new institutions and programs. A new wave of cross-national studies reveals cultural adaptations and social resistance to the market model in regional countries engaged in the global economy as newly industrialized nations.

3.3.1. Higher Education Finance in the Pacific Region

More than in other global regions, OECD nations on the Pacific Rim had emphasized loans to help lower low-income college students’ net costs, a strategy advocated in the Washington Consensus. Korea, Japan, Australia, and the US were the most privatized nations in the Pacific [73]. Like the US example, Korea, Australia, and Japan were in the top half for access. In contrast, Japan joined Mexico and Portugal as highly privatized OECD nations with lower-than-average college continuation rates. The Australian model of income-contingent repayment is an option being considered by some Asian countries as they review hardships caused by conventional loans.

The efficacy of loans has also become a topic of inquiry in the region. In Japan, traditional time-bound repayment has caused hardships for graduates, and the nation is considering shifting to income-contingent repayment as a national strategy [86]. A South Korean study found that borrowers concerned about their ability to repay had less social wellbeing, including feelings of despair [87]. The shift to loans over socially progressive forms of finance differentiates the Pacific economies from Europe. Students from lower- and middle-income families are more likely to depend on loans than wealthy families. Thus, nations shifting to privatization use debt to substitute for tax revenue and place the burden on students concerned about their ability to repay. Cross-generation decline—a pattern evident in the US and Europe [52]—is a possibility in many nations engaged in the global economy.

3.3.2. Overeducation in India

India had been the pride of British colonialism. Mohandas Gandhi organized early protests for independence, exhibited patience and support for the Empire during WWII, and became a spiritual leader in the struggle for independence after the war. His writings on nonviolence [88] inspired the Civil Rights movement in the US. After his undergraduate education in India, he obtained a law degree in England and went to South Africa, where he started organizing Indians using nonviolence. His educational journey from India to England was not uncommon for upper-caste students in India in the late nineteenth century. Colleges and universities continued developing in India in the early 20th century. By 1980, India had an over-educated population for the nation's employment capacity, especially before economic globalization [89].

The financing of education in India has continued with the traditional model, and India exported educated professionals through the late 20th century. Financial aid also ensures access, especially for students of the untouchable caste [90]. With its surplus of educated citizens, India was well-positioned for the early global economic boom. The process of decentralizing production took advantage of low-cost labor. The English-speaking education tradition aided the decentralization of the service industry. As industrialization continued in Asia, India's economy fell behind China [91].

The transition from a British colonial economic system to a market-based economy and the education system of the neoliberal period has created growing problems for higher education in India. Students coming from rural areas and attending lower-quality institutions are not repaying loans, sometimes willfully [92]. The expansion of higher education has been chaotic and unplanned, adding to the complexities of the market. India has public, public-aided private, and private colleges. India is also a federation of states with different educational and economic policies. College costs are a factor in college choice for high-merit students, but middle- or low-achieving students can end up in high-cost colleges with high loan burdens [92,93]. Thus, students' social contexts have become an increasingly important issue in the market system of higher education, adding substance to arguments that the system needs reform.

3.3.3. Alternative Narratives about Globalization Strategies in Southeast Asia

The "Washington Consensus" advocated student loans to expand higher education. There are two narratives among South Asian nations, one that embraced the Washington Consensus, and the other resisted adherence to this neoliberal vision.

The Association of Southeast Asian Nations (ASEAN) was formed in 1967 to promote technical education and economic development in Malaysia, Thailand, Singapore, and Taiwan. Known as "ASEAN Tigers," they engaged in the first period of global industrialization (starting about 1980), creating alliances with international corporations to manufacture products for export in the early supply chain. Thailand embraced student loans to provide access for high-poverty students, but there is now a concern about the needs of groups marginalized by the policy [94]. Medical educators in Singapore have concerns about the limitations of career choices for graduating doctors [95]. Scholars in Malaysia have begun to explore why low-income students form the intent to default on loans, a growing problem in the nation [96]. Like the developed nations in the Pacific region, ASEAN nations have discovered new challenges after following the Washington Consensus on higher education development.

Other nations have been slower to embrace loans; their national strategies seem linked to national cultures. In a country caught in a swirl at the edge of Islamic fundamentalism and Middle Eastern wars, Pakistani policymakers questioned the viability of using student loans to expand college access [97]. With forethought, one recent Pakistani study examined how personalities (e.g., extroversion) related to students' financial planning [98], an issue related to the eventual implementation of loans. Following the lead of Thailand and Korea, the Philippines developed a financial assistance strategy in 2016 to provide adequate funding expansion. Evaluators hope to monitor implementation to ensure "justice" prevails

in the transition from free colleges in the Philippines [99]. The research on loans in South Asian nations reveals cautionary inquiry into the strengths and limits of loans.

3.4. Post-Soviet Transitions in Postsecondary Education

With the breakdown of the USSR, the Soviet system ended in Eastern Europe. The Soviet model centralized planning and control. This approach to institutional development did not emphasize markets and students' freedom to choose institutions. Marketization using loans to expand access was not a preferred method of finance.

The Soviet central control approach during the Cold War allowed for coordinated expansion in "factory-like" institutions. The Soviet model also created research institutions separate from universities, inhibiting the development of globally competitive research capabilities in post-Soviet universities during globalization [100]. The transformation from central control to market systems was not easy. There was no "Marshall Plan" for building institutions during the Cold War or after the transition to democratic forms of governance, complicating the transition to the post-Soviet era in higher education systems competing in economic and educational spheres with Western Europe and the US [99].

The OECD data reveals variabilities in programs through the early transition period, and scholarly research reveals some of the challenges facing post-Soviet nations. Like the Western European nations noted above, post-Soviet countries were low on the privatization scale in the mid 2000s [73]. However, they were also lower in enrollment rates, indicating they were slower to adapt to the push toward universal access in the early globalization period.

One of the problems has been corruption in the administration of institutions, with wealthy families buying access [101,102]. A mixed-methods study of 14 Ukrainian universities before the current war illuminates the risks facing post-Soviet nations:

Local reform efforts are viewed as being anchored in the outdated 'factory-model' of higher education and generate more losses than gains in regional and global competitions. The discussion focuses on the argument that a failing higher education system is likely to lead to a failed state. One of the contributors to this failure is the lack of a globally conditioned set of indicators, independent of local politics. The world-class university model could become a major reform driver, but it could also be thwarted by a legacy of entitlements, corruption, and poor performance. [102] (p. 249)

Chankseliani argues that post-Soviet universities face a "double disadvantage" caused by "Russian imperialism and Western academic colonialism" [103] (p. 265). These insights touch the core issue. In contrast, the US' higher education system has weathered tuition and admissions scandals in the past decade [104,105] because of the US' independent court system. The weaknesses of democratic institutions slowed the transition in Eastern European universities, but other factors contributed to the challenges they faced.

US standards became the basis of the global ranking of universities. At the same time, most high-ranking global universities have local (state or community) links and support. The 'bean counting' in academic indicators—publishing in highly ranked journals, for example—was never the core value of Soviet academic life. The older Soviet factory model produced graduates but did not generate knowledge to support local democratic institutions, a core value in the American universities. If a factory-like emphasis on producing journal articles prevails over reason, the global system of democratized institutions is at further risk. The journal rankings often marginalize critical thinking when these bean-counting norms are dominant in US universities.

3.5. Economic and Educational Transitions in China and Central Asia

Urbanization, strategic positioning, trade, and competition between Russia and China have influenced development in Central Asia since WWII, with a shift in the balance of power toward China in trade and economic growth since the breakdown of the Soviet Union [106,107]. China's ascent in world trade in Central Asia was part of its emergence as a dominant global economic power.

While Eastern European nations embraced democratic ideals after the breakup of the Soviet Union, China pioneered a different course. As China's boundaries in Central Asia expanded, it promoted opportunities for immigrant Han populations over indigenous residents in the regions it governs. This practice has been especially problematic and visible internationally in China's Xinjiang Uygur Autonomous Region. Inequality in college access for Uyghur students has become a vital issue of increasing concern in the international discourse on education equality [108,109].

China departed from the path taken by post-Soviet nations in higher education finance and institutional governance. China followed the Soviet approach with dual academic and technical secondary and postsecondary education and has retained dual collegiate pathways [110]. China has loan programs, has studied the repayment burdens [15], and is currently considering the Australian approach to debt repayment [16]. After the USSR broke up, China did not convert to democratic government and did not engage in globalization until the second wave emphasized international corporatization rather than political institutions [9]. China balanced the features of public and private higher education systems as it expanded rapidly this century [110]. Even when compared to other rapidly growing higher education in other East Asian nations, China made a remarkable and rapid transition, expanding educational opportunities and access as it developed new forms of decentralization and innovation [111].

The Chinese Communist Party has evolved a dual system of governance, with a parallel Party hierarchy and governing structures within universities, private corporations, and other entities. The hybrid form of academic administration in China is unique. It has allowed universities to respond to local and global developments, undertake new educational and research initiatives, and build international academic partnerships. Yet, the Communist Party has made demands on academic research in many fields, including social scientists engaged in studies of education reforms. National plans, along with Communist Party priorities, can constrain content and interpretations as part of internal reviews of academic papers in social sciences, sometimes increasing uncertainty in external reviews by international journals.

3.6. Education Development Strategies and Issues

This review illustrates that strategies for educational development vary substantially across regions and nations. The tension between traditional and market-based public finance strategies for expanding access was a source of conflict during the neoliberal transition. As we enter the post-neoliberal period, comparisons of contexts take on a renewed importance, especially concerning the rights of people in this new period. In addition to comparing the expansion of progressive education using free college, we have several examples of loan adoption at the national level, the approach recommended as part of the Washington Consensus. Since nations widely adopted student loans in the Pacific region, evidence about social issues emerged after countries adopted this policy. This review reveals:

- The movement toward education marketization, especially using loans for access in the Pacific region, raised social issues and inequalities, which have been examined by social scientists across these nations.
- Maintaining both academic and technical options at the secondary and postsecondary levels has facilitated a greater expansion of education than the American model, which emphasizes collegiate academic preparation and reduces tech prep.
- However, maintaining dual academic and technical pathways reinforced social class stratification in Western Europe, a form of social inequality.
- The history of central control in Eastern European post-Soviet countries complicated transitions to democratic education markets.
- Urbanization in China marginalized educational opportunities for the children of urban immigrants and created barriers to access for some social groups. New policies providing universal access to K-8 schools in China break down some barriers.

Addressing social issues emerging from neoliberal policies should be foundational in social research during this new period. Research on diverse groups within a nation can inform the development and change of education policy in countries, provinces, and states. Social research can also inform social initiatives that empower people to overcome barriers and expand and equalize chances for education success and economic wellbeing. A human-capabilities approach to social and policy research can inform interventions seeking to promote opportunities within the constraints of educational systems in rapidly changing times.

4. Building Human Capabilities

Research on capabilities can inform public policy. This special issue of *Education Science* focuses on research that informs social action to build human capabilities for people left behind in their local context and promotes learning across contexts.

Human capabilities emerged from comparisons of states in India and women's opportunities in Islamic countries [112–114]. Nussbaum argued that women had a right to education to a level needed to support a family, a threshold of wellbeing not met in countries that denied education to women. Nussbaum [112,113] focuses on health, education, faith, and other freedoms and responsibilities. Building on her ideas, the capabilities noted in Table 3 relate to education and career pathways, along with localized social support for actualizing them. Local schools and community organizations are at the center of this approach. Their capacity to organize interventions is enhanced by investment from the government, businesses, and foundations, including university–school partnerships that provide information and local groups providing mentoring and social support (Table 3).

Table 3. Human-capabilities framework for addressing educational inequalities: assessing gaps and opportunities for social support and networking.

Capability/Strategy	Assess Capabilities Gaps	Build Support Networks
Financial Wellbeing	Minimum basic income for subsistence for individuals and families	Local agencies, businesses, schools, health care, and social services provide safety nets
College Preparation	Local educational opportunities through K-12 schools, including localized preparation for college and work opportunities	Community engagement in schools, providing supplemental support for engaged learning, social services, and networking
College Opportunity	Access to college, either academic or career education; guaranteed financial aid covering tuition when families cannot afford college costs	Social networks provide local and regional support; college networks linked to communities; technology access for distance learning
Career Pathways	Access to local, regional, and global collegiate career pathways; appropriate employment opportunities	Partnerships among schools, colleges, governmental agencies, and businesses supporting local economic and social development
Realistic Information about Opportunities	Realistic information about education, health, and career; support for realistic self-assessment	Local, regional, national, and global networks provide access to information on pathways
Social Support Networks	Opportunities to support peers and rising generations through mentoring and social support	Churches, schools, community centers, and businesses provide mentors for social support

Comparing strategies used to support marginalized students and communities in Ireland and the US [61] reveals no simple solutions to K-12 preparation and access inequality. Of course, the US is much larger but about half of the states have more population than Ireland. A comparison of US states also shows that states that coordinated student aid funding with rising costs and provided social support saw more substantial gains in college enrollment rates than comparable states [43,114].

The human-capabilities approach provides workable means for research informing policy and practice. Studies informing policymakers in Ireland, England, and the US confirm the workability of this approach in raising capabilities (preparation, access, and college success) for groups that would likely otherwise be left behind [9,69,115]. Students' engagement in encouragement and support services improves the odds of college enrollment [47]. Research informs practitioners about what does not work as intended, why this is the case, and alternative policies and practices. However, substantial changes will likely be needed to transport innovations across contexts, even when successful interventions occur.

In addition, and perhaps more importantly, action studies informing social support projects help expand and refine services and the quality of information and mentoring they provide. The global experience of the move to marketization through student loans in higher education raises differing social issues across nations. Consider the example of possible social interventions that would minimize the negative consequences of growing student debt, a problem of emerging importance across countries in the Pacific region. The economic wellbeing of students who graduate with debt, as measured by their ability to support their families, is a primary indicator in the human-capabilities framework (Table 3). Since local and national economies vary substantially, the local remedies to this challenge must differ to fit policy circumstances and cultures.

5. Moving Forward

Knowledge of local contexts is vital to designing successful interventions that build human capabilities for marginalized groups in their locales. Both qualitative and quantitative studies can inform local and government action. Compared to Western nations, there is only modest prior research on capabilities development among Chinese school-age and college-age youth students. Studying social class and education uplift may become a priority for Chinese education scholars and social scientists. For example, in a large-scale qualitative study of Chinese undergraduates, Ciupak [44] documented differences in college preparation and pathways for students from peasant backgrounds, working-class families, and resources with the resources for studying abroad. She also encouraged systematically studying these issues as China expands educational opportunities [116].

Building an international community of scholars who share interests and research that supports and informs human-capabilities development is crucial. This approach provides a means of engaging scholars in educational improvement in China [117], as it has in the US and Ireland. Beijing Normal University's Center for Education Development and Social Justice aims to promote a new generation of research. This volume starts a concerted effort to promote this theme. In the concluding chapter, the editors use the three frameworks—global transition, policy frames, and human capabilities—to review these articles and to illustrate an integrative approach to policy studies.

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References

1. Trow, M. *Problems in the Transition from Elite to Mass Higher Education*; McGraw-Hill: New York, NY, USA, 1974.
2. Meyer, H.-D.; Benavot, A. *PISA, Power, and Policy: The Emergence of Global Educational Governance*; Symposium Books: Providence, RI, USA, 2013.
3. Meyer, H.-D.; St. John, E.P.; Chankseliani, M.; Uribe, L. *Higher Education Access at the Intersection of Excellence, Efficiency, and Fairness. The Role of Business, Government, and Civil Society*; Sense Publishers: Boston, MA, USA, 2013.
4. Smith, A. *The Wealth of Nations*; Collier: London, UK, 1790. Available online: <https://archive.org/details/wealthofnations0/smituoft> (accessed on 2 February 2023).
5. Özmucur, S.; Pamuk, Ş. Real wages and standards of living in the Ottoman Empire, 1489–1914. *J. Econ. Hist.* **2002**, *62*, 293–321. [CrossRef]
6. Pamuk, Ş. The Ottoman Economy in World War I. In *The Economics of World War I*; Cambridge University Press: Cambridge, MA, USA, 2005; pp. 112–136. Available online: https://www.google.com/books/edition/The_Economics_of_World_War_I/rpBbX3kdnhgC?hl=en&gbpv=1&dq=6.%09Pamuk,+Ş.+The+Ottoman+Economy+in+World+War+I.+In+The+Economics+of+World+War+I%3B+Cambridge+University+Press:+Cambridge,+MA,+USA,+2005%3B+pp.+112--136.&pg=PA112&printsec=frontcover (accessed on 2 February 2023).

7. Gardner, J.A. Illiberalism and authoritarianism in the American states. *Am. UL Rev.* **2020**, *70*, 829. Available online: <https://heinonline.org/HOL/LandingPage?handle=hein.journals/aulr70&div=22&id=&page=> (accessed on 2 February 2023). [CrossRef]
8. Rodríguez, J.P. The politics of neoliberalism in Latin America: Dynamics of resilience and contestation. *Sociol. Compass* **2021**, *15*, e12854. [CrossRef]
9. Chen, W.; St. John, E.P.; Li, X.; Hannon, C. Introduction. In *Actionable Research for Education Equity and Social Justice: Higher Education Reform in China and Beyond*; Chen, W., St. John, E.P., Li, X., Hannon, C., Eds.; Routledge: London, UK, 2018; pp. 11–19.
10. Stengel, R. *Information Wars: How We Lost the Global Battle against Misinformation and What We Can Do about It*; Atlantic Monthly: New York, NY, USA, 2019.
11. Grofman, B. *Prospects for Democratic Breakdown in the United States: Bringing the States Back in Cambridge Core*; Cambridge University Press: Cambridge, UK, 2022. Available online: <https://www.cambridge.org/core/journals/perspectives-on-politics/article/prospects-for-democratic-breakdown-in-the-united-states-bringing-the-states-back-in/8C2D8B0E554A611AB1854F5491E4B7C9> (accessed on 2 February 2023).
12. Rostow, W.W. *The Stages of Economic Growth: A Non-Communist Manifesto*; Cambridge University Press: Cambridge, UK, 1960.
13. Stiglitz, J.E. *Globalization and its Discontents*; W.W. Norton: New York, NY, USA, 2002.
14. Gore, C. The rise and fall of the Washington Consensus as a paradigm for the developing countries. *World Dev.* **2000**, *28*, 789–803. Available online: <https://www.sciencedirect.com/science/article/pii/S0305750X99001606> (accessed on 2 February 2023). [Cross-Ref]
15. Partner, R. The Washington Consensus. In *Regional Development Banks in the World Economy*; Cambridge University Press: Cambridge, MA, USA, 2021; p. 243.
16. St. John, E.P. *Co-Learning in Higher Education: Community Wellbeing, Engaged Scholarship and Creating Futures*; Routledge: London, UK, 2023.
17. OECD. *Latin American Economic Outlook 2021: Working Together for a Better Recovery*; OECD Publishing: Paris, France, 2021. [CrossRef]
18. Galston, W.A. The Populist Challenge to Liberal Democracy. Brookings. Available online: <https://www.brookings.edu/research/the-populist-challenge-to-liberal-democracy/> (accessed on 17 April 2017).
19. Thelin, J.R. *A History of American Higher Education*; Johns Hopkins University Press: Baltimore, MD, USA, 2011.
20. Clark, B.R. Concepts, models, and perspectives. In *Academic Power: Patterns of Authority in Seven National Systems of Higher Education*; Van de Graff, J.H., Ed.; Praeger: New York, NY, USA, 1978; pp. 164–190.
21. Whitesides, G. *Science and American Foreign Relations since World War II*; Cambridge University Press: Cambridge, MA, USA, 2019.
22. Catchpole, J.E. *The International Space Station: Building for the Future*; Springer Science & Business Media: Berlin/Heidelberg, Germany, 2008. Available online: <https://www.sciencedirect.com/science/article/abs/pii/S0094576596000562> (accessed on 2 February 2023).
23. Huang, Y.; Lin, C.; Liu, S.; Tang, H. Supply chain linkages and financial markets: Evaluating the costs of the US-China trade war. In *Trade War: The Clash of Economic Systems Endangering Global Prosperity*; 2019; pp. 65–72. Available online: https://cepr.org/system/files/publication-files/60137-trade_war_the_clash_of_economic_systems_threatening_global_prosperity.pdf#page=74 (accessed on 2 February 2023).
24. Bell, D. *The Radical Right: The American Right Expanded and Updated*; Doubleday Publishing House: New York, NY, USA, 1963.
25. Marcuse, H. *One Dimensional Man: Studies in the Ideology of Advanced Industrial Society*; (first edition in 1964); Beacon Press: Boston, MA, USA, 1991.
26. Drury, S.B. *Leo Strauss and the American Right*; St. Martin's Press: New York, NY, USA, 1997.
27. Strauss, L. *The History of Political Philosophy*; University of Chicago Press: Chicago, IL, USA, 1963.
28. Bennett, W.J. Text of Secretary Bennett's speech on college costs and U.S. student aid. *Chron. High. Educ.* **1986**, *33*, 20.
29. Bloom, A. *The Closing of the American Mind*; Simon and Schuster: New York, NY, USA, 1987.
30. National Commission on Excellence in Education. *A Nation at Risk: The Imperative for Educational Reform*; U.S. Government Printing Office: Washington, DC, USA, 1983. Available online: http://edreform.com/wp-content/uploads/2013/02/A_Nation_At_Risk_1983.pdf (accessed on 2 February 2023).
31. Oakes, J. *Keeping Track: How Schools Structure Inequality*; Yale University Press: New Haven, CT, USA, 2005.
32. Oakes, J. Critical Conditions for Equity and Diversity in College Access: Informing Policy and Monitoring Results. 2003. Available online: <https://escholarship.org/content/qt427737xt/qt427737xt.pdf> (accessed on 2 February 2023).
33. Oakes, J. Keeping track: Structuring equality and inequality in an era of accountability. *Teach. Coll. Rec.* **2008**, *110*, 700–712. [CrossRef]
34. Sumption, M.; Forde, C.; Alberti, G.; Walsh, P.W. How Is the End of Free Movement Affecting the Low-Wage Labour Force in the UK? In *The Economics of Brexit: What Have We Learned*; 2022. Available online: https://kclpure.kcl.ac.uk/portal/files/175707837/Economics_of_Brexit.pdf#page=91 (accessed on 2 February 2023).
35. Shin, J.C.; Toutkousian, R.K. The past, present, and future of university rankings. In *University Rankings: Theoretical Basis, Methodology, and Impacts on Global Higher Education*; Shin, J.C., Toutkousian, R.K., Teichler, U., Eds.; Springer: New York, NY, USA, 2011; pp. 1–18.
36. Wan, X. Chinese students wary of studying in the United States. *Int. High. Educ.* **2020**, *101*, 26–27. Available online: <https://ejournals.bc.edu/index.php/ihe/article/view/14281> (accessed on 2 February 2023).

37. Wang, Y. Israel-China relations in the Trump era. *J. Mod. Jew. Stud.* **2021**, *20*, 277–300. [CrossRef]
38. St. John, E.P.; Daun-Barnett, N.; Moronoski-Chapman, K. *Public Policy and Higher Education: Reframing Strategies for Preparation, Access, and Success*, 2nd ed.; Routledge: London, UK, 2018.
39. Piketty, T. *Capital in the 21st Century*; Belknap Press: New York, NY, USA, 2014.
40. Auzinger, M.; Ulicna, D.; Messerer, K. (Eds.) European Commission, Directorate-General for Employment, Social Affairs and Inclusion. In *Study on Higher Vocational Education and Training in the EU: Final Report*; Publications Office of the European Union: Luxembourg, 2016. Available online: <https://op.europa.eu/en/publication-detail/-/publication/cf35147d-0a60-11e7-8a35-01aa75ed71a1> (accessed on 2 February 2023).
41. Javala, M. The Finnish model of higher education access: Does egalitarianism square with excellence. In *Higher Education Access at the Intersection of Excellence, Efficiency, and Fairness. The Role of Business, Government, and Civil Society*; Meyer, H.D., Ed.; Sense Publishers: Rotterdam, The Netherlands, 2013.
42. Moene, K.O.; Pagrotsky, L.; Soros, G. Scandinavian Equality. A Prime Example of Protection without Protectionism. In *The Quest for Security*; Columbia University Press: New York, NY, USA, 2013; pp. 48–88.
43. O'Sullivan, K.; Mulligan, R.; Kuster, M.; Smith, R.; Hannon, C. A college focused mentoring programme for Students in socioeconomically disadvantaged schools: The impact of mentoring relationship and frequency on college going confidence, application efficacy and aspirations. *Widening Particip. Lifelong Learn.* **2017**, *19*, 113–141. Available online: <https://www.ingentaconnect.com/content/open/jwpl/2017/00000019/00000002/art00007> (accessed on 2 February 2023). [CrossRef]
44. Ciupak, Y.Z. *On the Nexus of Local and Global: Chinese Higher Education and College Students in the Era of Globalization. Issues in Globalization and Social Justice: Comparative Studies in International Higher Education*; AMS Monograph Series Volume 3; AMS Press, Inc.: New York, NY, USA, 2017.
45. OECD. *Education at a Glance: OECD Indicators*; OECD Publishing: Paris, France, 2022. Available online: <https://www.oecd.org/education/education-at-a-glance/> (accessed on 2 February 2023).
46. Hollis, K. A qualitative study of mobility and preparation among partnership program and regular admission Chinese students. In *Actionable Research for Education Equity and Social Justice: Higher Education Reform in China and Beyond*; Chen, W., St. John, E.P., Li, X., Hannon, C., Eds.; Routledge: London, UK, 2018; pp. 226–243.
47. Dalton, R.; St. John, E.P. *College For Every Student: An Educator's Guide for Building College and Career Skills*; Eye on Education/Taylor & Francis: Abingdon, UK, 2017.
48. Hannon, C. *Capital, Culture, and Capabilities: A Human Development Approach to Student and School Transformation*; Vernon Press: Wilmington, DE, USA, 2019.
49. Girmay, F.; St. John, E.P. College choice in global markets: Remixing migration, education, and human rights. In *Actionable Research for Education Equity and Social Justice: Higher Education Reform in China and Beyond*; Chen, W., St. John, E.P., Li, X., Hannon, C., Eds.; Routledge: London, UK, 2018; pp. 109–132.
50. Parsons, T. The Place of Ultimate Values in Sociological Theory. *Int. J. Ethics* **1935**, *45*, 282–316. [CrossRef]
51. Parsons, T. *Action Theory and the Human Condition*; Free Press: New York, NY, USA, 1978.
52. Brooks, R. Higher education mobilities: A cross-national European comparison. *Geoforum* **2018**, *93*, 87–96. Available online: <https://www.sciencedirect.com/science/article/pii/S0016718518301489> (accessed on 2 February 2023). [CrossRef]
53. Bukodi, E.; Paskov, M.; Nolan, B. Intergenerational class mobility in Europe: A new account. *Soc. Forces* **2020**, *98*, 941–972. Available online: <https://academic.oup.com/sf/article-abstract/98/3/941/5477829> (accessed on 2 February 2023). [CrossRef]
54. Coleman, J.S. *Equality of Education Opportunity Study*; ICPR 3689-v 3; Inter-University Consortium for Political and Social Research: Ann Arbor, MI, USA, 1966.
55. Coleman, J.S. Social capital in the creation of human capital. *Am. J. Sociol.* **1988**, *94*, S95–S120. [CrossRef]
56. Mirón, L.F.; St. John, E.P. Implications of the new global context for urban reform. In *Reinterpreting Urban School Reform: Have Urban Schools Failed, or Has the Reform Movement Failed Urban Schools?* SUNY Press: Albany, NY, USA, 2003; pp. 299–326.
57. Orfield, G.; Ashkinaze, C. *The Closing Door: Conservative Policy and Black Opportunity*; University of Chicago Press: Chicago, IL, USA, 1991.
58. Finn, C.E. Why we need choice. In *Choice in Education: Potential and Problems*; McCutchan Press: Oklahoma City, OK, USA, 1990; pp. 3–20.
59. Finn, C.E. Making school reform work. *Public Interest* **2002**, *148*, 85–96. Available online: <https://www.proquest.com/openview/e21d6ec2d3f885ac08fef8351f275d52/1?pq-origsite=gscholar&cbl=34750> (accessed on 2 February 2023).
60. Peterson, P.E. School choice: A report card. *Va. J. Soc. Policy Law* **1998**, *6*, 47–80. Available online: <https://heinonline.org/HOL/LandingPage?handle=hein.journals/vajsp1w6&div=10&id=&page=> (accessed on 2 February 2023).
61. St. John, E.P.; Bigelow, V.M.; Lijana, K.; Masse, J. *Left Behind: Urban High Schools and the Failure of Market Reform*; Johns Hopkins University Press: Baltimore, MD, USA, 2015.
62. St. John, E.P.; Girmay, F. *Detroit School Reform in Comparative Contexts: Community Action Overcoming Policy Barriers*; Palgrave Macmillan: New York, NY, USA, 2019.
63. Bourdieu, P. *Outline of a Theory of Practice*; Cambridge University Press: Cambridge, MA, USA, 1972.
64. Bourdieu, P. Cultural reproduction and social reproduction. In *Knowledge, Education, and Cultural Change*; Tavistock: London, UK, 1973; pp. 71–112.

65. Bourdieu, P. The school as a conservative force: Scholastic and cultural inequalities. In *Contemporary Research in the Sociology of Education*; Eggleston, J., Ed.; Methuen: North Yorkshire, UK, 1974.
66. St. John, E.P.; Hu, S.; Fisher, A.S. *Breaking through the Access Barrier: Academic Capital Formation Informing Policy in Higher Education*; Routledge: London, UK, 2011.
67. St. John, E.P. *Research, Actionable Knowledge and Social Change: Reclaiming Social Responsibility through Research in Partnerships with Practitioner*; Stylus: Sterling, VA, USA, 2013.
68. St. John, E.P.; Lijana, K.C.; Musoba, G.D. *Using Action Inquiry in Engaged Scholarship: An Organizing Guide*; Stylus: Sterling, VA, USA, 2017.
69. Hannon, C.; O'Sullivan, K. Taking action: The Irish case. In *College For Every Student: An Educator's Guide for Building College and Career Skills*; Dalton, R., St. John, E.P., Eds.; Eye on Education/Taylor & Francis: London, UK, 2017; pp. 132–157.
70. Breen, R.; Müller, W. *Education and Intergenerational Social Mobility in Europe and the United States*; Stanford University Press: Redwood City, CA, USA, 2020.
71. Sen, A. *The Idea of Justice*; Belknap: Cambridge, UK, 2009.
72. Sen, A. *Development as Freedom*; Anchor Press: New York, NY, USA, 1999.
73. St. John, E.P.; Kim, J.; Yang, L. Introduction. In *Privatization and Inequality: Comparative Studies of College Access, Education Policy, and Public Finance. Globalization and Social Justice: Comparative Studies in International Higher Education*; AMS Press, Inc.: New York, NY, USA, 2013; Volume 1, pp. 3–18.
74. Carper, J.C.; Hunt, T. *The Dissenting Tradition in Education*; Peter Lang: New York, NY, USA, 2007.
75. Smelser, J.J.; Almond, G. *Growth, Structural Change, and Conflict in California Higher Education*; University of California Press: Berkeley, CA, USA, 1974.
76. Halstead, D.K. *Statewide Planning in Higher Education*; Government Printing Office: Washington, DC, USA, 1974.
77. St. John, E.P.; Asker, E.H. *Refinancing the College Dream: Access, Equal Opportunity, and Justice for Taxpayers*; Johns Hopkins University Press: Baltimore, MD, USA, 2003.
78. Hearn, J.C.; Anderson, M.S. Integrating postsecondary education financing policies: The Minnesota model. In *Studying the Impact of Student Aid on Institutions. New Directions for Higher Education*; Fenske, R.H., Ed.; Jossey-Bass: San Francisco, CA, USA, 1989; pp. 55–74.
79. Hearn, J.C.; Anderson, M.S. The Minnesota finance experiment. In *Rethinking Tuition and Student Aid Strategies. New Directions for Higher Education*; St. John, E.P., Ed.; Jossey-Bass: San Francisco, CA, USA, 1995; pp. 5–26.
80. St. John, E.P.; Musoba, G.D. *Pathways to Academic Success: Expanding Opportunity for Underrepresented Students*; Routledge: London, UK, 2012.
81. Agnew, J.; Entrikin, J.N. *The Marshall Plan Today: Model and Metaphor*; Psychology Press: London, UK, 2004.
82. O'Dwyer, G. Finland and Sweden May Take Unhurried Route to NATO Membership. Defense News. 2022. Available online: <https://www.defensenews.com/global/europe/2022/03/04/finland-and-sweden-may-take-unhurried-route-to-nato-membership/> (accessed on 4 March 2022).
83. Hatzivassiliou, E. Greek reformism and its models: The impact of the Truman Doctrine and the Marshall Plan. *J. Mod. Greek Stud.* **2010**, *28*, 1–25. Available online: <https://muse.jhu.edu/article/386350> (accessed on 2 February 2023). [CrossRef]
84. Gounari, P. Neoliberalizing Higher Education in Greece: New laws, old free-market tricks. *Power Educ.* **2012**, *4*, 277–288. [CrossRef]
85. Saiti, A.; Chletsos, M. Opportunities and barriers in higher education for young refugees in Greece. *High. Educ. Policy* **2020**, *33*, 287–304. [CrossRef]
86. Armstrong, S.; Dearden, L.; Kobayashi, M.; Nagase, N. Student loans in Japan: Current problems and possible solutions. *Econ. Educ. Rev.* **2019**, *71*, 120–134. Available online: <https://www.sciencedirect.com/science/article/pii/S027277571730691X> (accessed on 2 February 2023). [CrossRef]
87. Kim, S.; Woo, M. College student loans and subjective wellbeing in South Korea. *J. Asian Sociol.* **2020**, *49*, 121–162. Available online: https://www.jstor.org/stable/26921155?casa_token=K52WeyFianQAAAAA%3AsZJzbEMkojcnSOHFZW12QfdTriZKUBtrcLvJddEcenMjTngpOeE2AGYLRxareY78Dwc3Qa3bpMaUpmZRCsS-JkBcuSV7a2rvqHF7RqscrRdV3Q6vAt (accessed on 2 February 2023).
88. Ghandi, M. *Mohandas Gandhi Essential Writings; Selected with an Introduction by J. Dear. Maryknoll*; Orbis: New York, NY, USA, 2002.
89. Heyneman, S.P. Investment in Indian education: Uneconomic? *World Dev.* **1980**, *8*, 145–163. Available online: <https://www.sciencedirect.com/science/article/pii/0305750X80900236> (accessed on 2 February 2023). [CrossRef]
90. Pathania, G.J.; Tierney, W.G. An ethnography of caste and class at an Indian university: Creating capital. *Tert. Educ. Manag.* **2018**, *24*, 221–231. [CrossRef]
91. Tilak, J.B. Dilemmas in reforming higher education in India. *High. Educ. Future* **2020**, *7*, 54–66. [CrossRef]
92. Tilak, J.B. Who goes to private colleges in India and why? Determinants of students' choice of engineering institutions in India. *Glob. Comp. Educ. J. World Council. Comp. Educ. Soc.* **2020**, *4*, 78–110. Available online: https://www.theworldcouncil.net/uploads/8/6/2/1/86214440/gejournal-wcces_vol4-nos1-2_sept2020.pdf#page=87 (accessed on 2 February 2023).
93. Chaiya, C.; Ahmad, M.M. The Student Loan Fund and the Education for All in Thailand. In *Education as the Driving Force of Equity for the Marginalized*; IGI Global: Hershey, PA, USA, 2022; pp. 135–157. Available online: <https://www.igi-global.com/chapter/the-student-loan-fund-and-the-education-for-all-in-thailand/296417> (accessed on 2 February 2023).

94. Fong, J.M.N.; Tan, Y.T.W.; Sayampanathan, A.A.; Mohan, N.; Koh, Y.Q.; Jang, J.H.J.; Tambyah, P.A. Impact of Financial Background and Student Debt on Postgraduate Residency Choices of Medical Students in Singapore. *Singap. Med. J.* **2018**, *59*, 647. Available online: <https://pubmed.ncbi.nlm.nih.gov/29876578/> (accessed on 2 February 2023). [CrossRef] [PubMed]
95. Ismail, S.; A Razak, N.A.; Shaidin, S.; Mohd Rafien, N.S.; Ismail, S. Determinants of Borrowers' Intentions on Educational Loan Repayment in Malaysia: An Empirical Investigation. 2021. Available online: <https://ir.uitm.edu.my/id/eprint/51127/> (accessed on 2 February 2023).
96. Sarwar, S.; Nadeem, M.S.; Khawar, M. A Critical Study of Students' Financial Issues in Higher Education in Pakistan. 2021. Available online: <http://ijses.com/wp-content/uploads/2021/10/52-IJSES-V5N9.pdf> (accessed on 2 February 2023).
97. Ghaffar, J.A.; Khattak, M.S.; Shah, T.A.; Jehangir, M. Impact of personality traits on financial planning: Empirical evidence from Pakistan. *J. Econ. Adm. Sci.* **2022**, ahead-of-print. [CrossRef]
98. Lomer, S.; Lim, M.A. Understanding Issues of 'Justice' in 'Free Higher Education': Policy, Legislation, and Implications in the Philippines. *Policy Rev. High. Educ.* **2021**, 1–30. [CrossRef]
99. Lovakov, A.; Chankseliani, M.; Panova, A. Universities vs. research institutes? Overcoming the Soviet legacy of higher education and research. *Scientometrics* **2022**, *127*, 6293–6313. [CrossRef]
100. Ivanova, M.N. Why there was no 'Marshall Plan' for Eastern Europe and why this still matters. *J. Contemp. Eur. Stud.* **2007**, *15*, 345–376. [CrossRef]
101. Round, J.; Rodgers, P. The problems of corruption in post-soviet Ukraine's higher education sector. *Int. J. Sociol.* **2009**, *39*, 80–95. [CrossRef]
102. Chankseliani, M. Charting the development of knowledge on Soviet and post-Soviet education through the pages of comparative and international education journals. *Comp. Educ.* **2017**, *53*, 265–283. [CrossRef]
103. Burazer, L. Attitudes to Education Reflected in the Context of the US College Admissions Scandal. *J. Foreign Lang.* **2020**, *12*, 95–112. Available online: <https://journals.uni-lj.si/Vestnik/article/view/9765> (accessed on 2 February 2023). [CrossRef]
104. Beaver, W. The student loan scandal. *Society* **2008**, *45*, 216–221. [CrossRef]
105. Libman, A.; Vinokurov, E. Is it really different? Patterns of regionalisation in post-Soviet Central Asia. *Post-Communist Econ.* **2011**, *23*, 469–492. [CrossRef]
106. Panncll, C.W.; Laurence, J.M. Urban transition and interstate relations in a dynamic Post-soviet borderland: The Xinjiang Uyghur Autonomous Region of China. *Post-Sov. Geogr. Econ.* **1997**, *38*, 206–229. [CrossRef]
107. Çaksu, A. Islamophobia, Chinese style: Total internment of Uyghur Muslims by the people's Republic of China. *Islam. Stud. J.* **2020**, *5*, 175–198. Available online: <https://about.scienceopen.com/privacy-policy/> (accessed on 2 February 2023). [CrossRef]
108. Wang, Y.; Ye, H.; Schapper, A. Multiculturalism and multilingual education for minority ethnic groups in China: Examples of Southwest China and Xinjiang Uyghur regions and the goal of educational equality. In *Learning from Difference: Comparative Accounts of Multicultural Education*; Springer: Cham, Switzerland, 2016; pp. 51–68. [CrossRef]
109. Rizvi, F. The ideology of privatization in higher education: A global perspective. In *Privatization and Public Universities*; Priest, D.M., St. John, E.P., Eds.; Indiana University Press: Bloomington, IN, USA, 2006; pp. 65–84.
110. Rong, L.; Chen, R. Educational Development in China: Policy and Access. In *Privatization and Inequality: Comparative Studies of College Access, Education Policy, and Public Finance. Globalization and Social Justice: Comparative Studies in International Higher Education*; AMS Press, Inc.: New York, NY, USA, 2013; Volume 1, pp. 105–138.
111. Marginson, S. Education, poverty, and east Asia development miracles. In *Rethinking Education and Poverty*; Johns Hopkins University Press: Baltimore, MD, USA, 2015; pp. 177–199.
112. Nussbaum, M.C. *Sex and Social Justice*; Oxford University Press: Oxford, UK, 1999.
113. Nussbaum, M.C. *Creating Capabilities: The Human Development Approach*; Belcamp Press: Cambridge, MA, USA, 2011.
114. Daun-Barnett, N.; St. John, E.P. Constrained Curriculum in High Schools: The Changing Math Standards and Student Achievement, High School Graduation and College Continuation. *Educ. Policy Anal. Arch.* **2012**, *20*, 5. Available online: <http://epaa.asu.edu/ojs/article/view/907> (accessed on 2 February 2023). [CrossRef]
115. Bray, A.; Hannon, C.; Tangney, T. Large-scale, design-based research facilitating iterative change in Irish schools—The Trinity Access approach. *Irish Educ. Stud.* **2023**, 1–22, ahead-of-print. [CrossRef]
116. Ciupak, Y.Z. Architecture of capitals: A rigorous qualitative inquiry framework and its application in China. In *Actionable Research for Education Equity and Social Justice: Higher Education Reform in China and Beyond*; Routledge: London, UK, 2018; pp. 244–272.
117. Chen, W.; Jun, Z. Improving equity in Chinese higher education through action research: Its content, possibilities, and issues. In *Actionable Research for Education Equity and Social Justice: Higher Education Reform in China and Beyond*; Chen, W., Ed.; Routledge: London, UK, 2018; pp. 135–159.

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Article

A Human Capability Perspective on the Progression of Low-SES Students to Higher Education in Ireland and the UK

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Abstract: This article focuses on targeted programs for low-SES students in two selective universities: Trinity College Dublin, the University of Dublin, Ireland (Trinity Access Programmes/TAP) and the University of Oxford, UK (Lady Margaret Hall Foundation Year/LMH FY). The programs were collaborative developments, as examples of the potential of learning and adaptation across geographical contexts. It poses two questions: (a) How did the admissions processes in both universities change to target low-SES students? (b) How do social and academic support services for low-SES students, provided by two universities, contribute to the development of student capabilities? The article draws on the capability approach as the evaluative lens used to explore the two programs. Findings indicate (a) innovative approaches to socio-economic assessment in both programs, resulting in effective targeting of low-SES students, (b) the scaling of the programs beyond their initial remit and (c) the emergence of specific student capabilities through their engagement in the programs.

Keywords: capability; education; inequality; justice; socio-economic status

1. Introduction

Higher education participation rates have reached a record high across the Organisation for Economic Cooperation and Development (OECD) countries. Young adults with degree-level qualifications constituted 48% of 25–34-year-olds in 2021 and reached rates of 69% in Korea and 66% in Canada. Despite this expansion across the OECD, a low-SES young person is less than one-half as likely to be in higher education compared with the proportion of low-SES families in the population. This compares with a high-SES young person, who is almost twice as likely to be in higher education [1]. The disparity in academic achievement between students from low-SES and high-SES backgrounds—the ‘socio-economic achievement gap’—is documented across a wide range of countries, and there is evidence it has increased in the last 50 years [2].

The economic returns of a higher education remain high. OECD evidence shows that, for young people, the higher their educational attainment at the start of the last economic crisis, the more likely they were to be employed throughout the Great Recession [3]. In Ireland, graduates hold almost a half of all jobs, although they comprise only one-third of the working age population, and their employment rate is 80%, against a 61% rate for the population at large [4]. Higher education confers other social and cultural returns, including better health, longer life expectancy and greater life satisfaction. Graduates are also more likely to participate in society through voting and volunteering [5].

While progression to higher education is the outcome of complex, interwoven factors both within and outside of school, many universities across the OECD have established targeted programs to tackle inequalities in higher education progression. This article is a comparative case study of the impact of two such programs: Trinity College Dublin (Trinity Access Programmes/TAP), Ireland and The University of Oxford (Lady Margaret Hall Foundation Year/LMH FY), UK. The programs were collaborative developments, as examples of the potential of learning and adaptation across geographical contexts.

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This article draws on the capability approach as the evaluative lens used to explore the qualitative outcomes of both programs. It poses two questions: (a) How did the admissions processes in both universities change to target low-SES students? (b) How do social and academic support services for low-SES students, provided by two universities, contribute to the development of student capabilities?

The article begins with an overview of ‘widening participation’ programs to improve access to higher education by low-SES groups in the UK and Ireland. It explores how the admissions systems within both universities were adapted to target low-SES students. It explains the materials and methods used in evaluating the two programs. It continues with an explanation of the emergent capabilities in low-SES students in both programs. Finally, it considers the contribution of the capability approach as an evaluative lens and the benefits of cross-national collaboration in tackling low-SES student higher education progression.

2. Widening Participation in Ireland and the UK

This section explains the access to higher education (HE) landscape in Ireland and the UK. Higher education access policy in both countries was developed in the late 1990s under the term ‘widening participation’ (WP). The approach to WP in both countries shares similarities. ‘Targeted programs’ between schools and universities were funded by government from the 1990s onwards. In both cases, regulatory frameworks have emerged to monitor and incentivise HEIs to further diversify their admissions intake. Unlike the UK, Ireland has remained a comparatively low-cost HE system, and maintenance grants are still available to low-SES students. While Ireland has a much smaller HE system, there has been much greater collaboration across the Irish HE system in developing shared admissions systems to target low-SES students.

2.1. Access to Higher Education in Ireland

In Ireland, 93% of students attend a state secondary school and 7% attend a private (fee-paying) or independent school. Ireland has recently launched its fourth National Access Plan. Secondary-school completion rates have risen to 90% and 64% of young adults progress to higher education [6]; however, a number of surveys show that there are significant, and persistent, disparities in social class participation in higher education [6–12]. Twenty-seven per cent of low-SES students progressed to higher education in 2017 [13]. In 2020, there were 4.9 students from disadvantaged areas to every 10 students from affluent areas [6].

Higher education institutions (HEIs) focus on widening the participation rates of low-SES students through a combination of educational outreach programmes and diversified admissions routes. The standard outreach model provides a range of educational opportunities, including visits to the HEI’s campus, learning supports, foundation courses to help bridge the gap between school and HE, and contextual admission routes to access “targeted” places in HE institutions.

Ireland embarked on a policy of funding “targeted” widening participation programmes between schools, community groups and HEIs in the late 1990s. These programmes focused on sustained outreach to schools and communities, alongside the development of contextualised admissions systems, which allowed for admission of low-SES students at lower tariffs than those from more advantaged backgrounds. HEIs agree targets for students from low-SES backgrounds as part of their “performance based compact” with the Higher Education Authority (HEA). The compact is an agreement across a range of institutional metrics, and it forms the basis of discussions between each HEI and the HEA to determine state investment levels. This is similar to the role played by the Office for Students (OfS) in England in incentivising institutions to diversify their intake.

2.2. Access to Higher Education in the UK

Similar to Ireland, higher education institutions in the UK developed localised responses to improve their socio-economic diversity, and research demonstrates these inter-

ventions were effective [14]. The current progression rate to HE in the UK is 37% [5]. The cost of HE to students was relatively low-cost, similar to Ireland, until 2010, when the then coalition government precipitated substantial changes to the HE funding model, raising the tuition fee limit to GBP 9000, while larger government-funded loans were provided to students taking a first degree. Subsequent policy changes mean that HE maintenance grants are no longer available to students, regardless of their SES. Institutions charging the current GBP 9250 tuition fee tariff are required to produce an access agreement outlining how they will use their additional revenue to support access measures. These are normally set out in an agreement between the Office for Students (OfS) and each institution [15]. This means the UK now has one of the most expensive tuition fee systems in the world for a primary degree and young people can anticipate leaving university with a debt burden of at least GBP 50,000.

Not all universities are created equal, and the policy discourse around access to HE in the UK has shifted in the last decade to a closer consideration of “fair access” for low-SES students to selective higher education institutions. Prestige differences emerged between the “Old” (pre-1992) and “New” (post-1992) universities [16–18]. Graduates of more selective universities are more likely to secure professional and managerial jobs and to earn higher salaries [19,20]. Data show that students from low-SES backgrounds who applied to university in 2020 were four times less likely to go to a highly selective university than students from the most advantaged backgrounds [5].

In 2018, the government established the Office for Students (OfS) as the regulator of higher education in England. It took on responsibility for promoting “fair access” to higher education and ensuring students from all backgrounds are supported to progress and graduate. The OfS introduced Access and Participation Plans (APPs) as a condition for HEIs who wished to charge higher tuition fees. APPs required HEIs to demonstrate the range of on-campus and outreach activities they take to ‘widen participation’. HEIs are also encouraged to make use of “contextual data” in their admissions decisions. This process involves considering an individual’s socio-economic background and their school performance data, among other things, rather than relying solely on their results in exams and coursework [21]. Contextualised admission varies across countries. Mountford-Zimdars and Sabbagh [22] explain the holistic admissions approach taken in the USA, where each student is considered individually. In the UK and Ireland, on the other hand, the admissions system draws on “indicators” of disadvantage. Four types of indicators are generally used: individual, postal code-level, school-level and participation in widening participation programs [18].

This section has explained the context in Ireland and the UK for low-SES student progression to higher education. The following section outlines the materials and methods used to explore two questions posed in relation to two educational interventions: (a) the admissions adjustments required in both countries to diversify low-SES student intake and (b) the developing capability set of students participating in a community-based educational outreach programme (TA21) and a university-based academic programme (LMH FY).

3. Materials and Methods

This section explains the use of a comparative case study to explore two programs: a community-based programme, Trinity Access 21 (TA21), Trinity College Dublin and a university-based programme, Lady Margaret Hall Foundation Year (LMH FY), the University of Oxford. A case study is “an in-depth examination, over time, of a single case”, whereas comparative case studies “cover two or more cases in a way that produces more generalisable knowledge about how and why particular programmes or policies work or fail to work” [23]. A comparative case study is useful to understand how context influences the implementation of an intervention. This section also provides an overview of the capability approach as the exploratory lens applied to the qualitative outcomes of both programs.

This comparative case study (CCS) poses two questions: (1) How did the admissions processes in both universities change to target low-SES students? (2) How do social and academic support services for low-SES students, provided by two universities, contribute to the development of student capabilities? The CCS is undertaken in the context of a collaboration between Trinity College Dublin and LMH Oxford University (2016–2020) in the development of a foundation year and an adapted admissions process. TA21 developed from an experienced team (Trinity Access Programmes/TAP), which had built a range of community- and university-based programs and admissions processes over a 20-year period. The LMH FY developed in partnership with TAP but from a team that had limited experience in developing such programs. Despite this, the LMH community had a strong commitment to improving diversity and leading admissions change in the University of Oxford.

The TA21 (community-based) developed in response to team experience and the research evidence base, which indicated a range of challenges for low-SES students in second-level education. Smyth and McCoy note that schools in areas of low-SES have a higher proportion of “newcomer” (immigrant) students, students with disabilities and traveller students than schools in more affluent areas and have a higher incidence of serious literacy and numeracy problems, emotional and behavioural problems, absenteeism, lower student motivation, problematic student–teacher relationships and less parental involvement [24].

The LMH Foundation Year (university-based) arose in the context of persistent inequalities in accessing selective universities in the UK and the research evidence base, which indicated that barriers to greater equality in higher education included the prior academic attainment of students, inadequate advice and support during school and financial concerns about the cost of higher education.

The CCS draws on the recent research and evidence base for both programs in the form of published peer-reviewed articles and internal university publications and reports. It uses a capability approach lens to explore the available qualitative findings on the impact of both programs on participating students. It also draws on the relevant literature and policy context within both domains. Table 1 below describes the key features of each programme:

Table 1. Targeted programs in Ireland and the UK to improve access to HE for low-SES students.

	Community-Based within Schools: TA21	University-Based within a College: LMH FY
Programme lead	Trinity Access Programmes (TAP), Trinity College Dublin (TCD).	Lady Margaret Hall, Oxford University, in partnership with Trinity Access Programmes (TAP), TCD.
Aims	To provide every student in a “Leader” school with multiple opportunities to receive (a) educational advice and guidance, (b) relatable educational role models, and (c) opportunities to identify and lead change in the classroom and in the wider school community. To undertake an action research study on the programme and to use the outcomes for (a) school improvement and planning and (b) national policy change.	To provide low-SES students aiming to progress to Oxford University with a personal, social and academic foundation (the “foundation year” or FY) to enable them to flourish in higher education. To reform the low-SES admissions system in LMH and Oxford University using the student selection experience from the FY. To scale the FY beyond from LMH to across Oxford University.
Description	TA21 provides a “whole school approach” to university–school widening participation interventions, involving every student from year one of second-level schooling (and throughout) in three “core practices”: (a) Pathways to College, (b) Mentoring and (c) Leadership in Learning. Schools agree a framework for the three “core practices” and the research across all year groups and participate in a programme network that includes teacher continuous professional development (CPD).	LMH developed a year-long foundation year that includes 16 subjects, a blend of academic content and preparation for undergraduate studies. FY students are full members of the college community. FY students may then matriculate to Oxford University provided they meet set academic standards on the FY.

Table 1. Cont.

	Community-Based within Schools: TA21	University-Based within a College: LMH FY
Target group	Second-level students ages 12–18.	Second-level students (age 18–19) who have recently completed their A-levels and who have strong academic ability but are unlikely to be admitted directly to Oxford University, as their A-level grade achievements have been affected by their socio-economic context.
Geographic focus	Mainly concentrated in Dublin but includes schools across Ireland. A total of 20 “Leader” schools and 40 “Network” schools participate each year.	Low-SES students ages 18–19 drawn from across the UK. Approximately 10 students are selected for the programme each year.
Sampling for qualitative studies	Purposive sampling: 35 students from 4 different school types (all low-SES), male and female and low-SES family backgrounds.	Purposive sampling: all students on the LMH FY.
Number of students involved in qualitative studies	35	10
Evidence base	References [25–33]	References [34–40].
Emergent student capability set after programme	Autonomy, hope, identity, social relations and social networks, practical reason and knowledge.	Identity, social relations and social networks, practical reason and knowledge.

3.1. Overview of Comparative Case Study Programme A: Trinity Access 21

This section explains the TA21 programme, which is the main educational outreach programme within Trinity Access Programmes (TAP), Trinity College Dublin. The TA21 programme evolved from a 20-year evidence base in practice and policy to improve low-SES progression to higher education. It aimed to address two problems: first, that in addition to the educational barriers caused by poverty, there was limited educational guidance, subject choice and educational role models within some schools. Second, the post-primary curriculum is considered to be inflexible and focused on the terminal exams [25–27].

The overarching goal of TA21 is to address these two problems through the delivery of a suite of programmes for students and the provision of professional development for teachers, both of which are embedded in an iterative cycle of data collection and analysis, feedback to schools and consultation with stakeholders [25].

There are 20 “leader” schools in the project, all of which are post-primary schools located in low-SES communities. In addition, there are 40 linked “network” schools associated with the project. These are spread over a wide geographic area and receive less direct support from the team. The “leader” and “network” schools approach allows the project to scale both deep and wide and to use learning from the scaling deep in scaling more broadly within the “network” schools.

The TA21 project is underpinned by a “widening capability” [29] model of widening participation and aims to shift from a focus solely on student progression to one that includes student potential and capability. TA21 draws on a US intervention, CFES Brilliant Pathways, which has three components derived from the theory of Academic Capital Formation [29] that aim to increase students’ understanding of college application and support services (Pathways to College), provide individual mentoring of students (Mentoring) and develop students’ leadership skills (Leadership through Service). A fourth aspect—twenty-first century (21C) teaching and learning—was added to the original CFES model with the goal of supporting teachers to transform their pedagogical approaches to help develop students’ key 21C skills. This final component was combined with Leadership through Service, as there was significant overlap between many of the skills that were developed through participation in both practices. The new core practice has been termed Leadership in Learning [26].

This subsection has explained the TA21 programme. The following subsection explains the LMH FY programme.

3.2. Overview of Comparative Case Study Programme B: Lady Margaret Hall (LMH) Foundation Year, the University of Oxford

This subsection explains the University of Oxford admissions context within the wider UK policy landscape and as the backdrop for the development of the LMH FY. In the UK, approximately 93% of A-Level students attend state schools, while the remaining 7% attend independent (fee-paying) schools. Research shows that 30% of state schools have at most one or two students progressing to the prestigious Russell Group universities in the UK, with just 40 schools and colleges providing a quarter of all Oxbridge (Oxbridge is a combined term used in the UK to describe the Universities of Oxford and Cambridge) entrants [34]. The University of Oxford admissions report (2022) shows significant geographical bias to South East England, and the majority of admissions are to students with professional parents [34,35].

Oxford and Cambridge universities have significantly increased their WP activity over the last decade, but this has not had the effect of diversifying its socio-economic intake. Admissions to Oxford are complex, as it is a collegiate university comprising 38 colleges and 6 Permanent Private Halls (PPHs) of religious foundation. Every student must be a member of a college or a PPH. Each college is an autonomous, self-governing institution with responsibility for its own admissions. Admissions are carried out in accordance with the Oxford University Common Framework of 2006 [34].

Therefore, admissions decisions are taken at the level of individual colleges and PPHs, each one of which has significant latitude in planning for WP. Some colleges provide for greater flexibility over minimum entry requirements and academic attainment for students from low-SES backgrounds [34].

Lady Margaret Hall, a college of the University of Oxford, partnered with Trinity College Dublin to adapt a year-long intensive academic preparation course (the Foundation Year or FY) to that context. The goal of this project was to increase socio-economic diversity in the University of Oxford and to prove that students from low-SES backgrounds could reach their full academic potential within a well-supported environment. A secondary goal was to scale the pilot project beyond LMH to other colleges within the University of Oxford collegiate structure.

Universities in Ireland and England have developed FY programmes as a way of supporting students to transition into university and to supplement “academic attainment gaps” at second level. These are intended for students without the formal entry qualifications for their chosen degree. They are designed to prepare entrants for degree-level study [35]. FY programmes recognise that the challenges facing low-SES students in HE are complex and focus on the importance of supporting the development of peer relationships, academic skills and a sense of belonging in the university.

In 2016, a group from Lady Margaret Hall (LMH), a college of the University of Oxford, visited Trinity College Dublin (TCD), the most selective higher education institution in Ireland, to explore the potential of adapting the Trinity Access Programme (TAP) Foundation Course to the Oxford context. The TAP Foundation Course (TAP FC) for Higher Education was established in 1997 in Trinity College Dublin (TCD) as a year-long, intensive academic preparation course. It was developed to provide an alternative matriculation into the university for low-SES students who had not reached their academic potential for socio-economic reasons. Progression to the university depended on successfully completing the course and meeting specific academic requirements. The TAP FC provides social and financial supports for these students throughout their time in the University. At the time of LMH’s visit to Ireland, TAP had developed a 17-year-long evidence base, with over 90% of TAP FC students successfully progressing to the university and 89% of those who had progressed successfully completing a degree. The positive story of the TAP FC, which had been captured from the outset through research and evaluation, therefore presented a strong model from which to develop a Foundation Year in Lady Margaret Hall (LMH) [35].

The governing body of Lady Margaret Hall articulated a strong desire to widen their admissions to socio-economic groups and areas of the country from which they did not

have robust representation. LMH had its historical foundations in taking radical action on admissions, as it was the first women’s college within Oxford University; however, developing this kind of alternative entry route was a challenge to the university. It had been agreed by LMH’s Governing Body that Foundation Year students would be admitted to the programme on lower academic attainment than those being admitted to first year in the university. The rationale for this was that the Foundation Year would target students from backgrounds where they had not had the opportunity to reach their full academic potential. This approach was considered by some within the university to represent a deviation from the common framework on admissions (Robson et al., 2017). Despite internal challenges in Oxford, in 2016 TCD and LMH established a partnership to adapt the TAP Foundation Course to the Oxford University context as part of a four-year pilot. In the 2016–2017 academic year, within an overall intake of 670 students, 10 Foundation Year students were registered for the inaugural LMH Foundation Year (LMH FY) [35].

The LMH FY is a year-long academic programme consisting of 16 subjects, including a range of sciences and humanities, and students also take a subject-specific course. The students have group teaching that includes the core modules of academic writing and preparation for undergraduate study. Students sit an interview as well as an examination to be considered eligible for the degree course they wish to progress into following the FY. Lectures by guest speakers and educational visits occur throughout the FY and these sessions are shared with undergraduate students. Students on the LMH FY who wish to progress to the University of Oxford for undergraduate study have to go through the standard admissions process for undergraduates, including admissions tests (subject-dependent) and interviews. If they are made an offer, it is conditional on successful completion of the LMH FY to an agreed academic standard. This section has described the key features of the TA21 and LMH FY programs within the CCS. The next section explains the capability approach, which was used as an exploratory lens with the qualitative data from both programs.

3.3. Using the “Capability Approach” to Explore the Qualitative Data

Drawing on the qualitative data from both of the CCS programs, a capability approach is used as an exploratory lens. Robeyns [41] argues that regardless of whether we focus on structure or agency, individual well-being should be the “ultimate unit of moral concern”. The capability approach is a theoretical framework with two core-normative claims. First, the claim that freedom to achieve well-being is of primary moral importance and, second, that this freedom is to be understood in terms of individual capabilities, that is, their real opportunity is to do and be what they have reason to value [42]. An individual’s capability represents their freedom or real opportunity set [43].

In recent times, the capability approach has been used to explore policy and practice in education, as an alternative framework to human capital theory, through which the process, purpose and impact of education can be evaluated [44–46]. Developed by Amartya Sen [47–49] and subsequently elaborated by Martha Nussbaum [50–52], the key idea of the capability approach is that social arrangements should aim to expand people’s capabilities, which is their freedom to promote or achieve functionings that are important to them.

A key concept in the approach is people’s “functionings”: these are the “beings” or “doings” that are important to them, such as being able to access adequate food, accommodation or having time to read. The capability to achieve a functioning depends on a range of personal and social factors that vary across geographies and contexts. Focusing on the individual’s *capability to achieve a functioning* rather than the function alone recognises the different circumstances of people and their varying preferences [53]. The capability approach has four central concepts [54–56]. These are:

1. Capabilities: the freedom an individual has to enjoy valuable functionings. Capabilities are the alternative combinations of functionings that are feasible for a person to achieve.
2. Functionings: beings or doings that an individual values (achieved outcomes). Examples of functionings can vary from being healthy or having a good job, to more

complex states, such as being happy or having self-respect. A functioning is the active realisation of capabilities.

3. Agency: the ability of an individual to realise the goals that they value.
4. Well-being: the appropriate focus for assessment of how well an individual is doing, defined by the links between material, mental and social well-being.

Individuals differ in their capacity to convert capabilities into functionings and conversion factors, such as structural or social arrangements, influence their exercise of agency.

3.4. Human Capital and Human Capability

Human capital theory is relevant to higher education access as it posits that by enabling more people to access higher education and to achieve post-secondary qualifications, we will generate a greater economic contribution and therefore create more opportunities for all.

Melanie Walker [57] has written extensively on the limitations of a human capital approach to education in the South African and UK contexts. She argues that it assumes labour markets are efficient at placing people in work suitable to their skills and that opportunities are shared equally. Walker [57] remarks that developing widening access to higher education is primarily useful in building human capital and is a persuasive and verifiable, market-aligned model, but it offers an impoverished model for education as it does not prioritise well-being, human agency or the transformative potential of education. She concludes that the human capital model is not sufficiently expansive to address social justice, given that what is really at stake in the model is economic growth.

Taking a capability approach, the dimension for measuring equality would be each person's capabilities. Walker [58] advocates that we ask the question "What is each person however able to be and to do?" rather than "What resources do they have?" Policy, Sen argues, should not just aim to increase income and educational qualifications but to increase access to the resources that enable these freedoms [59].

From this perspective, for instance, it may be that some students within schools with low progression rates do not choose higher education because they are "low achievers" or have "low aspirations" but instead they have "different aspirations". The freedom to choose higher education must include the freedom to reject it [60]; however, it is important to consider the context within which decisions are made and whether or not adequate information, guidance and support have been available. The capability approach invites a range of more searching questions about equality than just a focus on desire satisfaction. It is a challenge not just to evaluate resources and inputs, but also to consider whether learners are able to convert resources into capabilities and thereafter potentially into functionings. This section has provided an overview of both of the programs within the CCS and the materials and methods used to compare their impact in Ireland and the UK. It also explained the strengths and purpose of applying a "capability approach" lens to qualitative findings in both programs. The following section elaborates on the outcomes of this capability approach exploration and compares other key outcomes from both programs.

4. Results and Discussion

This section explains the outcomes from the comparative case study (CCS) which considers two programs: Programme A—TA21, a whole-school, educational outreach programme and Programme B—LMH FY, the collaborative development of a foundation year for low-SES students, between Trinity College and LMH in the University of Oxford (2016–20). It also compares the development of contextualized admissions processes in Ireland and the UK. It discusses how these were framed by and within specific policy contexts and how TA21 operated as a community-based programme focused on change at a school level, whereas LMH FY was a university-based programme, focused on change in higher education.

This CCS poses two questions:

- (1) How did the admissions processes in both universities change to target low-SES students?

- (2) How do social and academic support services for low-SES students, provided by two universities, contribute to the development of student capabilities?

Table 2 below identifies the key features of comparison across the two programs, and these are then explained.

Table 2. Comparing change between a community-based and a university-based education intervention to improve low-SES higher education access.

	Community-Based Change TA21	University-Based Change LMH FY
1	Socio-economic indicators	Socio-economic indicators
2	Focused on community- and system-level change	Focused on diversifying SEG profile of university
3	Evolution of practice based on local evidence base	Adaptation of practice from another country or institution, customised to local need
4	University as change agent in partnership with schools, communities and students	University responding to external policy requirements and some internal pressure to diversify
5	Using capability lens to explore lived experience of students, drawing on research to re-frame practice with schools as partners	Using capability lens to explore lived experience of students, drawing on research to persuade faculty and administration of the viability of the FY as an admission route

4.1. A Comparison of Socio-Economic Indicators Used in Admissions Processes in Both Universities to Target Low-SES Students for HE Admissions

While national policy had incentivised the development of “targeted programs” for low-SES students in Ireland and the UK, in the early 2000s, there was no agreed definition of “educational disadvantage” or the low-SES students who were to be targeted, and neither was there a system within the universities for doing so. In both programs, there was a need to define the socio-economic indicators that would serve as proxies for educational disadvantage. Trinity College Dublin had developed a set of national policy-based indicators for the TAP FC. The Higher Education Access Route (HEAR) emerged from this evidence base, and it was built and tested in close collaboration with two other universities: University College Dublin and Maynooth University [37]. Both universities and the Dublin Institute of Technology collaborated to develop a nationwide systems-based scheme. It was agreed across the sector that no single indicator would be sufficiently robust to qualify a student as eligible to compete for the targeted places in HEIs. There were both individual- and group-level indicators and they combined financial and socio-cultural proxies. Six indicators were ultimately agreed upon across the HE sector, and students had to meet at least three indicators to compete for a targeted HE place. HEAR was scaled from a local, manual process to a university-wide system in 2012. It is mainly through HEAR that each university recruits low-SES students to meet their SES targets. The six socio-economic indicators used in the scheme combined individual (e.g., family income) and group-level (e.g., geo-code) information linked to “disadvantage”, which together functioned as a “proxy definition” of educational disadvantage.

This was an important development in moving contextualized admissions from a local, manual process with considerable subjective input on a university-by-university basis, to a systems-based, nationwide online application system that combined individual- and group-level data. The rationale for including both individual- and group-level indicators is that it enables more effective targeting of HE admissions processes at those low-SES students who need it. For instance, not all individuals living within a low-participation postal code is from a low-SES background, and there are low-SES students within high-attainment schools, and high-attainment postal codes. Combining a range of indicators enables a more

effective targeting of the students who have had a complex and disadvantaging experience of education. These were represented in Table 3 below.

Table 3. The Higher Education Access Route socio-economic indicators for low-SES students [27].

Financial Indicators	Socio-Cultural Indicators
Income (students must meet a set threshold)	Socio-economic group
Medical card	School type
Means-tested social welfare payment	Postal code
Also considered: In the care of the State	

This system has now been in use across the Irish HE system since 2012, and it is integrated within the shared application infrastructure used by all HEIs. Students apply to any HEI and provide documentation which is uploaded to the system and reviewed by a collaborative team nationwide. Students must meet certain academic thresholds for each course and institution in addition to the socio-economic indicators.

This learning was used by LMH in Oxford, where there was no agreed set of common indicators for selecting low-SES students across the university and there was an anecdotal view that the students who were being selected as “low SES” did not meet that definition. This was because the indicators used to assess socio-economic status leaned towards group-level indicators, such as POLAR or ACORN (school and postal-code progression), rather than integrating a focus on the SES of the applicant. This risks allocating highly competitive places to students within these postal codes or schools who may come from better-off, educated families. The LMH FY team did considerable work, drawing on national policy, to develop a robust system for selecting low-SES students. Through literature review and an iterative process of testing, the LMH Foundation Year team identified a set of socio-economic indicators to act as proxies for educational disadvantage in the UK. Using these indicators enabled LMH to identify students whose socio-economic background was likely to have had an impact on their GCSE and A-Level grades. Current Higher Education policy suggests that such contextualisation is key to widening access [36,37]. See Table 4 below for more details.

While there are differences in the socio-economic assessment systems, there are some similarities. Both systems take a multi-indicator approach to assessing low SES. In both cases, this means that the targeted places within HE are more likely to be used for low-SES students. This individual targeting, or “contextualisation”, was essential, as it enabled the LMH FY team to make a strong case to the university to modify the admissions requirements for the LMH FY, as it provided a holistic context for previous socio-economic circumstances having impacted on low-SES grade attainment. While there were concerns in the university that the assessment of both individual- and group-level proxies would be resource-intensive and unmanageable, it helped to be able to refer to HEAR in Ireland, where the application system is online, and documents are reviewed by a trained team nationwide. In Trinity, this multi-indicator assessment process began with the TAP Foundation Course in the early 2000s. The objective was to demonstrate to Trinity College Dublin that low-SES students could thrive in the university if given extra academic, personal and social support for a year prior to admission to first year, and that there was a robust alternative to identifying and supporting their potential. Within five years, the student academic attainment and retention within Trinity was so strong that this multi-indicator approach was tested for low-SES admission directly to the first year of university. By 2012, this developed into a national scheme, HEAR, alongside all other universities in Ireland. The collaboration between Trinity and LMH in Oxford enabled the use of this evidence base from Ireland to effect change in the University of Oxford. In some respects, LMH FY is now in the place TAP was in 20 years ago, aiming to scale the FY across the university and to establish a more robust approach to socio-economic assessment of low-SES students.

Table 4. The LMH FY Oxford University socio-economic indicators for low-SES students [36].

Year 3: 2018/19		
Compulsory Criteria		
State-educated	Income Below GBP 42,875	NS-SEC 4–8
Indicators Used for Further Contextual Information:		
Receipt of free school meals		
Parental education level		
Index of multiple deprivation		
Index of deprivation affecting children		
POLAR quintile (school progression to HE)		
ACORN category (post code progression to HE)		
School admissions policy		
% 5A*-A at GCSE school (attainment at age 16)		
% 5A*-C at GCSE school (attainment at age 16)		
Average point score at A-Level (attainment at age 18)		
% of students in school receiving free school meals		
School progression rates to Russell Group University		
School progression rates to Oxford University		
OR		
Care leaver (at least six months in care of the local authority)		

A* denotes the highest academic grade a student may achieve in the English second level school system.

This section has described the development of socio-economic assessment systems within the context of admission to the University of Oxford and Trinity College Dublin. It explains how the evidence base from Trinity was used to strengthen the case for change within Oxford. It highlights how the indicators varied in both contexts, as they are drawn from nationally verifiable data sources; however, in both systems, a multi-indicator assessment approach is taken to better target the low-SES students who are most likely to need academic “contextualisation” and a year-long foundation course to address gaps in their schooling.

4.2. Community-Focused Change, versus University-Focused Change

The next point of comparison between Trinity and Oxford is in their approach to change. The TA21 programme emerged from the evidence base in Ireland regarding the grade attainment in higher education of low-SES students who had been given additional supports at entry to higher education. The students were found to perform as well, and in some cases better, than their non-low-SES counterparts [27–29]. This precipitated the TAP team to consider how much more untapped student potential was within their partner schools and to consider how to build a closer partnership with the schools to engage every student throughout their time in second-level schooling and to aim to address some of the gaps highlighted in the literature (limited educational guidance, an absence of educational role models, a limited range of subject choices, lack of money for additional educational support). This community-focused change has at its heart the concept of how best to use the university resources to support change within low-SES communities. The corollary of that is that students within those communities will be better prepared—in both information and academic attainment—to make informed decisions regarding their post-secondary trajectory, whatever that might be.

The LMH FY case is focused on institutional change within the University of Oxford. It aims for two substantial departures from practice: (a) to establish a university-wide foundation year, based on the success of the LMH FY and to admit low-SES students to

the course at lower academic attainment than those who progress directly to first year and (b) to change the socio-economic assessment process within the admissions process, to better target individual low-SES students. These are the changes that Trinity engaged in within the Irish context in the 2000s. Both are substantial changes to Oxford's admissions landscape, and they have already precipitated comparable changes within the University of Cambridge [38].

4.3. Evolution of Practice Based on Local Evidence Base versus Adaptation of Practice from Another Institution, Customized to Local Need

A third point of comparison is the use of evidence in both cases. TA21 combined the institutional evidence base for the success of low-SES students with the academic literature and policy indicators to determine how it could best have a “whole-school” effect within partner schools. This was an evolution of practice, which began with recruiting individual low-SES students for the TAP foundation course back in the 1990s. The greater their success, the more the team reflected that there must be many more talented, undersupported students in the schools, who could also benefit from progression to Trinity or another institution.

In LMH, there was a steep learning curve, as the leadership and college staff were committed to changing the socio-economic profile of the college and the university but did not have specific expertise in this field. The collaboration with Trinity enabled LMH to draw on its evidence base and to customize it for the Oxford context. This collaboration and “transfer” of expertise from Trinity to LMH over the first few years of the foundation year was pivotal in making the institutional change possible. Within Oxford, this meant the director of TAP and the LMH Foundation Year director addressing groups of fellows in different colleges within the university system, meeting with academics resistant to change on a one-to-one basis to discuss their concerns, addressing admissions committees, building external policy support for change through bodies such as The Sutton Trust and the OfS, and the principal of LMH leading the case for change at the heads-of-colleges level. The principal of LMH had himself been recruited from a major national newspaper to the position of principal, so he was acutely conscious of the rolling national debate regarding limited admission to the University of Oxford of low-SES students. The collaboration extended to building wider public support through media (radio, television, print media) and to bringing the TAP FC students and the LMH FY students together each year to consider how they could collaborate for change.

4.4. University as Change Agent versus University Responding to External Pressures

A final point of comparison is the position that each university took in their respective programs. In Trinity, the 20-year evidence base gave the institution confidence and experience to reach back into the second-level system and build a larger scale programme and to aim for system-level change—in creating strong whole-school, college-going cultures.

In LMH FY, there was some academic support for change but there was concern that it was not possible to recruit the “right” low-SES students and that the university would not be able to address gaps in schooling through a one-year course. There were also people within the university who believed that change was not necessary, and it was not the role of the university to “fix” gaps in schooling. There were external pressures on Oxford from the OfS, in respect of being able to charge full tuition fees, from the media, in highlighting continuing inequalities in its admissions, and from the “do-tank” The Sutton Trust, which had long called out the issues with Oxford and Cambridge admissions. The pressure for change within Oxford was mainly from external sources: policy, financing, media. The motivation for change within Trinity derived from the successful evidence base across the HE sector in preparing and admitting low-SES students, most of whom went on to have high academic achievement in their degree courses. low SES.

This subsection has considered the first of two questions posed by the CCS, exploring changes to admissions processes in both institutions alongside a comparison of the two

programme approaches and the policy context within which they emerged. The following subsection seeks to answer the second research question.

4.5. *The Development of Capabilities in Students Engaged in Two University-Based Programs Aimed at Low-SES Students*

Until 2014, university-to-school educational outreach activities targeting low-SES students mainly adhered to a standard national model of providing some senior students from partner schools with opportunities to visit the university campus. Thanks to a significant external grant, this model changed in Trinity College Dublin, to focus on building the social, academic and human capital of *all students* within partner schools (grades 7–12) and providing professional development support for teachers to foster collaborative and reflective learning environments [28]. The first pilot phase of the initiative (Trinity Access 21 (TA21)) involved a three-year, quasi-experimental, intervention-style study, which ran until 2017 and followed a cohort of 1100 year 1 (grade 10) students from 11 treatment and 4 control schools (2 from areas of similar SES, as well as 2 with high progression rates to higher education). Results from this three-year pilot intervention indicate that the TA21 programme has a positive effect on participants' aspirations to continue in education after completing post-primary school, with evidence of increased aspirations and capabilities in the intervention group with respect to the control groups [25].

In addition to this overarching research study, Hannon undertook a qualitative longitudinal research (QLR) study on the program, which explored the question of *how social and academic supports for students, provided within the context of a school–university partnership, might contribute to the development of student capabilities*. The “capability approach” study used qualitative longitudinal research (QLR) a group of 35 research participants, who were students in the second year of secondary education at the outset (age 14). All students were from families where the parents did not initially progress to higher education, although two of the students had parents who had more recently undertaken higher education qualifications. The study began with students when they were 14 years of age and continued with the same students as they progressed through second-level education for the following 3 years (age 17). Student focus groups and interviews were triangulated with teacher focus groups and principal interviews. The study aimed to determine if there is a specific set of educational capabilities, the development of which would support *the capability to aspire towards post-secondary education* in low-SES students [24,25,33].

4.6. *Generating a Capabilities List*

Hannon [33] adapts a “top-down and bottom-up” approach to developing a capability list for low-SES student progression to post-secondary education from Wilson-Strydom’s 2016 paper with a similar focus in South Africa [56]. Firstly, it proposes an ideal theoretical list [51], which combines the literature on access, widening participation and education policy with the body of research on using the capability approach in education (top-down).

- Stage one: developing an ideal theoretical capabilities list (top-down approach).

The development of a capabilities list for low-SES students' preparation for higher education progression began with a review of the literature on educational disadvantage, widening access and participation, social justice theories, theories of social and cultural reproduction and theories of critical pedagogy. These were considered in the context of the growing body of literature related to the capability approach and its usefulness in exploring education and, specifically, widening participation.

- Stage two: participatory-list development through qualitative longitudinal research.

This involved an empirical approach to the development of the list by interrogating its usefulness with young people in the four case-study schools. This engages with Sen’s concern that it is critical to have a participatory process with those involved in the development of their own capability set. This research therefore involved young people in the discussion and development of the capability list for higher education progression through

a qualitative-longitudinal research approach and specifically focused on their engagement with the TA21 programme. Student interviews and focus groups were designed with the ideal theoretical capability list in mind, and they involved discussions with the students of “valued doings and beings”, to explore the development of capabilities relevant to education and their ability to convert these to valued functionings. The capabilities that emerged frequently in thematic analysis are not all-encompassing of the young people’s lives; they are focused on the impact of the TA21 programme, as that is the focus of the evaluative lens of this study.

Having adapted Wilson-Strydom’s [56] “top down/bottom up” approach, it is proposed that there are five key capabilities which students develop through their engagement in this university-to-school partnership programme. These capabilities are enriching student ability to make informed choices about their future, to feel more autonomous as young adults, to build trusted networks of relationships across their communities and to engage constructively with their own “identities in flux” to refine and embellish their hopes for the future. The capabilities emerging through this application of the capability approach are defined in Table 5 below:

Table 5. A pragmatic capabilities list to prepare low-SES students to aspire towards higher education [25,33].

Capability	Definition
1. Autonomy	Being able to have choices, having information on which to make choices, planning a life after school, reflection, independence, empowerment.
2. Practical reason and college knowledge	Being able to make well-reasoned, informed, critical, independent and reflective choices about post-school study and career options. Knowledge is system knowledge, rather than academic skills or abilities, and is aligned to practical reason such as the capability to assess and evaluate this new knowledge base and incorporate it into a new frame of reference.
3. Identity	Identity as a matter of “becoming” as well as “being”, belonging to the future and the past, taking place in the spaces of relations in which individuals are embedded.
4. Social relations and social networks	The capability to work with others to solve problems or tasks. Being able to form networks of friendship, belonging and mutual trust to support the development of navigational capital for progression to higher education.
5. Hope	Aspiration, motivation to learn and succeed, to have a better life, to hope.

- Conversion Factors

The pragmatic capability list provides a framework for what is required to successfully enable low-SES students to aspire to higher education; however, as Wilson-Strydom [56] observes, it is also important to identify conversion factors that impact a person’s ability to convert resources into opportunities or capabilities. This draws attention to the point at which agency and structure intersect and therefore provides a mechanism to explore how individual agents can engage with positive or negative structural processes, or conversion factors, to realise their goals. Table 6 below provides an overview of the three TA21 core practices and the capabilities that emerged over the three-year period (2014–2017).

Table 6. The TA21 core practices and emergent student capabilities [33].

Valued Capabilities Identified through the Research and Related Social and Cultural Capital Themes	TA21 Core Practice	Example of Activity
Autonomy, practical reason and knowledge, identity, hope Understanding college costs Understanding career pathways	Pathways to College	College visits, gaining course knowledge, building information on financial processes.
Autonomy, practical reason and knowledge, social relations and social networks College and career knowledge Overcoming barriers Goal-setting	Leadership	Redeveloping an unused school room as a 21st century learning space, identifying funding sources, project planning and implementation.
Social relations and social networks, hope, identity Networks Trustworthy information Navigational capital/educational resilience	Mentoring	Total of 6 structured mentoring workshops per year with a mentor who has recently progressed from local school to college.

The research demonstrated three main findings: (1) Specific student capabilities emerged following their engagement in the core practices of Leadership, Mentoring and Pathways to college; these are: autonomy, practical reason and college knowledge, identity, social relations and networks and hope. (2) Students encountered a range of inhibiting social conversion factors in developing capabilities and persisting with higher-education aspirations; these were: the negative pull of peer relations, pressure related to state examinations, and limited subject choice and conflicting family expectations. (3) There are four themes that arise throughout: (a) the centrality of informed choice, (b) confidence, (c) resilience and (d) trusted relationships with reliable others.

Having access to early information about subject choice and levels enabled them to consider their educational choices in the long term and understand how thinking about their future now might positively impact their progress. The Leadership core practice helped students to develop the confidence and ability to “ask the right questions”. This also enabled them to broaden their networks outside of the immediate community, through campus visits and business presentations. Students built new, trusted relationships with their mentors, which made them believe that “if they can do it, then so can I!” This encouraged them to discuss their future with their families and teachers, which in turn, improved the quality of those relationships. Having access to reliable others and to information on the variety of entry routes to post-secondary education supported students’ educational resilience, as they internalised the message that there are many ways in which they could progress and that they could draw on their social networks [33].

4.7. The Development of Capabilities in Students Engaged in the LMH FY

O’Sullivan et al. [34,35], a research team from Maynooth University and the University of Oxford, undertook a longitudinal comparative case study of the student experience on the LMH FY. Pre- and post-questionnaires and in-depth focus groups were undertaken with the FY students. Analysis of the focus groups conducted at the start of the academic year explored students’ experiences before entering university and perceptions of why they needed an alternative entry route to the university. Ten students from the LMH FY participated. They completed a questionnaire at the start and the end of the year to determine their perceived levels of academic capital and sense of belonging in the university. Qualitative data were analysed using interpretative phenomenological analysis [34], a qualitative approach which explores in detail how participants are making sense of their personal and social world.

Similar to the second-level students in the TA21 programme, O’Sullivan [34,35] reports strong feelings of inequality in student views of the education system. They perceived some students as having a natural sense of belonging, while others believed the lack of educational guidance and knowledge in their school meant they had a lack of “navigational capital” to support their progression to HE. Another similarity in the findings both in Ireland and the UK is that students in the LMH FY referenced the importance of having relatable role models within their family and community to build this sense of confidence, belonging and identity as a HE student.

Thematic analysis of the focus groups conducted at the end of the LMH FY explored students’ experiences of the LMH FY, their perceptions of how it impacted upon their capacity to participate in university life and any challenges students faced over the year. The analysis identified the processes of change which occurred over the course of the year and four themes that arose, related to student identity, belonging and confidence [34,35].

This article draws on the findings of the O’Sullivan et al. paper as a basis for comparison with the TA21 programme to consider the capabilities that emerged in students during their participation in both programs. In Table 7 below, a capability lens is applied to the qualitative findings of O’Sullivan et al.’s research and the emergent capabilities of academic identity, affiliation and practical reason that are aligned with the LMH component and practical examples.

Table 7. The LMH FY in Oxford University and emergent student capabilities.

Valued Capabilities Identified through the Research and Related Social and Cultural Capital Themes	LMH FY Component	Example of Activity
Identity, Social Relations and Social Networks, Practical Reason. Understanding academic processes. Managing college finances. Building social networks. Knowledge development and cultural engagement. Sense of belonging and confidence.	Tutoring system. Preparation for undergraduate study course. Course participation. Extra-curricular cultural and social events. Academic assessment and feedback.	Attending course on study skills. Information sessions on academic processes. Attending university events and talks. Participating in student-led events and student council.

Identity. FY students described a significant shift in how they viewed their academic potential. Academic courses, focused on essay writing and critical skills, alongside a supportive, accessible tutoring system, changed students’ perception of their academic identity. This helped students to grow in self-confidence. The process of drafting academic essays, presenting and defending their academic ideas with others, further strengthened this emergent identity as a member of the LMH college community and as students within the University of Oxford. The tutorial system in Oxford, which gives each student a close academic advisor and support, was essential in developing the students’ identity, their academic confidence and their sense of belonging.

Practical Reason and College Knowledge. The knowledge developed through small-cohort class discussions with tutors and professional staff within the college helped students to build the capability of practical reason to plan their future and to assess their own strengths and abilities within the University of Oxford context.

Social Relations and Social networks. FY students formed a strong community amongst themselves; however, they were also integrated within LMH as part of the college community, and within the University of Oxford as part of the wider institutional community. As the first FY cohort in the university, they were subject to considerable scrutiny as an “admissions experiment”. There were sceptics both among the staff and student bodies. In-depth work between the LMH team and the FY students was essential to teasing these complexities out, enabling them to explore and discuss their social class identities, inequali-

ties within the wider system and to build an understanding of their legitimate place within the university. This process strengthened FY students' capability of social relations and social networks, by building a stronger sense of collaboration with their peers and their tutors, enabling them to reach beyond their own networks into the wider university community, and exposing them to public discussions, fora and cultural events which enhanced their sense of belonging. The LMH FY students were all high academic achievers before they began the course; however, O'Sullivan et al. [34] demonstrated that this academic success masked a sense of "outsider" within the university and the process of engaging in the FY helped students to develop the capabilities of identity and social networks within the university.

5. Conclusions

This article provides an overview of how countries with common challenges regarding the participation rate of low-SES students in higher education have partnered in practical and academic ways to adapt and scale effective models and to build the evidence base for further learning. It has used the capability approach as a lens through which to consider the impact of the programs on participating students. These programs and associated research would not have happened without an openness by the institutions, the partner schools and the students to learn from each other and collaborate to address the common challenge of unequal access to higher education. This comparative case study (CCS) poses two questions:

- (1) How did the admissions processes in both universities change to target low-SES students?
- (2) How do social and academic support services for low-SES students, provided by two universities, contribute to the development of student capabilities?

5.1. Admissions Changes

The CCS have undertaken, in the context of a collaboration between Trinity College Dublin and LMH Oxford University (2016–2020), the development of a foundation year and an adapted admissions process.

Admissions processes in both institutions changed to target low-SES students. The evidence of strong academic performance by such students in the Irish context helped to strengthen the case for more targeted admissions at lower academic thresholds in the UK context. Both institutions drew on nationally available proxies for educational disadvantage. In Ireland, students admitted to Trinity and the other Irish universities now have a long and strong track record of academic progression and achievement in higher education, and they continue to make the case for diversified admissions, that takes account of the fact that student potential may be masked or underestimated due to socio-economic circumstances.

By 2022, 43 former LMH FY students had matriculated at the University of Oxford. Thirteen former Foundation Year students had graduated with degrees from Oxford University including two with First Class Honours. The student success on the LMH FY echoes the strong academic attainment and higher education progression of the TAP FC and HEAR students in Ireland [36].

The persistence and success of the LMH FY students, along with external policy pressure from the OFS, helped to make the case for Oxford University to scale the FY project beyond LMH. Between 2019 and 2020, both Oxford and Cambridge Universities announced their intentions to develop a university-wide FY to diversify their socio-economic intake, with an objective that one in four of their admissions would be from low-SES groups by 2025 [36]. The University of Cambridge admitted 43 low-SES students to its first Foundation Year in 2022, and the University of Oxford will admit 50 students to an institution-wide programme in September 2023 [38,39]. This is the biggest shift in the Oxbridge admissions landscape since the awarding of degrees to women over a hundred years ago.

5.2. Community-Based Change

The TA21 programme emerged from 20 years of practice, which demonstrated that low-SES students could survive and thrive in selective HEIs. By 2013, the TAP team considered what more they could do to develop the potential of all students within partner schools and to tackle some of the persistent challenges identified in the literature. TA21 aimed to build a whole-school college-going culture and to engage as many students, staff and community networks in this objective as possible. In 2014, 48% of students from TA21-linked schools progressed to higher education. Over time, this number has gradually increased and in 2020, the schools with high levels of engagement are reporting up to 74% of their students progressing to HE [30].

The LMH and Oxford approach focused much more on bringing 16–18-year-olds to the campus for summer schools and other outreach programs, but it was not aiming for this deeper level of community-based change. It took an individual approach to selecting low-SES students rather than a broader structural approach that considered the students' lived realities. In this respect, the development of thinking and associated practices within Oxford are at a much earlier stage of development than in Trinity.

As the former Principal of LMH, Alan Rusbridger observed, "If Oxford shrugs—"we can't find them either!"—and blames a failing school system, it will look to some as if it's failing in its wider social, educational and charitable purposes" [40]. The Oxford response was, in many respects, a consequence of public policy pressures and, within LMH, emerged from a genuine desire to create greater socio-economic diversity and respond to its historic mission as the first women's college. The Trinity response, through TA21, evolved from institutional learning about the potential and success of thousands of students from low-SES backgrounds and a commitment to aim for larger-scale community-based change. These differences provide insight into diversification strategies in two of the world's most selective universities.

5.3. A Capability Approach to Exploring Change

Using the capability approach to explore outcomes on these two programs enables us to visualise the impact widening participation interventions might have if they were designed to widen the capability of low-SES students towards valued beings and doings rather than a principal focus on ensuring more students' complete schooling with the attainment required to progress to higher education. Its conceptual contribution is therefore to combine the capability approach with theories of social and cultural reproduction, social justice and critical pedagogy to develop a pragmatic list to best prepare low-SES students to aspire towards higher education. It enables us to build a picture over time of what student capabilities are emerging and how these may be either strengthened or diminished by social, personal or environmental conversion factors.

The "capability approach" framing contends that if educational interventions had as their starting point the objective of empowering students to develop to their full potential, through a focus on the capabilities they need to continue to aspire, then students would be more likely to develop educational resilience and navigational capital to persist and to focus on their longer-term goals, even in the context of environmental adversity. It also proposes that students who have the knowledge they need to make informed choices, particularly at an earlier stage in their second level education, are less likely to be inhibited in their decision making by adapted preferences and, whether they choose to progress to higher education, are at least making their choices in the context of a more complete information base and relatable, college-going networks.

In both programs, this individualised approach to exploring student capability development, and to socio-economic assessment, factors in that each individual is unique within the blunt scope of policy formation and that programs and evaluations can be designed to take into account this potential and the possibilities of change through collaboration.

This article began by providing the context for widening participation in Ireland and the UK. It proceeded with an explanation of two programs and the admissions changes

that took place as a result of collaboration and shared learning. It provided an overview of qualitative research that informed this comparative case study and applied a “capability lens” to exploring the data.

Drawing on a community-based programme in Ireland, the article explained the impact of a whole-school partnership approach to low-SES student capability development and contrasted this with a university-focused academic programme, aiming to diversify student intake in Oxford University. The Trinity strategy had moved beyond a consideration of its own student profile to the potential impact the university could have within communities. The Oxford strategy resembled the Trinity strategy in the early 2000s in that its focus is on individual student recruitment from low-SES backgrounds and efforts to reform the institutional admissions system. Both programs are examples of the power of learning across geographical contexts and collaborative action. The two programs share a focus on building human capability as a way of improving the realisation of opportunities for the many capable, committed and challenged low-SES young people, who are often overlooked and underestimated by the mainstream-schooling and higher-education selection systems.

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References

1. Organisation for Economic Cooperation and Development (OECD). *Education at a Glance*; Organisation for Economic Cooperation and Development (OECD): Paris, France, 2022.
2. Chmielewski, A.K. The Global Increase in the Socioeconomic Achievement Gap, 1964 to 2015. *Am. Sociol. Rev.* **2019**, *84*, 517–544. [CrossRef]
3. Organisation for Economic Cooperation and Development (OECD). *Education at a Glance*; Organisation for Economic Cooperation and Development (OECD): Paris, France, 2014.
4. Cassells, P. *Investing in National Ambition: Report of the Expert Group on Future Funding for Higher Education*; The Stationary Office: Dublin, Ireland, 2013.
5. Bolton, P.; Lewis, J. *Equality of Access and Outcomes in Higher Education in England*; The Commons Library: London, UK, 2023.
6. Higher Education Authority. *National Access Plan: A Strategic Action Plan for Equity of Access, Participation and Success in Higher Education, 2022–2028*; The Stationary Office: Dublin, Ireland, 2022.
7. Clancy, P. *Participation in Higher Education: A National Survey*; Higher Education Authority: Dublin, Ireland, 1982.
8. Clancy, P. *Who Goes to College? A Second National Survey of Participation in Higher Education*; Higher Education Authority: Dublin, Ireland, 1988.
9. Clancy, P. *Access to College: Patterns of Continuity and Change*; Higher Education Authority: Dublin, Ireland, 1995.
10. Clancy, P.; Wall, J. *The Social Backgrounds of Higher Education Entrants*; Higher Education Authority: Dublin, Ireland, 2000.
11. Clancy, P. *College Entry in Focus: A Fourth National Survey of Participation in Higher Education*; Higher Education Authority: Dublin, Ireland, 2001.
12. O’Connell, P.; Clancy, D.; McCoy, S. *Who Went to College in 2004?* Higher Education Authority: Dublin, Ireland, 2006.
13. Higher Education Authority. *Progress Review of the National Access Plan and Priorities to 2021*; Higher Education Authority: Dublin, Ireland, 2018.
14. Bowes, L.; Thomas, L.; Peck, L.; Nathwani, T. *International Research on the Effectiveness of Widening Participation*; Higher Education Funding Council for England: Bristol, UK, 2013.
15. University of Oxford. *University of Oxford Access and Participation Plan 2020–21 to 2024–25*; University of Oxford: Oxford, UK, 2020.
16. NCIHE. *Higher Education in the Learning Society: Report of the Scottish Committee*; Department for Education and Skills: London, UK, 1997.
17. Boliver, V. How Fair is Access to More Prestigious UK Universities? *Br. J. Sociol.* **2013**, *64*, 344–364. [CrossRef] [PubMed]
18. Chevalier, A.; Conlon, G. *Does It Pay to Attend a Prestigious University?* SSRN: New York, NY, USA, 2003.

19. Whitty, G.; Power, S. The school, the state and the market: The research evidence updated. *Curriculo Sem. Front.* **2002**, *2*, 1–23.
20. Undergraduate Common Application System (UCAS). End of Cycle Data Resources. 2022. Available online: <https://wwwucas.com/data-and-analysis/undergraduate-statistics-and-reports/ucas-undergraduate-end-cycle-data-resources-2022> (accessed on 31 March 2023).
21. Mountford-Zimdars, A.; Sabbagh, D. Fair Access to Higher Education: A Comparative Perspective. *Comp. Educ. Rev.* **2013**, *57*, 359–368. [CrossRef]
22. Goodrick, D. Comparative Case Studies: Methodological Briefs-Impact Evaluation No. 9, Methodological Briefs, no. 9, 2014. Available online: <https://www.unicef-irc.org/publications/754-comparative-case-studies-methodological-briefs-impact-evaluation-no-9.html> (accessed on 31 March 2023).
23. Smyth, E.; McCoy, S. *Investing in Education: Combating Educational Disadvantage*; Research Series No. 6. The Economic and Social Research Institute: Dublin, Ireland, 2009.
24. Bray, A.; Hannon, C.; Tangney, T. Large-scale, design-based research facilitating iterative change in Irish schools—The trinity access approach. *Ir. Educ. Stud.* **2023**, 1–22. [CrossRef]
25. Hannon, C.; Faas, D.; O’Sullivan, K. Widening the Educational Capabilities of Socio-Economically Disadvantaged Students through a Model of Social and Cultural Capital Development. *Br. Educ. Res. J.* **2017**, *43*, 1225–1245. [CrossRef]
26. Higher Education Access Route. 2023. Available online: <https://accesscollege.ie> (accessed on 31 March 2023).
27. Share, M.; Carroll, C. *Ripples of Hope: The Family and Community Impact of Trinity College Dublin Access Graduates*; Children’s Research Centre: Dublin, Ireland, 2013.
28. Trinity Access Programme (TAP). “What Happened Next?” *The Employment and Further Study Experiences of Trinity Graduates of TAP 2002–2008*; Trinity College Dublin: Dublin, Ireland, 2010.
29. Hart, M.; Klugman, J. Trinity Access Programme: Foundation Course for Higher Education External Review. *Trinity Coll. Dublin* **2016**.
30. Bray, A.; Hannon, C.; Tangney, B. Large-scale, design-based research facilitating iterative change in Irish schools—The Trinity Access Approach. *Ir. Educ. Stud.* **2022**, in press. [CrossRef]
31. O’Sullivan, K.; Kuster, M.; Smith, R.; Byrne, J.; Keane, L.; Tangney, B.; Hannon, C. *Trinity Access 21: Year One Report*; Trinity College Dublin, the University of Dublin: Dublin, Ireland, 2017; Available online: <https://www.tcd.ie/ta21/assets/files/Report2016.pdf> (accessed on 31 March 2023).
32. Hannon, C.; O’Sullivan, K. Responding to the Global Access Challenge: Expanding College and Career Opportunities for Students from Low-SES Communities in Ireland. In *Actionable Research for Educational Equity and Social Justice (Abingdon, Routledge)*; Chen, W., Li, X., John, E.S., Hannon, C., Eds.; Routledge: New York, NY, USA, 2018; pp. 86–107.
33. Hannon, C. *Capital, Capabilities and Culture: A Human Development Approach to Student and School Transformation*; Vernon Press: Dover, DE, USA, 2019.
34. O’Sullivan, K.; Byrne, D.; Robson, J.; Winters, N. Who Goes to College via Access Routes? A Comparative Study of Widening Participation Admission in Selective Universities in Ireland and England. *Soc. Incl.* **2019**, *7*, 38–51. [CrossRef]
35. O’Sullivan, K.; Robson, J.; Winters, N. ‘I feel like I have a disadvantage’: How socio-economically disadvantaged students make the decision to study at a prestigious university. *Stud. High. Educ.* **2019**, *44*, 1676–1690. [CrossRef]
36. Begbie, J.; Fisher, E. LMH Foundation Year Report 2021. In *Lady Margaret Hall 2021*; Internal University Report; University of Oxford: Oxford, UK, 2021.
37. Begbie, J.; Hannon, C.; Fisher, E. Mid-Pilot Internal Evaluation: The Foundation Year. In *Lady Margaret Hall 2018*; University of Oxford: Oxford, UK, 2018.
38. University of Cambridge. 2023. Available online: <https://www.cam.ac.uk/news/first-ever-cambridge-foundation-year-offers-made-to-prospective-students> (accessed on 31 March 2023).
39. University of Oxford. 2023. Available online: <https://www.ox.ac.uk/admissions/undergraduate/increasing-access/foundation-year> (accessed on 31 March 2023).
40. Rusbridger, A. If Oxford Shrugs: The Inside Story of How England’s Oldest University Picks Its Students, and Why It Needs to Change. *Prospect Magazine*, September 2018.
41. Robeyns, I. Sen’s Capability Approach and Feminist Concerns. In *The Capability Approach*; Comim, F., Qizilbash, M., Alkire, S., Eds.; Cambridge University Press: Cambridge, UK, 2008.
42. Robeyns, I. Capabilitarianism. *J. Hum. Dev. Capab.* **2016**, *17*, 397–414. [CrossRef]
43. Commin, F.; Qizilbash, M.; Alkire, S. *The Capability Approach: Concepts, Measures and Applications*; Cambridge University Press: New York, NY, USA, 2008.
44. Unterhalter, E.; Vaughan, R.; Walker, M. The Capability Approach and Education. *Prospero* **2007**, *13*, 13–21.
45. Walker, M. Selecting Capabilities for Gender Equality in Education. In *Amartya Sen’s Capability Approach and Social Justice in Education*; Walker, M., Unterhalter, E., Eds.; Palgrave Macmillan UK: Basingstoke, UK, 2007.
46. Hart, C.S. The Capability Approach and Education. *Camb. J. Educ. Spec. Issue Capab. Approach Educ.* **2012**, *42*, 275–283. [CrossRef]
47. Sen, A. *Inequality Re-Examined*; Oxford University Press: Oxford, UK, 1992.
48. Sen, A. *Commodities and Capabilities*; Oxford University Press: Oxford, UK, 1999.
49. Sen, A. *The Idea of Justice*; Harvard University Press: Cambridge, MA, USA, 2009.
50. Nussbaum, M. Women’s Capabilities and Social Justice. *J. Hum. Dev.* **2000**, *1*, 219–247. [CrossRef]

51. Nussbaum, M. Wellbeing, Contracts and Capabilities. In *Rethinking Wellbeing: Essays on Health, Disability and Disadvantage*; Manderson, L., Ed.; API Network: Perth, Australia, 2005.
52. Nussbaum, M. Capabilities, Entitlements, Rights: Supplementation and Critique. *J. Hum. Dev. Capab.* **2011**, *12*, 23–37. [CrossRef]
53. Hart, C.S. *Aspirations, Education and Social Justice: Applying Sen and Bourdieu*; Bloomsbury: London, UK, 2013.
54. Alkire, S.; Deneulin, S. The Human Development and Capability Approach. In *An Introduction to the Human Development and Capability Approach*; Deneulin, S., Shahani, L., Eds.; Earthscan: London, UK, 2009.
55. Hart, C.S. Quo Vadis? The Capability Space and New Directions for the Philosophy of Educational Research. *Stud. Philos. Educ.* **2009**, *28*, 391–402. [CrossRef]
56. Wilson-Strydom, M. A Framework for Facilitating the Transition from School to University in South Africa: A Capabilities Approach. Ph.D. Thesis, University of the Free State, Bloemfontein, South Africa, 2012.
57. Walker, M. Towards a Capability-Based Theory of Social Justice for Education Policy-Making. *J. Educ. Policy* **2006**, *21*, 163–185. [CrossRef]
58. Walker, M. Widening participation; widening capability. *Lond. Rev. Educ.* **2008**, *6*, 267–279. [CrossRef]
59. Walker, M. A capital or capabilities education narrative in a world of staggering inequalities? *Int. J. Educ. Dev.* **2012**, *32*, 384–393. [CrossRef]
60. Sen, A. Editorial: Human capital and human capability. *World Dev.* **1997**, *25*, 1959–1961. [CrossRef]

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Article

Research on the Development of Equitable Education in China from the Human Capability Perspective

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Abstract: “Capability” is an important conceptual tool for addressing educational inequity (EI). This paper analyzes the existing limitations of developing educational equity in China from the human capital perspective and proposes the human capability approach as a way to improve it. This paper begins by a policy review on China’s education equity measures, revealing a troubling emphasis on resources allocation and a “top-down” governance. In response, we propose an actionable research approach as a means to improve multi-stakeholder collaboration in educational equity reform and to further the development of student capabilities. The study also presents a case study to illustrate the process of using “capability” and actionable research methods to promote educational equity, demonstrating the necessity and effectiveness. We also note that education inequality is a delicate and complicated topic that requires joint, flexible and innovative efforts.

Keywords: capability; equitable inequality (EI); equitable education (EE); actionable research; LFCF

Under the influence of Knowledge Economy, the pursuit of economic values of education not only solidifies the neglect of human subjectivity in educational reforms, but also aggravates educational inequality. China’s recent mainstream approach to equitable education (EE) development in poverty-stricken areas is to “empower” the poor through education, making them talented workers, and in return promote local economic development. For example, the difference in education level between regions is often regarded as one of the most important manifestations of the income gap between urban and rural areas in China [1]. In addition, it is widely accepted that promoting balanced development in education between regions is going to help narrow the income gap between regions [2]. However, we believe that education should not regard people as economic tools, and human capability development is the fundamental purpose of education. Hence, education policies guided by human capital theory play a limited role in solving educational inequality. Therefore, we need to complement a theory of education that has human capability development at its core. How should this theory be applied in practice to improve educational inequity? Considering actionable research conforms to the norms of both qualitative and quantitative research and seeks to identify unequal phenomena and their causes in society and education, we try to combine the human capability approach with actionable research, developing new theoretical perspectives and applied frameworks.

1. Human Capability Approach and Education Development

As Yates summarized, the transition from human capital theory to human capability development theory will achieve an overall change in educational goals and assessment, thereby driving the innovation of educational practice [3]. Human-capital-oriented education regards development as “growth”, pays attention to student learning achievements, and emphasizes the “input–output” evaluation system. Hence, the ratio of educational input to educational output is the key to determining the success of education practices. In this process, students themselves are invisible. Unlike the human capital approach, if education focuses on the development of individual capabilities, then the goal of education

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is to promote individual freedom, and the initiative shown by individuals becomes a key factor in evaluating the success of education practices (see Table 1).

Table 1. Development discourses and quality learning.

Discourse: Development As	Notion of Quality Education	Focus of Learning	Evaluative Focus	Agency–Structure Relationship	Underlying Political Philosophy
Growth—Human capital	Behaviorism	Consequences	Input–output	Intervention	Utilitarianism
Improved human rights	Humanism	Constructions	Processes	Institution	Liberalism
Liberation	Criticality	Connections	Outputs/outcomes	Interaction	Post-Marxism
Enhanced freedoms	Capability	Combinations (3C) “rich learning”	Agency	Integrative (3I)	Globalism Thick cosmopolitanism

In the above Table, 3C represents a richer form of learning, which regards learning as a consequence, construction and connection (3C); 3I means that this work needs short-term intervention supplemented by long-term institutionalization and sustained social interaction [3] (p. 3).

The capability approach is a theoretical framework that essentially highlights the neglected factors under human capital theory and reshapes the way education is reformed. And it has been widely used to study social inequality in education. According to this theory, people’s development should be a process in which individuals regain their subjectivity, gain their capability and realize their cherished life. The application of this conceptual tool can help break the limitation of the human-capital-oriented approach and pursue the development of EE centered on developing people’s capabilities.

Sen defines capability as “an optional combination of things that a person can do or can be, that is, various functions that he or she can achieve” [4] (p. 30). Opposing the view of traditional welfare economics that welfare is equal to utility, he thinks that there are two indispensable stages from welfare to utility: capability and function. Functions are realized results such as reading, while capability is the potential to realize these functions such as being taught to read and having books or newspapers to read. Therefore, the difference between capability and function is the difference between realized opportunity and actual achievement, or the difference between potential and result [5] (p. 4).

Sen further distinguished capability from function as follows [6] (pp. 34–35):

- Functioning refers to a person’s achievements and what an individual tries to do or be. It reflects, as it were, a part of the “state” of that person;
- Capability refers to a person’s ability to achieve a given functioning (“doing” or “being”);
- Functioning n-tuple describes the combination of “doings” and “beings” that constitute an individual’s life state, with each functional n-tuple representing a possible lifestyle;
- The capability set describes a set of attainable functioning n-tuples that an individual can realize, where an individual can choose between different commodity bundles and utilization methods.

Therefore, a person’s capability refers to an alternative combination of functions that they can realize. In other words, they have effective opportunities to engage in their voluntary actions and activities, to have freedom to realize various lifestyles and to become the person they want to be. The capability approach proposed by Sen has been widely accepted and applied because it considers human beings to be the goal, recognizes human heterogeneity and diversity, pays attention to group differences, accepts people’s initiative and participation, and recognizes that different people, cultures and societies may have different values and aspirations [6] (p. 34).

The capability approach has important implications for social justice in education. First, education itself is a basic ability, which affects the development and expansion of other abilities [5] (p. 8). This means that if there is an absence or a lack of educational opportunities, essential harm and disadvantage is caused to individuals. Second, educational capability plays a substantial role in expanding other existing and future capabilities, so it is the basis of different capabilities and the possibility of living a better life. Third, the instrumentality and the intrinsic value of education itself can improve individual freedom, including freedom of well-being and freedom of initiative, which are emphasized by the capability approach [7] (pp. 30–31). Finally, in the educational application, human capability provides a set of conceptual tools to think about how to reduce injustices in the current education system and the wider society. As Hart (2012) explains, this set of tools allows us to think creatively about the role, process, and content of education, broadening our horizons beyond the limitations of standardized testing, neoliberal discourse, and quantitative policy directives [8] (p. 278). In this way, we can transcend the limitations of human capital, truly think about the goals and values of education from the perspective of human freedom and human ability development itself, and improve educational inequality.

It is on this basis that many scholars prefer the concept of “educational capability”. It refers to offering students with low socio-economic status (SES) rights and information so that they can choose the educational path they value. Cliona pointed out that education reform should aim at expanding human capability and providing activities for students with a low SES to help them fill the gaps in their social and cultural capital [9] (p. 70), since such gaps determine the size of their “capability set” to some extent. Furthermore, education provides opportunities for individuals to transform their capabilities into functions, which is particularly critical to the educational problems faced by vulnerable groups in many low-income countries [10] (p. 395). This means that improving the education of vulnerable groups actually requires us to pay attention to whether the education received by the disadvantaged groups can improve their capability, whether the ability of the disadvantaged group has been freely developed, and whether they can choose the life they want to live with the ability acquired. In other words, equity in education is ultimately a kind of equity in competence.

Although human capability is an important supplementary framework for the research and formulation of the EE policy in China, it is still lacking in partitionable grounds. Most scholars regard it as a theoretical tool to analyze and discuss poverty governance and social welfare issues, and lack the awareness of using action research concepts to solve local problems, failing to form the theoretical connotation and the practical system of feasible ability with local vitality.

Research shows that human capability theory can be an effective tool to promote equitable education development. According to a nationwide empirical study on education satisfaction, people are paying more attention to capability equity than resource equity when it comes to education distribution, and are more concerned about the equity within the organization and the equity that is more closely related to their current experience than the equity in distribution and the equity between organizations, such as narrowing the gap between schools and integrating urban and rural education [11] (p. 39). Meanwhile, capability theory pays more attention to the EE of specific individuals. The realization of such equity depends not only on educational resources and results, but also on the expansion of students’ capability or the enhancement of students’ initiative through education.

Therefore, based on the current research of human capability theory and troubled practices, we believe that in order to better employ the human capability theory to solve the problem of equitable development of education in the Chinese context, we should further combine actionable research approach to explore feasible ideas of capability expansion, achieve the social welfare needs of the target group, provide a basis for the introduction of relevant social welfare policies, and help the sustainability of China’s social welfare needs. On this basis, we also need to develop appropriate solutions to improve educational equality through actionable research to explore feasible capability expansion at the educational

level, both theory-wise and practice-wise; this is the core topic of this research. We aim to promote the development of educational equity through actionable research to expand the viable capabilities of individuals and call for more research investment.

2. Equity of Educational Opportunities in China from the Human Capability Approach

As an important social issue in China, EE is commonly associated with topics like economic growth, social solidarity, social equality and justice, and draws wide attention. Since the Tenth National Five-Year Plan for Education Development released in 2001 proposed “EE” as a basic education policy for the first time, China has made documented progress in promoting EE. However, due to China’s huge population, social stratification and vastness in territory, the development of EE in China is arduous. Although this kind of extensive resource redistribution among different regions and population groups is conducive to achieving relatively fair results at the macro level, it masks many practical problems and dilemmas. In particular, the individual experience of fairness and the development of specific abilities of vulnerable groups are actually invisible with the extensive policies. According to the theory of human capability development, the focus of EE promotion should shift from extensiveness to fineness, from the equality of resources to the equality of human capability. In other words, circumstances dictate that the development of EE in China needs to move beyond macro control, taking into consideration the micro- and fine-grained factors, and consider the equitable development of individual capability.

At the beginning of each year, the Ministry of Education of the People’s Republic of China issues the Key Points of Work of the Ministry of Education as a guide to the education work for the year. A textual analysis documents from 2012 to 2022 shows that “equity in education” is a core task every year, and “educational equity” still aims at promoting equality of educational opportunities and balanced allocation of educational resources (see Table 2).

Table 2. Key points of work of the Ministry of Education from 2012 to 2022 for the purpose of “educational equity”.

Serial Number	Tenet of “Educational Equity”	Year
1	We will promote fairness in education and effectively protect the people’s right to receive education	2012
2	We will vigorously promote equity in education so that every child can become a useful person	2013
3	We will reform the way resources are allocated and vigorously promote equity in education	2014
4	We will vigorously promote equity in education and gradually narrow the gap between regions, urban and rural areas and schools	2015
5	We will uphold shared development and effectively protect the people’s right to receive education	2016
6	We will vigorously promote equity in education and effectively narrow the gap between urban and rural areas, between regions, between schools and between groups of people	2017
7	We will vigorously promote equity in education and improve the public education service system	2018
8	We will enhance people’s sense of gain from education	2019
9	We will vigorously promote equity in education and gradually narrow the gap between regions, urban and rural areas and between schools	2020
10	We will enhance people’s sense of gain from education	2021
11	We will actively respond to the concerns of the people and ensure that the fruits of education development are more equally shared by all the people	2022

Source: Key Points of Work of the Ministry of Education (2012–2022) http://www.moe.gov.cn/jyb_sjzl/moe_164/ (accessed on 25 February 2023).

Although some scholars point out that China's EE has entered a stage of "equal quality" from the old stage of "equal opportunity", in terms of practices, there are complications. These EE-related problems mainly exist in disadvantaged groups such as rural populations, populations in poverty-stricken areas, ethnic minority populations, left-behind children, and children who are living with their migrant parents. For a long time, disadvantaged groups have been the main target of EE, but they are still faced with the real problem of being deprived of capability.

Problems related to ethnic minority groups: Preferential policies for ethnic minority education in China can be divided into four categories: special policies for running schools (classes) for inland ethnic groups; special policies for senior high school entrance examination and college entrance examination; special policies for university enrollment; and special policies for ethnic preparatory classes in colleges and universities. Although these policies are aimed at enhancing the education opportunities for minority students, they are not adequate. According to an empirical survey conducted in 2013, the average length of education of China's ethnic minority population is shorter than the national average, and ethnic minority women are the group most affected by EI in particular [12]. Influenced by their social custom, China's ethnic minorities as a whole do not pay sufficient attention to education compared to the Han, and their motivation for education is not as strong. Worse still, the current teaching system is dominated by the Han culture, causing learning obstacles for ethnic minorities [13]. At the same time, the preferential education policy gives preferential treatment to all students with the "minority identity", which has caused a lot of new problems, such as "hitchhiking" by the dominant social strata in the ethnic groups and falsification of ethnic identity. In practice, therefore, the preferential education policy has become an "educational privilege" for some people and stimulated more inequality [14].

Problems related to migrant children: China's current household registration (Hukou) system creates a dual social structure, exacerbating EI problems to rural migrants working in cities. Since migrant workers are rural by Hukou registration but work in the cities, it is often difficult for their children to attend urban schools. According to statistics, the floating population (non-permanent resident in a region) in China reached 376 million in 2020, including about 200 million migrant workers [15]. Although China implements a college matriculation policy for migrant children in order to meet their needs for fair education opportunities, all localities, especially developed areas, take a "high-threshold policy", which overtly deprives migrant children of their opportunity to higher education. For example, in Beijing, the conditions for migrant children to take the college entrance examination are the following: their parents must hold a valid Beijing residence permit, residence registration card or work and residence permit, have a stable residence and occupation, and pay social insurance premiums for a certain number of years continuously; and the children must have a student status in Beijing and have been attending high school for 3 years in a row. However, even if they have the above qualifications, migrant children can only apply for the entrance examination of higher vocational schools. As a result, migrant children cannot realize the life state that they have a reason to cherish through free choice, which shows a lack of capability. This includes the lack of ability to choose further studies (such as lack of academic ability and insufficient ability to pay for education), the deprivation of local opportunities for further studies, or unequal opportunities for further studies (in fact, many cities, especially Beijing, Shanghai and Guangzhou, only offer vocational education to migrant children) [16].

Problems related to urban-rural gaps: China's administrative division has three categories: Urban Areas, County and Town Areas, and Rural Areas. This is the basis of China's regional education disparity management, macro-level resource allocation, and data collection and comparison for measuring urban-rural gaps. According to this logic and the Educational Statistics Yearbook of China [17], the urban-rural gap in education has almost been eliminated. Take the number of books and digital resources in the basic education stage as an example (see Table 3). Although Urban Areas have the most books and digital resources, followed by County and Town Areas, and then by Rural Areas, the

number of students in these three types of areas are also in the same descending order. Therefore, from a per-student perspective, there is little difference in educational resources between the three types of areas; moreover, the average number of books and computers available per student in Rural Areas is even higher than that in Urban Areas and County and Town Areas. Does this mean no regional difference in education in China? Only in numbers, not from the perspective of capabilities. This is because not everyone can turn the provided educational resources into the same or similar advantages in life [8] (p. 276).

Table 3. China’s urban–rural gaps in terms of the number of books and digital resources for basic education (2020).

Type		Urban Areas		County and Town Areas		Rural Areas	
Senior high school	Number of students in school	12,322,698		11,716,754		905,077	
	Number of books	562,340,117	3,050,865	425,263,938	1,865,754	39,032,944	201,294
	Quantity per student (rounded)	46	0.25	36	0.16	43	0.22
Junior high school	Number of students in school	19,029,366		23,733,472		6,378,055	
	Number of books	663,943,679	3,307,564	866,688,808	3,499,747	286,113,228	1,186,617
	Quantity per student (rounded)	35	0.17	37	0.15	45	0.18
Primary school	Number of students in school	42,030,976		40,717,741		24,504,815	
	Number of books	949,166,676	622,984	933,357,062	301,632	696,694,344	206,818
	Quantity per student (rounded)	39	0.015	23	0.0074	28	0.0084

For example, schools carried out large-scale online teaching due to COVID-19 in 2020. The digital teaching crisis revealed that the actual digital resources available to urban and rural students depended on the capability of students’ families, rather than the number of school computers shown in the above statistics. A survey in 2020 showed that 70.62% of students in Urban Areas and County and Town Areas used computers or tablets to attend online classes, while 74.98% of students in Rural Areas used mobile phones [18] (p. 63). Therefore, it was clear that the urban–rural gap in education was further widened due to the urban–rural gap in family capability. Admittedly, educational aid can help low-SES students to a certain extent, which is also one of the important educational policies in China. In 2014, 2018, 2020 and 2021, the Chinese government provided subsidies of RMB 11.51 billion, 18.98 billion, 16.89 billion and 16.43 billion, respectively, to ordinary high school students, and most of the funds flowed to the central and western regions where low-SES students were concentrated (see Figure 1). However, it remains unclear to what extent these subsidies have improved the capability of disadvantaged groups.

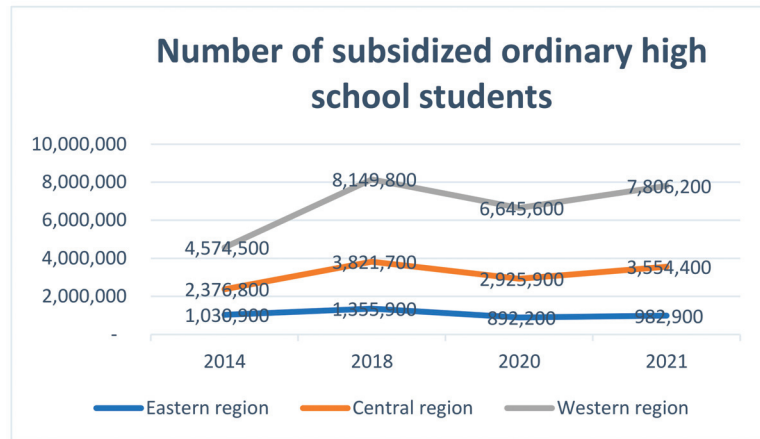


Figure 1. The number of subsidized ordinary high school students. Data comes from China National Center for Student Financial Aid. <https://www.xszz.edu.cn/n85/index.html> (accessed on 3 March 2023).

According to the latest statistics, the gross enrollment rate of higher education in China reached 57.8% in 2021, and the population with higher education backgrounds reached 240 million. MOE China declares, institutionalizing the famous Martin Trow Elite-Mass-Universal triptych on the development of Higher Education in a country, that China marking that the Chinese population now has a universal higher education. Although increasing university enrollment opportunities seems to be able to correct social injustice, it actually masks the inequality of opportunities for low-SES students to transform their capability into functions [9] (p. 70). This is because low-SES students cannot effectively convert resources into functions like their counterparts from more affluent background, and they have various obstacles to the realization of functions in school. This is more obvious after they start attending college. A “study on low-SES students’ adaptability to campus life” shows that students from poor families have lower adaptability and longer adaptation period than urban students after entering the universities. This research samples students in China’s ‘World Class Universities’ and ‘World Class Disciplines’, a token for their exceptional ability to get great scores in college entrance examinations. Despite their extraordinary academic performance, the researchers find that university students from low SES backgrounds are less “dedicated”, less concentrated on learning, less interested in the discipline they learn, and introverted in interpersonal relations [19]. This means that even if low-SES students have the same academic achievements as high-SES students, there is still a big gap between them, which is caused, in essence, by the gap in capability.

Therefore, the equality of educational resources and results does not necessarily mean the equality of education. According to Nussbaum, among the three ways to promote social justice, the resource-based approach and the preference-based approach cannot solve the problem of inequality but aggravate it instead. In fact, the problem with fair allocation of resources is that different individuals have different capabilities to transform resources into functions. This includes both physical differences and social (hierarchical) differences [20] (pp. 232–233).

Therefore, the capability approach opposes the traditional view of fair distribution of resources and criticizes the traditional theory about what inputs (ideas, teachers and teaching materials) form specific opportunities to achieve the expected results (economic growth or social solidarity). The capability theory holds that an evaluation of social (including educational) arrangements must be based on people’s capability, rather than the resources they can obtain or the results they can achieve [5] (pp. 2,4). Therefore, according to Sen’s concept of equality, what should be equal is not resources (such as equitable

allocation of education funds) or results (such as the leveling of students' qualifications), but people's capability, that is, what people can become and do [5] (p. 3).

This means that we need to evaluate educational development based on people's capabilities, accurately identify the capabilities of different groups according to their economic, cultural, capital and social status, reconstruct the EE development framework based on the full investigation and experiments according to the basic idea of expanding the capability set beyond the macro allocation of resources, and reach a more complex, diverse, individualized and refined level so as to truly enhance the ability of disadvantaged groups through education.

3. Capability Building: Actionable Research Application on Educational Equity

The capability approach has been constantly questioned since it was put forward. One of the most famous questions is "To what extent is the capability framework operable?" [21] (p. 1953). Although Nussbaum criticized Sen for not establishing a clear framework and developing the list of ten core capabilities by means of analytical philosophy, Sen himself has always opposed setting a fixed list of capabilities, advocated an engaged human development model, and emphasized the importance of public participation and dialogue in achieving valuable capabilities. This means that some form of participatory dialogue is always needed in evaluating education-related capabilities [5] (p. 12). According to Santos Mehrotra's research, it is only at the community level that the capability approach can be really practical and useful [22] (p. 306). In this sense, actionable research is one of the effective ways to solve the EI problem using the capability approach.

Actionable research, proposed by Edward St. John, aims to identify social and educational inequities and their root causes. Through actionable research, we can reflectively choose the policies and action strategies from multiple options to address these inequities. The specific steps include identifying problems, collecting data or conducting surveys, determining solutions, taking actions, evaluating effects, and revising policies and practices, and all of these steps require cooperation among researchers, policymakers and practitioners [23] (p. 147).

The capability approach is essentially an evaluation method, so in order to make this method operable, it is necessary to determine the conditions that lead to the realization of simple functions (such as being able to read and write) and complex functions (such as being able to participate in community life and having self-esteem). Embedding the capability approach into the actionable research model means that when evaluating the topics that need to be reformed in the research-based action inquiry model (AIM), researchers and practitioners need to jointly determine the conditions for individuals to realize simple functions and complex functions; evaluate whether the development of education makes it possible to realize these functions; generate problems on this basis; conduct empirical research or data collection; and further determine the generative system to expand students' capability while following quantitative and qualitative evaluation methods. However, the measurement of capability and function is the most important challenge in applying the capability approach in empirical research and specific social environment, and the pluralism of Sen's evaluation framework actually makes research, policymaking and practice more complicated [24]. In comparison, Nussbaum's view that emphasizes the necessity of a list of core and universal human capabilities and supports the establishment of a national standard for specific capabilities is more operable as the basic way for different scholars to apply Sen's framework.

It is the challenge of building a system of capabilities and the unique role of actionable research in addressing this challenge that makes it possible to apply the capability approach to deal with educational inequalities through actionable research. That is to say, one of the important ways to construct the capability framework of disadvantaged groups is to design or create a basic capability list as a reference standard based on a large number of empirical studies and discussions under a specific social background so as to identify and examine

the capabilities that a certain group lacks and the specific factors thereof, to explore, develop and enhance the educational projects or methods for the identified capabilities.

Following the three methods of constructing the capability list commonly used in the world, Chinese scholars have studied China's capability lists of three aspects: "expert-selected capabilities", "more complicated rules and procedures for identifying capabilities" and "listening to the voices of disadvantaged groups" [6] (p. 6). The available lists present different results (see Table 4) [25] (p.80) [26] (p.122). This shows that the construction of capability lists are different when the groups they face, the problems they try to solve and the resources they have are different. In fact, this is in line with the viewpoint of the capability approach that recognizes the heterogeneity and diversity of human beings and pays attention to group differences. It is precisely because of this that capability building has become an effective way to solve the EI problem substantially. However, the available lists lack public participation and dialogue, while the capability approach emphasizes the importance of public participation in discussions and rejects paternalistic decisions. Sen clearly pointed out that decisions on what capabilities should be chosen should not be made only by local elites or cultural experts without the participation of direct stakeholders [27] (pp. 31–32).

Table 4. Comparison of two capability lists in China.

Chinese Citizens' Representative Capabilities	Migrant Children's Capability of Integrating into Society	
Health status	Health	Physical health; mental health; social adaptation; moral integrity
Education	Learning	Language learning; knowledge and information learning; policy learning and compliance
Leisure	Social communication	Social communication
Income	Participation	Educational participation; community participation
Economic satisfaction		
Trust		
Free choice		

Actionable research advocates the comprehensive use of three capability construction methods: analytical and philosophical construction at the academic level, empirical research on social reality, and letting disadvantaged groups speak out. The three methods used in combination will help put forward a representative list of capabilities.

However, creating a capability list is only the first step. To truly expand the capability set of disadvantaged groups, collective or organized activities are needed with the list as a reference standard. In other words, solving the problem of inequality in practice also requires cooperation among local schools, communities, governments, enterprises, foundations and other parties through public- and private-funded social networks. Taking the education of migrant children in Shanghai as an example, the city has formed an effective and refined cooperative group to solve the problem of EI for migrant children.

- Educational institutions conducted special investigations and studies. In 2011, for example, the Committee for Migrant Children's Education of the Chinese Society for the Study of Tao Xingzhi carried out a "Research on the Education of Migrant Children after Junior High School in the Context of Urbanization" and published the *Blue Book of Education of Migrant Children* in Shanghai, which pointed out the education-related problems faced by migrant workers' children in Shanghai and provided an important reference for further policy formulation.

- Governments at all levels in Shanghai promulgated and implemented a series of educational policies for children of migrant workers.
- Non-governmental educational organizations hold special seminars. Since 2002, Shanghai has regularly held national special seminars on the education of migrant children so as to draw more social attention to the EE of migrant workers' children, build a communication platform and trigger further reforms.
- Support came from all walks of life. Different community groups in Shanghai participate in improving the education of migrant children. For example, the Shanghai Municipal Committee of the Communist Youth League and the Shanghai Committee of NPSC-YPC used the Children's Palace to carry out social activities for the children of migrant workers; Shanghai universities used the summer vacation to carry out the "Hand in Hand with Love" campaign, in which college student volunteers and migrant children held education activities together; Hong Kong You Dao Foundation made donations to improving the education of migrant children (see Figure 2).

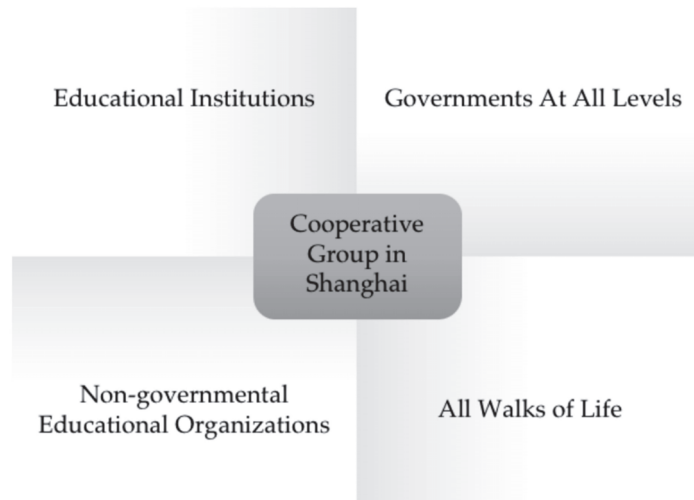


Figure 2. Cooperative groups in Shanghai.

Thus, the basic model of actionable research for constructing a list of capabilities for EE begins with the construction of a list of capabilities through engaged scholarship, using the functions presented by the list of capabilities as evaluation factors to locate and analyze the reasons for the lack of viable competencies of disadvantaged groups. This is followed by an analysis of the personal and social environment of disadvantaged groups and what influences them to transform what they already have into enabling resources, thus exploring ways of enhancing viable capability sets. Finally, the list of capabilities is practiced and revised through the collaboration of individuals, families, communities, and governments (see Figure 3).

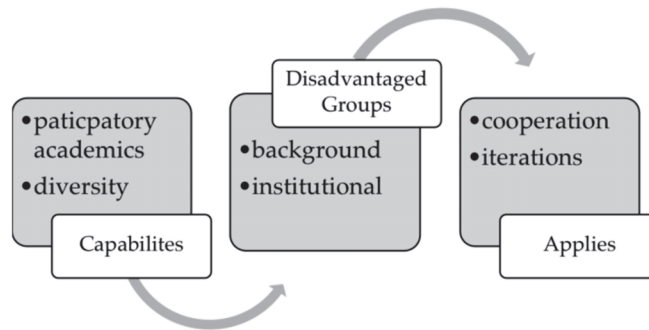


Figure 3. Actionable research route to build a list of capabilities.

4. Case Study: The LFCF Program and Its Efforts on Educational Equity

As mentioned above, actionable research is a principal and practical means to solve the EI problem through the capability approach. But what can be implemented specifically? To respond to this question, we further introduce our educational experiment in collaboration with the Chen Yidan Foundation.

In 2020, to promote the development of people’s capability, we joined the Learner for the Future Competence Frame (LFCF) program launched by the Chen Yidan Foundation and established an education expert workshop. In the past two years, we have been carrying out research and experiments on how to re-endow learners with a subjective status. The core idea of the workshop is that education should focus on enhancing the development of student capabilities rather than emphasizing quantitative achievements, such as test scores. Therefore, a collaborative educational ecology involving students, families, schools and communities was built. The ultimate aim of the LFCF program is to develop learners with infinite growth possibilities, meaning that individuals develop sufficient viable competencies over the course of education and be able to achieve their own goals for a better life.

Referencing actionable research principles, the LFCF project is a collaborative educational dialogue and experiment with a rich hierarchy of participants, including students, parents, K-12 education practitioners, university academics, social activists and relevant government personnel, as well as a team of international scholars. The professors range from those with a Western cultural background to those who are native to China. The native professors are from several key universities in China, such as Tsinghua University, Peking University, Beijing Normal University and Zhejiang University. Participating K-12 education practitioners include both educators from regular schools, such as the Affiliated High School of Peking University, and educators from innovative schools, such as Avenues International School. Participating students and parents mainly come from the educational experiments conducted by the LFCF project. After numerous talks, seminars and workshops, we presented our final research report. “Competence and Education of the Learner for the Future” [28] was presented at the international education forum “Learning Ecosystem for the Future: Family, School, Society” on 12–13 November 2022. The two core contents of the report are a competence framework for the infinite growth of individuals and a PBL-dominated comprehensive practice system of educational grammar.

For students, the most critical step in capability building is the improvement of their ability, which is also one of the core goals of the LFCF project. In the early stage of the project, the LFCF team held a workshop and invited various stakeholders to discuss and analyze 763 literacy databases formed by 45 global literacy frameworks. Based on the scenario and social reality of Chinese students, a capability list (see Table 5) was preliminarily developed and a PBL-dominated community education model was proposed to effectively help students develop those capabilities. With this list as a benchmark, Chen Yidan Foundation launched the “Mars Rescue Plan” summer camp in the Shenzhen Mingde

Experimental School in July 2021. They provided a set of PBL education courses oriented to the development of the capability list with the students who entered the camping. At the end of the camping, they showcased relevant achievements in a seminar and collected comments and suggestions on this educational activity from the participating students and their parents. Then, we further adjusted and optimized the capability list based on empirical results. After two years of refinement and re-calibration, we can say that the learners in the context of China should have five basic capabilities: exploration, critical thinking, collaboration, creativity and care. These five capabilities are what people as both individuals and part of society should develop. They transcend the social structure stratification and group differences and lead to the ultimate equality of all individuals in realizing their capabilities.

Table 5. Capability list of the LFCF project.

C1—Exploration	C1-1 curiosity C1-2 recognition of the problem	C1-3 courageous and resolute C1-4 concentration	C1-5 planning C1-6 trial and error
C2—Critical thinking	C2-1 reasoning C2-2 cling to the difference	C2-3 reflection C2-4 systems thinking	C2-5 resilience
C3—Collaboration	C3-1 listening to others C3-2 effective communication C3-3 emotion management	C3-4 tolerance C3-5 dependability C3-6 positivity	C3-7 sharing C3-8 implementation
C4—Creativity	C4-1 divergent thinking C4-2 traceability C4-3 crossover	C4-4 integration C4-5 break through the stereotype	C4-6 meta-cognition C4-7 self-efficacy
C5—Care	C5-1 empathy C5-2 diversity	C5-3 dedication C5-4 consciousness of duty	C5-5 consciousness of history and society

Consistent with Nussbaum’s view on the necessity of updating the list of basic capabilities, the LFCF team believes that these five basic capabilities are a relatively complete but open and growing framework. At the same time, we refined 31 secondary literacy indicators and provided specific references for curriculum development and teachers’ teaching planning. More importantly, to increase the practicality and effectiveness of the list, the LFCF team set up a matching comprehensive practice system—Future Educational Grammar (CMYK), an interdisciplinary meta-programming system for curriculum projects corresponding to the capability list.

We not only try to provide a framework and effective tools for educational reform, but also work with individuals, families, communities, governments and other parties, emphasizing the diversified development of educational ecology. The capability approach advocates the participatory mode, and the development of EE also depends on the participation and practice of various stakeholders. At this stage, we have flexibly applied the capability list and the CMYK practice system in the education practice activities related to “protecting minority culture” and “developing the capability of students in remote rural areas”. The following is a detailed description of these two EE practices activities.

As mentioned earlier, one of the obstacles to the EE of ethnic minorities in China at this stage is the over-emphasis of the Han culture in education. According to the capability approach, an important way to realize the EE of ethnic minorities is to focus on their own cultural needs. Only by taking their cultural characteristics and educational experience into consideration can they have the right and freedom to choose a suitable educational model. Therefore, in July 2022, the Chen Yidan Foundation, the main investor of the LFCF project, collaborated with Starry Night Chinese Multicultural, a youth team dedicated to protecting, inheriting and innovating multi-ethnic cultural heritage. Together, they launched a five-day project-based learning camp on Haqniq culture inheritance and innovation in the Meng Song Primary School, Mengsong Village, Menglong Town, Jinghong City, Xishuangbanna

Dai Autonomous Prefecture, Yunnan Province. The detailed itinerary of the summer camp is as follows:

1. The team went to Meng Song village to conduct research. They noticed that the majority of the residents of Meng Song Village are Haqniq. The Haqniq culture has a long history and rich content. It has unique folk customs in dance, textiles, and architecture. However, under the impact of popular culture brought about by television and the Internet, local Haqniq children have limited channels to systematically learn their own ethnic culture both at home and in school.
2. In order to further preserve the Haqniq culture, the team created a project-based learning school curriculum for the Meng Song Primary School based on the theme of “Hani Cultural Inheritance and Innovation”. The curriculum is based on the LFCF capability list and the CMYK practice system and is geared towards the cultivation of the two major competencies of “inquiry” and “innovation”.
3. The team conducted a five-day curriculum practice in Mengsong Primary School structured around four modules: “Cultural Insight—Cultural Inclusion—Cultural Reflection—Cultural Practice”. The syllabus of the four modules is shown below (see Table 6).
4. After the summer camp, the mentors further improved the PBL school-based curriculum and teacher training materials according to the feedback from all parties involved in the teaching process, which helped the curriculum to run sustainably at the Meng Song Primary School. This means that the educational philosophy of the LFCF program which is guided by capability has taken an important step forward in realizing the EE of ethnic groups.

Table 6. The syllabus of the camp.

Module	Lesson	Capability
Cultural Insight	Haqniq’s architecture	C1-1 Curiosity
	Haqniq’s costume	
	Haqniq’s traditional festival	
Cultural Inclusion	The colorful world of tea	C5-2 Diversity
	The community of Minorities	
	Interaction with Minorities from other cities	
Cultural Reflection	Unearthing cultural treasures	C5-4 Consciousness of duty
	Fieldwork around Mengsong	C1-2 Recognition of the problem
	Create a cultural map of Mengsong	C4-4 Integration
Cultural Practice	Learn how to arrange an exhibition	C4-1 Divergent thinking
	Arrange a Haqnia culture exhibition	C4-7 Self-efficacy
	Guided tours	C5-4 Consciousness of duty

In addition to the development of EE for ethnic minorities, the capability lists and CMYK practice system are also systematically applied to disadvantaged groups in rural and remote areas and further optimized after a series of educational practices. In February 2023, the Chen Yidan Foundation cooperated with the Sustainable Education Innovation Alliance to launch the project of “promoting the development of literacy education and the realization of equitable education in rural areas”. In chronological order, the operation mechanism of this project in the coming year (2023.2–2023.12) is presented (see Figure 4).

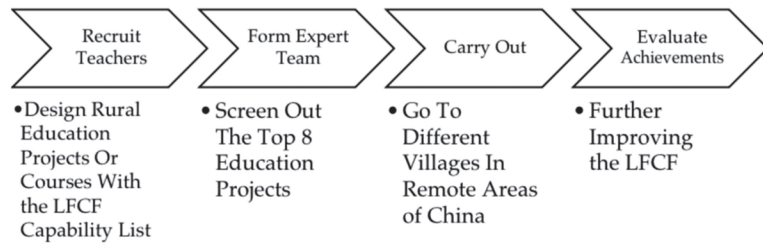


Figure 4. The action of “promoting the development of literacy education and the realization of equitable education in rural areas”.

So far, more than 80 volunteer teaching teams have signed up to participate in this initiative, many of which aim to improve the education of disadvantaged groups. A sign language volunteer teaching team from the Xuzhou Qiyang Public Service Center conducted a sign language course on “How to make deaf students in special schools and students in general schools equally and jointly inherit the Yi cultural heritage?”. Another team from Shenzhen University conducted the project “How to guide left-behind children to explore the environment and nature in their neighborhoods under the concept of sustainable development?”. Although this action is still in the early stage at present, and its effectiveness needs further observation, we hope that this year-long educational action will help literacy capability education to take root, sprout and grow better in rural areas.

Based on actionable research approach, the LFCF project and its existing educational experiments bring together stakeholders to have an equitable dialogue and exchange and develop a series of educational actions to promote the development of human capability. Although officially China has multiple approaches in place to expand university enrollment and increase educational opportunities in rural areas, using engaged scholarship partnership can accelerate this process, because social justice is a commonly shared pursuit [25] (p. 60). The LFCF team’s three-year action and its initial results show that engaged scholarships are of great value for and significance to the development of EE. At the same time, it also shows that human-capability-based action research about EE and social justice also needs to apply “engaged scholarship” in order to build a knowledge system that eliminates the deeply rooted and increasingly widening structural, institutional, social and cultural inequalities. As St. John and others pointed out in 2018, it is still a lofty mission of the academic community to participate in academic research that supports social actions and efforts to reduce various inequities in human society [29] (p. 51). It should be noted that the focus of the engaged scholarship is not on critique but on construction, which is also the core of actionable research. Educators should not only describe or criticize the current situation of the world, but rather think about how our actions today could create a future better educational world.

5. Conclusions

We advocate the combined use of the concept of capability and actionable research to organize multi-stakeholder conversations in order to deal with the problem of EI. The way we look at education is challenged by a paradigm shift from an economic orientation to human development, with human beings placed at the center of education and human capability development. A human-centered perspective is premised on expanding how people can choose to live freely, rather than promoting socio-economic development. Although some progress has been made in the development of educational equity in China at this stage, there are differences in the ability of individuals to convert resources into functions, and the government’s emphasis on a balanced allocation of resources at the macro level cannot actually solve the problem of educational equity completely. From the Human Capability Perspective, we will constantly ask whether education enables individuals the “capability” to freely choose their lifestyles. We will explore possible

solutions and work together to promote equity in education. In doing so, challenges arising from the gap between theory and practice are inevitable. However, more dimensions of educational equity and more possibilities for improving educational inequalities will be demonstrated. It can be said that the LFCF project and the educational experiments that we have undertaken are a prototype of such possibilities.

Investigating and solving the EI problem from the perspective of human capability needs more voices from scholars, policymakers, social groups, and disadvantaged groups. Based on the theory of human capability, the reform of educational equity is no longer a matter of filling in or repairing, nor is it a matter of fine-tuning data measurement or stratification structures, but an innovation of individual educational development based on human capability and a holistic educational turn needs more joint actions of all social groups.

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References

1. Binkai, C.; Pengfei, Z.; Rudai, Y. Government Educational Expenditure, Human Capital Investment and Urban-rural Inequality in China. *Man. World* **2010**, *196*, 36–43. (In Chinese)
2. Zhao, C.; Ming, L.; Yu, J. Regional Differences of Human Capitals and Education Development in China: An Estimation of the Panel Data. *World Econ.* **2004**, *12*, 25–31. (In Chinese)
3. Yates, C. Teacher education policy: International development discourses and the development of teacher education. In *Paper Prepared for the Teacher Policy Forum for Sub-Saharan Africa 6–9 November 2007*; UNESCO Paris: Paris, France, 2007.
4. Sen, A. Capability and Well-Being. In *The Quality of Life*; Nussbaum, M.C., Sen, A.K., Eds.; Clarendon Press: Oxford, UK, 1993; pp. 30–53. [CrossRef]
5. Walker, M.; Unterhalter, E. The Capability Approach: Its Potential for Work in Education. In *Amartya Sen’s Capability Approach and Social Justice in Education*; Walker, M., Unterhalter, E., Eds.; Palgrave Macmillan: New York, NY, USA; Hampshire, UK, 2007; pp. 1–18.
6. Clark, D. The Capability Approach. In *The Elgar Companion to Development Studies*; Clark, D.A., Ed.; Cheltenham·Northampton: Northampton, UK, 2006; pp. 32–45.
7. Terzi, L. The Capability to Be Educated. In *Amartya Sen’s Capability Approach and Social Justice in Education*; Walker, M., Unterhalter, E., Eds.; Palgrave Macmillan: New York, NY, USA; Hampshire, UK, 2007; pp. 25–44.
8. Hart, C.S. The capability approach and education. *Camb. J. Educ.* **2012**, *42*, 275–283. [CrossRef]
9. Cliona, H.m.; O’Sullivan, K. Responding to the Global Access Challenge: Expanding College and Career Opportunities for Students from Low-SES Communities in Ireland. In *Actionable Research for Educational Equity and Social Justice*; Chen, W., St. John, E.P., Eds.; Routledge, Taylor & Francis Group: New York, NY, USA; London, UK, 2018; pp. 66–87.
10. Fertig, M. Educational leadership and the Capabilities Approach: Evidence from Ghana. *Camb. J. Educ.* **2012**, *42*, 391–408. [CrossRef]

11. Research Group of National Education Satisfaction Evaluation. An Empirical Research on Satisfaction Degree of Basic Education. *Educ. Res.* **2016**, *37*, 31–42. (In Chinese)
12. Changan, L.; Yuanwei, L. Research on Educational Equity in Ethnic Areas—An Empirical Analysis Based on the Survey Data of Guangxi in 2011. *Ethno Natl. Stud.* **2013**, *205*, 35–44+124. (In Chinese)
13. Jianhong, D. A Study on the Equality of Ethnic Educational Issues from the Perspective of Culture Reproduction. *Guizhou Ethn. Stud.* **2017**, *38*, 201–204. (In Chinese)
14. Minggang, W.; Xiaotong, Z. From Preferential Status to Targeted and Differentiated Support: Internal Logic of Evolution of the Ethnic Education Policy. *J. Res. Edu. Eth. Mino.* **2022**, *33*, 5–13. (In Chinese)
15. Wanpeng, L.; Zihan, Z. On the Education Policies for Migrant Children under the Perspective of Equity. *J. Cent. China Norm. Univ. Hum. Soc. Sci.* **2022**, *61*, 144–153. (In Chinese)
16. Hui, L.; Yingxiu, Y. Lack and promotion of migrant children’s capabilities to study in different places. *Educ. Sci. Res.* **2014**, *226*, 25–29. (In Chinese)
17. Ministry of Education. *The Educational Statistics Yearbook of China 2020*; China Statistics Press: Beijing, China, 2021. (In Chinese)
18. Hong, Z.; Fei, J.; Xueli, T.; Zhiping, Z. Online Education: Digital Divide or Digital Opportunity? Based on the Differences of Online Learning between Urban and Rural Areas during the COVID-19 Pandemic. *Open Educ. Res.* **2021**, *27*, 62–68. (In Chinese)
19. Xiaojing, Z.; Zuobin, Z.; Guangxin, L. Study on Adaptation to College for Students from Low-Income Families: Based on the Survey of Freshmen in a “Double First-Class” Construction University. *China Hig. Educ. Res.* **2020**, *324*, 72–77+103. (In Chinese)
20. Nussbaum, M. Women and equality: The capabilities approach. *Int. Labour Rev.* **1999**, *138*, 227–245. [CrossRef]
21. Sugden, R. Welfare, resources, and capabilities: A review of Inequality Re-examined by Amartya Sen. *J. Econo Lit-Era* **1993**, *31*, 1947–1962.
22. Mehrotra, S. Human Capital or Human Development? Search for a Knowledge Paradigm for Education and Development. *Econ. Political Wkly.* **2005**, *40*, 30–306.
23. Chen, W.; Jun, Z. Improving Equity in Chinese Higher Education through Actionable Research: Its Contexts, Possibilities, and Issues. In *Actionable Research for Educational Equity and Social Justice*; Chen, W., St. John, E.P., Eds.; Routledge, Taylor & Francis Group: New York, NY, USA; London, UK, 2018; pp. 135–159.
24. Hart, C.S. Quo Vadis? The Capability Space and New Directions for the Philosophy of Educational Research. *Stud. Philos. Educ.* **2009**, *28*, 391–402. [CrossRef]
25. Limin, X. Capability Building for Social Integration of Migrant Children of Migrant Workers-Based on the Perspective of Sen’s “Capability”. *Acad. Forum* **2015**, *38*, 78–84. (In Chinese)
26. Chaoji, L.; Bing, W.; Yu, Z. Empirical Study on Chinese Nationals’ Capability Based on WVS. *Stud. Dial. Nat.* **2012**, *28*, 120–125. (In Chinese)
27. Sen, A.K. *Development as Freedom*; Oxford University Press: Oxford, UK, 1999.
28. Niemi, H.; Chen, W. Competence and Education of the Learner for the Future. In Proceedings of the Learning Ecosystem for the Future: Family, School, Society, The Keynote Report of Yidan Education Forum, Beijing, China, 12–13 November 2022.
29. St. John, E.P.; Hannon, C.; Chen, W. Engaged Scholarship Promoting Education Equity: Building Alliances Using Actionable Research. In *Actionable Research for Educational Equity and Social Justice*; Chen, W., St. John, E.P., Eds.; Routledge, Taylor & Francis Group: New York, NY, USA; London, UK, 2018; pp. 43–65.

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Article

Building Equitable Education Datasets for Developing Nations: Equity-Minded Data Collection and Disaggregation to Improve Schools, Districts, and Communities

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Abstract: Many studies of education engage with large datasets to attempt to solve educational problems. However, no studies have provided a systematic overview of how large datasets could be compiled with an eye toward solving educational problems related to equity, especially as it relates to racial, gender, and socioeconomic equity. This study provides a synthesis of literature and recommendations for how developing nations can learn from peers and collect, disaggregate, and analyze data in ways that promote equity, thus improving schools, school districts, and communities.

Keywords: education; datasets; big data; decision-making; developing nations; equity

1. Introduction

Over the past three decades, attributable to the rise of the Internet and digital technologies, the era of big data (data that is large and potentially hard to manage due to volume and organizational issues) has grasped the global education community [1–3]. More so now than ever, educational leaders are using large datasets to make decisions at the student, teacher, school, district, local, national, and international levels [3–6]. With access to information, there has been exponential growth in scholarship since 2000 related to data-driven decision-making and evidence-based practices, which are implemented for the purpose of improving schools and educational outcomes for students and other stakeholders [1,2,5]. In addition, this movement toward big data has been broadly global in scope.

1.1. *The Role of the Organization for Economic Cooperation and Development (OECD)*

In 1961, the Organization for Economic Cooperation and Development (OECD) was founded to help spur economic growth and world trade, including gathering educational data to inform how countries can guide the development of schools and school systems [7]. During its early years, the OECD administered international educational surveys to 20 founding members about topics such as educational budgeting, teacher recruitment, student engagement, and the establishment of new schools [6]. However, in the late 1990s and the early 2000s during the dot-com boom, the OECD began gathering much more comprehensive data from member nations and their schools, including the total number of educational personnel (teachers, administrators, etc.) in 1998, student count and age of enrolled students in 2000, and graduation rates and student–teacher ratios in 2005 [8]. Now, the OECD has 38 full members across the world and publishes some of the most comprehensive international education reports available [6]. The same approach to data collection and aggregation has been adopted at the continent and country levels as well.

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1.2. The European Union (EU)

When the European Union (EU) was established in 1993, individual EU member states were tasked with administering and measuring their own educational systems, leading to several decades of misalignment between different member states and no common dataset for EU leaders to make data-driven educational decisions [3]. However, EU leaders encouraged member states to participate in surveys administered by the OECD, while creating the “Open Methods of Coordination” (OMC) for policies in social fields, including education and training” [3] [p. 989]. Later, the EU devised the “Education and Training 2020 strategy (ET2020), as part of the Europe 2020”, which prioritized cross-country collaboration and information sharing to improve educational outcomes [3] [p. 990]. This led to the creation of the European Commission, which houses educational information and data across all EU member states [9]. These organizations ultimately allowed independent researchers to explore relationships between education outcomes and its citizenry, informing how the EU could improve its interconnected educational systems [4].

1.3. India’s Ministry of Education

Similarly, in 2002, India’s Ministry of Education developed the capacity to gather data related to organizational budgets and school expenditures to better distribute resources in India’s developing areas outside of their major cities such as Mumbai, Delhi, and Bangalore [10]. Before 2002, India’s government had only released broad data to the World Bank related to government spending on education as a percentage of India’s overall gross domestic product (GDP) without any student- or school-level data [11]. As technology proliferated in India and the Indian government established more policies to emphasize data-driven decision-making, more data was able to be collected related to school enrollment growth, the establishment of new schools, and gender equity, culminating in some of India’s most comprehensive education reports in the mid-2000s [12]. When the COVID-19 pandemic rocked the world of education, India’s school closures were among the longest in the world, averaging 73 weeks per school compared to the global average of 35 weeks [13]. Contributing to this length was the fact that many of India’s public schools are entrenched in densely populated urban areas or remote rural areas with inadequate access to medical care [13]. Yet, because of India’s increasingly centralized educational data system, India was able to swiftly compile a comprehensive report targeting equity gaps among India’s most under-resourced rural schools, allowing India’s government to provide interventions and assistance, as well as guidance on how to formulate future year budgets to fill these gaps [14].

1.4. The United States

Among developed nations, the United States (U.S.) likely has the longest-standing and most comprehensive educational data collection methods and reporting structures in the world. In the United States context, governmental policies after the first Morrill Act of 1862 greatly expanded educational opportunities for the U.S. people, and the Department of Education Act of 1867 created the U.S. Office of Education, which later became the U.S. Department of Education [15]. The aim of the office was to organize educational functions at the federal level and provide resources for states to measure the educational progress of students in their schools. In 1867, the Office of Education began making early attempts at building large datasets to measure educational goals and outcomes, with the first national-level education surveys administered and data collected being largely from public grade schools in 1870 [15]. However, scholars have long lamented that better, more robust data was not collected earlier in the history of postsecondary data collection in the United States [16].

Partially owing to the success of the 1870s surveys, the second Morrill Act of 1890 greatly expanded on the federal government’s data collection program, thrusting the U.S. into the 1900s when multiple data collection and analysis efforts built upon the Second Morrill Act: the statistical program of 1920, the Vocational Rehabilitation Act of 1943, the

Information and Education Exchange Act of 1948, and the establishment of the National Center for Education Statistics (NCES) in 1962. Today, the NCES includes secondary and postsecondary data at the school, district, state, and regional levels and is one of the most robust national educational datasets in the world [15]. Moreover, the Civil Rights Era of the 1960s and President Lyndon Baines Johnson's aggressive education agenda produced many landmark education developments in the U.S., including the signing of the Elementary and Secondary School Act (ESSA) and the Higher Education Act (HEA) in 1965 [15], both of which required data reporting by schools to the federal government. These acts paved the way for the Office of Education (now known as the Department of Education) to begin administering the National Assessment of Educational Progress in 1969, the "largest nationally representative and continuing assessment of what students in public and private schools in the United States know and are able to do in various subjects" [17] (para. 1). To date, it remains the largest and most comprehensive collection and report of big education data in the United States and the world.

Decades later, the United States developed even more formal attempts to compile large education datasets, introduced in 1990 with the advent of the National Education Goals Panel pursuant to a Congressional mandate under President George H. W. Bush [18]. The aim of the panel was to annually report on national and state educational progress toward the National Education Goals adopted by the President and the nation's governors, as well as requirements by the U.S. Office of Management and Budget for data documenting the effectiveness of federal programs both in and outside of education under the Government Performance and Results Act (GPRA) of 1994 [18]. More recently, the American Recovery and Reinvestment Act (2009) indicated that federal education officials sought to ensure that data and evidence are used to inform policy and practice [19]. The Act provided USD 10 B to "help local educational agencies hire, retain, or rehire employees who provided school-level educational and related services", including bolstering data collection and analysis initiatives related to the profession of education in the United States [19] (para. 1).

2. Issues with Big Data

Many developed nations (developed nations defined as sovereign states with a high quality of life and high Human Development Index per the International Monetary Fund) gather high-quality data to make informed educational decisions [20,21]. However, many developing nations do not have the resources to compile the types of large, national-level datasets that the European Union, India, or the United States has. Moreover, researchers have criticized these organizations and countries for failing to target equity gaps and facilitate resources for the most marginalized populations [20,21]. In these cases, more data does not mean and has not meant more progress for the most impoverished, at-need communities around the world.

Moreover, many developing nations (defined as sovereign states with a lower Human Development Index than developed nations per the International Monetary Fund) in South America, Africa, and Asia do not report local- or national-level data beyond information shared with the OECD, rendering it difficult for developed nations, charitable non-profit organizations, and schools themselves to make data-informed decisions to improve the education and lives of children, their families, their local communities, and their nations. As a result, this study will explore how developed or developing nations can assemble large, inclusive educational datasets, using the United States as an exemplar and deeply flawed model. Although the U.S. has built enviable educational datasets, these datasets are often compiled inequitably and do not allow for appropriate disaggregation to inform targeted invention and policy work to assist children and families most in need. By learning from the U.S.—the positives and negatives—other countries can compile datasets in an equitable fashion to ensure that minoritized populations are heard and supported by their school systems and governments.

3. How Large Education Datasets Are Compiled and Equity Implications

3.1. Surveying

From the 1800s through the 1990s, the primary method that federal, state, and local governments have used to compile large education datasets is surveying. Historians estimate that early Sumerian societies around 3200 B.C. conducted censuses of their population to distribute resources and plan for levees and canals to ensure adequate water and food supply [22]. In modern societies, many countries have censuses written into their founding government documents, including the United States, Australia, several South American countries, and most of the European Union [22]. Other developing and developed countries, such as China and India, began mass collecting and publishing census data in the 1990s, and globally, nearly all forms of the census have included questions related to educational attainment level and the number of school-aged children in the household [22].

However, multiple issues arise when promoting equitable data collection for developing educational datasets through survey methods. First, organizations such as the OECD and the European Union now gather data online through Internet-based questionnaires and other methods using Internet technologies. By contrast, many developing nations do not have access to high-speed Internet—or any Internet—to facilitate effective and efficient data collection, especially in rural areas. Moreover, many developing nations have large swaths of people spread across rural, sparsely populated areas of the country, rendering robust and equitable data collection nearly impossible in countries within the Latin American and Caribbean region, Burundi, Uganda, and Nepal where rural populations comprise over 80% of the overall citizenry in each country [7].

Beyond geographic and technological limitations, many developing nations' governments do not have the human or financial resources to staff survey developers, census takers, or data architects to administer the work and disseminate its results. For instance, the United States begins its hiring process for its ten-year census two years before its administration, usually hiring over 200,000 temporary workers to complete the work [23]. Moreover, the U.S. Department of Education specifically created the National Center for Education Statistics to help liaise with schools to gather and disseminate educational data [15]. In these cases, many developing nations do not have the resources to create such offices and protocols to gather consistent, representative, reliable education data at any time interval, much less on a yearly basis as is the status quo in the United States and many other developed nations.

Finally, a wealth of education data is often tied to government funding or grant administration, requiring educational organizations to report data to their funding agency, usually a local-, state-, or federal-level entity. Although this method is not surveying in a typical sense, there are yearly reports that institutions of higher education must complete that often arrive in the form of a questionnaire. For instance, in the United States context, the process for distributing federal student aid to postsecondary students is mediated by the U.S. Department of Education through a program called Title IV, which authorizes U.S. institutions of higher education to administer financial aid programs through federal funds. As federal student aid is responsible for most of the student financing in the United States, there are over 6000 Title-IV-participating institutions of higher education in the United States. To participate, institutions must regularly report education data to the U.S. Department of Education related to the amount and type of aid that their students are receiving, as well as students' academic progress indicators [24]. Here, nationally representative educational datasets are being created in part by federal programming that requires institutional data reporting, yet many countries may not have these policy mechanisms in place through federal programs to gather such data.

3.2. Technologically Mediated Data Sharing Agreements

One of the largest international data-sharing platforms is the Statistical Data and Metadata eXchange (SDMX), sponsored by seven international organizations: the Bank for International Settlements (BIS), the European Central Bank (ECB), Eurostat (Statistical

Office of the European Union), the International Monetary Fund (IMF), the Organization for Economic Cooperation and Development (OECD), the United Nations Statistical Division (UNSD), and the World Bank. SDMX is a technology and data-sharing initiative that “aims at standardising and modernising the mechanisms and processes for the exchange of statistical data and metadata among international organisations and their member countries” [25] (para. 3). Extending the survey work performed by individual nations, the SDMX allows for larger, international organizations to integrate their data into an even larger repository, allowing for unique collaborations, such as the OECD working with the International Monetary Fund, to better understand how international monetary policies may affect low-GDP nations.

However, developing nations that cannot perform the national-level survey work to lay the foundation for international data sharing thus cannot reap the benefits of international platforms such as SDMX. In this case, educational datasets across nations may be further stratified by efforts such as the ones by SDMX, with developed nations already able to gather their own national-level data in addition to reaping the benefits of international data sharing, collaboration, and joint policy development. As a result, it is critical for developed nations to scaffold the efforts of developing nations to begin the national-level survey work to allow for developing nations to participate in international data-sharing agreements, such as SDMX.

3.3. Collaborative Conglomeration Efforts

Independent researchers have also begun to integrate single-year datasets from organizations such as the OECD to compile large, longitudinal educational datasets to inform how policies and other administrative mechanisms influence the field of education over time. Barro and Lee (2013) have repeatedly conglomerated UNESCO data to compile a large educational dataset from 1950 until 2010 across 146 countries, disaggregated by sex and at five-year intervals [26]. Because of their conglomeration efforts, the researchers were able to use the data to evaluate how human capital is produced through years of schooling and the compositional education attainment of citizens. In all, the researchers found that schooling has a direct and positive impact on human capital development, and after controlling for other factors, the researchers also found that individual rate-of-return for one additional year of school was between 5 and 12% per individual [26].

At the country level, Moore’s (2022) evaluation of state-level data from two Indian states [27] and Bo et al.’s (2019) use of administrative data from China also serve as evidence that conglomerated educational datasets can drive empirical inquiry and inform policy change toward equity [28]. Moore (2022) combined datasets from two state-level datasets in India to reveal that there were large school-level effects in terms of student performance, suggesting that India’s state-level datasets could reveal state-to-state stratification that could inform Indian education policy [27]. Similarly, Bo et al. (2019) analyzed an administrative dataset from each of China’s postsecondary institutions, exploring how standardized test scores predict how students find an academic match with their institution [28]. The researchers learned that Chinese college students would reduce their probability of mismatch by 18% if they were allowed to submit their college preferences after learning their standardized test scores and not before [28]. Again, by accessing a large, national dataset in a postsecondary context, researchers were able to evaluate college matches and potentially inform national policy related to college admissions and student choice.

In 2021, State of California (USA) legislation approved funding to create a comprehensive suite called the California Cradle-to-Career Data System. This system would merge previously disconnected data systems from schools, colleges, social services agencies, financial aid providers, and employers [29]. Streamlining these data systems will allow various stakeholders to easily access information, resources, and data [30]. By using the California Cradle-to-Career Data System, students and families will be able to access pertinent information about college opportunities and other social services (e.g., medical care) in addition to formally applying to colleges and financial aid. Educators, on the other hand,

will have a centralized platform to monitor the progress and completion of college and financial aid applications. This is essential to building equity because it gives educators the ability to provide targeted support to under-resourced areas or specific communities of people. Lastly, for policymakers, researchers, and advocates, this comprehensive system will provide longitudinal student and employment outcome data that will allow them to see trends and inform potential interventions [31]. While still in its planning stage, the Cradle-to-Career Data System provides a glimpse into the future in terms of how multiple data systems across sectors can be streamlined into one cross-sector data system that provides information and data to various stakeholders to promote equity and inform change.

3.4. Collaborative Comparative Efforts

Understanding the parameters of higher education in international contexts is necessary to make sense of how institutional data are developed and used. While sociopolitical and cultural variability exists in countries around the world, data are becoming more prominent in higher education institutions. From here, institutions and countries may be able to collaborate to compare data and seek out equity-based solutions to interinstitutional or intercontinental problems.

It is important to note that although countries have generated institutional data, the contexts in which they use this data vary; for instance, in Europe and Asia, these institutional data systems are focused on public policies [21]. According to Lepori et al. (2022), higher education in Asia is often compared to examples from China and Thailand in that this type of training and education is extensive and diverse. There has been an increase in higher education in Asia and as such, there is more emphasis on discussing institutional data [21].

Lepori et al. (2022) indicated that the institutional data in the United States, Europe, and Asia contain similar information that is required by the state (education and existing higher education resources), and these data are equally important as the data from UNESCO and OECD [21]. This is indicative of the need for collaborative comparative efforts to move forward in the development of appropriate and relevant institutional data for high education.

4. Limitations

Yet, developing nations without the human or financial capital to gather data and conglomerate datasets will remain behind developed nations. As a result, developing nations need to prioritize widespread survey administration to build local and national datasets to be able to engage with larger, internationalized datasets, thus joining the global data community to use data to make informed decisions regarding education policy and practice. First, however, governments need to inventory their current data collection procedures and consolidate efforts to begin working toward robust, longitudinal datasets. Then, as developing nations are generating the capacity to perform this survey work, researchers and policymakers in these countries could begin to learn how other countries use technologies such as SDMX to explore how their own country could utilize and benefit from such a resource. Finally, educational leaders need to engage with these data to make equitable decisions and allocate resources to the most marginalized communities, rather than merely collecting and reporting on the data.

5. Equity Issues Related to Survey Instruments and Data Collection

As mentioned above, there are five primary hurdles to developing survey instruments and mass-collecting data in developing countries:

- (1) Human capacity: Who will develop instruments and gather data? Does an organization have the human capability to develop data collection instruments and carry out the work?
- (2) Financial capacity: who will finance the data collection efforts?

- (3) Technological capacity: are there technological resources available to render the data collection process more efficient and effective?
- (4) Geography: are all areas of the country physically accessible without considerable resource allocation, and do countries know where their people are?
- (5) Sociopolitical contexts and variability: Certain organizations and countries are situated within sociopolitical contexts that may not be amenable to truly equitable data collection and database building. For instance, some countries openly oppress and discriminate against queer people [32], whereas in other countries people who identify as women are not allowed to attend school or enjoy various social freedoms that women enjoy in different countries [33,34]. As a result, many countries and organizations may not be willing or able to gather accurate data for equity for all people.

Once developing nations have negotiated these five hurdles, it becomes crucial that initial or current survey instruments and data collection strategies are built with equity in mind. Robust datasets can be powerful tools for educational stakeholders; however, depending on how robust the data collection is and what variables were included within data collection instruments can either strengthen or weaken its utility. One way for datasets to become more robust is to expand the survey instrument to gather specific demographic characteristics beyond what is typically gathered. Most survey instruments meant to capture educational data include demographic questions about a respondent's race and/or ethnicity, gender identity and/or sexual orientation, religion, and other salient identities. However, many survey instruments deployed by the most developed countries, such as the United States, do not adequately specify groups of people, especially given the long history of immigration to the United States from countries around the world. By including more specific questions about the participant's identities, the dataset allows users to explore potential trends within and between groups. Whether the differences are stark or nuanced, the ability for users to compare and contrast data between and within groups allows for better data analysis.

The following sections will detail three examples of why it is important to expand the questions about participants' identities. While not exhaustive of all identities, we highlight examples of how gathering specific, accurate information on participants' identities is critical to advancing equity in education through large datasets.

5.1. The Importance of Expanding the Race/Ethnicity Variable for People of Color

In no uncertain terms, homogenized racial and ethnic categories do little to help understand cultural nuances between and among different races and ethnicities. A crucial example of the problematic nature of how the U.S. has gathered educational data related to race and ethnicity is the current situation facing Asian Americans. Within the racial fabric in the United States, Asian Americans find themselves in a peculiar position [35]. Beginning in the 1960s, Asian Americans, who were once viewed as a threat to White Americans regarding jobs and sheer numbers in specific regions, became the model minority due to their quiet demeanor, work ethic, and educational prowess [36]. However, inequitable data collection initiatives have grouped Asian Americans into an inauthentic homogenized group that does not allow for pointed, accurate data analysis and disaggregation by race or ethnicity.

To begin with, many Westernized data collection instruments do not gather race or ethnic data beyond homogenized categories, typically including White and/or Caucasian, Black and/or African American, Hispanic and/or Latinx, and Asian American. These categories are problematic, as researchers have articulated many equity gaps between racial and ethnic groups within these broader categories [37,38]. For instance, in Western contexts, especially the United States, the model minority myth portends that "Asian Americans achieve universal and unparalleled academic and occupational success" which "perpetuate ignorance and distorted perceptions of the realities that this population" faces [37] (p. 6).

Here, the way in which researchers and other stakeholders gather racial and ethnic data may perpetuate the model minority myth, especially as it relates to Asian American

educational achievement data. For instance, the United States' National Center for Education Statistics recently published disaggregated statistics regarding Asian American postsecondary success, finding that 54% of Asian American adults aged 25 or older held a bachelor's degree or higher. However, when parsed by ethnic group, these achievement data reveal that 74% of Asian Indians aged 25 or older held a bachelor's degree or higher, while Cambodian (16%), Hmong (18%), Laotian (18%), Burmese (21%), and Vietnamese (29%) adults have different levels of education experience [39]. Here, researchers in developing countries must build survey instruments that allow for survey respondents of color to narrowly define their racial and/or ethnic group to best represent the population and allow policymakers to allocate resources equitably given educational access and success gaps.

5.2. The Importance of Expanding the Gender Variable for the Queer Community

The same disaggregation that must occur within racial and/or ethnic groups should also occur within gender identities if feasible given the cultural context, as researchers must move behind the gender binary and allow queer survey respondents to accurately and narrowly define their own gender identity. However, we already addressed issues in several countries where some countries openly oppress and discriminate against queer people [32]. In these circumstances, it may be difficult or impossible to gather truly equitable and democratic datasets where everyone's voice—and their personally accurate identities—is captured accurately and in a culturally-responsive way. For decades, scholars of queer studies have criticized the male–female sexuality binary and man–woman gender binary of data collection and analysis, insisting that people who do not feel that one of the binary categories describes them have felt their sense of existence silenced and marginalized [40,41].

Research regarding the higher education experiences of transgender people has suggested that people who do not view school supports as gender neutral, such as gender-inclusive bathrooms and nondiscrimination policies that are inclusive of diverse and non-binary gender identities, may self-exclude from higher education, limiting the educational opportunities for non-binary conforming individuals [40,41]. As a result, researchers and social justice advocates in developing nations must first challenge oppressive societal norms, such as the subjugation of queer people, and work to facilitate more welcoming, inclusive societies on the basis of gender identity. Then, researchers and policymakers should build survey instruments that allow non-binary conforming respondents to narrowly define their gender identity to best represent the population and allow policymakers to allocate resources equitably.

5.3. Intersectional Analysis: Gender and Race and/or Ethnicity

Collecting and disaggregating data beyond gender identity and race and/or ethnicity has been found to be critical for intersectional education equity. For instance, in the United States context at the postsecondary level, men outpaced women in college access and bachelor's degree attainment from the inception of U.S. higher education in the 1600s until roughly the year 2000. Around 2000, women surpassed men in both college access and completion, with 10% more women earning bachelor's degrees than men [42]. Now, in both the U.S. context and around the world, women comprised roughly 60% of the overall postsecondary enrollment in the United States in 2021 [43], and recent research suggested that men, across at least 18 other countries, are less likely to access and complete their K-12 and higher education than women, continuing the global trend of inequitable education gaps between men and women [44].

However, integrating both gender and race and/or ethnicity into data collection and analysis reveals even starker, more critical equity gaps. For instance, Sáenz and Ponjuan (2008) highlighted the improvement that Latinx college students had made in accessing U.S. higher education over prior decades, yet Latinx men had the lowest high school graduation rates of men across all ethnic groups [45]. These researchers also found that over 60% of postsecondary credentials were earned by Latinx women [45]. After analyzing

large educational datasets, Sáenz et al. (2015) set out to fill these educational equity gaps by establishing Project MALES, a research-to-practice mentoring program that provides specific mentoring and education interventions for young men of color to improve their access to and success within schools at both the secondary and postsecondary level [46].

5.4. Disproportionality in Education for People of Color and People with Disabilities

The issue of disproportionality in special education has persisted over the decades. In the United States, the disproportionate representation of students of color and with disabilities in special education continues to be reported and studied in the literature. Disproportionality is referred to as “the overrepresentation and underrepresentation of a specific demographic group in special education relative to the presence of this group in the overall student population” [47] (p. 1). There has been perpetual rampant discrimination against culturally and linguistically diverse students and students with disabilities, thereby resulting in disproportionality. While in the United States, the Individuals with Disabilities Education Act has been amended to account for this challenge of misrepresentation of minority groups in special education, more national data are needed to further address this grave problem [47]. Overall, emphasis needs to be placed on gathering demographic data on race and ethnicity and disability status, allowing an intersectional view of oppression, and ultimately, equity.

According to Artiles and Trent (1994), researchers have yet to create thorough analyses incorporating both history and social factors in special education issues that would assist in the development of better policies and practices for marginalized groups [48]. It is critical to consider these factors when collecting national, and large-scale data, as Van Roekel (2008) proposed in a call to action for policymakers and other stakeholders to collaborate in reducing disproportionality in special education [47]. However, the reality is that there needs to be richer data that shed light on this issue. While it is well-documented that disproportionality exists in the United States [47,48], little is known about this issue in other countries around the world, suggesting that developing nations could prioritize this work to inform equitable policies for people with disabilities [49].

5.5. Other Critical Variables: Income Status, Educational Attainment, and Family Structure

Beyond gathering expanded categorical data related to race and/or ethnicity, gender identity, and disability status, there are several other critical demographics for researchers to integrate into large educational datasets to improve equitable outcomes for students, their families, and their communities. First, and at all levels, it is critical to gather the household or family income level as a proxy of a student’s socioeconomic status. After decades of analysis of large, longitudinal educational datasets, it has been established that understanding an individual’s, school’s, or community’s socioeconomic status can help identify gaps in educational services for low-income people [16,50], including high-quality teachers and school buildings, transportation to school, meals at school, and other factors known to affect one’s educational experiences and outcomes.

Although closely related to income status, it is also critical for education researchers and policymakers to gather educational attainment data at all levels, including access and completion rates at the intermediate/middle school, secondary/high school, and postsecondary/higher education levels. In most developed nations, educational attainment data has been used to understand how or if people have equitable access to educational institutions and whether policies can positively impact one’s ability to earn secondary and postsecondary credentials and improve their economic future [3,4,9,16]. At the postsecondary level, a wealth of research has emerged from large, national datasets to suggest that students who do not have parents who have earned a bachelor’s degree (known as first-generation college students) do not access postsecondary education or earn salaries at the level of their peers [51]. Moreover, equity gaps widen between first-generation students of color and White peers, suggesting that it is important to understand a student’s race and/or ethnicity and their parent’s educational attainment to identify and stem equity

gaps [51]. As a result, it is critical to gather data related to educational attainment to build datasets that understand education gaps at multiple levels to advocate for policy to fill these gaps.

Finally, it is critical to understand the family or household structure that a student is raised in to understand that student's educational opportunities and future. Researchers across the world have investigated the roles that being raised in foster care [52], being a child of divorced parents [53], being adopted [54], and growing up in diverse living environments play in the educational attainment of children and young adults, often finding that children without supportive and consistent parenting and mentorship will not have access to the same educational experiences as privileged peers [52–54]. Although the national census in many countries may capture family or household information [55], that information must be synthesized with educational data to best understand how and where a student is raised and whether they face educational hurdles or lack opportunity.

6. Conclusions

Ultimately, developed nations have provided guidance for developing nations when building large educational datasets to improve educational decision-making and fill equity gaps. As most developed nations have done, central governments in developing nations should continue to build both human and financial capacities to survey their population and pay close attention to demographic information that has been found to impact students' educational success and economic development. This implies broad, equitable surveying of diverse geographic areas to ensure that all people are counted, and their data contributed to the local- or national-level dataset. Here, developing nations will likely need to develop relationships with community-based organizations and collaborate with local communities to understand how to survey the people and understand local demographics. Building trust and communicating clearly with local communities could help ensure that surveying is robust and accurate, as well as ensure that resources can be distributed equitably once data are collected and analyzed.

Moreover, researchers should develop survey instruments that capture a wide range of races and/or ethnicities, gender identities, disability statuses, and other personal demographics to ensure people are accurately and authentically counted and supported. As robust as their data are, the shortcomings of the U.S. and E.U. datasets are that demographics are often reported by categories that are far too large and miss the nuance that is required to provide targeted educational interventions. Whether survey instruments are newly developed or new iterations of old designs, researchers should expand demographic categories to better understand—and respect—all people to improve their educational opportunities and outcomes.

In general, developing nations must consider the five major limitations of building large educational datasets: human capacity, financial capacity, technological capacity, geography, and sociopolitical contexts and variability. Although developing nations such as India and developed nations such as the United States, the European Union, Australia, and China have enviable datasets and educational resources, other developing nations can follow their lead and begin developing inclusive survey instruments and collaborating with communities to build rich datasets capable of being integrated with international data exchanges, such as SDMX. In modern society, forging a path toward educational equity will require data-driven decision-making to uncover equity gaps and distribute resources equitably, and developing nations can serve their people through the equitable building of educational datasets to improve lives everywhere.

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References

1. Mandinach, E.B. A Perfect Time for Data Use: Using Data-Driven Decision Making to Inform Practice. *Educ. Psychol.* **2012**, *47*, 71–85. [CrossRef]
2. Schildkamp, K.; Poortman, C.; Luyten, H.; Ebbeler, J. Factors promoting and hindering data-based decision making in schools. *Sch. Eff. Sch. Improv.* **2016**, *28*, 242–258. [CrossRef]
3. Volante, L.; Ritzen, J. The European Union, education governance and international education surveys. *Policy Futur. Educ.* **2016**, *14*, 988–1004. [CrossRef]
4. Hakhverdian, A.; van Elsas, E.; van der Brug, W.; Kuhn, T. Euroscepticism and education: A longitudinal study of 12 EU member states, 1973–2010. *Eur. Union Politics* **2013**, *14*, 522–541. [CrossRef]
5. Mandinach, E.B.; Gummer, E. Data-Driven Decision Making: Components of the Enculturation of Data Use in Education. *Teach. Coll. Rec.* **2015**, *117*, 1–8. [CrossRef]
6. Organisation for Economic Co-Operation and Development [OECD]. Education: Online Education Database. 2022. Available online: <https://www.oecd.org/education/database.htm> (accessed on 15 January 2023).
7. Organisation for Economic Co-operation and Development [OECD]. Education. 2022. Available online: <https://www.oecd.org/education/> (accessed on 13 January 2023).
8. Organisation for Economic Co-Operation and Development [OECD]. Graduation Rates and Entry Rates. 2022. Available online: https://stats.oecd.org/Index.aspx?datasetcode=EAG_GRAD_ENTR_RATES (accessed on 13 January 2023).
9. European Commission. *European Education Area: Quality Education and Training for All*; European Commission: Luxembourg, 2022. Available online: <https://education.ec.europa.eu/> (accessed on 13 January 2023).
10. National Informatics Centre. Statistics. New. Ministry of Education, Government of India. 2022. Available online: https://www.education.gov.in/en/statistics-new?shs_term_node_tid_depth=All&page=5 (accessed on 13 January 2023).
11. World Bank Group. *Government Expenditure on Education, Total (% of GDP)—India*; World Bank: Bretton Woods, NH, USA, 2022. Available online: <https://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS?locations=IN> (accessed on 13 January 2023).
12. National Informatics Centre. Statistics of School Education, 2008–09. Ministry of Education, Government of India. 2022. Available online: https://www.education.gov.in/sites/upload_files/mhrd/files/statistics-new/SES-School_2008-09.pdf (accessed on 13 January 2023).
13. Sharma, S. Will Budget 2022 Heal India’s Sagging Education System? *India Today*. 2022. Available online: <https://www.indiatoday.in/diu/story/budget-india-education-system-covid-school-closures-1906438-2022-01-30> (accessed on 13 January 2023).
14. ASER Centre. Annual Status of Education Report (Rural). ASER Centre. 2021. Available online: <http://img.asercentre.org/docs/aser2021forweb.pdf> (accessed on 15 January 2023).
15. National Center for Education Statistics. *Federal Education Data Collection: Celebrating 150 Years*; National Center for Education Statistics: Washington, DC, USA, 2017. Available online: https://nces.ed.gov/surveys/annualreports/pdf/Fed_Ed_Data_Collection_Celebrating_150_Years.pdf (accessed on 15 January 2023).
16. Goldin, H. *NBER Working Paper Series On Historical Factors in Long Run Growth: A Brief History of Education in the United States*; National Bureau of Economic Research: Cambridge, MA, USA, 1999. Available online: https://www.nber.org/system/files/working_papers/h0119/h0119.pdf (accessed on 15 January 2023).
17. Institute of Education Sciences. An Overview of NAEP. National Center for Education Statistics. 2021. Available online: https://nces.ed.gov/nationsreportcard/subject/about/pdf/naep_overview_brochure_2021.pdf (accessed on 15 January 2023).
18. United States Government. National Education Goals Panel. Federal Register. 1990. Available online: <https://www.federalregister.gov/agencies/national-education-goals-panel> (accessed on 15 January 2023).
19. United States Department of Education. Office of the Inspector General: American Recovery and Reinvestment Act. U.S. Department of Education. 2019. Available online: <https://www2.ed.gov/about/offices/list/oig/recoveryact.html> (accessed on 15 January 2023).
20. Data Quality Campaign. *Using Educational Data for Equity*; The Data Quality Campaign: Washington, DC, USA, 2023. Available online: <https://dataqualitycampaign.org/our-work/policy-areas/data-for-equity/> (accessed on 15 January 2023).
21. Lepori, B.; Borden, V.M.H.; Coates, H. Opportunities and challenges for international institutional data comparisons. *Eur. J. High. Educ.* **2022**, *12*, 373–389. [CrossRef]
22. Whitby, A. *The Sum of the People: How the Census has Shaped Nations, from the Ancient World to the Modern Age*; Basic Books: New York, NY, USA, 2020.

23. Federal Student Aid. *Knowledge Center Home: Overview of Title IV*; U.S. Department of Education: Washington, DC, USA, 2022. Available online: <https://fsapartners.ed.gov/knowledge-center/library/functional-area/Overview%20of%20Title%20IV> (accessed on 15 January 2023).
24. United States Bureau of Labor Statistics. *Beyond the numbers: How Did the 2020 Census Affect Employment?* United States Government: Washington, DC, USA, 2022. Available online: <https://www.bls.gov/opub/btn/volume-11/how-did-the-2020-census-affect-employment> (accessed on 15 January 2023).
25. Statistical Data and Metadata eXchange. What Is SDMX? SDMX. 2022. Available online: https://sdmx.org/?page_id=3425 (accessed on 18 January 2023).
26. Barro, R.J.; Lee, J.W. A new data set of educational attainment in the world, 1950–2010. *J. Dev. Econ.* **2013**, *104*, 184–198. [CrossRef]
27. Moore, R. Variation, context, and inequality: Comparing models of school effectiveness in two states in India. *Sch. Eff. Sch. Improv.* **2022**, *33*, 588–609. [CrossRef]
28. Bo, S.; Liu, J.; Shiu, J.-L.; Song, Y.; Zhou, S. Admission mechanisms and the mismatch between colleges and students: Evidence from a large administrative dataset from China. *Econ. Educ. Rev.* **2018**, *68*, 27–37. [CrossRef]
29. State of California. About the Cradle-to-Career System. State of California Cradle-to-Career System. 2023. Available online: <https://c2c.ca.gov/about-cradle-to-career-system/> (accessed on 18 January 2023).
30. WestEd. California Cradle-to-Career Data System. California All: California Data System. 2023. Available online: <https://cadatasystem.wested.org/> (accessed on 22 January 2023).
31. California Data System. About the Cradle to Career System. The Cradle to Career Data System. 2023. Available online: <https://c2c.ca.gov/about-cradle-to-career-system/> (accessed on 21 January 2023).
32. Yavuz, M.; Byrne, S. Center for Peace and Justice Education at Villanova University Violence Against the Queer Community in Turkey. *J. Peace Justice Stud.* **2021**, *30*, 102–125. [CrossRef]
33. Baldwin, E.; Fernea, E.W. Children in the Muslim Middle East. *J. R. Anthr. Inst.* **1998**, *4*, 145–146. [CrossRef]
34. Hamdan, A. Women and education in Saudi Arabia: Challenges and achievements. *Int. Educ. J.* **2005**, *6*, 42–64.
35. Hartlep, N.D.; Porfilio, B.J. *Killing the Model Minority Stereotype: Asian American Counterstories and Complicity*; Information Age Publishing: Charlotte, NC, USA, 2015.
36. Au, W. Asian American racialization, racial capitalism, and the threat of the model minority. *Rev. Educ. Pedagog. Cult. Stud.* **2022**, *44*, 185–209. [CrossRef]
37. Museus, S.D.; Kiang, P.N. Deconstructing the model minority myth and how it contributes to the invisible minority reality in higher education research. *New Dir. Inst. Res.* **2009**, *2009*, 5–15. [CrossRef]
38. Poon, O.; Squire, D.; Kodama, C.; Byrd, A.; Chan, J.; Manzano, L.; Furr, S.; Bishundat, D. A Critical Review of the Model Minority Myth in Selected Literature on Asian Americans and Pacific Islanders in Higher Education. *Rev. Educ. Res.* **2016**, *86*, 469–502. [CrossRef]
39. National Center for Education Statistics. *Status and Trends in the Education of Racial and Ethnic Groups 2018*; National Center for Education Statistics: Washington, DC, USA, 2019. Available online: <https://nces.ed.gov/pubs2019/2019038.pdf> (accessed on 18 January 2023).
40. Goldberg, A.E.; Beemyn, G.; Smith, J.Z. What Is Needed, What Is Valued: Trans Students’ Perspectives on Trans-Inclusive Policies and Practices in Higher Education. *J. Educ. Psychol. Consult.* **2018**, *29*, 27–67. [CrossRef]
41. Jones, A. *Trans Theory and Gender Identity in Education*; Oxford University Press: Oxford, UK, 2021. [CrossRef]
42. Parker, K. *What’s Behind the Growing Gap between Men and Women in College Completion?* Pew Research Center: Washington, DC, USA, 2021. Available online: <https://www.pewresearch.org/fact-tank/2021/11/08/whats-behind-the-growing-gap-between-men-and-women-in-college-completion/> (accessed on 18 January 2023).
43. Stewart, M. The Enrollment Crisis for Men Continues to Worsen. Insight into Diversity. 2022. Available online: <https://www.insightintodiversity.com/the-enrollment-crisis-for-men-continues-to-worsen/> (accessed on 17 January 2023).
44. Stoet, G.; Geary, D.C. Gender differences in the pathways to higher education. *Proc. Natl. Acad. Sci. USA* **2020**, *117*, 14073–14076. [CrossRef]
45. Saenz, V.B.; Ponjuan, L. The Vanishing Latino Male in Higher Education. *J. Hisp. High. Educ.* **2008**, *8*, 54–89. [CrossRef]
46. Sáenz, V.B.; Ponjuan, L.; Segovia, J.; Viramontes, J.D.R. Developing a Latino Mentoring Program: Project MALES (Mentoring to Achieve Latino Educational Success). *New Dir. High. Educ.* **2015**, *2015*, 75–85. [CrossRef]
47. Van Roekel, N.P.D. *Disproportionality: Inappropriate Identification of Culturally and Linguistically Diverse Children*; National Education Association: Washington, DC, USA, 2008. Available online: <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.190.3895> (accessed on 17 January 2023).
48. Artiles, A.J.; Trent, S.C. Overrepresentation of Minority Students in Special Education. *J. Spéc. Educ.* **1994**, *27*, 410–437. [CrossRef]
49. Charran, C.; Sorrells, A.M.; Cooc, N. Quantitative Research Methods and Design for Investigating Inclusive Education in the Caribbean. In *Achieving Inclusive Education in the Caribbean and Beyond*; Springer: Berlin, Germany, 2019; pp. 51–65.
50. Meschi, E.; Scervini, F. A new dataset on educational inequality. *Empir. Econ.* **2014**, *47*, 695–716. [CrossRef]
51. Trevino, N.N.; DeFreitas, S.C. The relationship between intrinsic motivation and academic achievement for first generation Latino college students. *Soc. Psychol. Educ.* **2014**, *17*, 293–306. [CrossRef]
52. I Männistö, I.; A Pirttimaa, R. A review of interventions to support the educational attainments of children and adolescents in foster care. *Adopt. Foster.* **2018**, *42*, 266–281. [CrossRef]
53. Amato, P.R. Research on Divorce: Continuing Trends and New Developments. *J. Marriage Fam.* **2010**, *72*, 650–666. [CrossRef]

54. Barclay, K.J. Birth order and educational attainment: Evidence from fully adopted sibling groups. *Intelligence* **2015**, *48*, 109–122. [CrossRef]
55. United States Census Bureau. *CPS historical Time Series Tables*; U.S. Census Bureau: Suitland, MD, USA, 2022. Available online: <https://www.census.gov/data/tables/time-series/demo/educational-attainment/cps-historical-time-series.html> (accessed on 17 January 2023).

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Article

Public Investment in Short-Cycle Tertiary Vocational Education: Historical, Longitudinal, and Fixed-Effects Analyses of Developed and Less-Developed Countries

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Abstract: We use three analytic steps to examine public investment in short-cycle tertiary education. First, reviewing the historical development, the literature reveals that national and regional policies on educational development emphasized bachelor's programs in vocational education in the early twenty-first century, especially in the EU. This historical background informs the longitudinal trend analysis in the second step of the educational and public investment variables (2000–2018) in our econometric analysis. The combined descriptive studies illuminate competitive advantages for EU and ASEAN nations in networks emphasizing open economic and academic exchange. Third, the fixed-effects analysis indicates a higher level of investment in general tertiary education per student, associated with a lower enrollment level in short-cycle vocational and technical tertiary programs. Using insights from this three-step process, we explore the implications of a nation's capacity to invest in short-cycle tertiary programs as part of economic development and the pursuit of social equity within and across countries. Specifically, we conclude that short-cycle programs are a step toward integrating vocational education into programs in polytechnics and other higher education institutions.

Keywords: short-cycle tertiary vocational education; public investment; government expenditure; historical education development; trend analysis; fixed-effects models; European Union; ASEAN

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1. Introduction

Patterns of public investment in higher education differ between and within countries. Many countries have prioritized vocational training in their national policies [1]. Many European Union (EU) countries have focused on STEM preparation in secondary schools and STEM fields in universities [2]. Enrollment in short-cycle tertiary education programs has decreased or fluctuated in the past two decades [3]. According to the International Standard Classification of Education (ISCED) developed by the United Nations Educational, Scientific and Cultural Organization (UNESCO), short-cycle tertiary education, or ISCED Level 5, refers to those programs below bachelor's or equivalent level that are practically based, occupationally-specific, at least two years long, and prepare students to enter the labor market (please refer to Appendix A for a detailed definition) [4]. For example, short-cycle tertiary education in the United States is mainly offered through two-year community and technical colleges as associate bachelor's degree programs [4]. For analytical purposes, this paper adopts the classification developed by the United Nations [5] and groups the countries of the world into two broad categories: developed countries (or economies) and less-developed countries (those not listed as developed countries, including economies in transition, developing economies, and the least developed economies).

In developed and less-developed countries, short-cycle tertiary vocational education shares multiple important aims related to social and economic growth: a pathway to a bachelor's degree or equivalent, vocational and technical education, workforce training, and continuing or lifelong learning [6,7]. As the global production of parts—the supply chain—developed in the early twenty-first century, many manufacturing functions moved from developed nations to less-developed countries, incentivizing vocational and higher education expansion in some of these [8]. For example, in Malaysia, the public polytechnics offering two-year certificate and three-year diploma programs in areas of industry and commerce expanded their enrollment by 1.5 times from 2009 to 2012 and become the most extensive public tertiary vocational education providers [9]. In China, to promote economic development and address the shortage of skilled technicians in trades and industries, the number of tertiary vocational colleges offering two- or three-year vocational programs has grown substantially since the late 1990s [10]. Investment in short-cycle technical training enables workers to develop skills needed for employment in newly industrializing economies. In theory, it allows them to achieve economic wellbeing (i.e., the ability to support their families), an essential human capability [11].

This study addresses two research questions: (1) How have education finance, economic development, and educational systems influenced tertiary short-cycle vocational education, after controlling for population characteristics? (2) Do the influences of education finance, economic development, and educational systems on short-cycle tertiary education (primarily vocational and technical programs) differ between developed and less-developed countries?

We use three steps: a review of historical education development, a trend analysis of educational and public investment variables, and an econometric model analyzing factors related to public investment. The first step of this triangulation method is to present a policy review for the countries studied. Next, the longitudinal trend analysis explores differences in short-cycle programs, focusing on the shift toward bachelor's programs and the economic and educational developments within evolving trade alliances and supply chains [12]. Third, the econometric analysis adapts the fixed-effects model developed by Yang and McCall [13] to explore whether the strategies of education finance and the structure of educational systems help interpret recent changes in tertiary vocational education.

2. Public Policy on Postsecondary Vocational/Technical Education

European higher education systems and policies evolved different on a different trajectory to the USA in the early twenty-first century. The USA had adopted a British model during the colonial period but later pioneered an independent path [14]. European models for organizing education followed colonialism through the empire period before WWII. Educational planning in former colonizing nations continued to influence the Cold War, before economic globalization began influencing nations' strategies in higher education planning, especially in ASEAN and EU nations. In contrast, the British model substantially influenced the evolution of the educational system in Australia and other Commonwealth countries into the early 1980s [15,16]. Thus, European institutional forms and languages became the basis for educational developments in many colonizing nations [17]. Economic globalization continues to influence changes in educational planning in former colonial countries.

Initially, the "Washington Consensus" [18] argued that privatization through high tuition fees and student loans would expand college access in less-developed countries more rapidly than public spending. Using this logic, the World Bank argued that students should pay for their vocational education and training in less-developed countries, replacing tax subsidies to institutions and students with future debt for graduates (and dropouts). This policy shift recommended that private enterprises provide training with government interventions kept to a minimum. This policy prescription was seriously flawed. Newly industrializing nations sought ways to engage more fully in international production, especially the rapidly advancing and high-performing Asian economies [19]. During the

same period, European countries elevated technical programs to bachelor's status. The US embarked on collegiate prep requirements for most secondary students, emphasizing advanced science and math courses based on comparisons of Catholic and public secondary schools [20]. Some states failed to make exceptions before many students dropped out of K-12 [21,22]. Most community colleges focused on transfer to four-year colleges [23]. Patterns of investment in short-cycle training rapidly changed as nations and regions developed niches in the evolving global economy.

Furthermore, during neoliberal economic globalization after 1980, the adoption of American-style metrics for global rankings and the elite American university model was emulated in many nations [24]. However, the US model of STEM education did not become the basis for reorganizing vocational and technical education. Rather than integrating vocational education into high school programs, the first step in the USA was to replace more expensive vocational courses with advanced science and math courses. Europe followed the reverse path by integrating vocational courses into options for students in both secondary and higher education. Short-cycle training was a transitional step.

Historically, short-cycle postsecondary education (less than bachelor's) in technical and community colleges was central to economic development in states across the USA, achieving alignment of working-class educational and work opportunities. After WWII, the USA produced and supplied goods for a world recovering from the ravages of war. However, this pattern changed radically: most states raised high graduate standards to the level expected in collegiate programs in engineering and science [23]. As STEM reforms progressed, most US community colleges shifted away from certificates in auto repair, plumbing, and other technical fields to enable students to transfer to four-year programs. For example, Indiana turned its technical college system into the state community college system [25]. There is still strong demand for short-term courses in the USA, but in many states, preparation for transfer has become the priority for many community colleges.

In contrast, as noted above, many EU nations upgraded technical education in their technological institutes and universities. In addition, EU trade agreements purposefully protected manufacturing and working-class jobs [26]. These policies accelerated the decline of the working middle class in the USA compared with Western Europe [2,27]. Since the USA and other North American nations did not provide sufficient data for the empirical analyses in this research, we do not continue this comparison.

Below, we examine recent policy literature that covers trends and practices of tertiary vocational education and education finance policies in developed and less-developed countries. We consider technical and vocational education policy in the context of national and regional postsecondary education systems. We focus on nations within alliances as an additional force influencing developments in education.

2.1. Technical, Vocational and Higher Education Policy in European Countries

We focus on European nations because they provide sufficient data on education and economic developments for inclusion in the statistical analyses. We consider the EU, the UK, and post-Soviet nations separately because they followed different pathways when developing vocational and technical education policies. Our focus on the EU countries results from their high World Bank data reporting rate. We caution in generalizing beyond the EU because few non-EU developed countries provided sufficient data. We aim to build a comparative understanding and, thus, reference the US case when it helps clarify points arising in the review and analysis.

2.1.1. The UK, Brexit, and the Commonwealth

As England was engaging in the first industrialized age, Adam Smith [28] criticized the religion-centric European universities of the period for not developing sciences and subjects that could inform the economic development of nations in the emerging period. During the empire period, lasting until World War II (WWII), changes in education and industrial development were closely linked in nations within empires. The UK's break

from the European Union (EU) in 2015 and the continuing legacy of the British Empire illustrate the UK's distinctive role in education and the global economy.

The UK began changing international higher education access before the EU emerged. Although it has left the EU, the UK remains part of the European Higher Education Area (EHEA). Its national approach to developing and transforming vocational education remains distinctive. In 1856 the University of London originated distance education to educate children of government officials across the empire [28]. This history led to the British Open University further transforming access to higher education globally [29] in the EU and most developed nations. The UK's Oxford and Cambridge are now among the world's top five universities, having thrived during economic globalization since the end of the Cold War [30].

After 1980, British higher education came under attack by Margaret Thatcher [31]. While British higher education followed a new path thereafter [32], much of the course of US K-12 and higher education changed after Ronald Reagan's attacks on public education and college pricing refaced policy on markets and national standards. Britain shifted away from technical, short-cycle education after 1980. The British government emphasized economic globalization within and beyond the Commonwealth as Ronald Reagan withdrew support for international organizations and focused on tearing down the Berlin Wall. Of course, the adoption and troubled development of democratic institutions were part of the first stage of globalization. Still, the influence of Thatcher's free market ideology was globally transformative at the time, especially in South Asia.

The UK started to transform its technical education system before it joined the EU. Under UK leadership before WWII, the British Commonwealth had a lengthy history of technical and further education. It began to change its technical and further education system in the 1980s, well before the emergence of the EU. The British Commonwealth provides unique examples of the spread of a nation's model through diaspora networks before 1980, followed by the nation's neoliberal ideology influencing economic globalization [15]. Further education is no longer part of higher education in the UK and does not enjoy the same status. In contrast, starting in the late 1970s, the UK upgraded technical education into the tertiary system. The UK privatization of higher and technical education started by raising tuition and expanding loans in the late 20th century.

Thus, tertiary education was more privatized than in other EU nations in the early twenty-first century [18]. Marginson [33] argues that demand for higher education is inelastic and does not create an access barrier to education, because of income-contingent loans over the past decade. Continuing education of non-traditional part-time students also departs from the EU open-access approach, because part-time and mature students have access to loans but must repay the borrowed amount. Only about 11 percent of students enroll in further education colleges to pursue this pathway, where students are primarily at sub-degree certificate and diploma levels [33].

Comparing national histories within the Commonwealth presents a challenge. Ireland, for example, is in the EU, but its higher and vocational systems still have strong similarities to the UK. New Zealand and Ireland also have a long history of British influence. Further, the Commonwealth linkages and British investment in education training in Southeast Asia influenced collaborative engagement in education for economic development. Yet, these nations' educational systems had uncommon origins. The British and Australians supported indigenous development education for national industries in the 1980s, through the Colombo Plan (an alliance to rebuild Asia after WWII). For example, in 1988, the Colombo Plan Staff College organized an international "Planning Strategically" conference for senior officials from 15 Asian nations, in Manila, Philippines. In contrast, the Marshall Plan to rebuild Europe was strongly influenced by US democratic institutionalized values [34,35]. The aims were to cast off post-colonial status and focus on indigenous education for economic development.

We consider the British Commonwealth's legacy in technical education when comparing the UK nations to the EU or less-developed Commonwealth nations or groups

of developing countries around the globe. The UK and many Commonwealth nations upgraded technical education in the late twentieth century. England and other Commonwealth nations transformed technical education institutions into higher education institutions, a transitional process that started in the 1980s [15,16].

2.1.2. EU Countries

Created by the Maastricht Treaty and ratified by all members of the European Community, the EU was formed in 1993 to oversee economic and political integration. Most of the developed countries in our study are in the EU, an international organization that facilitates political integration, collaborates on education development, and fosters economic development through trade among nations within the EU and with other major trading partners. The Bologna Process is a unique internal collaboration coordinated within the European Higher Education Area (EHEA). The organization facilitates student mobility and employability and aligns educational development in the EU. This binding form of regional cooperation establishes a common context for vocational education and training (VET).

In 2010, the European Commission [36] developed plans to expand VET to meet the demand for higher-skilled workers and the need for medium- and high-level qualifications for the economy of 2020, an emphasis that eventually upgraded short-cycle programs into bachelor's degrees. The Commission's plans were consistent with the World Bank's [37] view: to upgrade technical and vocational education and training so students could gain skills and knowledge relevant to labor markets. This new stance departed from the Washington Consensus, which emphasized the privatization of postsecondary education that had dominated a decade earlier [19]. Increasing VET became a public policy priority in the EU, where most nations developed trade agreements protecting the working class, a step the US did not take [12]. EU nations used student grants, loans, or other financial aid to invest in VET and higher education [38], a path not chosen in the US, Latin America, or South Asia. The US also provided grants, loans, and other financial aid to many VET students in community colleges, but the unmet financial needs for attending four-year colleges widened [39]. In contrast to the US, states increased high math and science requirements for graduation in public and private high schools, and the proprietary sector in the US expanded to meet the demand for technical tertiary courses by using loans to aid students [23].

In contrast, European countries prioritized VET and higher education, aiming to increase the percentage of 30–34-year-olds holding degrees [38]. Within the EU, Ireland is small but unique [23,40]. Even after independence, it maintained the academic norm evolving from British rule, especially at the university level. However, unlike England, Ireland maintained technical programs of less than four years in tertiary institutions. Their programs helped build a new technical workforce for the booming high-tech economy. In addition, with support from Google Foundation and later from the national government, universities developed partnerships to support access and community development in schools serving low-income neighborhoods, resulting in a rise to the top of the EU college enrollment rates [40]. Cambridge and Oxford have developed their version of the access model that was started at Trinity College Dublin, an approach that influenced recent gains in national college access in Ireland.

In contrast, Germany is a leading nation in the EU, and the German university system, widely adapted in other countries, continues to influence models of academic organization [41]. Germany led the world in sciences and social sciences before WWII, but many leading scholars left before the war, and Germany's universities have not regained their status. Technische Universität München, the most highly ranked German University, is placed 50 in the global rankings [42]. The USA and Britain now dominate the top spots in international university rankings. The narrow approach to ranking does not value the legacy of connectivity between science, technology, and education. As WWII approached, the US, Britain, and Russia competed for German scientists. This history influenced Germany's trade protectionism after WWII [26]. The global university ranking schemes overlook

these and other societal aspects of university development [43]. The German K-20 model deserves greater attention in the US and other nations outside the EU.

VET is integral to secondary and higher education in Germany, which embrace apprenticeship-based vocational education, meaning that education happens in both the classroom and on-the-job training settings. In 2012, about 60 percent of most age cohorts pursued VET within the upper secondary system, but only 13 percent of that 60 percent completed a postsecondary vocational degree [44]. Germany had no unified system of institutions or agencies that regulated tertiary vocational education, creating a complicated regulatory environment. Land governments (e.g., the state/province) regulate VET. Federal and land governments share responsibility for higher education funding, with the former constituting about 18 percent of the total funding [45]. Chambers (i.e., labor market associations) of commerce and craft can also regulate specific areas of vocational programs connecting education with the labor market. Although training in vocational skills takes place at the learning sites, the chamber of commerce or crafts administers a centralized examination to assess trainees' skills, adhering to the principle that the teacher and the examiner should not be one and the same [46].

There is a history of postsecondary technical on-the-job training in Germany. "Berufsakademien (professional academies) form part of the tertiary sector and combine academic training at a Studienakademie (study institution) with practical professional training in a training establishment, thus constituting a *duales System* (dual system)" [47]. Companies that hire students subsidize education by paying wages and bearing partial costs for degrees [47]. Thus, Germany has a comprehensive open-access vocational education system with multiple pathways and relatively low barriers within pre- and postsecondary systems. After completing either of the education tracks, students may complete a bachelor's degree or a "Diplom".

While Italy was a leader in math and sciences during the Age of Enlightenment, the University of Bologna, ranked 161, is the most highly rated Italian university [48]. The legacies of the Catholic tradition and fascism have hampered the development of Italian universities [49,50]. Even though Italy did not sustain its role in global leadership, its postsecondary education adapted to support the working middle class. In Italy, vocational and technical training are part of upper-secondary education. Parallel to the vocational track in public schools, students can complete two to four years of vocational training programs organized regionally and closely aligned with local job markets [51]. Italian students with a five-year upper-secondary education diploma have open access to higher education. Academic performance does not restrict students' educational choices.

Most students in Italy (56 percent) choose VET, while a relatively low number of students enroll in academic programs in tertiary education (30 percent of native-born students) [36]. Interestingly, Contini and Triventi [51] regard open access to education and low cost as reasons for downward mobility (i.e., students first enter the academic track and then move to the vocational/technical track during upper-secondary education). The vocational sector provides options that prepare students for tertiary advancement and opportunities in the labor market.

Italy's integration of VET within the secondary and higher education systems is a typical pattern in many EU countries, as is the emphasis on this form of education. Across the diverse educational systems, integration of VET is a priority, consistent with the European Commission's stated aims.

2.1.3. Post-Soviet Nations

Technical and professional education has a long history in Russia and other post-Soviet nations. The Russian model includes vocational lyceums or secondary vocational education available at technical institutions [52]. No barriers exist for students who wish to complete undergraduate education after VET. However, the majority (62 percent) of students choose to pursue general secondary education (10th and 11th grades); about 20 percent of students pursue vocational training as part of secondary education [52]. In 2011, 53 percent of

students in Russia completed tertiary education compared with 32 percent on average among OECD countries and 26 percent among G20 countries [53]. Such high achievement is primarily due to the country's historically substantial educational investment [53]. Additionally, Russia's entry rate into tertiary vocational education programs was 31 percent, remarkably higher than the average (19 percent) of OECD countries [53]. Russia had a history of factory-like higher education that has a substantial legacy in former Soviet, less-developed nations [54], including a few of the countries that provided sufficient data for this study.

The contrast between the EU and post-Soviet nations in education and economic development is stark. The end of the Cold War and the rise of fragile democracies in post-Soviet countries did not substantially alter the legacy of centralized planning and control in education. With the lingering Ukraine–Russia war, post-Soviet nations face severe challenges that could distract policymakers from engaging in cooperative educational and economic exchange to support the development of high-quality postsecondary programs aligned with economic growth.

2.2. Postsecondary Education and VET Education in Less-Developed Countries

Nations not classified as developed and not included in World Bank data are making efforts to develop economically. There are significant variations in their economies and histories. Africa has a long history of European colonization and has been slow to emerge from poverty. Latin American nations are also in varying stages of development. Many South Asian countries are still not highly developed but are well integrated into the global high-tech supply chain.

In the 2000s, most developing nations viewed investment in vocational and technical education as integral to the pathway toward economic development. Pavlova and Mclean [55] argued that there are increasing trends in the vocationalization of tertiary education in less-developed countries, since vocational training remains a pathway to national economic uplift. Developing a skilled workforce increases a country's competitiveness, expanding opportunities to engage in producing goods and parts in an increasingly complex and fluid global economy. By the turn of the century, nations' decisions about whether to engage in the global economy would have a long-term impact on their economies, educational systems, and prospects of civil society, including the moral consequences of economic growth within supply chains. Most developing countries offer vocational education through secondary education, and further training through vocational colleges and institutes or private contractors. Pavlova and Mclean [55] advocated for providing technical and vocational education and training (TVET) in secondary education with a curriculum tailored towards specific jobs, or narrowing the breadth of tertiary education and focusing on employability.

Each nation's pathway to economic development is distinct and involves aligning learning and work opportunities, but there are regional patterns. We compare a few cases within Africa, Latin America, and Southeast Asia to illustrate some regional educational and economic barriers and challenges.

2.2.1. African Nations

Vocational education and training vary substantially across African countries. The K-12 and university systems are also less developed than in other regions. The indigenous capacity for building VET programs is limited. Climate change, wars, and disease challenge many countries. In Africa, a country's colonial past usually determines the present structure of VET [56]. We provide one example to illustrate the challenges of aligning education with national economic development, before examining the recent critical literature.

Before the 2010s, VET education had been a low priority in Africa for a quarter century [57]. For example, a former British colony, Ghana, underwent rapid economic uplift during the early 20th century: the average annual GDP increased by 8.1 percentage points in 2017 compared to 9.1 percentage points in 2008 and 14 percent in 2011 [58]. Fast economic

growth, mainly driven by oil and gas production output expansion, creates favorable labor market conditions for highly skilled populations. However, as in other emerging economies, vocational education and training in Ghana face challenges including rural–urban migration and demand for skilled human capital from more developed countries [59–62]. However, despite the endorsement of TVET at the national level, enrollment and completion rates remained lower than planned. Analysts point to the lack of prestige associated with TVET, lack of resources, and poor alignment of TVET with the market [59]. Gender parity is also weak for TVET, with the female student population comprising only 37.1 percent of enrollment [63].

Africa as a region continues to face severe challenges in delivering short-cycle VET programs. UNESCO now argues that developing a clear account of how to improve VET must be part of a transformative approach to development [64]. There is a growing understanding that conventional theories of development do not fit the challenges faced by African nations [64]. Sustainability is also emerging as a core issue; the African Union recently identified agriculture and rural development as priorities for technical and vocational training and skills development in Nigeria [65] and possibly in other African nations.

2.2.2. Southeast Asia

In contrast to Africa, several Southeast Asian countries are engaged in the global supply chain, especially in high-tech industries. In 1959, Japan, England, Australia, and other nations supported the founding of the Asian Institute of Technology (AIT), an international university north of Bangkok, Thailand [66]. AIT ranks highly in sustainability and technology management [66].

The Association of Southeast Asian Nations (ASEAN) was formed in 1967 to promote technical education and economic development in Indonesia, Malaysia, the Philippines, Singapore, and Thailand; it now includes ten member states. The Southeast Asian nations were engaged in global industrialization in the 1980s, creating alliances with international corporations to manufacture products for export. The ASEAN nations are involved in rethinking technical education through a series of strategic planning workshops offered by the Colombo Plan Staff College (CPSC) [34]. The CPSC supports national and regional meetings on economic and educational planning using an indigenous concept of development, a perspective advanced by the Australian leadership of the organization. They began rethinking technical education in relation to trends in technology and the high-tech supply chain and followed Western models of institutional development [35]. The Reagan administration had stopped funding the Colombo Plan, leaving room for a new Australian theory of change, with additional financial support from British and Japanese aid agencies [34,35].

By 2015, the ASEAN economic community had become a single market with a competitive superior production base. Many ASEAN countries' student loan programs are consonant with the World Bank advocacy guided by the Washington Consensus. Some are now adapting the Australian repayment model to deal with the stress created by student debt in less-developed nations [12]. The curriculum used in vocational schools was a priority for the ASEAN Economic Community or AEC [67]. Regional planning also informed research directions, including the alignment of programs with students' interests and their prior program content and teacher preparation [68].

2.2.3. Latin America

Thirteen universities were founded in Latin America before Harvard was in the USA (1636) [69]. Yet other than the USA and Canada, the nations in that hemisphere are still not economically developed. Latin American countries significantly expanded their vocational educational training before 2010. For instance, enrollment in technological tertiary education in Brazil, a rapidly growing economy, increased by 140 percent between 2007 and 2013 [70]. Chile has also expanded access to higher education, including tertiary vocational training, by improving secondary education outcomes and creating a bigger

pool of students [71]. Despite the progress in secondary and higher education, transitions between the educational system and labor market are still problematic in most nations.

Colombia, Mexico, and some other Central and South American countries have seen increased investment in tertiary vocational training to provide broader access to higher education, in order to further workers' social and technical development [72]. However, some common problems are impeding the progress and expansion of vocational education, such as misalignment between the market skill requirements and curriculum, lack of proper quality assurance of training and evaluation processes, and lack of a monitoring system to evaluate the educational outcomes of graduates [72,73].

2.3. Investment in Short-Cycle VET for Economic Development and Sustainability

Tertiary vocational education programs, designed as pathways for educational equity across developed and less-developed countries, are challenged to address and fulfill different missions created by rapidly changing global circumstances. From the African and Latin American VET literature, it also appears that these less-developed nations are questioning the notion that the best path forward involves adopting models foisted on them by more developed countries. Developing education for the sustainability of populations in a world with rapidly changing climates is emerging as a priority.

This paper takes a step toward developing a broader comparative perspective on international higher education development than has traditionally been used. Developments in international trade, especially involving regional associations of nations in Europe and South Asia, alter vocational training and provide a way of viewing the movement of reform from short-cycle programs into baccalaureate programs at senior universities, if not the transformation of technical tertiary schools into polytechnics and technical institutes.

2.4. Comparative Frameworks for Educational Globalization

Heinz Deiter Meyer [41] has provided a compelling analysis of the global influence of the German, British, and American university models. Globalization of elite higher education provides an organizational structure within the less-developed nations that borrowed these organizational forms. Our analysis extends this comparative approach by considering short-cycle VET programs as a step in developing educational systems in industrializing, less-developed countries.

Since most of the developed nations reporting data were in the EU, we have some empirical evidence about the role of this network. However, it was not possible to distinguish South Asia nations from other less developed countries. Therefore, we could not confirm propositions about this region. Our interpretive stance is mainly based on the historical review (above) instead of discerning trends for this group of nations.

The discussion of policies above is exploratory rather than confirmatory, except for the EU. The empirical analyses in Sections 3 and 4 make comparisons of developed and less-developed nations. Since most developed countries with adequate WB data were in the EU, we can generalize about this regional network but cannot draw implications for most other developed nations.

Section 3 compares trends in key indicators in both types of countries. Section 4 uses fixed-effects analysis to discern national variables associated with investment in technical education and also explores whether the differences in development status explain differences in public investment in short-cycle VET.

Burton Clark [17,74,75] pioneered comparison of higher education systems, using history and organizational theory. Clark [76] originally studied records of US liberal arts colleges before evolving his method to compare national systems. We use Clark's ideas about the international migration of systems in the review above. The first step in this study revealed that histories and regional trade alliances had influenced strategies for vocational education. We also found a two-step process in the development of VET, from short-cycle courses to integration into tertiary systems.

Then, we consider trends in factors that influence planning for and developing short-cycle programs, along with the statistical association between these variables and national public spending. We examine trends in these variables to inform our interpretations of the econometric analysis in Section 5 (the conclusion).

The fixed-effects approach considers the influences of public spending and other factors on short-cycle tertiary education at the national level. By considering interaction terms between developed and less-developed statuses, we gain insights into the influence on nations' economic development. Since European countries comprise the majority of developed nations providing adequate data to the World Bank, we can speculate about this association. However, we do not control for regional associations in Europe or Asia per se in the analysis.

This historical analysis of higher and vocational education provides the basis for an additional proposition: the history of alliances during the empire, Cold War, and global periods also influenced public spending. This proposition remains speculative, as we do not include data on regional associations in the regressions. However, we use this two-step proposition as an alternative frame within the study, a topic we reconsider in Section 5.

2.5. Adding Regional Alliances to Comparative Frameworks

The associations of EU and ASEAN nations illustrate the benefits of regional cooperation in educational development. The social aspects of uplift are critical but realized differently across contexts. With the guiding hand of the Marshall Plan, Western Europe rebuilt after WWII, emphasizing socially progressive democratic institutions. The plan guided the redevelopment of institutions with a democratic vision. The former Soviet Union had no guidance promoting the democratization of institutions. Instead, they suffered difficult transitions from totalitarian governments to quasi-democratic ones. Much less visible in the educational and economic development literature, the Colombo Plan Staff College focused on moving nations from post-colonial status in the shadow of colonizing countries to indigenous planning for economic, educational, and social development among ASEAN partners. Democratic institutions are developing, possibly faster than in the post-Soviet Eastern European nations. Education for all, including vocational education for the working class, is part of the new stability realized in both regions.

3. Trends in Economic and Educational Development Affecting Short-Cycle VET Courses

This section draws panel (cross-country time-series) data from the World Development Indicators (WDI) published by the World Bank. Our dataset is composed of 67 countries with sufficient data over 19 years from 2000 to 2018 for selected variables. The country cases include 25 developed and 42 less-developed (including developing and least developed countries) countries in Africa, the Americas, Asia, and Europe (see country list in Table 1).

Table 1. Developing and Less-developed Countries By Region in 2018 (n = 67): Nations and A Chinese Administrative Regions Providing Sufficient Data on Education Finance, Economic Development, Education System Development, and Population.

	Developed (25)	Less-Developed (42)
Africa (17)	--	Burkina Faso, Burundi, Cabo Verde, Cameroon, Cote d'Ivoire, Ghana, Guinea, Kenya, Lesotho, Mali, Mauritania, Mauritius, Niger, Rwanda, Senegal, Seychelles, South Africa
Asia (9)	--	Bangladesh, Hong Kong Special Admin Region of China, Indonesia, Islamic Republic of Iran, Israel, Lao People's Democratic Republic, Malaysia, Pakistan, Sri Lanka.

Table 1. Cont.

	Developed (25)	Less-Developed (42)
Europe (28)	Austria *, Bulgaria *, Cyprus *, Czech Republic *, Denmark *, Finland *, Germany *, Hungary *, Iceland, Ireland *, Italy *, Latvia *, Lithuania *, Luxembourg *, Malta *, Norway, Poland *, Romania *, Slovak Republic *, Slovenia *, Spain *, Sweden *, Switzerland, United Kingdom	Albania, Malta, Republic of Moldova, Ukraine
Latin America (12)	--	Belize, El Salvador, Mexico, Panama, Brazil, Chile, Colombia, Costa Rica, Guyana, Paraguay, Peru, Uruguay
Oceania (1)	New Zealand	

Breakdown of developed and less-developed countries was prepared by the United Nations (UN/DESA). Retrieved from https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2019_BOOK-ANNEX-en.pdf (accessed on 10 March 2023). (*) European Union Nation. Retrieved from: <https://www.google.com/search?client=safari&rls=en&q=is+finland+in+thr+Ru%3F&ie=UTF-8&oe=UTF-> (accessed on 10 March 2023).

Most of the developed countries that consistently reported were in the EU. The US and Canada did not provide sufficient data, eliminating the North American Trade Alliance from this analysis. Only one administrative area in China, Hong Kong, was included, limiting our ability to draw implications for the Asian high-tech supply chain. We limit generalization in recognition of these critical data gaps.

The less-developed nations from all regions across the world provided information. Several Eastern European countries formerly in the Soviet sphere of influence joined the EU in the early 2000s, including East Germany, which merged with West Germany, Poland, the Czech Republic, and the Slovak Republic. Engagement in the EU uplifted these economies as these nations met the economic standards of development by 2018. Former Eastern European nations, including Albania, Hungary, the Republic of Moldova, and Ukraine, once part of the Soviet sphere in Europe, did not develop rapidly. Per capita GDP is the primary indicator of development, and this indicator has a substantial differential (Figure 1). China and Russia did not supply sufficient data, so their influence is also beyond the scope of this study.

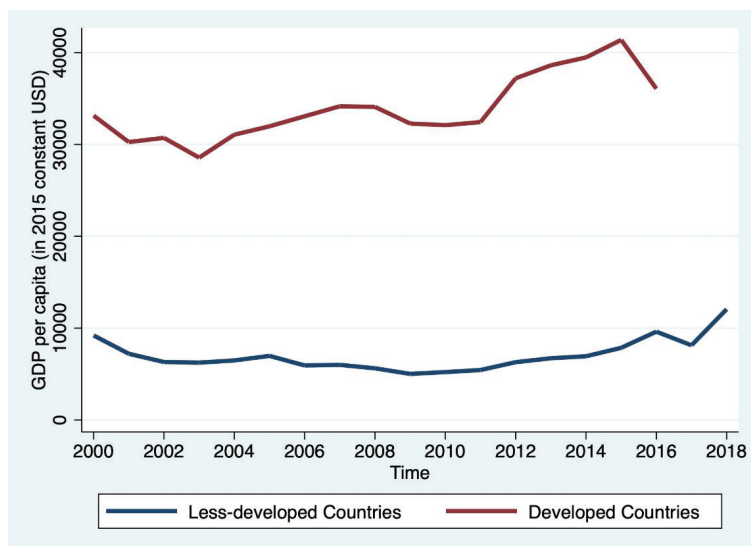


Figure 1. GDP Per Capita (in Constant 2015 US\$) by countries' development status.

Developed nations have more than three times the economic production per capita of less-developed countries. However, it would be a mistake to assume that the average citizen benefited from the economic growth of Western European nations [27]. Indeed, Western Europeans born after 1950 have experienced downward economic mobility on average compared to their parents [77].

Using World Bank data, we analyze the longitudinal trends in economic development in developed and less-developed nations, followed by enrollment in short-cycle programs. The trends analyzed below examine the variables included in the fixed-effects regression analysis in Section 4.

3.1. Economic Development within Globalizing Nations

Engagement in the global economy boosts the economies of less-developed nations. The GDP per capita remained below USD 10,000 (in constant US dollars) from 2000 until 2014 and only began to break this barrier after 2016 (Figure 1) with changes in trade alliances after 2015. The post-recession global economic recovery during this period seems a more likely influential factor. There was also a slight economic uplift in the economies of the less-developed nations after 2016. From this data, it is not possible to conclude that changes in trade alliances were a cause of these temporal changes; this is an issue that merits further study.

Between 2000 and 2010, manufacturing output in developed nations declined while it rose in less-developed countries (Figure 2). Manufacturing output grew from 2000 to 2007 in less-developed countries, then gradually declined until 2015, then fell sharply. Uncertainty about US–China trade is an issue not represented in this data. As recession waned in 2013, manufacturing increased in Easter Europe [78]. However, China realigned trade with the EU, and these nations seemed to benefit from the UK’s withdrawal [79]. These are recent developments and, therefore, probably would not impact these data reports.

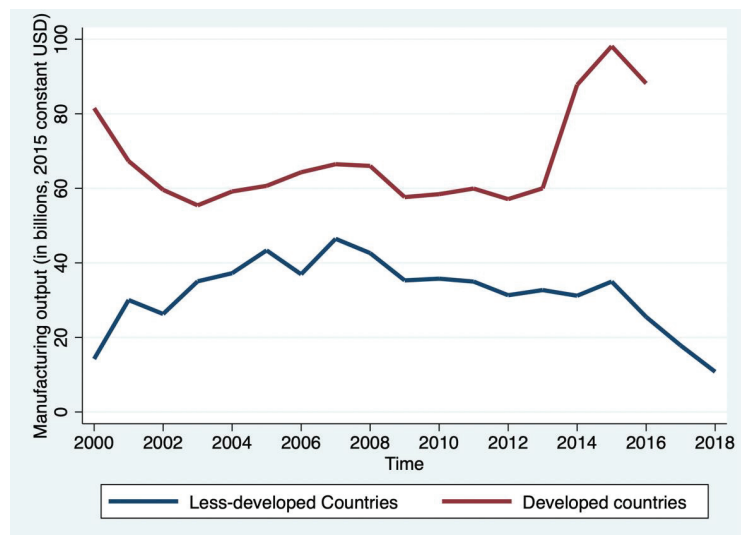


Figure 2. Manufacturing output (in billions, Constant 2015 USD) by countries’ development status.

3.2. Enrollment in Tertiary Short-Cycle (Mostly Vocational) Programs

At the turn of the century, funding organizations learned that vocational/technical education was more costly than academic programs and pre-employment vocational training was more expensive than in-service training [80], leading to public–private partnerships in many instances [81]. Since private corporations are often involved in training, public–private partnerships may benefit colleges and universities financially and speed up the

innovation process [82]. Literacy, a necessity for industrial work, was still a challenge in less-developed nations lacking primary education for all citizens [83]. Total enrollment (headcount and percentage) in short-cycle tertiary programs or ISCED level 5 education decreased from 2000 to 2018 for the selected developed countries (most EU countries, plus the UK and New Zealand) (Figures 3 and 4).

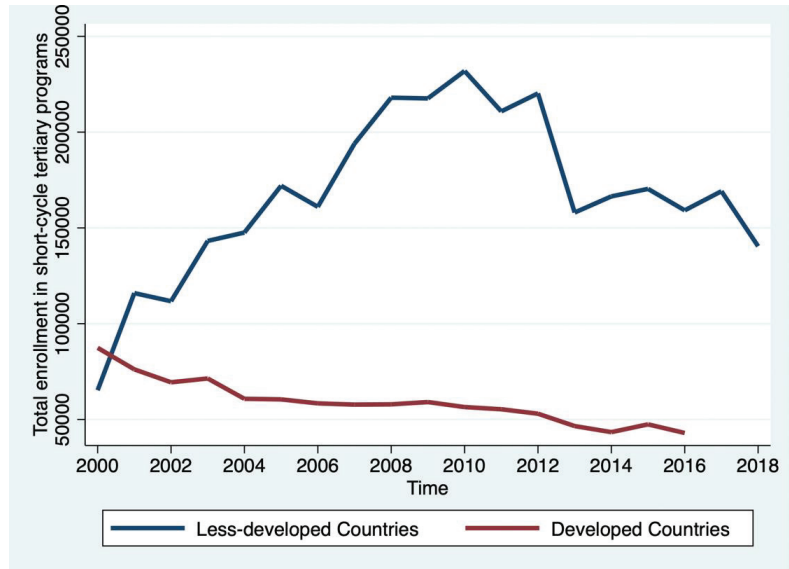


Figure 3. Total enrollment (headcount) in short-cycle tertiary programs (ISCED 5) by countries' development status.

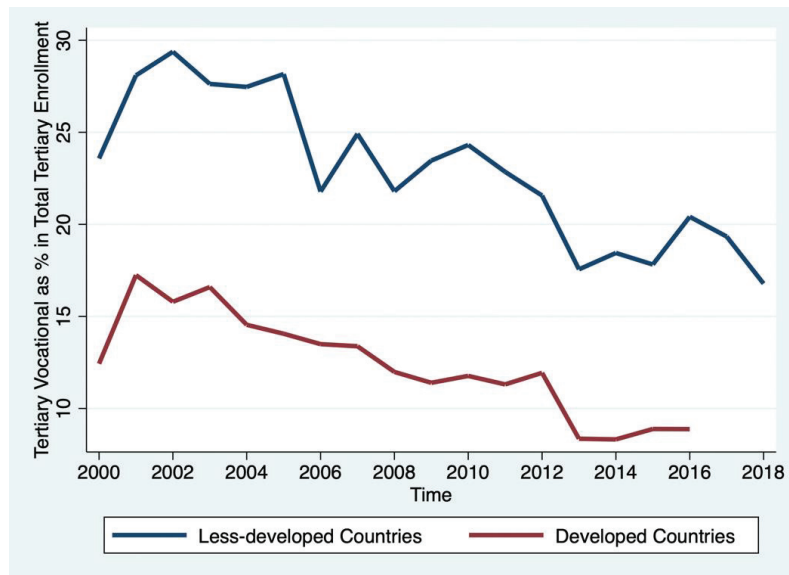


Figure 4. Total enrollment in short-cycle tertiary programs (ISCED 5) as a percentage of total enrollment in tertiary education by countries' development status.

The increased manufacturing activities beginning in 2013 in Eastern Europe corresponded with the drop in short-term training. Increased manufacturing activities created jobs for people who completed training programs for work. Growth in employment in Central and Eastern Europe seems to have been a force for change in manufacturing activities and short-cycle training, with a decline in training as the workforce expanded [84,85]. Economists have long noted that increases in employment decrease college enrollment of students meeting minimal qualifications [86,87]. In less-developed countries, although the percentage of short-cycle programs in total tertiary enrollment declined generally, the enrollment headcount in short-cycle training programs grew substantially between 2000 and 2013 but declined after 2013. As shown in Figure 3, enrollments fell sharply over a year or two, which could have been an effect of global recession, then stabilized at a lower level. Several factors contributed to the increased public investment in these programs in the pre-2013 period. Corresponding to the drop in enrollment in short-cycle courses in less-developed countries after 2013, the World Bank began to advocate for evaluations of the systematic impact of this investment. They argued that research could help inform nations about these shifts and related nuances [88].

3.3. Changing Structures and Financing of Short-Cycle and Institutionalized Vocational and Tertiary Education

After a brief decline, public investment in tertiary education as a percent of government expenditure on education increased as a priority in less-developed countries. At the same time, it was unstable in developed countries (Figure 5). Before 2016, developed countries spent a substantially higher percentage of total government expenditure on tertiary education than less-developed countries. The less-developed nations made a substantial new investment in tertiary education after 2007, especially after 2018, when it appeared nearly equal to the investment by developed nations (Figure 5). This increased spending on tertiary education in less-developed countries could be an artifact of four-year tertiary institutions taking on a more substantial role in technical and vocational education, similar to the changes in European higher education discussed in Section 2 above.

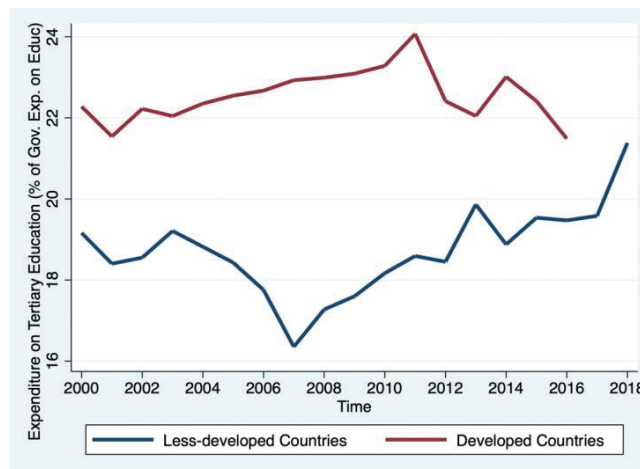


Figure 5. Government Expenditure on Tertiary Education as Percent of Government Expenditure on Education by countries' development status.

Except for 2000, a year outside the trend, the less-developed nations invested a substantially lower share of expenditure on secondary education per student than developed nations. After constrained expenditure on secondary education during 2000–2005, developed countries increased the percentage of government expenditure on secondary education per student between 2006 and 2011; spending declined to the level of the early 2000s

(Figure 6) in terms of public spending on secondary education across these less-developed nations over this period. In 2000, less-developed nations spent a higher percentage than the developed nations in this study. After a drop in 2002, this percentage rose again in less-developed nations after 2008.

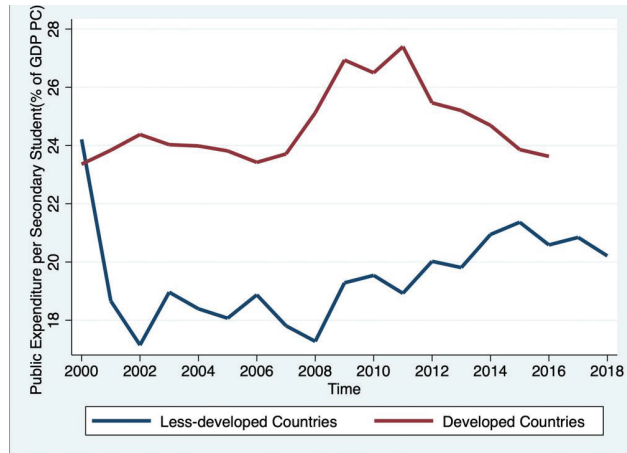


Figure 6. Public Expenditure per Secondary School Student as Percent of GDP Per Capita by countries’ development status.

Enrollment in vocational secondary school dropped substantially in the less-developed nations after 2000. the developed EU nations continued the VET approach, and the share of VET secondary enrollment was stable at around 25% (Figure 7). The longitudinal trend in the developed nations, primarily European, illustrates a link with regional cooperation on production, trade, and workforce migration. The VET high school courses in EU countries and New Zealand aligned with collegiate opportunities at the bachelor’s level, since all of these nations had upgraded collegiate technical education and aligned it with employment. The open-market approach enabled governments to continue production as part of within-EU trade.

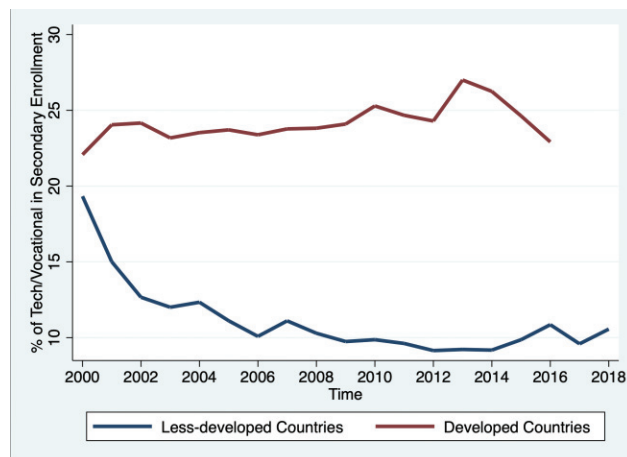


Figure 7. Tertiary Technical/Vocational Enrollment as Percent of Total Secondary Enrollment by countries’ development status.

Between 2000 and 2018, VET enrollment in less-developed nations declined from approximately 19% of high school students to 1% in 2006 and did not change substantially after that. This decline may be partially due to secondary school students preferring academic secondary school curricula. Such a substantial decrease must be due to policy changes in less-developed countries over the past two decades [13].

The shift away from vocational education enrollment in high schools has been cross-national. It is evident in developed and less-developed nations [89]—a structural change only partially influenced by the US STEM narrative. The rise in international testing and other changes promoted by OECD created new patterns of educational development and funding [90]. High-poverty countries have faced challenges, including AIDS and COVID-19, that shut down large portions of secondary enrollment [91]. They too often lack the resources to adapt quickly—home computers are essential for distance schooling, and accessible health care is necessary to prevent the spread of diseases. The education structure has been changing in the twenty-first century, and many of the highest-need nations cannot adapt when necessary.

Vocational programs are more expensive than general education, which adds nuance to interpreting these trends. Governments may be unable or unwilling to fund more costly VET secondary programs. However, moving VET into four-year degree programs provides an alternative. The EU maintained social responsibility in education and public finance policies, a value implicit in this shift in the locus of technical education. In contrast, the US STEM strategy seemed to be a cost-cutting move for federal government [22]. Social responsibility for the uplift of working-class families is especially critical in the US, where benign neglect of funding for vocational programs has influenced the decline of the middle class at a higher rate than in the EU [27]. While important, these issues remain speculative because they are beyond the scope of these analyses.

3.4. Comparing VET in Developed and Less-Developed Nations

As the final step in the longitudinal trend analysis, we reflect on patterns of policy development (Section 2). The EU approach to secondary and postsecondary development, the Washington Consensus, and the early British Commonwealth approach to institutional development have influenced developmental patterns.

Understanding the history of policy and planning within national and regional systems helps build an understanding of the evolution of institutional forms. The EU and ASEAN nations evolved regional strategies that helped resist some troubling effects, such as privatization and inequity in education, observed in early critiques of globalization [92] and marketization [93]. Recent developments suggest a change in the global trajectory.

Within regional supply chains, Europe and Southeast Asia avoided economic problems evident in the US economy associated with the decline in China's manufacturing activity during shutdowns in the COVID-19 crisis [85]. The EU and ASEAN countries have more extensive regional trade, which probably eased challenges created by COVID-19. These regional supply chains are closer than the US and China. Furthermore, China went through more severe shutdowns in industrial production than ASEAN and EU nations. The Washington Consensus influenced the patterns of institutional development on privatization in the 1990s; however, many Asian and Latin American countries are pondering the legacy of college debt in still-developing nations [12,94,95]. The British Commonwealth's development converged with strategic planning for technical development in ASEAN countries, contributing to the high-tech supply chain.

As noted above, changes in development in the past decade further inform the argument that the global trajectory has changed. The trends suggest that European trade benefited from tensions between the US and China. The tension about trade between China and the US began before Trump ran for President [96]. Changes in trade started before the election—Trump voiced the festering problem. There were also changes in the relationships among less-developed countries, Europe, and China as the EU nations took on more production. At the same time, less-developed nations in Africa and Latin America

began questioning the rapidly changing northern hemisphere theories of development promoted by UN organizations and the World Bank.

In the late 20th century, the World Bank and other international organizations aligned their guidance and financial support with the Washington Consensus that argued for privatization, using tuition fees and loans to pay for postsecondary education. As economic globalization progressed, however, these same organizations promoted VET to engage rapidly in many developing nations as they played increasingly substantial roles in the global economy. The shift was often motivated by assessments in less-developed countries that refocused on sustainability for their populations. Increasingly, it may be appropriate to view public spending on short-cycle VET as a step toward new industrial development that four-year technical programs may replace if economic development is successful. This idea fits patterns in the EU and may apply in some less-developed nations as they move forward in an increasingly politicized global economy.

It is evident from the longitudinal trend analysis and review of policy development that there is no longer a single narrative guiding international economic development. The EU, the UK, and ASEAN nations developed vocational bachelor's programs. Students and graduates in Latin America and Southeast Asia have educational debt that could constrain domestic economic development for another generation. The EU and ASEAN models show that national and regional interests support cooperative action in education and trade. These nations have been better prepared to adapt to the recent and rapid shifts in global patterns of economic development.

There is a relatively long history that includes European technical institutes, polytechnics in England, and engineering and specialized undergraduate colleges in the USA and other nations. Some US land-grant universities, such as Ohio State and Purdue, have two-year campuses with transferrable technical programs. In addition, graduate schools routinely offer short-cycle courses through continuing education to update professionals as technologies change. Private corporations also develop short-cycle programs to update practicing professionals and technicians with new technologies, especially in software and web-based applications. Integrating new content into academic programs for undergraduate and graduate students is the second step in adaptive change supporting local economic development. This two-step process makes sense and fits with the findings of the trend analysis, informed by the historical analysis in Section 2.

4. Fixed-Effects Study of Public Investment in Short-Cycle Postsecondary Education

Most of the literature examined above provides qualitative country/regional analysis and uses descriptive quantitative methods (e.g., using trends and mean) to study access to tertiary vocational education. None of these studies have provided empirical evidence on whether education finance policies have influenced the development of tertiary vocational education across different countries. The fixed-effects regression analysis of public investment reported here adds to the literature on public investment in short-cycle tertiary education. We discuss the methods and findings below.

4.1. Methods

This fixed-effects regression uses 19 years of data from nations reporting to the World Bank. The analyses provide insights into how the global economy and public investment have influenced tertiary vocational education. After accounting for missing data, the sample size of the final dataset is 681 (an unbalanced panel dataset with varying numbers of years for each country). We discuss the variables, statistical models, and data limitations below.

4.1.1. Variables

The two dependent variables are (a) enrollment (headcount) in ISCED-Level 5, or short-cycle tertiary education [4] and (b) the percentage of ISCED-Level 5 students within tertiary education. The sector incorporating ISCED-Level 5 is often designed to provide students with professional knowledge, skills, and competencies and offer a tertiary level

of education below the status of a bachelor's degree or equivalent (See Appendix A, Definitions of the Variables).

Guided by the conceptual framework, this study selected 18 independent variables from WDI to address the research questions. We use three blocks of independent variables. First, education finance policy variables include government expenditure on tertiary education as a percentage of governments' education expenditures, public expenditure per student at primary, secondary, and tertiary levels (as a percent of GDP per capita), and public spending on education (as a percent of GDP). Government expenditure on tertiary education as a percentage of government expenditure on education provides an indicator of government priority in financing the tertiary sector relative to elementary and secondary education. Public spending on education as a percentage of GDP indicates a country's prioritization of education compared with resource allocation to other public sectors (e.g., health, military). Public expenditure per student at each level as a percent of GDP per capita represents the government's role in sharing the cost of education.

Second, economic indicators include GDP per capita and total manufacturing output (in constant 2015 USD). GDP per capita can capture global economic changes and represent income level and education affordability. Since tertiary vocational education mainly supplies the labor force to the manufacturing industry in many countries [55], including manufacturing output may provide insights into how a country's manufacturing size and global competitiveness affect its growth in tertiary vocational education.

Third, the set of educational system variables includes the percentage of students enrolled in vocational and technical secondary education programs, gross enrollment ratios, and gender parity indices (GPI) at the three education levels (See Appendix A, Definitions of the Variables). The gross tertiary enrollment ratio is the total enrollment in tertiary education (ISCED 5 to 8), regardless of age, expressed as a percentage of the total college-aged population of the five-year age group after leaving secondary school. GPI is the female gross enrollment ratio at each educational level compared with males; a value less than 1 indicates a disparity in favor of males, and a value greater than 1 indicates a disparity in favor of females. Lagging variables for gross tertiary enrollment ratios and GPI at the tertiary education level by one year allowed countries time to respond to previous years' changes in higher tertiary vocational education systems.

Like Yang and McCall's [13] study, the analytical framework also includes a set of control variables on population characteristics, including the percentage of the population 65 years and older, the percentage of females in the population, and the total population size. These control variables partial out the impact of socio-demographic factors, such as aging trends and the gender gap in the school-aged population, on the dependent variables [13].

In addition, the literature review suggests that the purpose, access, and design of tertiary vocational education systems differ between developed and less-developed countries [36,55]. Thus, in the preliminary stage, this study included a dummy variable to classify the development level of the 67 countries (1 = developed countries; 0 = less-developed countries) based on the classification developed by the United Nations [5]. We created a series of interaction terms from the dummy variable and the first three blocks of indicators. Five interaction items between the dummy variable (countries' development level) and critical economic, education finance, and systems variables appeared statistically significant in the preliminary statistical analyses. Thus, this study retained only five interaction terms in the final models—manufacturing output, GDP per capita, tertiary expenditure, secondary expenditure, and secondary vocational education. The interaction terms can provide insights into whether the effects of a country's economy, education finance, and secondary vocational education on short-cycle tertiary vocational education depend on its development level.

We took steps to address multicollinearity, a potential limitation in regression analyses. We reviewed pair-wise correlations between all independent variables to check for severe collinearity. Additionally, our panel dataset includes a long time series with a maximum of

19 years of entries (2000–2018, with no missing data) clustered for each country, causing high intra-class correlation and serial correlation [97]. In this case, the traditional correlation matrix does not sufficiently capture the panel dataset's variance structure; thus, the correlation table is not provided (but available on request). Finally, all variables in dollar units or population headcounts were transformed using a natural logarithm to model a linear relationship.

4.1.2. Statistical Models

This study uses a fixed-effects regression approach to determine the influences of education finance, economic indicators, and educational systems on short-cycle tertiary vocational education enrollment. Using fixed-effects models to analyze cross-country time-series (panel) data can capture country-specific, unobservable, and time-invariant effects that may exist for each country (e.g., national history and culture, socio-political structure, education values, and finance pattern for higher education). Additionally, our fixed-effect models include time dummy variables for each year to detrend variables that tended to increase or decrease over time (e.g., enrollment ratios, total population). Detrending or controlling the time trend may help the study avoid a “spurious regression problem” in results [70]. The following fixed-effects model was applied to estimate country and time effects of education finance variables and other predictors of tertiary vocational education:

$$y_{it} = \alpha + \beta_1 x_{1it} + \dots + \beta_k x_{kit} + \mu_i + \gamma_t + \varepsilon_{it} \quad (1)$$

where $\varepsilon_{it} \sim IID(0, \sigma_\varepsilon^2)$, $\mu_i \sim IID(0, \sigma_\mu^2)$

In this model, $i(=1, 2, \dots, N)$ represents the i th country; $t(=2000, 2004, \dots, 2018)$ denotes the year, where the year of 2000 is treated as the reference category; α is the intercept of the model; β_k is the coefficient associated with the independent variables x_{kit} ; the term γ_t denotes the time effect; μ_i represents country-varying, time-invariant variables (country fixed-effects); and ε_{it} denotes the country-varying and time-varying error term. In a fixed-effects model, the country dummies μ_i are considered part of the intercept. By assumption, $E(\varepsilon_{it}) = 0$ and $\text{Var}(\varepsilon_{it}) = \sigma_\varepsilon^2$, while $\varepsilon_{it} \sim IID(0, \sigma_\varepsilon^2)$ denotes that errors are independent and identically distributed (IID).

This study uses the above equation to estimate four fixed-effects models on two dependent variables by excluding (Models 1 and 3) and including the interaction items between the country's development level and predictor variables (Models 2 and 4). We report the results from all models and highlight consistent results across two or more models. At least one of the interaction terms in Models 2 and 4 appears statistically significant, so we present the regression coefficients and the interaction effects.

4.1.3. Data Limitations

This study has some limitations. First, some potentially influential factors on vocational education are unavailable from the WDI dataset (e.g., tuition fees and financial aid programs are missing) or lack necessary classification into components. For example, government expenditure on tertiary education did not distinguish between vocational and academic programs.

Second, except for the two economic indicators and three population variables, the rest of the variables contain considerable missing values. Assuming that the mechanism of missing data is random and that variables change slowly over time, the study imputed a small part of the missing data, only 5 percent of all data points in total for the 18 variables, with values adjusted to an average growth rate of the individual variable that contains missing data.

Third, the countries in the statistical analysis are primarily middle- or upper-income countries that are more likely to report data to the World Bank. Moreover, the developed countries in the dataset are mostly members of the European Union plus New Zealand. In addition to the United States, referred to in many places in the paper, China, Russia, India, Turkey, Argentina, Venezuela, France, Australia, and other nations are also missing due

to a lack of data. Thus, it is inappropriate to generalize beyond the countries included in the study.

Fourth, since more recent data after 2018 are unavailable for most countries in the World Development Indicators dataset, caution is suggested when generalizing the results to the coronavirus pandemic and post-pandemic periods.

Finally, as noted above (Section 4.1.1), we took steps to reduce the risk of multicollinearity. We first reviewed pair-wise correlations between all independent variables and made sure no severe collinearity affected the estimation. Furthermore, our panel dataset has a long time series with a maximum of 19 years of homogeneous entries (2000–2018, when there was no missing data) clustered for each country, causing higher correlation than a single cross-country dataset [97]. Thus, the correlation table is not provided (but is available on request).

4.2. Findings

Table 2 provides the results from the fixed-effects regression models examining the impacts of education finance, the economy, and the educational system on tertiary vocational education. Models 1 and 3 (without interaction effects) and 2 and 4 (with interaction effects) yielded consistent results for the main effects of the variables.

Table 2. Fixed-effects Models of Regressions on Lower-Level Tertiary Vocational Enrollment (n = 681, 67 Countries).

	Enrollment (Headcount) in Tertiary Vocational Education (Log)		Enrollment in Tertiary Vocational Education as % of Total Tertiary Enrollment	
	Model 1 (Without Interaction Effects)	Model 2 (With Interaction Effects)	Model 3 (Without Interaction Effects)	Model 4 (With Interaction Effects)
Education Finance				
Expenditure on Tertiary Education (% of Gov. Expenditure on Education)	0.0477 * (0.020)	0.0742 ** (0.024)	0.534 * (0.221)	0.973 *** (0.279)
Public Expenditure per Primary School Student as % of GDP Per Capita	−0.005 (0.024)	0.009 (0.025)	−0.721 (0.488)	−0.608 (0.394)
Public Expenditure per Secondary School Student as % of GDP Per Capita	0.015 (0.011)	0.0298 ** (0.010)	0.178 (0.244)	0.504 * (0.233)
Public expenditure per Tertiary Student as % of GDP Per Capita	−0.00455 ** (0.002)	−0.00555 ** (0.002)	−0.0567 * (0.025)	−0.0711 ** (0.025)
Public spending on education (% of GDP)	−0.027 (0.117)	−0.043 (0.105)	2.388 (1.479)	2.156 (1.412)
Economy				
Manufacturing output (in Constant 2015 USD, Log)	−0.180 (0.536)	0.577 (0.608)	12.630 (9.428)	17.830 (11.710)
GDP Per Capita (in Constant 2015 USD, Log)	1.813 (1.099)	2.057 (1.240)	8.226 (13.530)	−0.245 (25.360)
Educational System				
Gross Primary Enrollment Ratio	0.026 (0.015)	0.0295 * (0.014)	−0.211 (0.236)	−0.210 (0.211)
Gross Secondary Enrollment Ratio	−0.015 (0.014)	−0.017 (0.014)	−0.013 (0.140)	−0.033 (0.122)

Table 2. Cont.

	Enrollment (Headcount) in Tertiary Vocational Education (Log)		Enrollment in Tertiary Vocational Education as % of Total Tertiary Enrollment	
	Model 1 (Without Interaction Effects)	Model 2 (With Interaction Effects)	Model 3 (Without Interaction Effects)	Model 4 (With Interaction Effects)
% Tech/Vocational in Secondary Enrollment	2.945 (2.021)	6.479 ** (2.276)	35.01 * (15.240)	42.220 (26.610)
% Female in Secondary Vocational Education	0.018 (0.016)	0.017 (0.015)	0.035 (0.226)	0.031 (0.208)
Gross Tertiary Enrollment Ratio (Lag)	−0.013 (0.014)	−0.014 (0.014)	−0.243 (0.154)	−0.309 * (0.154)
Gender Parity Index for Primary Enrollment	−0.0920 * (0.044)	−0.101 ** (0.036)	−0.867 (0.639)	−0.964 (0.618)
Gender Parity Index for Secondary Enrollment	0.010 (0.021)	0.011 (0.019)	−0.113 (0.251)	−0.080 (0.238)
Gender Parity Index for Tertiary Enrollment (Lag)	−0.012 (0.007)	−0.010 (0.007)	−0.196 (0.105)	−0.172 (0.093)
Population				
% 65 years and older	0.328 (2.172)	−0.939 (2.106)	−15.440 (25.990)	−10.810 (24.640)
% Female	16.460 (18.480)	9.851 (16.940)	−205.900 (445.400)	−196.800 (462.100)
Total Population (Log)	3.948 * (1.945)	1.634 (1.681)	−13.670 (23.390)	−1.014 (35.170)
Interaction Effects				
Development * Manufacturing		−1.603 (0.982)		−14.400 (15.890)
Development * GDP Per Capita		0.154 (1.667)		32.410 (32.470)
Development * Tertiary Expenditure as % of Gov. Exp.		−0.060 (0.053)		−0.994 ** (0.347)
Development * Secondary Expenditure		−0.0430 * (0.021)		−0.778 * (0.330)
Development * % of Secondary Vocational		−6.089 * (2.764)		−18.820 (29.020)

Note: All standard errors are adjusted for institutional clusters for panel data and reported in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

All models (Models 1–4) demonstrate that two types of tertiary expenditure have statistically significant relationships with the headcounts or percentages of tertiary vocational education. First, government expenditure on tertiary education as a percentage of government expenditure on education (compared to expenditure on elementary and secondary education) was positively related to tertiary vocational enrollment (headcount or percentage). Second, public expenditure per tertiary student as a percentage of GDP per capita was negatively associated with tertiary vocational enrollment (headcount or percentage).

In Models 2 and 4, public expenditure per secondary school student as a percentage of GDP per capita had a statistically significant and positive association with tertiary vocational enrollment. Models 2 and 3 show that the percent of vocational education within secondary enrollment has a positive, statistically significant relationship with tertiary vocational education ($\beta_1 = 6.479$, $p < 0.01$; $\beta_2 = 35.01$, $p < 0.01$) and the interaction term with country development level in Model 2 is also statistically significant ($\beta_{2\text{interaction}} = -6.089$,

$p < 0.05$), such that a single percentage increase in secondary vocational enrollment is associated with a nearly one (6.479) percent increase in tertiary vocational enrollment in less-developed countries, but with only a much smaller (0.39 (6.479–6.089)) percentage increase across developed countries.

4.3. Discussion

The fixed-effect models examining the influences of education finance policies, economy, and educational systems on tertiary vocational education reveal that public spending on tertiary and secondary education and secondary vocational enrollment have a statistically significant influence on short-cycle tertiary vocational education. The positive relationship between government expenditure on tertiary education (academic and vocational) as a percentage of government expenditure on education and short-cycle tertiary vocational enrollment suggests that short-cycle tertiary vocational education relies on public spending. In contrast, US community colleges rely more on government (local and state) appropriations than four-year institutions [98]. This pattern seems also to be true for the nations studied here. On the one hand, the open-access, low-tuition nature of admission into short-cycle tertiary education requires heavy public subsidies. On the other hand, unlike costly four-year bachelor's degree programs, financing short-cycle tertiary training, often of lower quality and cost, involves a lower level of financial commitment from the government. Thus, it is logical that increased public investment in tertiary education benefited short-cycle education rather than bachelor's education.

The negative relationship between public cost per tertiary student as a percentage of GDP per capita and tertiary vocational enrollment is consistent with the findings of Yang and McCall [13]. When countries have adopted a fixed total budget for tertiary education, the more students enrolled in tertiary vocational education, the less government investment per student. Competition for higher education resources under a fixed total budget may lead to an inverse relationship between public expenditure per student and tertiary vocational enrollment. Therefore, the negative relationship yielded in this study provides some evidence that budget allocation levels for tertiary vocational education are relatively fixed or do not increase proportionately with enrollment levels [99,100]. Similar to the findings for gross tertiary enrollment (both academic and vocational) in Yang and McCall's [13] research, this study finds that the negative relation remains the same for short-cycle tertiary education.

The regression results reveal a different story about public investment in short-cycle tertiary education compared with for higher education access in general (both vocational and academic tracks). According to Yang and McCall [11], higher education access to all sectors (vocational and academic) in general has borne statistically significant relationships with public spending on education as a percentage of GDP, GDP per capita, secondary enrollment ratio, and gender parity indices at secondary and tertiary levels. In this study, these relationships are not statistically significant, but the results are highly intuitive and well-aligned with existing literature. Primarily due to its openness in admission criteria and low-tuition nature, access to short-cycle tertiary vocational education is not very sensitive to public spending on education as a percentage of GDP, citizens' average income (represented by GDP per capita), secondary education preparation, or the gender pattern prevailing in secondary and tertiary education.

The positive, significant relationship between secondary vocational enrollment and tertiary vocational education and the significant interaction effect observed in this study are particularly illuminating. It is logical that in less-developed countries, tertiary vocational education mainly provides college access for students who have completed secondary vocational education. In other words, these less-developed countries have established pipelines through which secondary vocational students directly enter tertiary vocational education. It is also likely that secondary and tertiary vocational education in less-developed countries are encouraged by national policies. This parallel development strategy has enabled many developed and less-developed countries, such as Malaysia, Japan, and the Republic of

Korea [56], to expand students' options and meet the increasing demand for technical, managerial, and professional occupations. However, this study finds that a parallel vocational education development strategy has been more applicable for less-developed countries and much weaker across developed countries.

5. Building Understanding of Public Investment

We used a three-step method of reviewing the literature on VET policy, analyzing trends in related variables, and performing fixed-effects regression to address the research questions. We return to the two research questions using insights from each part of the analysis before considering the implications of using multiple methods to triangulate complex policy questions.

5.1. Findings

Our first research question was: How have education finance, economic development, and educational systems influenced tertiary short-cycle vocational education after controlling for population characteristics? The review of policy literature demonstrates the commitment of national governments to invest in VET education, a pattern evident in both the EU and ASEAN nations. The EU guides economic, educational, and social policies that promote national development.

All except one of the developed nations providing World Bank data were European. New Zealand, the additional case, had followed a British developmental pattern and was thus influenced by the UK system and traditions, as was Ireland (included as a case). In the early 1980s, nations in the British Commonwealth began transforming technical programs into more advanced collegiate programs. The ASEAN countries in Southeast Asia, including some Islamic countries, engaged in this process with the support of the Colombo Plan Staff College. These initiatives supported autonomous development, moving through the post-colonial stage, and collective inter-governmental efforts promoting the indigenous social and economic development of member countries in Asia and the Pacific region.

Some less-developed European nations providing data had been in the Soviet bloc. Post-Soviet countries were slower to create competitive postsecondary systems because of central control, the factory-like approach, and corrupt admissions, with wealthy families buying access [101,102]. In contrast, the former Soviet countries in the EU passed through the development barrier and have obtained higher GDP per capita. Of course, selection into the EU is vital because the EU's economy, workforce, education, and social openness provide more avenues for development.

The longitudinal trend analysis revealed changing patterns of trade and manufacturing after 2012 in less-developed countries, with an upward trajectory for enrollment in short-cycle courses before 2007. There were also changes in manufacturing patterns, with less-developed countries producing less manufacturing output and the developed nations increasing their manufacturing after 2012. However, changes in the supply chain were not the only factor.

The less-developed nations started spending more on tertiary education after 2014, as the European countries had throughout the period studied. The regression analysis demonstrates that tertiary spending as a share of all government spending on education bears a statistically significant and positive relationship with short-cycle tertiary enrollment. The impact of population size on enrollment in short-cycle programs ceased to be statistically significant in the second step of the fixed-effects analysis. We expect these findings would be different had China and India provided data. However, the question is beyond the parameters of our study. Thus, the European and less-developed nations in this study shifted VET programs from short-cycle to bachelor's level programs, a pattern of educational development that differs substantially from the US. The Biden administration's investment in building infrastructure, computer chips, and the environment could influence demand

for technical and vocational programs. The movement toward bachelor's programs in US community colleges [103] could also result in a meaningful and substantial change.

The second research question was: Do the influences of education finance, economic development, and educational systems on short-cycle tertiary education (primarily vocational and technical programs) differ between developed and less-developed countries? The best indicator of putting policy into practice is public investment. Among the nations providing World Bank data, we found that public spending on tertiary education was a key indicator of participation in VET education.

Collaboration within regional trade and education also appears to be a crucial factor in this period of global trade. Commonwealth nations engaged in innovation during economic globalization in the 1980s, especially in Southeast Asia. The evolution of the EU as an organizing entity fostering within-region trade and educational exchange seems to have accelerated economic development and supported economic equity better than in the USA. The UK becomes an exceptional case within this pattern. It pioneered upgrading technical education, influencing educational growth in Southeast Asia, Australia, and New Zealand. Still, Brexit symbolizes a go-it-alone strategy that differs substantially from the productive pattern of regional cooperation in education and trade evident in EU and ASEAN nations. It remains to be seen whether the UK's recent development of a trade agreement with the EU will change Brexit's apparent negative economic consequences.

5.2. Implications

These analyses have implications for economic and educational development across nations, particularly those countries included in the dataset. While neoliberal policy dominated the international trajectory in education and economic development early in the twenty-first century, national economies have entered a period of uncertainty and deep conflict about future directions. Underlying the new uncertainty lurk tensions between the development of democratic institutions promoting equity and support for uplift across generations, including short-cycle technical and vocational education preparing workers for new industries in a global economy.

The challenges created by the decline of democratic institutions are now evident in many nations. Many less-developed countries have not overcome totalitarian governments. Some Latin American nations suffer from elected leaders using demagogic tactics to maintain power [104]. Further, the development of universities in post-Soviet countries is hampered by the legacy of central control in government and universities [102]. The EU strategy supports the capacity of rising generations to learn, work, and engage in economic development. The current period of uncertainty affects citizens, students, administrators, and policymakers seeking a better financial future with stable social structures.

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Appendix A

Table A1. Glossary of Variables Used in Trend and Regression Analyses.

Variable	Definition
Enrollment in tertiary vocational education (ISCED 5)	Total enrollment in short-cycle tertiary programs (ISCED 5). Programs at ISCED level 5, or short-cycle tertiary education, typically are practically based, occupationally-specific, at least 2 years, and prepare students to enter the labor market. However, these programs may also provide a pathway to other tertiary education programs. Academic tertiary education programs below the level of a Bachelor's or equivalent is also classified as ISCED level 5 (UNESCO, 2012). Tertiary education comprises ISCED levels 5, 6, 7 and 8, which are labelled as short-cycle tertiary education, Bachelor's or equivalent level (3–4 years or more than 4 year), Master's or equivalent level (at least 5 years), and doctoral or equivalent level, respectively.
Percentages (%) of all students in tertiary education enrolled in ISCED 5, and both sexes	Total enrollment in short-cycle tertiary programs (ISCED 5) as a percentage of total enrollments in tertiary education (ISCED 5 to 8).
Education finance	
Expenditure on Tertiary Education (% of Gov. Expenditure on Education)	Current expenditure is expressed as a percentage of direct expenditure in public educational institutions (instructional and non-instructional) of the tertiary level of education. Financial aid to students and other transfers are excluded from direct expenditure. Current expenditure is consumed within the current year and would have to be renewed if needed in the following year. It includes staff compensation and current expenditure other than for staff compensation (ex. on teaching materials, ancillary services and administration).
Public spending on education (as % of GDP)	Total general (local, regional and central) government expenditure on education (current, capital, and transfers), expressed as a percentage of GDP. It includes expenditure funded by transfers from international sources to government. Divide total government expenditure for a given level of education (ex. primary, secondary, or all levels combined) by the GDP, and multiply by 100. A higher percentage of GDP spent on education shows a higher government priority for education, but also a higher capacity of the government to raise revenues for public spending, in relation to the size of the country. However, one should keep in mind in some countries, the private sector and/or households may fund a higher proportion of total funding for education, thus making government expenditure appear lower than in other countries
Public expenditure per primary student (as % of GDP per capita)	Average total (current, capital and transfers) general government expenditure per student in public or private institutions at the primary school level of education, expressed in the percentage of GDP per capita. The expenditure includes what the government spends, and not total spending per student (including household contributions).
Public expenditure per secondary student (as % of GDP per capita)	Average total (current, capital and transfers) general government expenditure per student in public or private institutions at the secondary school level of education, expressed in the percentage of GDP per capita. The expenditure includes what the government spends, and not total spending per student (including household contributions).
Public expenditure per tertiary student (as % of GDP per capita)	Average total (current, capital and transfers) general government expenditure per student in public or private institutions at the primary school level of education, expressed in the percentage of GDP per capita. The expenditure includes what the government spends, and not total spending per student (including household contributions).

Table A1. Cont.

Variable	Definition
Economy	
GDP per capita (in constant 2010 US\$)	GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 US dollars.
Manufacturing, value added (constant 2010 US\$)	Manufacturing value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3. Data are expressed constant 2010 US dollars.
Basic education	
Gross primary enrollment ratio	Total enrollment in primary education, regardless of age, expressed as a percentage of the population of official primary education age. GER can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition.
Gross secondary enrollment ratio	Total enrollment in secondary education, regardless of age, expressed as a percentage of the population of official secondary education age. GER can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition.
Gross tertiary enrollment ratio	Total enrollment in tertiary education (ISCED 5 to 8), regardless of age, expressed as a percentage of the total population of the five-year age group following on from secondary school leaving.
Gross secondary enrollment ratio % of tech/vocational enrollment in total secondary enrollment	Total number of students enrolled in vocational programs at the secondary education level, expressed as a percentage of the total number of students enrolled in all programs (vocational and general) at the secondary level. Vocational education is designed for learners to acquire the knowledge, skills and competencies specific to a particular occupation or trade or class of occupations or trades. Vocational education may have work-based components (e.g., apprenticeships). Successful completion of such programs leads to labor-market relevant vocational qualifications acknowledged as occupationally-oriented by the relevant national authorities and/or the labor market.
Gender parity index for gross primary enrollment	Ratio of female gross enrollment ratio for primary to male gross enrollment ratio for primary. It is calculated by dividing the female value for the indicator by the male value for the indicator. A GPI equal to 1 indicates parity between females and males. In general, a value less than 1 indicates disparity in favor of males and a value greater than 1 indicates disparity in favor of females.
Gender parity index for gross secondary enrollment	Ratio of female gross enrollment ratio for secondary to male gross enrollment ratio for secondary. It is calculated by dividing the female value for the indicator by the male value for the indicator. A GPI equal to 1 indicates parity between females and males. In general, a value less than 1 indicates disparity in favor of males and a value greater than 1 indicates disparity in favor of females.
Gender parity index for gross tertiary enrollment	Ratio of female gross enrollment ratio for tertiary to male gross enrollment ratio for tertiary. It is calculated by dividing the female value for the indicator by the male value for the indicator. A GPI equal to 1 indicates parity between females and males. In general, a value less than 1 indicates disparity in favor of males and a value greater than 1 indicates disparity in favor of females.

Table A1. Cont.

Variable	Definition
ISCED 6	The duration of Bachelor' level from 3 to 4 or more years when directly following ISCED level 3, or 1 to 2 years when following another ISCED level 6 program
ISCED 7	The duration of Master's level when following ISCED level 6, or from 5 to 7 years when directly following ISCED level 3
ISCED 8	Doctoral or equivalent level programs, are designed primarily to lead to an advanced research qualification. Programs at this ISCED level are devoted to advanced study and original research and are typically offered only by research-oriented tertiary educational institutions such as universities. Doctoral programs exist in both academic and professional fields.
Population	
% of 65-years and older	Total population 65 years of age or older. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.
% of female population	Female population is the percentage of the population that is female. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.
Total population (in millions)	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates.

References

1. Maclean, R.; Pavlova, M. Vocationalization of Secondary and Higher Education: Pathways to the World of Work. In *Revisiting Global Trends in TVET: Reflections on Theory and Practice*; UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training: Bonn, Germany, 2013.
2. St. John, E.P. (Ed.) *Co-Learning in Higher Education: Community Wellbeing, Engaged Scholarship, and Creating Futures*; Taylor & Francis: London, UK, 2022.
3. World Bank Databank. World Development Indicators [Data File]. 2018. Available online: <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators> (accessed on 9 March 2023).
4. OECD. ISCED 2011 Level 5: Short-Cycle Tertiary Education. In *ISCED 2011 Operational Manual*; OECD: Paris, France, 2015; pp. 73–79.
5. United Nations. World Economic Situation and Prospects. 2019. Available online: https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2019_BOOK-ANNEX-en.pdf (accessed on 30 March 2023).
6. CEDEFOP. The Changing Nature and Role of Vocational Education and Training in Europe. 2017, Volume 1. Available online: <http://www.cedefop.europa.eu/en/publications-and-resources/publications/5563> (accessed on 9 March 2023).
7. CEDEFOP. The Changing Nature and Role of Vocational Education and Training in Europe. 2017, Volume 2. Available online: <http://www.cedefop.europa.eu/en/publications-and-resources/publications/5564> (accessed on 9 March 2023).
8. Marginson, S.; Kaur, S.; Sawir, E. Global, Local, National in the Asia-Pacific. In *Higher Education in the Asia-Pacific: Strategic Responses to Globalization*; Springer: Dordrecht, The Netherlands, 2011; pp. 3–34.
9. Mustapha, R.B. Skills Training and Vocational Education in Malaysia. In *Education in the Asia-Pacific Region: Issues, Concerns and Prospects*; Springer: Singapore, 2017; pp. 137–153.
10. Zhang, J.; Chen, Z.; Wu, Z.; Hora, M. An Introduction to Technical and Vocational Education in China: Implications for Comparative Research and Practice on Internships. 2020. Available online: http://ccwt.wceruw.org/documents/ccwt_report_An%20Introduction%20to%20Technical%20and%20Vocational%20Education%20in%20China.pdf (accessed on 17 April 2023).
11. Nussbaum, M.C. *Women and Human Development: The Capabilities Approach*; Cambridge University Press: Cambridge, UK, 2008.
12. St. John, E.P. Higher Education in Post-Neoliberal Times: Building Human Capabilities in the Emergent Period of Uncertainty. *Educ. Sci.* **2023**, *13*, 500. [CrossRef]
13. Yang, L.; McCall, B. World Education Finance Policies and Higher Education Access: A Statistical Analysis of World Development Indicators for 86 Countries. *Int. J. Educ. Dev.* **2014**, *35*, 25–36. [CrossRef]
14. Thelin, J.R. *A History of American Higher Education A History of American Higher Education*, 3rd ed.; Johns Hopkins University Press: Baltimore, MD, USA, 2019.
15. St. John, E.P. *The Policy Process in Higher Education: A Strategic Approach*; IHE Monograph 2-1981: Armidale, Australia, 1981.
16. St. John, E.P. *Case Studies in Higher Education Policy and Management* (pp. Vii–Xix); IHE Monograph 2-1981: Armidale, Australia, 1984.
17. Clark, B.R. Concepts, models, and perspectives. In *Academic Power: Patterns of Authority in Seven National Systems of Higher Education*; Van de Graff, J.H., Ed.; Praeger: New York, NY, USA, 1978; pp. 164–190.

18. St. John, E.P.; Kim, J.; Yang, L. (Eds.) *Privatization and Inequality: Comparative Studies of College Access, Education Policy, and Public Finance*; AMS Press, Inc.: New York, NY, USA, 2013.
19. Gore, C. The Rise and Fall of the Washington Consensus as a Paradigm for Developing Countries. *World Dev.* **2000**, *28*, 789–804. [CrossRef]
20. Bennell, P.; Segerstrom, J. Vocational Education and Training in Developing Countries: Has the World Bank Got It Right? *Int. J. Educ. Dev.* **1998**, *18*, 271–287. [CrossRef]
21. Bryk, A.S.; Lee, V.E.; Holland, P.B. *Catholic Schools and the Common Good*; Harvard University Press: Cambridge, MA, USA, 1993.
22. St. John, E.P.; Asker, E.H. *Refinancing the College Dream: Access, Equal Opportunity, and Justice for Taxpayers*; Johns Hopkins University Press: Baltimore, MD, USA, 2003.
23. St. John, E.P.; Girmay, F. *Detroit School Reform in Comparative Contexts: Community Action Overcoming Policy Barriers*; Palgrave Macmillan: New York, NY, USA, 2019.
24. St. John, E.P.; Daun-Barnett, N.; Moronski-Chapman, K.M. *Public Policy and Higher Education: Reframing Strategies for Preparation, Access, and Success*; Routledge: Abingdon-on-Thames, UK, 2012.
25. St. John, E.P.; Musoba, G.D. *Pathways to Academic Success: Expanding Opportunity for Underrepresented Students*; Routledge: New York, NY, USA, 2012.
26. Huysmans, M. Exporting Protection: EU Trade Agreements, Geographical Indications, and Gastronationalism. *Rev. Int. Polit. Econ.* **2022**, *29*, 979–1005. [CrossRef]
27. Piketty, T. *Capital in the Twenty-First Century*; The Belknap Press of Harvard University Press: London, UK, 2014.
28. Smith, A. *The Wealth of Nations*; Collier: New York, NY, USA, 1902.
29. Holmberg, B. The Evolution of the Character and Practice of Distance Education. *Open Learn.* **1995**, *10*, 47–53. [CrossRef]
30. The Ultimate Guide to Studying in United Kingdom in 2023—World University Rankings—MastersPortal.com. Available online: <https://www.mastersportal.com/countries/30/united-kingdom.html> (accessed on 10 March 2023).
31. Ryan, D. The Thatcher Government’s Attack on Higher Education in Historical Perspective. *New Left Rev.* **1998**, *227*, 3–32.
32. Shattock, M. The Change from Private to Public Governance of British Higher Education: Its Consequences for Higher Education Policy Making 1980–2006. *High. Educ. Q.* **2008**, *62*, 181–203. [CrossRef]
33. Marginson, S. Global Trends in Higher Education Financing: The United Kingdom. *Int. J. Educ. Dev.* **2018**, *58*, 26–36. [CrossRef]
34. St. John, E.P. *Strategic Planning and Management: Workshop Workbook; Prepared for the Colombo Plan Staff College for Technician Education*; University of Life Publishing House: Manila, Philippines, 1987.
35. St. John, E.P. Postsecondary Policy and Management in the Far East: A Comparative Study. *High. Educ.* **1986**, *15*, 523–545. [CrossRef]
36. European Commission. *Study on Higher Vocational Education and Training in the EU*; European Commission: Brussels, Belgium, 2010.
37. World Bank. Understanding Poverty: Skills Development. 2017. Available online: <https://www.worldbank.org/en/topic/skillsdevelopment> (accessed on 9 March 2023).
38. European Parliamentary Research Service. Higher Education in the EU. 2015. Available online: <https://www.europarl.europa.eu/EPRS/EPRS-IDA-554169-Higher-education-in-the-EU-FINAL.pdf> (accessed on 9 March 2023).
39. Baum, S.; Ma, J.; Pender, M.; Libassi, C.J. *Trends in Student Aid 2018*; College Board: New York, NY, USA, 2018.
40. Hannon, C. A Human Capability Perspective on the Progression of Low-SES Students to Higher Education in Ireland and the UK. *Educ. Sci.* **2023**, *13*, 409. [CrossRef]
41. Meyer, H.-D. *The Design of the University: German, American, and World Class*; Routledge: New York, NY, USA, 2016.
42. Lane, C. Top Universities in Germany 2021. Top Universities. Available online: <https://www.topuniversities.com/university-rankings-articles/world-university-rankings/top-universities-germany-2021> (accessed on 10 March 2023).
43. Shaffer, G. Retooling Trade Agreements for Social Inclusion. 2019. Available online: <https://www.illinoislawreview.org/wp-content/uploads/2019/03/Shaffer.pdf> (accessed on 5 May 2023).
44. Fazekas, M.; Field, S. A Skills beyond School Review of Germany. In *OECD Reviews of Vocational Education and Training*; OECD: Paris, France, 2013.
45. Teichler, U. Recent Changes of Financing Higher Education in Germany and Their Intended and Unintended Consequences. *Int. J. Educ. Dev.* **2018**, *58*, 37–46. [CrossRef]
46. Euler, D. Germany’s Dual Vocational Training System: A Model for Other Countries? 2013. Available online: https://eunec.eu/sites/www.eunec.eu/files/attachment/files/2013_study_german_vet_system.pdf (accessed on 9 March 2023).
47. Kirsch, M.; Beernaert, Y. Short Cycle Higher Education in Europe: Level 5: The Missing Link. 2011. Available online: <https://vana.kutsekoda.ee/fwk/contenthelper/10378615/10402217> (accessed on 9 March 2023).
48. 53 Top-Ranked Universities in Italy—World University Rankings—MastersPortal.com. Available online: <https://www.mastersportal.com/ranking-country/15/italy.html> (accessed on 10 March 2023).
49. Bernardini, G. The Origins and Development of Racial Anti-Semitism in Fascist Italy. *J. Mod. Hist.* **1977**, *49*, 431–453. [CrossRef]
50. Roberts, D.D. *Syndicalist Tradition and Italian Fascism*; Manchester University Press: Manchester, UK, 1986.
51. Contini, D.; Triventi, M. Between Formal Openness and Stratification in Secondary Education: Implications for Social Inequalities in Italy. In *Models of Secondary Education and Social Inequality*; Edward Elgar Publishing: Cheltenham, UK, 2016; pp. 305–322.
52. Kosyakova, Y.; Yastrebov, G.; Yanbarisova, D.; Kurakin, D. The Reproduction of Social Inequality within the Russian Educational System. In *Models of Secondary Education and Social Inequality*; Edward Elgar Publishing: Cheltenham, UK, 2016; pp. 323–342.

53. OECD. *Education at a Glance 2013--Russian Federation*; OECD: Paris, France, 2013. Available online: https://www.oecd.org/education/Russian%20Federation_EAG2013%20Country%20Note.pdf (accessed on 9 March 2023).
54. Lovakov, A.; Chankseliani, M.; Panova, A. Universities vs. Research Institutes? Overcoming the Soviet Legacy of Higher Education and Research. *Scientometrics* **2022**, *127*, 6293–6313. [CrossRef]
55. Pavlova, M.; Maclean, R. Vocationalisation of secondary and tertiary education: Challenges and possible future directions. In *Skills Development for Inclusive and Sustainable Growth in Developing Asia-Pacific*; Springer: Dordrecht, The Netherlands, 2013; pp. 43–66.
56. Akoojee, A.; Gewer, A.; McGrath, S.A. *Vocational Education and Training in Southern Africa*; HSRC Press: Cape Town, South Africa, 2005.
57. McGrath, S. Where to Now for Vocational Education and Training in Africa? *Int. J. Train. Res.* **2011**, *9*, 35–48. [CrossRef]
58. World Bank. GDP Growth (Annual Percentage). 2023. Available online: <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2018&locations=GH&start=2000&view=chart> (accessed on 5 April 2023).
59. Alagaraja, M.; Arthur-Mensah, N. Exploring Technical Vocational Education and Training Systems in Emerging Markets: A case study on Ghana. *Eur. J. Train. Dev.* **2013**, *37*, 835–850. [CrossRef]
60. King, K. Technical and Vocational Education and Training in an International Context. *Vocat. Asp. Educ.* **1993**, *45*, 201–216. [CrossRef]
61. Oketch, M.O. To Vocationalise or Not to Vocationalise? Perspectives on Current Trends and Issues in Technical and Vocational Education and Training (TVET) in Africa. *Int. J. Educ. Dev.* **2007**, *27*, 220–234. [CrossRef]
62. Stuart, J.D. Investigating Policy Transfer from Both Sides: Case Study of a Technical and Vocational Education and Training Model in South Africa. Ph.D. Dissertation, University of Minnesota, Minneapolis, MN, USA, 2013.
63. Republic of Ghana Ministry of Education Sector Performance Report 2012. Amazonaws.com. Available online: <https://newndpc-static1.s3.amazonaws.com/publication/2012+Education+Sector+Performance+Report.pdf> (accessed on 9 March 2023).
64. McGrath, S.; Powell, L.; Alla-Mensah, J.; Hilal, R.; Suart, R. New VET Theories for New Times: The Critical Capabilities Approach to Vocational Education and Training and Its Potential for Theorising a Transformed and Transformational VET. *J. Vocat. Educ. Train.* **2022**, *74*, 575–596. [CrossRef]
65. Olufayo, O.; Akinlade, O. Enhancing Sustainable Food Security in Nigeria through Technical and Vocational Education and Training. Edu.ng. Available online: https://fpi3rdinterconf.federalpolyilaro.edu.ng/uploads/new_uploads/4091755.pdf (accessed on 9 March 2023).
66. Asian Institute of Technology. *The Grants Register 2019*; Palgrave Macmillan: London, UK, 2019; p. 122.
67. Zulaikha, Z.F.; Hariri, H.; Rini, R.; Sowiyah, S. Analysis of Vocational Education Curriculum in ASEAN Economic Community: A Literature Review. *J. Soc. Humanit. Educ.* **2021**, *1*, 157–170. [CrossRef]
68. Iqbal, N.; Khan, M.M.; Mohmand, Y.T.; Mujtaba, B.G. The Impact of In-Service Training and Motivation on Job Performance of Technical & Vocational Education Teachers: Role of Person-Job Fit. *Public Organ. Rev.* **2020**, *20*, 529–548. [CrossRef]
69. Wikipedia Contributors. List of Colonial Universities in Hispanic America. Wikipedia, The Free Encyclopedia. Available online: https://en.wikipedia.org/w/index.php?title=List_of_colonial_universities_in_Hispanic_America&oldid=1140377791 (accessed on 9 March 2023).
70. Arabage, A.; Souza, A.P.; Lima, L.; Camargo, J.; Lucena, T.; Soares, S. Vocational Education and Training in Brazil Knowledge Sharing Forum on Development Experiences: Comparative Experiences of Korea and Latin America and the Caribbean. 2015. Available online: https://publications.iadb.org/bitstream/handle/11319/6996/Vocational_Education_Training_Brazil.pdf (accessed on 9 March 2023).
71. OECD. *Vocational Education and Training in Chile Strengths, Challenges and Policy Options*; OECD: Paris, France, 2009. Available online: <http://www.oecd.org/education/skills-beyond-school/45164564.pdf> (accessed on 9 March 2023).
72. UNESCO-UNEVOC. Technical and Vocational Education and Training (TVET) Country Profiles. Colombia. 2023. Available online: https://unevoc.unesco.org/wtdb/worldtvetedatabase_col_en.pdf (accessed on 9 March 2023).
73. UNESCO-UNEVOC. World TVET Database. Mexico. 2015. Available online: https://unevoc.unesco.org/wtdb/worldtvetedatabase_mex_en.pdf (accessed on 9 March 2023).
74. Clark, B.R. *Creating Entrepreneurial Universities: Organizational Pathways to Transformation*; Pergamon Press: Oxford, UK, 1998.
75. Clark, B. University Transformation: Primary Pathways to University Autonomy and Achievement. In *The Future of the City of Intellect: The Changing American University*; Brint, S., Ed.; Stanford University Press: Palo Alto, CA, USA, 2002; pp. 322–342.
76. Clark, B.R. The Organizational Saga in Higher Education. *Adm. Sci. Q.* **1972**, *17*, 178–184. [CrossRef]
77. Breen, R.; Müller, W. *Education and Intergenerational Social Mobility in Europe and the United States*; Stanford University Press: Redwood City, CA, USA, 2020.
78. Jolly, D. Rising Output in Factories Hints at Growth in Europe. *The New York Times*, 13 August 2013. Available online: <https://www.nytimes.com/2013/08/14/business/global/industrial-production-lifts-european-economy.html> (accessed on 17 April 2023).
79. Sumption, M.; Forde, C.; Alberti, G.; Walsh, P.W. How Is the End of Free Movement Affecting the Low-Wage Labour Force in the UK? In *The Economics of Brexit: What Have We Learned*; CEPR Press: London, UK, 2022.
80. Tsang, M.C. The Cost of Vocational Training. *Int. J. Manpow.* **1997**, *18*, 63–89. [CrossRef]
81. Okoye, K.R.E. Private-Public Partnership and Technical Vocational Education and Training (TVET) in a Developing Economy. *Arab. J. Bus. Manag. Rev.* **2013**, *2*, 51. [CrossRef]

82. Powers, J.; St. John, E.P. (Eds.) *Higher Education, Commercialization, and University-Business Relationships in Comparative Context. Vol. 2, Issues in Globalization and Social Justice*; AMS Press: New York, NY, USA, 2017.
83. Fielden, J.; Larocque, N. *The Evolving Regulatory Context for Private Education in Emerging Economies*; World Bank: Washington, DC, USA, 2008.
84. EIB (European Investment Bank). Central, Eastern and South-Eastern Europe: Building Future Prosperity and Setting the Ground for Sustainable Upward Convergence. 2018. Available online: https://www.eib.org/attachments/efs/innovation_investment_in_cesee_en.pdf (accessed on 17 April 2023).
85. Sultan, T. *How the COVID-19 Pandemic has Changed Supply Chain Practices*; World Economic Forum: Cologny, Switzerland, 2022. Available online: <https://www.weforum.org/agenda/2022/01/5-ways-the-covid-19-pandemic-has-changed-the-supply-chain/> (accessed on 17 April 2023).
86. Goldin, C. *The u-Shaped Female Labor Force FunctIion in Economic Development and Economic History*; NBER Working Paper Series; NBER: Cambridge, MA, USA, 1994. Available online: https://www.nber.org/system/files/working_papers/w4707/w4707.pdf (accessed on 22 April 2023).
87. Becker, G.S. *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*, 3rd ed.; University of Chicago Press: Chicago, IL, USA, 1994.
88. McKenzie, D.; Woodruff, C. What Are We Learning from Business Training and Entrepreneurship Evaluations around the Developing World? *World Bank Res. Obs.* **2014**, *29*, 48–82. [CrossRef]
89. Benavot, A. The Rise and Decline of Vocational Education. *Sociol. Educ.* **1983**, *56*, 63–76. [CrossRef]
90. Meyer, H.-D.; Benavot, A. *PISA, Power, and Policy: The Emergence of Global Educational Governance*; Symposium Books: Oxford, UK, 2013.
91. Ainsworth, M.; Teokul, W. Breaking the Silence: Setting Realistic Priorities for AIDS Control in Less-Developed Countries. *Lancet* **2000**, *356*, 55–60. [CrossRef]
92. Henry, M.; Lingard, B.; Rizvi, F.; Taylor, S. *The OECD, Globalization and Education Policy*; Pergamon Press: Amsterdam, 2001.
93. Slaughter, S.E.; Rhoades, G. *Academic Capitalism and the New Economy: Markets, State, and Higher Education*; Johns Hopkins University Press: Baltimore, ML, USA, 2004.
94. Meyer, H.D.; St. John, E.P.; Chankseliani, M.; Uribe, L. The crisis in access to higher education—A crisis of justice. In *Fairness in Access to Higher Education in a Global Perspective: Reconciling Excellence, Efficiency, and Justice*; Meyer, H.D., St. John, E.P., Chankseliani, M., Uribe, L., Eds.; Sense Publications: Rotterdam, The Netherlands, 2013.
95. Meyer, H.D.; St. John, E.P.; Javala, M.; Kroth, A.J.; Somers, P. Fairness in Access to Higher Education: Towards a Global Public Debate. In *Fairness in Access to Higher Education in a Global Perspective: Reconciling Excellence, Efficiency, and Justice*; Meyer, H.D., St. John, E.P., Chankseliani, M., Uribe, L., Eds.; Sense Publications: Rotterdam, The Netherlands, 2013.
96. Ba, Y.; Schwaeble, K.; Birkland, T. The United States in Chinese Environmental Policy Narratives: Is There a Trump Effect? *Rev. Policy Res.* **2022**, *39*, 708–729. [CrossRef]
97. Baltagi, B.H.; Kao, C.; Peng, B. Testing Cross-Sectional Correlation in Large Panel Data Models with Serial Correlation. *Econometrics* **2016**, *4*, 44. [CrossRef]
98. Hendrick, R.Z.; Hightower, W.H.; Gregory, D.E. State Funding Limitations and Community College Open Door Policy: Conflicting Priorities? *Community Coll. J. Res. Pract.* **2006**, *30*, 627–640. [CrossRef]
99. OECD. How Much is Spent per Student on Educational Institutions? In *Education at a Glance 2019: OECD Indicator C1*; OECD iLibrary: Paris, France, 2019. Available online: <https://www.oecd-ilibrary.org/docserver/0fdccb3b-en.pdf?expires=1683724747&id=id&acname=guest&checksum=A50670882C740035D222BD87759AC0C9> (accessed on 8 May 2023).
100. Barr, A.; Turner, S.E. Expanding Enrollments and Contracting State Budgets: The Effect of the Great Recession on Higher Education. *ANNALS Am. Acad. Political Soc. Sci.* **2013**, *650*, 168–193. [CrossRef]
101. Chankseliani, M. Charting the Development of Knowledge on Soviet and Post-Soviet Education through the Pages of Comparative and International Education Journals. *Comp. Educ.* **2017**, *53*, 265–283. [CrossRef]
102. Round, J.; Rodgers, P. The Problems of Corruption in Post-Soviet Ukraine’s Higher Education Sector. *Int. J. Sociol.* **2009**, *39*, 80–95. [CrossRef]
103. Vidal-Rodriguea, A. The Impact of Adopting a Community College Baccalaureate Policy on States’ Graduation Rate and Enrollment; Consideration for All and Latino Students. Ph.D. Dissertation, University of Michigan, Ann Arbor, MI, USA, 2019.
104. Rodríguez, J.P. The Politics of Neoliberalism in Latin America: Dynamics of Resilience and Contestation. *Sociol. Compass* **2021**, *15*, e12854. [CrossRef]

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Article

Does Pre-Service Teacher Preparation Affect Students' Academic Performance? Evidence from China

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Abstract: Pre-service teacher preparation (PSTP) is generally considered a significant predictor of student achievements. This paper adopted a multi-tier linear model to estimate the PSTP effects on student performance by taking teachers and students in the high schools of Haidian District, Beijing, China, as the research population. It used exploratory factor analysis to classify PSTP into two categories: content knowledge preparation and pedagogical content knowledge preparation; and described the status of PSTP in three subjects: Chinese, mathematics, and chemistry. The study found differences in PSTP by subject. In Chinese, teachers' content knowledge preparation significantly negatively affected student performance, and their pedagogical content knowledge preparation significantly positively influenced student performance. In mathematics, PSTP had no significant effect on student performance. In chemistry, teachers' pedagogical content knowledge preparation had a significantly negative effect on student performance. Based on the findings of the empirical study, the study proposes further identifying PSTP's role in student performance by subject, strengthening the focus on pre-service preparation skills in recruiting Chinese and chemistry teachers, and developing a more suitable system for teacher selection and training.

Keywords: pre-service; teacher preparation; academic performance; high school student; college entrance examination

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1. Introduction

Teachers are a crucial factor in improving the quality of education and students' academic performance. To this end, governments are committed to enhancing teachers' quality. Den Brok et al. (2004) reported that 7–15% of the variance in student achievements could be attributed to differences between teachers [1]. Day et al. (2006) argued that the differences between teachers might explain 15–30% of the variance in student achievements [2]. The research by Hanushek and Rivkin (2010) has referred to two generally accepted findings regarding teachers' contributions to student performance. First, there is considerable variation in the quality of teachers as measured by the value of increased achievements, future academic achievements, or earnings; second, variables commonly used to determine careers and salaries, such as academic qualifications and certificates, do not explain the variations in measured teacher quality. Therefore, the teacher characteristics we observed are not representative of the quality [3]. Through an empirical study, Rivkin et al. (2005) stated that the variation in teacher quality is rarely explained by observable characteristics [4] and that the observable characteristics of teachers could shed light on only about 5% of the variation in student achievements [3].

Most studies have been conducted on the effects of teachers on students' academic performance by their attributes and characteristics (e.g., gender, teaching standing, academic qualifications, etc.) [5–7], but it remains insufficient to study the effects of teachers' professional development, such as pre-service teacher preparation (PSTP), on students' academic performance. PSTP, also known as initial teacher training, means the preparation

of teachers for theoretical knowledge and teaching before they start their teaching [8]. PSTP aims to help them transition from campus to career. The No Child Left Behind Act proposed that every student could be taught by highly qualified teachers. Consequently, the US government has invested heavily in teachers' professional preparation and career development to better PSTP and highlight its importance. Countries have focused on PSTP from a variety of perspectives. Through comparison, Zhu Xiaohu and Zhang Minxuan (2017) unveiled that Finland has great strengths in pre-service education and improves teachers' professionalism through rigorous selection. Shanghai, China, has invested heavily in induction training and others to enhance teachers' professionalism through standardized training [9–11]. In addition, Brazil's Accelerated Learning Program trains new teachers through a highly structured curriculum [12]. Schools hope to attract outstanding talents with teachers' qualities to their schools. By improving the PSTP model, they can refine the quality of teachers they recruit and boost their sustainable development and students' academic performance [13]. Ramírez (2006) found that well-prepared math teachers could teach more mathematical content in class [14]. Akiba (2011) noted that teacher preparation for diversity reported by pre-service teachers is associated with positive changes in pre-service teachers' beliefs about diversity in their personal and professional environments [15]. Little and Anderson (2016) found that although most pre-service teachers think that their beliefs are compatible with problem-solving tasks, the ability of middle school students, preparation time, and cooperative teachers are the main factors affecting their performance on problem-solving tasks [16]. Shaukat and Chowdhur (2021) analyzed the perceptions of 52 Australian and 68 Pakistani pre-service teachers (PST) on the professional standards for teachers to compare teacher preparation in the two countries, and concluded that standards-based integrated teacher preparation programs are more effective than non-integrated teacher preparation programs in promoting professional skills and competency development [17]. Evagorou et al. (2015) compared the teacher preparation courses in England, Finland, France, and Cyprus, and found that the pre-service teacher training programs in the different countries have different focuses. Finland attaches great importance to teacher preparation and encourages teachers to enhance their teaching performance through research skills. Meanwhile, Finnish university-affiliated schools and specially trained tutors emphasize exercises during preparation. Training in Cyprus and the UK also includes research training for students, but the focus is less pronounced than in the Finnish system [18].

There is a strong correlation between PSTP knowledge and content knowledge in teaching. Shulman (1986) summarized content knowledge in teaching into three core aspects: subject matter content knowledge, pedagogical content knowledge, and curricular knowledge [19]. However, the subject matter knowledge that teachers learn in higher education is not directly applied to primary and secondary school instruction, so it is inconclusive whether teachers' content knowledge preparation is beneficial to student performance. Based on the data from the Longitudinal Study of American Youth (LSAY), Monk (1994) showed that teachers' insight into what they have learned has a positive impact on student performance [20]. According to the analysis of Rowan et al. (1997), teachers' subject knowledge and expectations directly influence students' mathematics performance. These effects depend on the students' average ability in a given school [21]. Hill et al. (2015) examined whether and how mathematics teachers' pedagogical content knowledge contribute to students' mathematics performance. After controlling for key covariates of students and teachers, teachers' mathematics knowledge was significantly associated with student performance in both first and third grades [22]. However, Eberts and Stone (1984) found no relationship between college-level mathematics courses and fourth-grade test scores [23]. In addition, content knowledge in teaching is an important determinant influencing learning gain and motivation development [24]. Baumert et al. (2010) explored the importance of teachers' content knowledge and content knowledge in teaching for high-quality mathematics teaching and students' progress in secondary schools, confirming the correlation between specific teachers' expertise and high-quality

teaching and students' learning [25]. Slavíčková (2020) uncovered a strong correlation between preparatory mathematics teachers' capabilities for applied digital technology and their activities in the curriculum [26]. Creativity-oriented tasks are integrated into university courses in mathematics, which can better allow pre-service teachers to develop innovative mathematical skills for future students [27]. Corcoran and Flaherty (2018) found no significant relationship between personality traits and the outcome variable, teaching performance. However, teaching performance in the past has also emerged as an important predictor of teaching performance apart from academic performance [28]. Furthermore, for under-resourced teaching, teachers should receive specialized training on adapting their curriculum plans for students with different ability levels [29]. Tunjera and Chigona (2020) recommend the adoption of a technology integration framework and pedagogical theory at the level of policy development in pre-service teacher training institutions [30].

Although previous studies agree that PSTP can play a part in students' academic performance, PSTP's role needs to be discussed by discipline given the significant variation in course content and teaching design across disciplines [31]. There is little research on the disciplinary differences in PSTP. Consequently, this study presents the following hypotheses based on the key research issues of existing PSTP studies.

Hypothesis I. *PSTP can be divided into one for general subject matter knowledge and one for diverse pedagogical content knowledge.*

Hypothesis II. *There is interdisciplinary heterogeneity in PSTP levels due to various learning approaches across disciplines.*

Hypothesis III. *PSTP can have significantly positive effects on student performance.*

2. Methods

2.1. Participants

The dataset for this study combines the data concerning students and teachers. Student data mainly refer to the standardized test scores of Chinese, mathematics, and chemistry for students who took the college entrance examination in Haidian District, Beijing from 2016 to 2019, including the first simulated test results of the college entrance examination and the results of the senior high school entrance examination. Specifically, the senior high school entrance exam scores represent the knowledge acquired by students before entering high school, i.e., the entrance scores of high schools. The first simulated test scores of the college entrance exam serve as a proxy variable for college entrance exam scores and represent the exit scores of high schools after students have experienced three years of learning and training in a high school.

Teacher data are derived from the Regional Teaching and Research Survey questionnaire conducted between February and March 2019 for schools in Haidian District, Beijing. The survey aims to understand teachers' demands for professional development and their needs for teaching and research in the new era of educational reform. Based on the globally used questionnaire derived from the TALIS (Teaching and Learning International Survey) regarding teachers' professional development, effectiveness, teaching practices, and classroom behaviors, the questionnaire was developed concerning teachers' current professional development in China [32].

Based on student data, this study matched teacher data with student data according to the names and schools of teachers participating in the survey, and the names and schools of teachers in the student data. Thus, the dataset can be deemed as a combination of both secondary and primary data. The matching resulted in the creation of a multi-tier database containing the scores of the high school entrance examination, the first simulated test of the college entrance examination, and the survey data of corresponding teachers and school names. Through matching, the 542 teacher data from 60 ordinary high schools were linked with the 39,894 student data. The number of students with Chinese, mathematics, and

chemistry scores was 14,296, 15,662, and 9936, respectively; and the number of Chinese, mathematics, and chemistry teachers was 195, 216, and 131, respectively [32].

2.2. Measures

Student data were measured using objective test scores. Students' scores on the first simulated test for the college entrance examination and the senior high school entrance examination were continuous variables. To compare the data across years, this study standardized the scores of each exam in the entire Haidian District based on students' graduation year, liberal arts and sciences, and types of exams.

PSTP was measured using a scale consisting of 10 questions covering multiple aspects of PSTP, including subject matter knowledge, teaching competencies, pedagogy, and student management. The question on the PSTP scale in the teacher questionnaire is, "Does the specialized course you have taken include the following? If so, do you think you are well prepared when you graduate?" The specific scale is shown in Table 1, which collects information on how teachers who are already in service feel about the relevant pre-service training before their employment. All questions are measured using a 5-point scale. In the empirical analysis, "Not included" is assigned a value of 1, "Inclusion; no preparation" 2, "Inclusion; preparation to some degree" 3, "Inclusion; well prepared" 4, and "Inclusion; very well prepared" 5. Thus, each question is transformed into a fixed interval variable.

Table 1. Pre-Service Teacher Preparation Scale.

No.	Question	Not Included	Inclusion; No Preparation	Inclusion; Preparation to Some Degree	Inclusion; Well Prepared	Inclusion; Very Well Prepared
Q1	Knowledge and understanding of subject areas taught	1	2	3	4	5
Q2	Teaching ability of subjects taught	1	2	3	4	5
Q3	General education and teaching method	1	2	3	4	5
Q4	Teaching methods for subjects taught	1	2	3	4	5
Q5	Tiered teaching for students with different abilities	1	2	3	4	5
Q6	Teaching of interdisciplinary skills (e.g., STEAM, critical thinking, problem solving, etc.)	1	2	3	4	5
Q7	IT application in teaching	1	2	3	4	5
Q8	Student behavior and classroom management	1	2	3	4	5
Q9	Student development and academic evaluation	1	2	3	4	5
Q10	Helping students make a good transition between middle and high schools	1	2	3	4	5

2.3. Models

Based on the data structure of student data nested in teacher data, a duo-tier teacher-student model can be developed to estimate the PSTP effects on student performance in Chinese, mathematics, and chemistry. The measurement model is shown below.

$$\text{Level I: } Q_{ij} = \beta_{0j} + \beta_{1j}Q_{ij-1} + \beta_{2j}X_{ijyear} + \beta_{3j}X_{ijtrack} + \gamma_{ij}$$

$$\text{Level II: } \beta_{0j} = \gamma_{00} + \gamma_{01}M_j + \gamma_{02}P_j + \mu_{0j}, \beta_{1j} = \gamma_{10}, \beta_{2j} = \gamma_{20}, \beta_{3j} = \gamma_{30}$$

where tier I is an estimate of students Q_{ij} , Q_{ij} is the exit score of student i taught by teacher j , Q_{ij-1} is the student's baseline score, X_{ijyear} is the student's graduation year, $X_{ijtrack}$ is the liberal arts or sciences the student studied, γ_{ij} is the residual, and β_{0j} denotes that a random intercept is used at the teacher level. Tier II is an estimation of β_{0j} , M_j denotes the pre-service preparation of the j th teacher, P_j denotes the personal characteristic variable of the j th teacher, γ_{00} is a constant term, and μ_{0j} is a residual term.

In the estimation of the measurement model, the teacher tier was used with the methods of a random intercept and fixed slope. To exclude the interference factors at the school level, the school-fixed effect was considered in the estimation of the model. PSTP variables were replaced by the standardized values of the same subject in the multi-tier linear regression.

3. Results

3.1. Descriptive Statistical Analysis of Pre-Service Teacher Preparation Scale

Since some teachers responded to the pre-service preparation scale with missing values, the descriptive statistics were analyzed for each question after missing values were removed, with the sample size, mean, standard deviation, skewness, and kurtosis reported (Table 2). Of the 10 questions on the pre-service preparation scale, Q1 regarding "Knowledge and understanding of the subject taught" has the highest mean value, which indicates to some extent that teachers have good subject knowledge and understanding before entering the profession. Q6 regarding "Interdisciplinary skill teaching" (e.g., STEAM, critical thinking, problem-solving, etc.) has the smallest mean value, explaining that the PSTP for teaching capabilities for interdisciplinary skills needs to be improved. It could also be observed that the mean values of Q1 to Q4 are significantly larger than those of Q5 to Q10. There may be differences in the latent variables measured in the two parts of the questions that require further analysis.

Table 2. Descriptive Statistical Analysis of the Pre-Service Teacher Preparation Scale.

No.	Sample Size	Mean	Standard Deviation	Skewness	Kurtosis
Q1	501	3.908	0.881	−0.471	2.923
Q2	501	3.665	0.957	−0.413	3.053
Q3	501	3.699	0.916	−0.339	3.017
Q4	501	3.615	0.951	−0.365	3.087
Q5	501	3.020	1.168	−0.182	2.414
Q6	501	2.547	1.231	0.249	2.136
Q7	501	2.842	1.180	−0.058	2.254
Q8	501	3.267	1.114	−0.237	2.592
Q9	501	2.990	1.207	−0.158	2.266
Q10	501	2.834	1.332	0.005	1.896

3.2. Exploratory Factor Analysis of Pre-service Teacher Preparation

It may be biased that a subjective choice is made to split a full scale into subscales given the large number of components included in the PSTP scale. Consequently, we used the exploratory factor analysis approach to analyze the PSTP scale. Through the principal component analysis (PCA), we could know that the overall KMO (Kaiser–Meyer–Olkin) value of the scale was equal to 0.924, which was greater than 0.7. The p -value of Bartlett's sphericity test was less than 0.05, indicating that the information overlapping between questions was high and suitable for the factor analysis. Table 3 reports the eigenvalues and variance contribution rate of the factor analysis in which the eigenvalues of common factor 1 and common factor 2 are greater than 1, and the eigenvalues of the remaining common factors are less than 1. Meanwhile, the variance contribution rates of common

factor 1 and common factor 2 are 65.015% and 12.901%, respectively, indicating that two common factors are extracted to replace 77.916% of the information of the original scale. By analyzing the eigenvalues and the variance contribution rates, it could be confirmed that the scale was suitable for extracting two common factors with the pre-service preparation scale split into two subscales.

Table 3. Eigenvalues and Variance Contribution Rates of the Pre-service Teacher Preparation Scale.

Factor	Initial Eigenvalue			Sum of Squared Rotating Loads		
	Total	Percentage of Variance	Cumulative Percentage	Total	Percentage of Variance	Cumulative Percentage
1	6.501	65.015	65.015	4.110	41.098	41.098
2	1.290	12.901	77.916	3.682	36.818	77.916
3	0.577	5.774	83.690			
4	0.395	3.953	87.643			
5	0.319	3.192	90.835			
6	0.284	2.840	93.675			
7	0.229	2.290	95.965			
8	0.160	1.599	97.564			
9	0.140	1.402	98.966			
10	0.103	1.034	100.000			

The factor load array was rotated using the Kaiser standardized maximum variance method to further determine the measured question items for each subscale. The rotated factor load array is shown in Table 4. For the rotated factor load array, the main focus was on the loads of each item by the factors and the larger loads could be grouped under the common factor. By analyzing the factor load of each question, it could be found that loads of Q1 to Q4 were large by common factor 1 and the factor loads of all questions were greater than 0.6. According to the connotation covered by the common factors, we could name common factor 1 as content knowledge. Loads of Q5 to Q10 were large by common factor 2 and the factor loads of all questions were greater than 0.6. We could name common factor 2 as pedagogical content knowledge according to Table 1.

Table 4. Rotated Factor Load Array for Pre-service Teacher Preparation Scale.

No.	Common Factor 1	Common Factor 2
Q1	0.844	0.218
Q2	0.880	0.336
Q3	0.887	0.328
Q4	0.852	0.384
Q5	0.437	0.747
Q6	0.219	0.808
Q7	0.201	0.753
Q8	0.463	0.717
Q9	0.331	0.831
Q10	0.281	0.844

The Cronbach's alpha for the content knowledge subscale was 0.943 by further calculating the scale reliability. The Cronbach's alpha for the pedagogical content knowledge scale was 0.921. The reliability of the two subscales was good.

3.3. Descriptive Statistical Analysis of Content Knowledge and Pedagogical Content Knowledge

Table 5 reports the sample size (N), mean (Mean), standard deviation (St. Dev), minimum (min), maximum (max), skewness, and kurtosis for both content knowledge and pedagogical content knowledge. For the overall sample, the sample size was 501 teachers. The mean of content knowledge in the two PSTP subscales was 14.886, which was higher

than the median, while that of pedagogical content knowledge was 17.501, which was less than the median. It indicates that teachers were better prepared for knowledge in the PSTP self-assessment, while their preparation for teaching ability was less adequate than content knowledge. Likewise, the standard deviation of pedagogical content knowledge was large, reflecting the high discrete of the pedagogical content knowledge of the sample teachers.

Table 5. Descriptive Statistical Analysis of Teacher Behavior and School Support.

	Pre-Service Teacher Preparation	N	Mean	St. Dev	Min	Max	Skewness	Kurtosis
Overall	Content knowledge	501	14.886	3.425	4	20	−0.291	3.042
	Pedagogical content knowledge	501	17.501	6.134	6	30	0.111	2.339
Chinese	Content knowledge	178	14.399	3.524	4	20	−0.431	3.391
	Pedagogical content knowledge	178	17.152	5.97	6	30	0.217	2.452
Mathematics	Content knowledge	199	15.357	3.462	4	20	−0.313	2.687
	Pedagogical content knowledge	199	18.111	6.294	6	30	0.051	2.232
Chemistry	Content knowledge	124	14.831	3.131	5	20	0.031	2.789
	Pedagogical content knowledge	124	17.024	6.073	6	30	0.032	2.365

The results of the descriptive statistics were further analyzed in three subjects: Chinese, mathematics, and chemistry. In the sample of Chinese teachers, the valid sample size for the pre-service preparation scale was 178, and the Chinese teachers' content knowledge and pedagogical content knowledge were below the overall level. In the sample of mathematics teachers, with a valid sample size of 199 for the pre-service preparation scale, both teacher content knowledge and pedagogical content knowledge in mathematics were above average. In the sample of chemistry teachers, with a valid sample size of 124 for the pre-service preparation scale, the chemistry teachers' content knowledge and pedagogical content knowledge were lower than the overall level but higher than those of the Chinese teachers.

By subject, the results of the descriptive analysis revealed differences in teacher behaviors. If not by subject, the overall impact of various teacher behaviors on student performance may be estimated with biased results.

3.4. Effects of Pre-Service Teacher Preparation on Student Performance by Subject

After controlling for individual students' characteristics, school fixed effect, and the teachers' characteristic variables (including gender, academic qualification, whether they graduated from normal universities, whether they were holding officially approved positions/bianzhi, years of teaching, and professional ranks), this study estimated the PSTP effects on student performance using multilayer linear regression, as shown in Table 6.

Regarding Chinese, column (1) shows the PSTP effects on student performance, and content knowledge has a significantly negative effect on student performance ($p < 0.05$). Each standard deviation increase in the content knowledge of Chinese teachers is associated with a significant decrease of 0.043 standard deviations in student performance. Pedagogical content knowledge has a significantly positive effect on student performance ($p < 0.05$). For every standard deviation increase in Chinese teachers' pedagogical content knowledge, the student performance is significantly enhanced by 0.053 standard deviations. In the case of Chinese, teachers' content knowledge related to subject knowledge, pedagogy, and teaching methods learned in their pre-graduation specialized programs do not contribute to student performance, even in reverse. In contrast, teachers' pre-graduation pedagogical content knowledge concerning interdisciplinary skills teaching, applied information technology teaching, and student development and assessment significantly contribute to student performance. Considering that 91.3% of the sample Chinese teachers graduated

from normal schools, normal universities should focus more on Chinese-related prospective teachers' pedagogical content knowledge, such as interdisciplinary skill teaching in training.

Table 6. Effects of Teacher Behavior on Student Performance.

	(1) Chinese	(2) Mathematics	(3) Chemistry
Senior high school entrance examination results	0.243 *** (0.009)	0.277 *** (0.008)	0.232 *** (0.010)
Content knowledge	−0.043 ** (0.021)	−0.019 (0.023)	0.020 (0.030)
Pedagogical content knowledge	0.053 ** (0.022)	−0.001 (0.022)	−0.050 * (0.028)
Teachers' characteristic variables	Control	Control	Control
Liberal arts and sciences	Control	Control	-
Year of graduation	Control	Control	Control
School fixed effects	Control	Control	Control
Constant term	0.494 * (0.283)	0.393 (0.251)	0.647 * (0.369)
var(_cons)	0.021 (0.003)	0.029 (0.004)	0.027 (0.005)
var(Residual)	0.488 (0.007)	0.379 (0.005)	0.424 (0.007)
ICC	0.041 (0.006)	0.071 (0.009)	0.060 (0.010)
Sample size	10,824	11,609	7739

Note: (1) standard deviations are in parentheses; (2) *, **, and *** represent 10%, 5%, and 1% in significance, respectively; (3) teachers' characteristic variables include gender, academic qualification, whether they graduated from normal universities, whether they were holding officially approved positions/bianzhi, years of teaching, and professional ranks; and (4) liberal arts and sciences indicate the discipline chosen by students, and the graduation year is 2016–2019.

With respect to mathematics, column (2) shows the PSTP effects on student performance and both content knowledge and pedagogical content knowledge have a negative but not significant effect on performance. Thus, PSTP in mathematics does not directly significantly influence students' maths performance.

For chemistry, column (3) embodies the PSTP effects on student performance, and content knowledge has a positive but insignificant effect. Pedagogical content knowledge has a significantly negative effect on student performance ($p < 0.1$). For every standard deviation increase in the teachers' pedagogical content knowledge, the student performance in chemistry will decrease by 0.05 standard deviations. In the case of chemistry, teachers' pre-graduation pedagogical content knowledge concerning interdisciplinary skills teaching, applied information technology teaching, and student development and assessment have a significant inverse effect on student performance.

4. Discussions

Based on the description of PSTP, this study estimates the PSTP effects on student performance in the three subjects: Chinese, mathematics, and chemistry. First, the results of the empirical study show that PSTP in Chinese could be classified into content knowledge preparation and pedagogical content knowledge preparation. The results can verify Hypothesis I. According to the connotation covered by the common factors, content knowledge preparation includes teachers' knowledge and understanding of the subjects they teach, teaching competencies, general pedagogy, and teaching methods. The pedagogical content knowledge preparation involves teachers' preparation to differentiate instruction for various types of students, interdisciplinary skill teaching, and classroom management skills. The PSTP classification is consistent with Shulman's (1986) content knowledge in teaching [19].

Second, there are differences in PSTP between subjects. The empirical findings can verify Hypothesis II. Based on the results of the descriptive statistical analysis, the content knowledge and pedagogical content knowledge of Chinese teachers are lower than the overall level, while those of the mathematics teachers are higher than the overall average. The chemistry teachers' content knowledge and pedagogical content knowledge are lower than the overall level but higher than those of the Chinese teachers. It may be due to differences in subject knowledge. There also exist differences in the teachers' competencies by subject. The findings of this study are consistent with those of existing studies [26,27,29,33].

Finally, the effect of PSTP on student performance varies across subjects. The results of the empirical study show partial validation for Hypothesis III. In the Chinese subject, PSTP directly affects student performance in which content knowledge significantly negatively influences student performance, and pedagogical content knowledge significantly positively impacts student performance. In mathematics, PSTP does not have a significant effect on student performance. In chemistry, pedagogical content knowledge in PSTP has a significantly negative effect on student performance. According to existing literature, teacher preparation serves as a significant predictor of student performance. The negative relationship between students' performance and teachers' content knowledge may be contrary to the findings of some existing studies. For example, Monk (1994) suggested that teachers' knowledge positively affects student performance [20]. Meanwhile, the significantly positive effect of pedagogical content knowledge on student performance agrees with the findings of relevant research, which confirms the correlation between teacher expertise as well as high-quality teaching and student learning [25]. Given that there may be more teacher discretion in teaching Chinese than in teaching math or chemistry, pedagogical variations in the teaching of Chinese may be more influential on students compared with other subjects. In this way, the findings suggest that Chinese teachers should be more equipped with strong pedagogy than content expertise. Furthermore, it should be noted that the requirements of different subjects for high school students are nationalized, though with minor variations across the provinces, which may be comparable to the US curriculum variation (Daun-Barnett and St. John, 2012; St. John, 2006; St. John and Musoba, 2010) [23–25]. Therefore, the results based on the survey analysis of the Haidian District, Beijing, can be generalized to the nationwide population to a certain extent.

5. Limitations

First, post-hoc retrospective data did not allow for rigorous causal inference research. This study was based on the administration data of student performance and teacher questionnaires. The teacher data were only questionnaire data collected at the same time point. Matching the student and teacher data only enabled the analysis of the correlation between individual teacher characteristics and student performance based on cross-sectional data. If feasible, the best way is to track the evaluation and collect baseline data, process data, and outcome data, to compose longitudinal data for causal inference. Second, it should be noted that the survey measures teachers' perception that they are prepared in terms of content knowledge and pedagogical content knowledge, which may be accurately related to their actual perception or there may be biases. Third, the detailed student information was not collected and controlled. Since the 2016–2019 senior high school graduates involved in this study had left school, it was difficult to contact them to do the questionnaires again. If feasible, variables such as students' characteristics and parental background should be controlled in the model, making the estimates more accurate.

6. Conclusions

First, PSTP can be divided into content knowledge preparation and pedagogical content knowledge preparation.

Second, there are differences in PSTP by subject. Chinese and chemistry teachers' pre-service preparation is below average, while mathematics teachers' pre-service preparation is above average.

Third, the impact of PSTP on student performance varies across subjects. Chinese teachers' content knowledge preparation significantly negatively influences student performance in Chinese, while their pedagogical content knowledge preparation significantly positively impacts student performance in Chinese. Chemistry teachers' pedagogical content knowledge preparation has a significant negative effect on students' chemistry achievement.

In general, the research on the impact of teacher preparation on student achievement can provide guidance to better develop the criteria for teacher selection. Meanwhile, the empirical results reveal differences in teachers' pre-service preparation in different subjects and the impact on student performance could be inconsistent. Therefore, we should further devise a more accurate teacher training system by subject and give teachers proper training to promote their development as well as the innovation of teaching practice.

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References

- Den Brok, P.; Brekelmans, M.; Wubbels, T. Interpersonal teacher behaviour and student outcomes. *Sch. Eff. Sch. Improv.* **2004**, *15*, 407–442. [CrossRef]
- Day, C.; Stobart, G.; Sammons, P.; Kington, A.; Gu, Q.; Smees, R.; Mujtaba, T. *Variations in Teachers' Work, Lives and Effectiveness*; Final Report VITAE Project; DfES: London, UK, 2006.
- Hanushek, E.A.; Rivkin, S.G. Generalizations about using value-added measures of teacher quality. *Am. Econ. Rev.* **2010**, *100*, 267–271. [CrossRef]
- Rivkin, S.G.; Hanushek, E.A.; Kain, J.F. Teachers, schools, and academic achievement. *Econometrica* **2005**, *73*, 417–458. [CrossRef]
- Jepsen, C. Teacher characteristics and student achievement: Evidence from teacher surveys. *J. Urban Econ.* **2005**, *57*, 302–319. [CrossRef]
- Kukla-Acevedo, S. Do teacher characteristics matter? New results on the effects of teacher preparation on student achievement. *Econ. Educ. Rev.* **2009**, *28*, 49–57. [CrossRef]
- Wayne, A.J.; Youngs, P. Teacher Characteristics and Student Achievement Gains: A Review. *Rev. Educ. Res.* **2003**, *73*, 89–122. [CrossRef]
- Mason, K.O. Teacher involvement in pre-service teacher education. *Teach. Teach.* **2013**, *19*, 559–574. [CrossRef]
- Zhu, X.; Zhang, M. Possible Paths for Teacher Professional Development: A Comparative Analysis Based on TALIS 2013 Shanghai and Finland. *J. Chin. Soc. Educ.* **2017**, 1–8. (In Chinese)
- Sahlberg, P. The professional educator: Lessons from Finland. *Am. Educ.* **2011**, *35*, 34–38.
- Zhang, M.; Ding, X.; Xu, J. *Developing Shanghai's Teachers. Teacher Quality Systems in Top Performing Countries*; National Center on Education and the Economy: Washington, DC, USA, 2016.
- Navarro, J.C.; Verdisco, A. *Teacher Training in Latin America: Innovations and Trends*; Inter-American Development Bank, Sustainable Development Department: Washington, DC, USA, 2000.
- Yu, C.; Xie, S. Effective Teachers and Their Cultivating: On the Study of Effective Teachers in the West. *J. Guangxi Norm. Univ. Philos. Soc. Sci. Ed.* **2013**, *49*, 152–160. (In Chinese) [CrossRef]

14. Ramírez, M.-J. Understanding the low mathematics achievement of Chilean students: A cross-national analysis using TIMSS data. *Int. J. Educ. Res.* **2006**, *45*, 102–116. [CrossRef]
15. Akiba, M. Identifying Program Characteristics for Preparing Pre-Service Teachers for Diversity. *Teach. Coll. Rec.* **2011**, *113*, 658–697. [CrossRef]
16. Little, J.; Anderson, J. What factors support or inhibit secondary mathematics pre-service teachers' implementation of problem-solving tasks during professional experience? *Asia-Pac. J. Teach. Educ.* **2016**, *44*, 504–521. [CrossRef]
17. Shaukat, S.; Chowdhury, R. Pre-service Teachers' Perceptions of Professional Standards and their Integration into Pre-service Training: A Comparative Study of Australia and Pakistan. *Aust. J. Teach. Educ.* **2021**, *46*, 54–68. [CrossRef]
18. Evagorou, M.; Dillon, J.; Viiri, J.; Albe, V. Pre-service Science Teacher Preparation in Europe: Comparing Pre-service Teacher Preparation Programs in England, France, Finland and Cyprus. *J. Sci. Teach. Educ.* **2015**, *26*, 99–115. [CrossRef]
19. Shulman, L.S. Those who understand: Knowledge growth in teaching. *Educ. Res.* **1986**, *15*, 4–14. [CrossRef]
20. Monk, D.H. Subject area preparation of secondary mathematics and science teachers and student achievement. *Econ. Educ. Rev.* **1994**, *13*, 125–145. [CrossRef]
21. Rowan, B.; Chiang, F.-S.; Miller, R.J. Using research on employees' performance to study the effects of teachers on students' achievement. *Sociol. Educ.* **1997**, *70*, 256–284. [CrossRef]
22. Hill, H.C.; Rowan, B.; Ball, D.L. Effects of teachers' mathematical knowledge for teaching on student achievement. *Am. Educ. Res. J.* **2005**, *42*, 371–406. [CrossRef]
23. Eberts, R.W.; Stone, J.A. *Unions and Public Schools: The Effect of Collective Bargaining on American Education*; ERIC: Washington, DC, USA, 1984.
24. Hiebert, J.; Morris, A.K.; Berk, D.; Jansen, A. Preparing teachers to learn from teaching. *J. Teach. Educ.* **2007**, *58*, 47–61. [CrossRef]
25. Baumert, J.; Kunter, M.; Blum, W.; Brunner, M.; Voss, T.; Jordan, A.; Klusmann, U.; Krauss, S.; Neubrand, M.; Tsai, Y.-M. Teachers' mathematical knowledge, cognitive activation in the classroom, and student progress. *Am. Educ. Res. J.* **2010**, *47*, 133–180. [CrossRef]
26. Slavičková, M. Implementation of Digital Technologies into Pre-Service Mathematics Teacher Preparation. *Mathematics* **2021**, *9*, 1319. [CrossRef]
27. Bicer, A.; Bicer, A.; Perihan, C.; Lee, Y. Pre-service teachers' preparations for designing and implementing creativity-directed mathematical tasks and instructional practices. *Math. Educ. Res. J.* **2022**, *34*, 491–521. [CrossRef]
28. Corcoran, R.P.; O'Flaherty, J. Factors that predict pre-service teachers' teaching performance. *J. Educ. Teach.* **2018**, *44*, 175–193. [CrossRef]
29. Barrett, A.; Sajid, A.; John, C.; Enrique, H.J.; John, L.; Jutta, N.; Mario, N.; George, O.; Mario, P.; Tikly, L. *Initiatives to Improve the Quality of Teaching and Learning: A Review of Recent Literature Background Paper Prepared for the Education for All Global Monitoring Report 2008*; UNESCO: Paris, France, 2007.
30. Tunjera, N.; Chigona, A. Teacher Educators' Appropriation of TPACK-SAMR Models for 21st Century Pre-Service Teacher Preparation. *Int. J. Inf. Commun. Technol. Educ.* **2020**, *16*, 126–140. [CrossRef]
31. Harris, D.N.; Sass, T.R. Teacher training, teacher quality and student achievement. *J. Public Econ.* **2011**, *95*, 798–812. [CrossRef]
32. Liu, X.; Wei, Y. The Black Box of the Student Academic Performance: Teacher Characteristics. *Contemp. Educ. Sci.* **2020**, 59–69. (In Chinese)
33. Lancaster, J.; Bain, A. The design of pre-service inclusive education courses and their effects on self-efficacy: A comparative study. *Asia-Pac. J. Teach. Educ.* **2010**, *38*, 117–128. [CrossRef]

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Article

Say Yes to Education—Buffalo: A Human Capabilities Approach to College Access and Local Economic Development

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Abstract: In December 2012, researchers from the University at Buffalo partnered with Buffalo Public Schools and Say Yes to Education—Buffalo to assist students and families with the Free Application for Federal Student Aid (FAFSA). The community had just announced a last-dollar tuition guarantee for all public and charter high school graduates. Students had to apply for federal and state financial aid to be eligible. We use the human capabilities framework described by St. John to examine the contributions of this specific intervention and the broader collective impact strategy. In this study, we employ difference-in-difference regression analysis to examine the effects of a FAFSA completion intervention and find that providing support to students and families to complete the financial aid process increased FAFSA completion rates by more than 60%, year over year. In addition to considering the outcomes of this intervention, we report lessons learned in the process of establishing a university-community collaboration to improve postsecondary opportunity and economic development. We find that effective collaboration takes time and a shared commitment to understanding and addressing problems of practice in schools.

Keywords: university-community partnerships; college access; financial aid

1. Introduction

The city of Buffalo, like many postindustrial communities scattered across the Great Lakes and upper Midwest region of the United States (U.S.), suffered significant declines during what St. John (Ch. 1) describes as the global period, when neoliberalism replaced more progressive policies. At its height, Buffalo, NY, was a national center of commerce, serving as the gateway for the flow of goods from the interior portions of the country through to the Eastern Seaboard when the Erie Canal opened in 1825 [1]. Buffalo flourished through the middle of the 20th century and became a center for steel production. At the height of World War II, Bethlehem-Lackawanna Steel became the world's largest steelmaking operation, providing material supplies for the U.S. military effort [2]. As recently as the 1960s, the population of the city of Buffalo reached more than 580,000 residents [3]. Since that high water mark, the city declined in population to 278,379 [4] and grew increasingly segregated. Bethlehem Steel and the entire steel industry in Buffalo closed their doors along the shores of Lake Erie in the early 1980s. It would be fair to say that the city of Buffalo was in a period of social and economic decline for nearly a half-century. The past decade was very different for Buffalo and the Western New York region. The city experienced a renaissance in the early part of the 21st century. Part of that success is attributable to a comprehensive, community-based educational reform and economic development strategy driven by Say Yes to Education—Buffalo, a local non-governmental organization (NGO).

Say Yes Buffalo was launched in partnership between local civic, community, education, business, and philanthropic leaders and a national non-profit organization of the same name. The economic resurgence of the city and the region began before the organization started. Still, it was the driving force behind a comprehensive social change initiative to leverage the power of postsecondary education to drive economic growth in Buffalo. Say

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Yes was instrumental in shepherding a large-scale social change initiative in Buffalo, and this paper focuses on the signature feature of their work—an endowed scholarship that was described as a last-dollar tuition guarantee. In December of 2011, when Say Yes to Education, the national non-profit organization, announced it was coming to Buffalo, they promised that every student who graduates from Buffalo Public Schools would be eligible for free tuition at any state 2-year or 4-year college or university or equivalent support at a network of private colleges. To qualify for this last-dollar tuition guarantee, students must complete the Free Application for Federal Student Aid (FAFSA), the New York State Tuition Assistance Program (TAP) application, and an online registration form for Say Yes. In this paper, I examine the effects of an intervention designed to help students and families complete the financial aid application process and effectively maintain their eligibility for the tuition guarantee. In the process, I address two key questions:

1. Does the FAFSA completion project increase FAFSA completion rates for Buffalo public school students eligible for the Say Yes tuition guarantee?
2. In what ways does a collaborative partnership among university researchers, public school leadership, and a local NGO enhance efforts to assist students with their financial aid application process?

The first question is the focus of the empirical analysis of this paper, while the second question provides an opportunity to think about the underlying collaboration that made the FAFSA completion project possible.

Buffalo is part of a region in the U.S. known as the rust belt, which was essential to the steel and automobile industries through the middle of the 20th century. It earned the name because it represented the literal and figurative decay of the community, as many steel-producing industries were exported to nations with lower production costs. In many ways, the new period of populist nationalism in the U.S. is in response to the failings of neoliberal policies during a period of globalization. Populism in the U.S. context was complicated by our struggles to reconcile our history of racism rooted in the slave trade during our nation's founding. Moreover, we witnessed evidence of this during the COVID-19 pandemic when decisions to ban travel from Muslims and East Asian countries were fueled, at least in part, by ethnocentrism and xenophobia. These debates continue as we struggle to redefine our immigration policies as migrants from Mexico and the nations in South and Central America seek refuge on our Southern border.

Buffalo is a symbol, in many ways, of the challenges and opportunities facing the U.S. in the post-neoliberal transition. The city suffered significant economic challenges due to globalization, the decline of the steel industry, and the subsequent white and middle-class flight from the city center to the first and second-ring suburbs, beginning during the civil rights era and the desegregation of schools. Today, Buffalo serves as a refugee resettlement community on the Northern border with Canada. In recent years, the city experienced modest population growth, primarily attributable to the influx of refugees from across the globe. Today, the city is home to a majority-minority population, where slightly less than 45% of the population identifies as White. The remaining population is comprised of Black and African American (33.3%), Hispanic or Latinx (12.2%), Asian (6.7%), and residents of two or more races (5.9%). Additionally, students in the Buffalo Public School (BPS) system speak 82 different languages, and more than 19% identify as English language learners [5], which indicates the role immigration played in the resurgence of the city of Buffalo.

In the next section, I describe the work of Say Yes to Education—Buffalo and describe their role using the Human Capabilities Framework as St. John described earlier in this volume. Say Yes is a community-based strategy modeled after several place-based promise programs designed to leverage the benefits of postsecondary education for local economic growth. Hundreds of communities across the country considered launching similar initiatives and dozens developed some variation of a place-based tuition guarantee program [6], only a few of which were as successful as Buffalo. I review relevant literature examining these community-based strategies to improve student outcomes in this section. The third section describes the FAFSA Completion Project and its role in providing a community-

based strategy to promote postsecondary opportunities. Many researchers noted that the rising cost of higher education in the U.S. became a significant barrier for low-income, first-generation, and racially minoritized students [7–12], and several identified the complexity of the financial aid application process as a contributing factor [13–21]. The research literature is mixed on the effectiveness of existing strategies to improve the financial aid application process. The intervention we examine responds to the work being carried out to simplify the financial aid application process in the U.S. and focuses more on helping families navigate the complexity rather than simplifying the process. The fourth section reports on the results of the intervention and the implications of the work in terms of the broader educational and economic development goals of Buffalo and the Western New York region. In the final section, we reflect on the implications of this work for local communities situated in other national contexts.

1.1. *Say Yes to Education—Buffalo*

Say Yes to Education is a national non-profit organization founded in 1987 by George Weiss, who built his wealth as a hedge fund manager [22]. Initially, Weiss emulated Eugene Lang’s *I Have a Dream* initiative, promising a class of sixth-grade students in a Philadelphia elementary school a free college education. Weiss named the project in response to the famous “Say No to Drugs” campaign of the 1980s—his alternative for students was to “Say Yes to Education.” Weiss brought his model to cohorts of students in other cities, including a partnership with the Harlem Children’s Zone in New York. Say Yes differed from most philanthropist-driven tuition guarantee initiatives because it provided wrap-around support services to help students prepare themselves to take advantage of the promise.

In 2008, Say Yes launched its first citywide initiative in Syracuse, NY. Instead of sponsoring a cohort of sixth-grade students in a school or across a district, the new model was to build the capacity for the city to cover the cost of postsecondary education for every graduate of the Syracuse school district. This version of the Say Yes to Education strategy was announced only three years after the city of Kalamazoo, Michigan, launched the Kalamazoo Promise [23]. The shift from individual efforts of private philanthropy to the collective action of an entire city shifted the purpose from unique postsecondary opportunity to local and regional economic development. To secure the support of local business, civic, education, and philanthropic leaders, the strategy was linked to leveraging an educated workforce to catalyze economic growth for the city and the region. Kitchens [24] described how the Kalamazoo Promise was one of five distinct strategies designed to grow the local economy, recognizing that in a knowledge economy, a college-educated workforce is a necessary first step to growing the local economy.

Local leaders in Buffalo were following the evolution of the promise community models and considered the Kalamazoo approach but chose to partner with Say Yes to Education, mainly because the model included both the tuition guarantee and a comprehensive approach to supporting students and families throughout the journey from kindergarten through the attainment of a college degree. The Syracuse chapter of Say Yes to Education focused on reforming the local school district [25] and relied heavily on the Chancellor of Syracuse University to accomplish its postsecondary objectives. The university and community partnership became a cornerstone of the model and continued to be the case when Say Yes announced its partnership in Buffalo.

Say Yes to Education Buffalo is organized as a collective impact strategy for social change, where the focus is on developing a broad partnership of local leaders who can set a shared agenda, engage in mutually reinforcing activities, utilize data to examine the collective effects of the work, and support continuous communications among critical stakeholders. A central feature of successful collective impact strategies is the existence of a backbone organization whose sole responsibility is to manage the shared agenda for the partnership [26,27]. As Kania and Kramer (2013) noted, the backbone organization is critical because every other stakeholder has its agenda and cannot easily take on the priorities of the collective when the plans may not overlap.

The tuition guarantee is the most prominent feature of the Say Yes to Education collective impact strategy. However, as George Weiss and others realized, financial resources are necessary but insufficient to ensure students can take advantage of promise programs. To illustrate, in 1999, the Detroit Pistons won the National Basketball Association (NBA) championship, and in response, the Detroit News published and sold commemorative programs to the fans of Detroit. The Detroit News used the proceeds to sponsor a free college education for sixth-grade students in a local middle school. In 2005, the News ran a story following the classroom of students they sponsored six years earlier. Of the 20 students in the class, five could no longer be located, and only two were planning to attend college in the fall—in short, only 10% of students were prepared to take advantage of the promise with no other resources or support to help them along the way.

Say Yes to Education provides a generous tuition guarantee, but their support does not stop with the scholarship. They include access to health clinics, a legal clinic, access to mental health support, individual social workers placed in every school to address the emergent needs of students and their families, parent resource centers in schools staffed by college navigators, and robust campus-based support for students who make the transition to the local colleges which educate the most BPS graduates. Additionally, Say Yes provides leadership on an array of additional supports typically provided by the school district, including extended learning programs after school and on weekends, peer mentoring, and a program called Breaking Barriers, designed to support boys and men of color in the schools and the local community. One additional wraparound service provided as part of the Say Yes to Education model is the focus of this study—the FAFSA Completion Project [28].

The work of Say Yes, even from the earliest stages of its organization, reflected the tenets of the human capabilities framework (St. John, above). While Say Yes—Buffalo was not meeting families' complete subsistence needs with organizational resources, they partnered with schools and other community-based organizations to improve postsecondary opportunities for low-income families. Over time, the organization evolved to pay more specific attention to students' postsecondary pathways into college and careers, providing information to students and families about the process and creating sustainable networks to support postsecondary participation and success. The collective impact model that shaped their citywide initiatives is consistent with the community support networks designed to address various family needs, prepare students for college, and provide the resources the community needs to help students navigate the transitions into and through college.

1.2. The FAFSA Completion Project

The cost of college is a significant barrier to postsecondary access for many students and families—particularly those from families with lower incomes and limited intergenerational wealth. According to the most recent trends in college pricing reports, undergraduate tuition ranges from \$3800 at community colleges and \$10,470 for in-state public four-year colleges to more than \$38,000 for a private non-profit college [29]. These prices do not account for the cost of living, which is approximately \$13,000 per year for room and board. To put these numbers into perspective, the median household income in the U.S. in 2021 was \$70,784 [30], and a low-income family would earn less than 200% of the federal threshold, the equivalent of \$52,492 for a family of four in 2020. Sending a child away to the public, in-state, four-year college would cost nearly \$25,000 per year, nearly half of what a low-income family would earn in a year. Fortunately, the federal—and many of the state—financial aid programs are means-tested, and so, lower-income families receive more significant financial assistance. The challenge is applying for the financial aid they need.

The Advisory Committee on Student Financial Assistance [31] identified the need to simplify the financial aid application process. It made ten recommendations to Congress, including creating a more straightforward form, eliminating unnecessary questions, reducing reliance on paper applications in favor of a completely online system, and allowing students to apply for aid sooner to have better information in the college decision process.

Many of those early recommendations were adopted, but the FAFSA continued to be a complex application for students and families. Dynarski and colleagues [10,18,19] continued to call for a more straightforward application, arguing that complexity in the financial aid system was a barrier to postsecondary participation and that the form could be reduced to as few as four or five questions that would provide reliable estimates of family need. Over the past decade, the Department of Education simplified the form and dealt with using tax information in two ways. First, they now allow “prior-prior” year taxes to be used in calculating a student’s expected family contribution (EFC) so that the application can open sooner for students. Second, they built the Internal Revenue Service (IRS) tax retrieval tool to allow families to import their tax information into the form automatically. Creating a more straightforward form is an effective policy response but not a panacea. For example, the U.S. Department of Education added more questions to determine eligibility for independent student status, recognizing there are a variety of reasons why a student may not be supported by their parents to pay for college, including homelessness, participation in foster care, the death of their parents, or having and supporting their children. In those situations, increasing the number of questions helped to make the process more equitable. To this point, scholars discussed the importance of simplifying the financial aid application process, and they were effective advocating for change, but they did not conduct empirical research to examine the effects of those efforts to simplify the application.

Another line of inquiry focuses on providing direct support to students and families to complete the financial aid application process. This body of research recognizes that it may not be feasible to make the process simple enough, so they focus on strategies to help students and families complete the complicated processes. The College Goal Sunday initiative was created to assist families with the financial aid application process. The campaign name is a play on “Superbowl Sunday,” which is the most popular sporting event in the U.S. that occurs each year in late January or early February—when most families would complete their financial aid forms (until the recent shifts to prior-prior year taxes and the October 1 opening of the form). In a typical event, financial aid counselors from local colleges would partner with school districts in their service area and identify a day (Saturday or Sunday most commonly) when families could sit and fill out their FAFSA and any relevant state forms with a financial aid expert. An evaluation of the program found that, in a typical year, these events served nearly 40,000 students but did not reach the target audience—low-income families who were least likely to apply for financial aid or attend college [20]. The program was effective for some, but it was not able to reach those with the greatest need. It was largely a descriptive study that suggested mixed effects overall but little success reaching the population of students who need financial aid most in order to attend college in the U.S.A.

Bettinger and colleagues [13] took a slightly different approach to FAFSA simplification, and their work was a precursor to the IRS tax retrieval tool. In 2008, they partnered with H&R Block tax accountants to conduct an experiment testing three conditions for FAFSA completion. Eligible families were sorted into three randomly assigned groups: (1) the control group that had their taxes completed, (2) the information-only group where families completed their taxes with an expert and were given information about how to file the FAFSA, and (3) the FAFSA completion group where the tax data were automatically transferred into the FAFSA online. The findings were striking. First, the information-only group was no different from the control group, meaning they were no more likely to apply for financial aid or attend college than those who received no information. This was a significant finding on its own because the most common FAFSA intervention in schools is a financial aid night where a local expert conducts a session for students and parents to educate them in the financial aid system and the application process—essentially, the information only treatment and the study found that it was not an effective strategy. The more important finding was that students in the whole treatment group were much more likely to apply for financial aid and to attend college. In some ways, this was a more robust version of the College Goal Sunday initiative because it had both the expertise of tax

accountants and the automatic import of tax information into the FAFSA. Both initiatives focused on simplifying the process by helping families navigate the complexity rather than attempting to simplify the form. The limitation of the H&R Block approach was that it is a fee-for-service model, and many low-income families cannot afford it or do not file taxes at all. They also mainly served independent students who did not need to use their parents' taxes to file their FAFSAs. Our intervention builds upon both the College Goal Sunday and the H&R Block interventions. We provide a comparable support to that of the College Goal Sunday, but we partnered with school counselors during the school day to reach students who would not otherwise seek out the support.

In Buffalo, we also built from the strengths of the Bettinger model but adapted it to target high school graduates financially dependent on parents or guardians while providing free tax support. Before developing the program, I spent six months shadowing school counselors at one of the lower-performing high schools in Buffalo. During that time, I was interested in understanding what barriers prevented low-income students and students of color in BPS from choosing to attend college. I found that counselors were asked for a considerable amount of help from their students on the administration of the college choice process—the college search, college applications, campus visits, SAT or ACT registrations, fee waivers for eligible students, and the federal and state financial aid forms. After that period of exploration, I proposed several strategies to free counselors from the administrative burden of the college choice process so they could spend more time counseling students on their future career paths.

In January 2010, we launched a simple pilot project at another comprehensive high school in Buffalo. We partnered with the United Way to make the voluntary income tax assistance (VITA) program accessible to students and families. At the same time, the university would provide trained volunteers to assist with the FAFSA and TAP applications. In just two months of service, our volunteers assisted 31 students with their financial aid applications—a modest number, but it was two-thirds of all the FAFSA applications submitted at that high school. We also found that the VITA program was not a successful addition to the project. Very few of the families came in to use the VITA service, and we did not have the technical capability to automatically import tax information into the FAFSA, as Bettinger was able to. Perhaps the most important finding from the school counselor's perspective was that it took approximately 90 min per student we served, which was effectively 45 h of their time that we could give back to them.

Less than a year later, Say Yes announced they would begin operating in Buffalo and offer a tuition guarantee to the next graduating class. District leadership asked their school counselors what could help more families complete the FAFSA and TAP applications. The counselors identified the pilot project as a possible solution. To bring the program to scale, we began by recognizing what was already being offered in the Buffalo schools. For several years, the district hosted a College Goal Sunday event which assisted approximately 110 students, on average, with the financial aid application process. The event accounted for over 20% of the FAFSAs submitted in Buffalo Schools in 2012.

In consultation with Say Yes and Buffalo Schools, we created a three-phase project to assist students and families with the financial aid application process. In the first phase, we went into each of the 14 participating schools, met with classes of students in a computer lab, and helped students complete the first half of the process, which, at that time, included generating their personal identification number (PIN) and completing the student information sections of the FAFSA, including their demographic information, high school attended, list of possible colleges, and responses to the independent status questions. The second phase was the College Goal Sunday event, which BPS called the Scholarship Fair. At this event, we integrated the tax prep services from VITA with financial aid support from local financial aid counselors. The final and longest phase of the project brought individual volunteers into each high school once or twice per week to work individually with students and their families on the remaining portions of the form. Say Yes announced a deadline of April 1 for financial aid forms to be submitted to be eligible for the tuition

guarantee, and so, the project was active from the middle of January through the end of March. From our experience shadowing school counselors in the year prior, we understood the importance of tailoring the project to each school; so, at the beginning of January, we met with each school counseling team to learn how best to implement the program in their schools, and we made slight modifications to the classroom/computer lab portion at the beginning and the final phase working with individual students. We understood that the program would only be effective if the counselors believed in it and were willing to connect their students to project volunteers.

2. Materials and Methods

In this study, we were interested in examining the effects of the FAFSA completion intervention on the submission of financial aid applications. Our primary challenge was isolating the FAFSA Completion Project's effects from the scholarship announcement. Both interventions were likely to impact financial aid application behavior, and it can be challenging to assess the contributions of each. As with most education research, we could not randomly assign students to treatment and control groups in this situation, and so, we relied on several comparisons to help establish the FAFSA project's effects. First, we compared FAFSA completion rates from Buffalo to those of comparable, mid-sized urban centers across New York State. The tuition guarantee applied primarily to New York State public colleges and universities, and so, this contrast helped to assess the extent to which financial aid application behavior changed in Buffalo compared to peer cities. It did not indicate the relative contribution of the tuition guarantee or the application support. However, it did illustrate that something different was happening in Buffalo, and it was not the result of changes happening across the state.

The second set of analyses compared the FAFSA completion behavior in BPS to their public charter school peers. The advantage of this comparison was that both BPS and charter school students were eligible for the tuition guarantee. However, in the first year of the project, the FAFSA Completion project only assisted students in BPS, meaning charter school students provided a useful counterfactual. In later years, we expanded the project to include charter schools. However, the first year allowed us to examine the extent to which the FAFSA project had an independent impact on financial aid application behaviors beyond the announcement of the tuition guarantee. It is important to note that the study reports the total number of applications completed per school rather than the percentage completed because it was difficult to identify the appropriate denominator. At the time of the intervention, all seniors and any juniors identified as eligible to graduate early could utilize the services of the FAFSA Completion project. However, not all eligible students graduated from high school, and not all graduates intended to go to college. So, the possible denominators would be the number of currently enrolled seniors, the number of high school graduates in the cohort, or the number of graduates who intend to enroll in college—a measure for which reliable data were unavailable.

2.1. Data Source

The year we began the project, the U.S. Department of Education published FAFSA completion numbers by high school and state bi-weekly. These data reports included the number of FAFSAs submitted and the number of FAFSAs completed (accepted by the federal government) during the current filing year by the date the data were made available. They provided comparable data for the same school and date from the prior year. The Education Department (ED) continued making these data available each year so that counselors, schools, and college-access programs can track their progress at the school level. The bi-weekly data remain useful to examine completion trends throughout the project and compare them to the same time points in the previous year for Buffalo Schools. For the regression analyses, the data from the April 12 data file were used because it was the final period available at the end of the project.

The data are publicly available through Federal Student Aid [32], and they were extracted from submitted FAFSA forms by linking the student to the high school from which they graduated, identifying the first time a student was ever enrolling in college, and limiting the age of students to no greater than 19. These data are appropriate for comparison purposes across schools in the aggregate, but they were likely to under-report total numbers for two reasons. First, at the time of this project, students could type in the name of their high school and submit without verifying the school from the list of identified schools in the application. Those applications cannot be assigned to the appropriate school or districts and do not appear in the data. Second, it is not uncommon for a student in BPS to graduate after age 19. Students older than 19 will not appear in the aggregated high school numbers. This is a limitation of the data, but we expect similar patterns across all high schools and districts included in the study because we are comparing schools and districts serving similar demographics of students. Each school/year was one case in this analysis, and there were a total of 44 high schools across the four urban centers, resulting in 88 school-year cases. Only two years of data were used for two reasons. First, we only had access to one year of data before the implementation of the project, and so, we wanted the sample to be balanced in terms of treatment and control group sizes. Second, it was the first year of the intervention, which was ideal for assessing the effects of the intervention, independent of the ways a system may adapt over time.

2.2. Analytic Method

We employed difference in differences (DID) analysis to consider whether the FAFSA completion intervention had an effect independent of other state-level factors or the announcement of the Say Yes to Education scholarship. The DID method is an econometric tool that allows researchers to more closely approximate experimental treatment and control groups when random assignment is impossible. A simple time series difference analysis considered the outcome before and after the policy implementation and assumed any measurable difference was a consequence of the policy. However, there may be something unique about the schools where the intervention is implemented. The difference in differences approach allows researchers to use non-treated groups as a counterfactual. The difference between the treatment and control groups before the treatment was removed and the observed difference post-treatment was attributed to the intervention. The DID model assumed that the trajectories of the treatment and control groups were parallel in the absence of the intervention and that differences between the two groups after the pre-treatment differences were removed attributable to the program. We were unable to test the parallel trends assumption, given our data constraints, and so, we added several controls that may account for sources of variation, including school size, percent of students eligible for free or reduced-price lunch, the percentage of students of color enrolled in the school, and the percentage of students suspended in the school in a year. Each school's controls were available through the New York State Report Card.

The difference in differences model takes the form:

$$y_{it} = \beta_0 + \beta_1 X_i + \beta_2 T_t + \beta_3 X_i \times T_t + \varepsilon_{it} \quad (1)$$

In Formula (1), X is a dummy variable for assignment to the treatment group, T indicates the time, where a value of 1 is assigned to the post-treatment period, and the coefficient of interest (β_3) is the interaction of treatment group assignment and the treatment period. We added several school characteristics to the analysis to account for observable characteristics that might account for differences in FAFSA completion rates. The complete model takes the form:

$$y_{it} = \beta_0 + \beta_1 X_i + \beta_2 T_t + \beta_3 X_i \times T_t + \beta_{4(\text{class})} T_t + \beta_{5(\text{FLRE})} T_t + \beta_{6(\text{URM})} T_t + \beta_{7(\text{susp})} T_t + \varepsilon_{it} \quad (2)$$

In Formula (2), the size of the graduating class, the proportion of free or reduced lunch eligibility, the percentage of underrepresented minority students enrolled, and the percentage of students suspended each year are included as controls. DID was used to

analyze the effects of several higher education policies [33], notably to evaluate the Georgia HOPE scholarship and the federal tax credit [34] and the adoption of state high school graduation requirement policies [35].

3. Results

The first results in Table 1 showed a trend comparison over the two months of the project, from the year before the intervention to the first year of implementation. During the two years under investigation here, the FAFSA application opened on 1 January; the figure shows that just a month into the filing season, 381 students already submitted their applications in 2012, and 422 submitted their applications during the year Say Yes announced the tuition guarantee and the FAFSA Completion project began. By February 15, a few of the applications submitted resulted from the project. The computer lab sessions in Phase I were already completed by then, but only students who qualified as independent could submit during those sessions. In both years, the scholarship fair in phase II was held by the end of January, and the fair accounted for nearly a third of submitted applications by 15 February.

Table 1. The difference in Differences Analysis Comparing Buffalo to Other Urban Centers, 2011–2013.

Variable	B	SEB	Beta	Sig.
Cons.	58.523	13.818	0.000	***
Year of FAFSA Completion	−5.526	4.608	−0.062	
Percent Free/Reduced Lunch	−0.661	0.213	−0.213	**
PercentNon–White Students	−0.087	0.203	−0.029	
Percent Suspensions	−0.188	0.125	−0.061	
Number of HS Completers	0.465	0.025	0.827	***
Treatment	−10.514	5.368	−0.117	~
DID	30.151	6.816	0.283	***
F-test	90.088			***
R2	0.910			

*** $p < 0.001$, ** $p < 0.01$, ~ $p < 0.10$.

Phase III began during the week of 22 February, when we expected more significant gains in FAFSA application submissions. For the next month, the rate of increase during the project exceeded the rate from 2012. During March, the rate of increased FAFSA submissions grew by 27% in 2012 and more than 35% in 2013. By the submission deadline for Say Yes to Education, the number of FAFSA applications submitted to the U.S. Department of Education grew nearly 62%. These data alone do not indicate whether the increase is attributable to the tuition guarantee, the FAFSA Completion project, or other factors. However, it does suggest a substantial increase that is worth exploring further.

There is another difference that we note descriptively, which is not pictured in the figure. FSA provided us with two numbers—FAFSA submitted and FAFSA Completed. The difference between the two numbers was that some applications were rejected because they either included errors or were missing signatures. If we take the ratio of completed applications to those submitted, we have an accuracy rate. In 2012, the federal government accepted approximately 87% of all applications submitted by BPS students. During the 2013 year, when the project was underway, those accuracy rates improved to 92%. We did not see accuracy rates improve across the other schools in this study. While we did not focus on this outcome, it may be most directly linked to the work of the FAFSA Completion project because individualized help was more likely to result in catching errors before the applications were submitted. In practical terms, that may amount to as many as 50 students in BPS schools whose applications were accepted that would not have been without the assistance of the project.

The first contrast compares outcomes for BPS students to those in Albany, Syracuse, or Rochester public schools. Table 1 summarizes the regression analysis, and the findings

can be understood relative to the total number of FAFSA forms submitted at a given school each year. Approximately 58 students submit the FAFSA each year across each high school included in the study. Schools with a higher enrollment of low-income students—as approximated by free or reduced lunch (FRL) eligibility—report a slightly lower average. A 10-percentage point decline in FRL would result in an average of five additional students completing the FAFSA. The difference-in-differences coefficient is an interaction term between year (pre- and post-program intervention) and treatment location (Buffalo vs. other three metro areas). The result compares BPS schools in the treatment year to BPS before the intervention and the three comparable mid-sized cities, which we expect to have a similar trend over time. The DID coefficient suggests that BPS schools saw an increase of 30 FAFSA applications submitted, compared to the trend for the other metro areas—an increase of approximately 50%, slightly less than the descriptive difference shown in Figure 1 above.

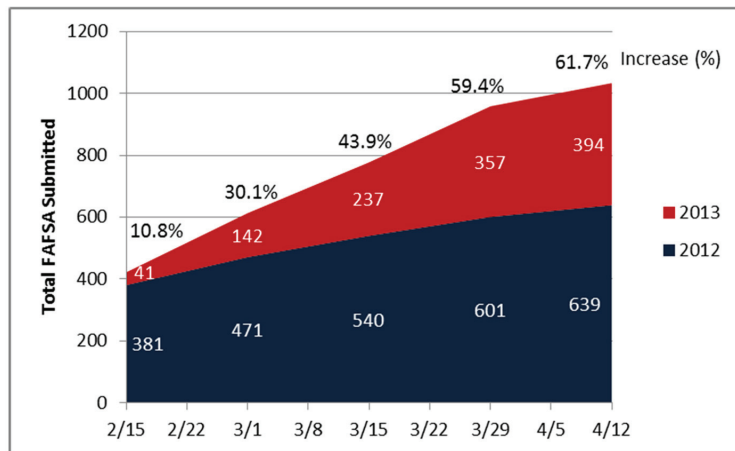


Figure 1. Comparing FAFSA Completion Rates in Buffalo, 2012–2013.

The second analysis in Table 2 compares BPS schools to the Buffalo public charter schools, which were eligible for the tuition guarantee but did not receive support from the FAFSA completion project during the first year. The sample size for the second analysis was much smaller because there are only sixteen BPS schools and five charter high schools in Buffalo, which accounts for the more modest *p*-values reported here. The mean number of applications submitted across all schools was 25, which was considerably lower than in the last analysis—and the reason is simple. The metropolitan areas outside of Buffalo have fewer high schools but are more extensive. A similar relationship exists between free and reduced lunch eligibility, indicating a 10-percentage point decrease in the free or reduced lunch eligibility would result in an additional eight students submitting their forms. The DID coefficient in this analysis suggests that BPS schools nearly doubled their FAFSA completion numbers from the first to the second year compared to the charter schools. The DID coefficient suggests that controlling for other school characteristics, an additional 24 students per school completed their FAFSA in Buffalo schools.

Table 2. The Difference in Differences Analysis Comparing BPS Schools to Buffalo Charter Schools, 2011–2013.

Variable	B	SEB	Beta	Sig.
Cons.	25.045	13.547	0.000	~
Year of FAFSA Completion	0.200	8.287	0.003	
Percent Free/Reduced Lunch	−0.810	0.255	−0.361	**
Percent Non–White Students	0.338	0.251	0.171	
Percent Suspensions	−0.399	0.188	−0.160	*
Number of HS Completers	0.544	0.052	0.758	***
Treatment	−3.900	6.848	−0.049	
DID	24.425	9.495	0.352	*
F–test	34.879			***
R2	0.878			

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, ~ $p < 0.10$.

The analyses reported above provide evidence to suggest two key outcomes. First, it appeared that the announcement of the tuition guarantee influenced students' FAFSA submission behavior, which should not be a surprise given that it is a condition of eligibility. When comparing BPS to other mid-sized cities in NY, Buffalo increased the number of students completing the FAFSA, even after controlling for key demographic characteristics of schools. In the descriptive analysis, we reported a change of 62% from the year before the announcement of the Say Yes tuition guarantee to the first year of implementation. The comparison with Syracuse, Rochester, and Albany indicated a 50% increase after controlling for other factors, which was similar in magnitude. The comparison with the public charter schools in Buffalo may indicate the independent effects of the FAFSA completion project because both groups were eligible for the tuition guarantee. However, only BPS received the FAFSA completion support.

It is important to recognize that the differences reported here were by April 12 of that year. We know that in the past, many students would have completed their FAFSA in August, right before the start of college—and many of them were attending community colleges. The advantage of setting the deadline for submission is that students are forced to complete the process sooner when help is available. They receive more information about higher education costs sooner, which makes the college choice process more manageable. What we did not change in any meaningful way were the factors that lead to many students making last-minute decisions about whether or where to attend. For example, some students were unclear whether they would graduate high school, and some required additional summer coursework. Our goal with the project was not to suggest that every student should go to college but to keep the option open to as many students as possible.

4. Discussion

The program's potential effects are an essential part of the experience in Buffalo. Our findings on the FAFSA completion project provide strong evidence that a personalized intervention can increase the likelihood students will complete a financial aid application, particularly in a high-need district like Buffalo. This has significant implications for other large metropolitan centers in the U.S.A. and potentially other countries with higher tuition prices for tertiary education [36]. The project was effective in the Buffalo context, because it was developed and implemented in the context of a larger collective impact strategy designed to leverage the power of the school district, local colleges and universities, and participating NGO's. However, the more important implications for researchers, community educators, and NGO's is the collaboration that led to this intervention. We believe there are several important lessons for other local communities, regardless of state or national context, about effective collaborations among schools, colleges, universities, and local community-based organizations.

4.1. Invest Time to Develop Strong Collaborative Relationships

Perhaps the most important lesson from this program is that collaboration takes time, and it is easiest to cultivate those relationships when the stakes are lower. The opportunities to establish trust are higher. Researchers from UB were already engaged in work around high school dropout prevention well before we began the pilot for the financial aid application process. At that time, dropout prevention was a priority for the district, and our participation helped develop a level of trust necessary when we spent six months shadowing school counselors. The time we spent shadowing counselors was instructive because we had an opportunity to identify problems of practice, all related to the administration of the college choice process. We saw firsthand how much time and energy counselors spent working with students on college applications, essays, admissions test registrations, college visits, fee waivers, and financial aid. We understood the challenges from their perspective and set out to develop solutions that were responsive to the needs of counselors and adapted to the work they were already doing to solve many of these problems. We focused on financial aid in the pilot study because this was part of the college choice process that made counselors most nervous. School counselors were less knowledgeable about financial aid and apprehensive about managing student and family personal data, including social security numbers and tax documents. No matter what problem we hope to address, in partnership with schools, researchers must spend time understanding the experiences of their collaborators and establishing trust.

4.2. Translate Research into Practice

As partners from a research university, our most important contribution was to be able to bring research to bear on the problems we were trying to address. As such, it was beneficial for us to be immersed in the research on college access and choice to identify research-informed strategies to address the complexity of the financial aid process. Perhaps the most notable contributions were the findings from Bettinger and colleagues that information-only strategies are not effective, at least in terms of improving college participation or financial aid application behavior, and the evaluative work of College Goal Sunday finding that the program was not reaching the students and families it was designed to serve. Financial aid information nights tended to be the most frequent intervention, mainly because they were inexpensive to provide. We could change our strategies to more active interventions because the research was compelling.

4.3. Collaborate with Trusted Community-Based Partner Organizations

Say Yes to Education played a critical role in the success of the collaboration between BPS and the university. As a backbone organization in a collective impact strategy, its primary responsibility is to manage the collective's shared agenda. They very effectively built trust among BPS leaders and local community partners. In many large districts, multiple partners provide similar services in schools with little coordination. Say Yes brought those partners together to identify ways to work together, and we found that the most effective mechanism was data sharing. Every pre-college program in Buffalo assisted its students and families with the financial aid application process. We found that sharing data across partner organizations incentivized more program providers to collaborate more effectively with school counselors.

4.4. Listen to the Experiences and Needs of Education Partners

Finally, and perhaps where we started, it was essential to listen to school counselors and tailor our strategies to the school's needs. We started by spending the first six months at a single school to better understand counselors' challenges in helping students with the college choice process. Then, we spent a semester learning with and from the school counselors at our pilot project site to understand better whether our design worked in the school context and how to adapt it to changing circumstances. When we began scaling the project up to serve the entire district rather than a single school, we conducted a site visit at

each school to discuss the plan with the school counseling teams. Each school followed different schedules, identified different classes that would be optimal for the computer lab portion of the intervention, and had different strategies for connecting students with the FAFSA completion volunteers. That time was necessary for the earliest stages of our work. While the trust established from the shadowing experiences and the advocacy of our partner counselors was helpful, we found it beneficial to continue to earn that trust with each set of school partners. Once the project concluded, we conducted follow-up visits with each school to learn what worked and could be improved. This formative evaluation was equally important for managing and sustaining relationships while refining the program to meet the needs of each school.

Effective collaboration takes time and, in our experience, cannot be rushed. We did not begin the relationship with a solution in search of a problem. Instead, we worked with the district to identify the problems most salient to them and coordinated with partners to develop, test, and refine a strategy to simplify the financial aid application process and increase the number of students eligible for the Say Yes tuition guarantee. Our work was possible because we constantly communicated with partners and used data to shape our work. The project is entering its tenth year, and the partnership continues to strengthen and grow. The project looks very different today than in the first year of implementation. Some of that is a consequence of the learning that occurred through the formative evaluation process. However, several program changes resulted from modifications to the financial aid application, including moving the opening of the application from January 1 to October 1, shifting from the PIN to the Federal Student Aid (FSA) ID username and password, and launching the IRS tax retrieval tool.

The collaboration among Say Yes, BPS, and the University at Buffalo established a community support network that attends to the six dimensions St. John identified in the human capabilities framework. Our focus in this study was on a specific and targeted intervention, but the larger collective impact initiative attends to the financial well-being of families. In partnership with the department of social services (DSS), Say Yes places a social worker in every school to identify and respond to the emergent needs of students and their families. The health clinics, legal clinics, and the growing mental health support are all related to the family's financial well-being because most would not have the resources to seek these services independently. During the pandemic, Say Yes led an effort to make laptops available to families that did not have the technology and to develop solutions for families that did not have high-speed internet access in their homes. Our work on the financial aid application process was not central to the preparation students received for college but Say Yes partnered closely with BPS to provide extended learning time after school, on weekends, and in the summer; they developed strategies to improve early childhood preparation; and they are assisting the district with some of their professional development needs. The entire program is predicated on improving college opportunities and Say Yes leveraged its relationships to establish a social network to support students through that process. They worked with employers to identify pathways through college or directly into the workforce. They engaged partners in the schools, community centers, churches, and the business community to make the promise of postsecondary education pay off for the students in the hope that they will return to the community and pay it forward to those that follow.

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References

1. Erie Canalway National Heritage Corridor. History and Culture. 2022. Available online: <https://eriecanalway.org/learn/history-culture> (accessed on 30 December 2022).
2. LaChuisa, C. Buffalo Architecture and History: Bethlehem Steel Company in Lackawanna, NY. 2002. Available online: <https://www.buffaloah.com/h/beth/index.html> (accessed on 30 December 2022).
3. Biggest U.S. Cities. Buffalo, NY Population History, 1840–2021. 2022. Available online: <https://www.biggestuscities.com/city/buffalo-new-york> (accessed on 30 December 2022).
4. U.S. Census Bureau. *2020 Decennial Census: Total Population of Buffalo city, New York*; U.S. Census Bureau: Washington, DC, USA, 2022.
5. Buffalo Public Schools. Multilingual Education: Translation & Interpretation. 2022. Available online: <https://www.buffaloschools.org/Page/85595#:~:text=The%20Buffalo%20Public%20Schools%20is,by%20our%20English%20language%20learners> (accessed on 30 December 2022).
6. Miller-Adams, M. *The Path to Free College: The Pursuit of Access, Equity, and Prosperity*; Harvard University Press: Cambridge, MA, USA, 2021; 240p.
7. Archibald, R.B.; Feldman, D.H. *Why Does College Cost So Much?* Oxford University Press: Oxford, UK, 2011; Volume xii, 289p.
8. Avery, C.; Hoxby, C.M.; Jackson, C.K.; Burek, K.; Pope, G.; Raman, M. *Cost Should Be No Barrier: An Evaluation of the First Year of Harvard's Financial Aid Initiative*; NBER Working Paper Series; National Bureau of Economic Research: Cambridge, MA, USA, 2006; p. 24.
9. Daun-Barnett, N.; Behrend, C.; Bezek, C. *College Counseling for Admissions Professionals: Improving Access and Retention*; Routledge: New York, NY, USA, 2013; p. 226.
10. Dynarski, S.M.; Scott-Clayton, J.E. *The Cost of Complexity in Federal Student Aid: Lessons from Optimal Tax Theory and Behavioral Economics*; Harvard University, Kennedy School of Government & National Bureau of Economic Research: Cambridge, MA, USA, 2006; pp. 1–50.
11. Novak, H.; McKinney, L. The Consequences of Leaving Money on the Table: Examining Persistence Among Students Who do not File a FAFSA. *J. Stud. Financ. Aid.* **2011**, *41*, 5–23. [CrossRef]
12. St John, E.P.; Daun-Barnett, N.; Moronski, K. *Public Policy in Higher Education*, 2nd ed.; Routledge: New York, NY, USA, 2018.
13. Bettinger, E.; Long, B.; Oreopoulos, P.; Sanbonmatsu, L. The role of information and simplification in college decisions: Results from the H&R Block FAFSA experiment. *Q. J. Econ.* **2012**, *127*, 1205–1242.
14. Castleman, B.; Page, L. Beyond FAFSA Completion. *Change Mag. High. Learn.* **2015**, *47*, 28–35. [CrossRef]
15. College Goal Sunday USA. College Goal Sunday. 2011. Available online: <http://www.collegegoalsundayusa.org/> (accessed on 10 October 2011).
16. Council of Economic Advisers and National Economic Council. *Simplifying Student Aid: The Case for an Easier, Faster, and More Accurate FAFSA*; Executive Office of the President: Washington, DC, USA, 2009; p. 25.
17. Daun-Barnett, N.; Mabry, B. Simplifying the FAFSA Process: Local Initiatives Linking Tax Preparation with FAFSA Completion. *J. Stud. Financ. Aid.* **2013**, *42*, 25–45.
18. Dynarski, S.M.; Scott-Clayton, J.E. College Grants on a Postcard: A Proposal for Simple and Predictable Federal Student Aid. In *The Hamilton Project: Advancing Opportunity and Growth*; The Brookings Institution: Washington, DC, USA, 2007; pp. 1–54.
19. Dynarski, S.M.; Wiederspan, M. Student Aid Simplification: Looking Back and Looking Ahead. *Natl. Tax J.* **2012**, *65*, 211–234. [CrossRef]
20. Institute for Higher Education Policy. *College Goal Sunday 2007: Evaluation Report*; Institute for Higher Education Policy: Washington, DC, USA, 2007; pp. 1–44.
21. Spitfire Strategies. *Research Report for College Goal Sunday 2006: It's Not What You Tell Them, It's What They Hear*; NASFAA: Washington, DC, USA, 2005.
22. Reeves, R.V.; Guyot, K.; Rodrigue, E. *Gown Towns: A Case Study of Say Yes to Education, in Center on Children and Families at Brookings*; Brookings Institution: Washington, DC, USA, 2018; p. 219.
23. Miller-Adams, M. *The Power of a Promise: Education and Economic Renewal in Kalamazoo*; W.E. Upjohn Institute for Employment Research: Kalamazoo, MI, USA, 2009; Volume xi, 257p.
24. Kitchens, R.; Gross, D.; Smith, H. *Community Capitalism: Lessons from Kalamazoo and Beyond*; AuthorHouse: Bloomington, IN, USA, 2008; Volume xii, 111p.
25. Maeroff, G.I. *Reforming a School System, Reviving a City: The Promise of Say Yes to Education in Syracuse*, 1st ed.; Palgrave MacMillan: London, UK, 2013; Volume xi, 227p.
26. Kania, J.; Kramer, M. Collective Impact. In *Stanford Social Innovation Review*; Winter: Heidelberg, Germany, 2011; pp. 36–41.
27. Kania, J.; Kramer, M. Embracing Emergence: How Collective Impact Addresses Complexity. In *Stanford Social Innovation Review*; Stanford Center on Philanthropy and Civil Society: Stanford, CA, USA, 2013.
28. Riehl, C.J.; Henig, J.R.; Wolff, J.R.; Rebell, M.A. *Building Impact: A Closer Look at Cross-Sector Collaborations for Education*; Teachers College, Columbia University, Department of Education Policy and Social Analysis: New York, NY, USA, 2019.
29. Ma, J.; Pender, M. *Trends in College Pricing and Student Aid 2021*; Trends in Higher Education Series; College Board: New York, NY, USA, 2021; p. 53.
30. U.S. Census Bureau. *Income in the United States: 2021*; U.S. Census Bureau: Washington, DC, USA, 2022.

31. Advisory Committee on Student Financial Assistance. *The Student Aid Gauntlet: Making Access to College Simple and Certain*; Advisory Committee on Student Financial Assistance: Washington, DC, USA, 2005; p. 64.
32. Federal Student Aid. FAFSA Completion by High School and Public School District. 2022. Available online: <https://studentaid.gov/data-center/student/application-volume/fafsa-completion-high-school> (accessed on 2 January 2023).
33. Zhang, L. The Use of Panel Data Models in Higher Education Policy Studies. In *Higher Education: Handbook of Theory and Research*; Smart, J., Ed.; Springer: New York, NY, USA, 2010; pp. 307–350.
34. Dynarski, S.M. Hope for whom? *Financial aid for the middle class and its impact on college attendance*. *Natl. Tax J.* **2000**, *53*, 629–661.
35. Daun-Barnett, N.; John, E.P.S. Constrained Curriculum in High Schools: The Changing Math Standards and Student Achievement, High School Graduation and College Continuation. *Educ. Policy Anal. Arch.* **2012**, *20*, 5. [CrossRef]
36. Johnstone, D.B. Financing Higher Education: Who Should Pay? In *American Higher Education in the Twenty-First Century*; Altbach, P.G., Berdahl, R.O., Gumport, P., Eds.; The Johns Hopkins University Press: Baltimore, MD, USA, 2001; pp. 347–369.

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Article

Individualized and Innovation-Centered General Education in a Chinese STEM University

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Abstract: The concept and practice of general education have been widely discussed and debated in the Euro-American world, but its adaptation in China needs further discussion and understanding. Over the past decade, its impact on Chinese higher education is increasingly salient, with a large number of Chinese first-tier universities claiming to initiate general education reforms to their previously narrowly focused undergraduate programs. This paper explores the development, implementation, and support of general education in a new type of research university in China from an organizational perspective. Through a case study of the Southern University of Science and Technology (SUSTech) prior to the COVID-19 pandemic, this paper examines SUSTech's individualized and innovation-based general education system, highlighting its institution-wide approach and innovation-centered perspective. The findings underscore the importance of integrating general education principles throughout the university to foster self-directed thinkers and cultivate students' self-awareness, interests, and passions. This study also reveals how general education is used as an organizational solution to address a variety of historical and complicated issues that challenge Chinese universities. This research serves as a catalyst for reform and innovation in Chinese higher education, inspiring transformative practices that meet the evolving needs of students and society.

Keywords: general education; STEM university; whole-institution approach

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1. Introduction

China, renowned as the world's oldest continuous civilization, has deep philosophical traditions that emphasize character development and the acquisition of knowledge, aligning closely with the holistic principles of general education. Over the past two decades, the number of higher education programs focusing on general education has increased significantly in China. These programs advocate a holistic educational philosophy and provide lifelong learners with a solid foundation of integrated knowledge and social responsibility, challenging the traditional system of specialized training for specific professions.

The roots of general education in China can be traced back to the Republican Era (1911–1949), when Western ideas and practices of liberal arts and general education influenced the country's modern universities. However, these ideas took a backseat in the 1950s when China adopted the Soviet model of specialization [1]. It was not until the 1980s, amidst criticism of the limitations imposed by narrow specialization, that general education regained prominence. Since the 1980s, there have been three proponents of general education in China, each aimed at addressing specific problems [2]. The first was *versatile education* (tongcai education) in the 1980s, which sought to broaden knowledge scope and emphasize knowledge structure. The second was *culture quality education* (wenhua suzhi education) in the 1990s, which focused on humanities and moral education to counterbalance the dominance of hard sciences and engineering. Finally, in the 2000s, *general education* (tongshi education) emerged, emphasizing the intrinsic value of education and combating the sense of self-loss amid a prevailing utilitarian ethos. It has been pointed out

that Chinese educators' commitment to general education in the 21st century has shifted from theoretical debates to practical implementation, with varying degrees of success [2].

An exemplar case of implementing general education exploration in China is the Yuanpei Program at Peking University. Its five-year review (2000–2005) of the program highlighted the recognition of general education as a concept and model for talent development in higher education and emphasized the importance of tailoring the idea of general education to Chinese cultural characteristics [3]. The case study conducted at Peking University examined the significance, feasibility, and systemic challenges involved in implementing general education in comprehensive universities across China. These challenges encompassed institutional environment, conventions, stakeholder conflicts, limited understanding, faculty competence issues, and resource constraints. The study also provided suggestions for foundational modules of general education, encompassing rationales, goals, program arrangements, curriculum design, faculty resources, pedagogy, evaluation, and support systems. Furthermore, the study highlighted the link between general education and liberal education, both aspiring to cultivate well-rounded individuals. This 2008 research report on the Yuanpei Program played a pivotal role in informing and inspiring subsequent education reformers in China, shedding light on critical success factors, obstacles, and difficulties associated with the implementation of general education, particularly when integrated with specialized education within the same university [3].

The two decades before the COVID-19 pandemic have witnessed more prestigious universities in China undertaking educational reforms and pedagogical innovations driven by the aspiration to achieve excellence and leadership in higher education in an increasingly globalized world. Among the forefront scenarios in the reform of Chinese higher education, notable developments include the remarkable expansion of research capacities and the implementation of general education in arts and sciences [4]. These reforms aimed to enhance the quality and global competitiveness of Chinese universities while adapting to the evolving demands of the modern educational landscape.

In addition to internal considerations within universities, scholars have also pointed out that Chinese universities' engagement with general education is motivated by the student recruitment market [5]. The term "general education" gained attention as comprehensive universities sought to establish elite degree programs focused on broader knowledge content and educational objectives. The exploration of general education by top-tier Chinese universities has served as a marketing strategy to attract prospective students, and in turn, has shaped models within the higher education sector. While China has introduced general education with the aim of fostering creativity and innovation and supporting national development goals [6], specific goals and implementation strategies at the institutional and program levels remain unclear [7]. Chinese universities face the challenges of adapting the models of Western universities to their own contexts [8], often drawing on their own practical approaches to general education [7]. In the last decade, newly established research universities in China have embraced the ambition of cultivating innovative and well-rounded talents by using general education as a foundation [7].

This study closely examines the establishment and implementation of general education at a new research university in China that places particular emphasis on fostering students' creativity, innovation, and holistic development. The main objective is to gain insights into the organizational aspects of developing, implementing, and supporting general education programs in alignment with the university's overarching goals. This study also examines how general education has been exploited as an action strategy to address ambiguous systematic problems and thus has gone beyond the scope of discussion in the scholarly field outside of China. By addressing these research questions, this study aims to contribute to the understanding and advancement of general education practices in Chinese higher education and shed light on the broader landscape of educational reform in China.

2. Literature Review

The terms “liberal arts education” or “general education” are widely discussed throughout the world. The earliest writing that attempted to define “general education” can be traced back to the Reports on the Course of Instruction in Yale College in 1828, in which education is believed to provide an individual with a general foundation in areas that are common for all professions, and not just one specialized profession. The Harvard Committee Report in 1945 defines general education as a part of a student’s whole education which looks first of all to his life as a responsible human being and citizen. A review of the current literature in China shows a lack of a coherent and articulated theoretical framework for general education reform [8–10]. This section will discuss the theoretical foundations for this study, which include the functions, approaches, and models of general education, as well as the specific theoretical framework employed in this research.

2.1. Functions of General Education

The surge in general education has been attributed to various factors by scholars, policymakers, and pundits. These factors include the increasing demand for well-rounded workers in the current and future economy, the need to educate individuals who can tackle complex global issues beyond their specific areas of expertise, the imperative for higher education to address ethical, individual, and social responsibilities alongside imparting knowledge and skills, and the importance of granting students the freedom to choose their career paths instead of pressuring them into potentially unsuitable professions at a young age. General education serves multiple functions that include student learning, communal well-being, and institutional purposes. These functions underscore the significance of general education in shaping individuals, society, and educational institutions.

One of the primary functions of general education is to facilitate student learning by promoting a broad range of student learning outcomes. These include developing intellectual proficiencies, fostering ethical and meaningful engagement, and providing a holistic education [11–13]. Through general education, students acquire essential concepts, methodologies, and knowledge in various disciplines [14]. Additionally, general education emphasizes the development of intellectual skills that enable students to make sense of information and their own lives and to apply knowledge for ethical purposes. It aims to produce well-rounded individuals equipped with the intellectual capacities necessary for employment in today’s context [15].

Beyond individual learning, general education also plays a role in fostering communal well-being. It contributes to the formation of an educated citizenry and cultivates a sense of public responsibility [16]. General education is viewed as a means of preparing students who will actively contribute to building a more equitable society and a global community. It strives to achieve democratic outcomes and global learning and aims to create inclusive and just societies. By fostering knowledge, awareness, and actionable consciousness, general education seeks to empower students to become active agents for the betterment of their communities.

Moreover, general education serves institutional purposes by providing integration and imprinting a mission and identity on the educational program. In the complex landscape of college students’ lives, general education offers a unique context for integrative learning [13]. It allows students to make connections and meanings across diverse academic disciplines and experiences. By facilitating integrative learning, general education helps students navigate the fragmented nature of their education and develop a comprehensive understanding of knowledge. Additionally, general education influences an institution’s educational program and reflects its mission and identity. It contributes to framing and fulfilling the overall educational philosophy of a college or university [17,18]. The general education curriculum, which is mandatory for all students, becomes a reflection of an institution’s values, goals, and educational mission [19]. Thus, general education plays a critical role in shaping the institutional identity and ensuring that the educational program aligns with the institution’s overarching mission.

2.2. Approaches to General Education

Walker and Soltis (1997) summarize three approaches to general education that reflect institutional academic values and intended learning outcomes: the first is a subject-centered approach that focuses on transmitting knowledge to the next generation, and general education is delivered by teaching basic skills, critical thinking, and mastery of important facts and information; the second is a society-centered approach that focuses on creating and ensuring a prosperous and healthy society, so the aims of education focus on civic responsibility, vocational training, ethical values, development of democratic attitudes, and the preparation of individuals for an industrialized society and for economic competence; and the third one is an individual-centered approach, which emphasizes the importance of individual freedoms, talent, and happiness, developing the student's potential, and preparing them for community life [20].

Aldegether (2015) points out that there are three perspectives on general education requirements, namely the traditional or conservative perspective, the multicultural perspective, and the radical perspective [21]. Each of these perspectives holds a different view of academic values and hence the direction of education. The traditional perspective emphasizes the importance of the classical curriculum, which deals with how to live right and suggests teaching the courses for that purpose in their original texts. The multicultural perspective emphasizes that general education should include multiple perspectives rather than a single-knowledge perspective to help students search for reliable knowledge about the world by teaching them to use their own judgments on what they read or learn about and what is happening around them. The radical perspective emphasizes the importance of critical pedagogy through which educators and students can think critically about how knowledge is produced and transformed in relation to the construction of social experiences and help students change their current social practices. In brief, Aldegether's summary draws the distinctions by knowledge-based, society-based and individual-agency-based and resonates with Walker and Soltis' categorization of subject-centered, society-centered and individual-centered.

2.3. Models of General Education

Models of general education play a crucial role in structuring the core curriculum for undergraduate students. Several models have been identified and elaborated upon in the literature, each with its own advantages and challenges. This section summarizes different models of general education and their key features.

The liberal arts model emphasizes a well-rounded education in the humanities, social sciences, and natural sciences [22]. It originated from the classical curriculum of colonial colleges and focuses on subjects such as literature, history, philosophy, and foreign languages. However, it does not include distribution requirements in natural or social sciences. While this model develops critical thinking skills, it has been criticized for prioritizing subjects distant from the practical skills valued by employers [23].

The core model of general education assumes the existence of a discrete body of knowledge that every educated person should know [24–26]. It requires all students to complete a series of prescribed interdisciplinary courses outside their academic department. The core model promotes interconnections across different disciplines, diverse methodologies, and various ways of viewing the world. However, designing and sustaining these courses can be expensive, and students may struggle to see the benefits, particularly if they are more focused on their majors [26].

The distribution model requires students to take a certain number of courses in different subject areas, such as humanities, social sciences, and natural sciences [27]. This model aims to provide breadth and exposure to a wide range of ideas. It introduces students to various disciplines and their bodies of knowledge and methodologies. However, one challenge is that students may prioritize ease or schedule convenience over actual learning [26,28]. Students may also perceive these requirements as arbitrary hoops to jump through without clear value or connection to their personal or professional goals [29].

In the thematic model, courses are organized around a central theme or set of themes to provide students with a coherent and integrated education that helps them understand the connections between different subject areas. By structuring courses around a theme, it offers students the opportunity to explore a specific theme or set of themes in depth, while also gaining a broad understanding of various disciplines and perspectives [30].

The competency-framed model focuses on individual abilities and skills of learning and personal growth [24]. It emphasizes the development of specific competencies rather than the acquisition of specific content knowledge. This model allows for overlap with the requirements of the major and focuses on transferable skills. However, it presents challenges in determining the distinctiveness and necessity of general education courses outside the major, as well as coordination and communication between faculty and administrators [31].

In practice, many institutions employ a hybrid model that combines elements from different models to create a unique program that meets their specific needs. Hybrid models can include thematic strands, core-distribution approaches, or combinations of core, distribution, and competency elements [26,32]. These hybrid models aim to integrate different perspectives and requirements and provide students with a more comprehensive and personalized educational experience.

Overall, the selection of a general education model depends on the goals and values of an institution, as well as the desired outcomes for undergraduate students. Each model has its own strengths and weaknesses, and institutions often strike a balance by adopting a combination of models that best suits their educational philosophy and student needs.

2.4. Theoretical Framework

To gain insights into the organizational aspects of developing, implementing, and supporting general education programs in alignment with the university's overarching goals, this study employs Bolman and Deal's (1991) four frames of organizational thought, namely the structural, human resources, political, and symbolic frames, as its theoretical framework [33]. These frames offer distinct perspectives that shed light on the functioning of organizations and can be effectively applied to comprehend the nature and operation of general education. By using these frames, this study aims to gain a comprehensive understanding of how general education operates within an organizational context.

Structural frame: The structural frame emphasizes the importance of formal roles, responsibilities, and organizational structure. It views organizations as systems that adapt to their environment and allocate resources and responsibilities accordingly. In the context of general education, this frame suggests that colleges and universities have established goals and objectives, and the curriculum is structured to achieve those goals. General education courses provide a foundational knowledge base and ensure coordination and integration across different academic disciplines.

Human resources frame: The human resources frame focuses on the interdependence between individuals and organizations. It recognizes that organizations are composed of people with diverse needs, skills, and values. In the context of general education, this frame emphasizes the personal and professional growth of students. It seeks to align educational experiences with students' needs and values, allowing them to develop critical thinking, analytical skills, and informed value judgments. The human resources frame values relationships beyond formal organizational structures, encouraging students to engage in holistic learning experiences.

Political frame: The political frame views organizations as arenas where different interest groups compete for power and resources. It acknowledges the presence of conflicts and the diverse perspectives and needs among individuals and groups within an organization. In the context of general education, this frame recognizes the existence of power dynamics and the distribution of resources within educational institutions. It suggests that decision-making processes, resource allocation, and curriculum design can be influenced by various stakeholders, including institutional leaders, faculty, administrators, students, and external forces.

Symbolic frame: The symbolic frame emphasizes the social and cultural aspects of organizations. It recognizes that organizations are driven by symbols, rituals, ceremonies, stories, and myths. In the context of general education, this frame highlights the importance of the educational institution's culture, values, and history. General education serves as a manifestation of an institution's educational philosophy and reflects its distinctive characteristics. It may also be exploited as legitimacy or norms set by benchmark institution in the field. Symbolic elements, such as institutional traditions, educational experiences, and shared values, shape students' perceptions and contribute to their overall educational journey.

By employing Bolman and Deal's (1991) four frames, the analysis of general education can encompass the structural aspects of curriculum design and organizational goals, the interpersonal and developmental aspects of student growth, the power dynamics and resource allocation processes, and the cultural and symbolic elements that shape the educational experience. This multidimensional approach provides a comprehensive theoretical framework for examining general education and understanding its role within the larger educational landscape.

3. Research Methodology

The case study method is considered the most appropriate approach for this study, as it allows a detailed investigation of a specific social phenomenon in its real context [34]. For this study, a single case study design was chosen to comprehensively examine the development and support of institution-wide, individualized, and innovation-centered general education at a specific university where the authors are action researchers and can access the actual process of decision making and implementation. This approach aimed to gain a comprehensive understanding of the complex social phenomena involved in cultivating innovative talents at the case university.

3.1. Case Selection

The selection of Southern University of Science and Technology (SUSTech) as the case university for this study was based on its unique characteristics and its pioneering role in developing a comprehensive general education model. As a university entrusted by the Ministry of Education to explore the establishment of a modern university system and an innovative talent cultivation model, SUSTech differs from other Chinese universities in its emphasis on integrating general education throughout the institution to promote students' self-directed thinking. Located in Shenzhen, a city with a limited number of higher education institutions despite its large and young population and thriving economy, SUSTech was established to address the demand for fundamental research, high-level talent, and sustainable development. With the opportunity to start anew, SUSTech strives to become a world-class university by drawing from the best practices of excellent universities worldwide and attracting faculty members with extensive international backgrounds. SUSTech's success is evident in its rankings and reputation, attracting students with ever-improving academic preparation. While still in its nascent stage, SUSTech awaits the test of time to fulfill its mission of cultivating innovative talents who will grow into leading scientists and engineers.

3.2. Data Collection and Analysis

To ensure a comprehensive dataset to gain insights into the organizational aspects of developing, implementing, and supporting general education programs in alignment with the case university's overarching goals, multiple data collection methods were employed. (1) Various university documents were collected, including policies, strategic plans, regulations, and minutes of general education-related meetings. These documents offered insights into the formal roles, responsibilities, and organizational design of the general education program. They provided a foundational understanding of how the goals and objectives of general education were structured, as well as how resources and responsibili-

ties were allocated within the university environment. (2) External reports from reputable sources, such as university rankings and external quality evaluations, were gathered to display the external perceptions and recognition of the case university's general education initiatives. (3) The researchers employed a participant observation approach in which they directly observed the implementation of general education programs, interactions among institutional leaders, stakeholders, and the general environment and culture surrounding general education within the case university. (4) Focus groups and discussions involving faculty, administrators, and students were conducted in the university's natural setting to gain different perspectives and insights related to general education and to triangulate the findings the researchers had obtained from other data. By engaging these stakeholders, the interdependence between individuals and the organization was explored, allowing for a comprehensive understanding of personal and professional growth opportunities for students.

Data collected through various methods were rigorously analyzed and carefully integrated to gain a comprehensive understanding of the establishment and implementation of general education within the new research university. (1) University documents and external reports were subjected to a thorough content analysis. Recurring themes, goals, and strategies contained in these documents were identified. The structural and political frames were used to examine how the university formally outlined its approach and resources to general education. The insights gained in this part shed light on the goals and structural dimensions of the general education at the case university. (2) Participant observation data in the form of researcher notes, narrative descriptions, audio and video documents, and visual documents and comments were analyzed through iterative coding and thematic analysis. This qualitative approach allowed the researchers to gain a comprehensive understanding of the implementation of the general education program in the university context. Observations were viewed through the lens of both human resources and symbolic frames. The human resources frame shed light on how individuals' interactions and behaviors contributed to the program's effectiveness in fostering holistic student growth. The symbolic frame, on the other hand, provided insights into the cultural nuances and institutional values that manifested in the observed practices. The findings with this lens are presented in the implementation, structural, pedagogical, and integrative dimensions of the general education at the case university. (3) Data collected in the focus groups and discussions were subjected to thematic coding and qualitative analysis to identify recurring themes and underlying patterns in participants' narratives. Findings from the focus groups were viewed with structural, human resources, and symbolic frames to gain insights related to general education and to triangulate the findings that the researchers had obtained from other data.

Integrating data from these different sources was a meticulous process that involved triangulation to ensure credibility and validity. Findings from each method were cross-referenced to provide a nuanced and comprehensive understanding of the multiple dimensions of the general education program. Findings from university documents and external reports provided context for the observed practices and discussions. Similarly, participant observation and focus group data enriched each other by offering different perspectives on the same phenomenon. The integration of these data sources facilitated a holistic analysis that culminated in a coherent interpretation of the complex organizational dynamics that shape general education at the research university.

4. Research Findings

SUSTech stands as a unique example of this transformative approach to general education. Its methodology defies easy categorization because it goes far beyond the boundaries of conventional curricular discussions. Instead, SUSTech's general education embodies a multifaceted approach that is interwoven with the university's core missions and unique historical path and embedded in its own structure. Intricately serving multiple functions, SUSTech's general education program not only nurtures student learning but

also fosters communal well-being while integrating the institution's overarching mission into its educational endeavors. The result is a distinctive model that combines elements from multiple educational paradigms, as discussed in the literature review.

In order to gain insight into the organizational intricacies associated with designing, implementing, and sustaining general education initiatives that align with the overall goals of the university, a detailed description of SUSTech general education is used to provide readers with a clear picture. In order to comprehensively present the development, implementation, and support aspects of SUSTech's general education paradigm from an organizational perspective, the findings are structured into five dimensions that together comprise the description of SUSTech's general education.

- ◆ Goal dimension: innovation and excellence as drivers of institutional advancement;
- ◆ Implementation dimension: continuous exploration and adaptation;
- ◆ Structural dimension: a whole-institution approach;
- ◆ Pedagogical dimension: a student-centered approach;
- ◆ Integrative dimension: enriching the educational experience through a holistic, immersive approach.

This description of the different dimensions illustrates the complex interplay that makes up SUSTech's innovative approach to general education.

4.1. Goal Dimension: Innovation and Excellence as Drivers of Institutional Advancement

In 2009, Professor Qingshi Zhu embarked on his journey as the inaugural president of SUSTech following an extensive global search. An academician of the Chinese Academy of Sciences and a renowned higher education leader widely known for his reform mindset, President Zhu's vision for this new university was influenced by the famous question posed by Academician Xuesen Qian (1911–2009), a prominent scientist—"Why have Chinese schools rarely produced truly outstanding talents?" The so-called Qian's Question was raised in his meeting with the then Prime Minister Jiabao Wen and has ever since become the classical educational conundrum that has bedeviled Chinese educators. The question raised existing criticism about Chinese universities to a level that led to heated debates nationwide. In response, President Zhu declared that the mission of SUSTech is to answer Qian's Question by developing into one of the best universities in China that fosters real capabilities in students and trains them to be talent needed by the society upon their graduation.

In December 2010, the Ministry of Education approved preparations for the establishment of SUSTech and set a preparation period of three years. In April 2012, after concerted efforts by visionary SUSTech people, higher education leaders, and government leaders, the Ministry of Education approved the official establishment of SUSTech ahead of schedule and entrusted to SUSTech the two-pronged mission of "exploring the establishment of a modern university system" and "developing an education model for the cultivation of innovative talents". In parallel with the formal process of the Ministry of Education, SUSTech undertook action to form a legitimate mission statement for itself by deriving the key messages firstly from a meeting in December 2009 between President Zhu and Mr. Guiren Yuan, the then-minister of the Ministry of Education, and secondly from the national education reform policy, Outline of China's National Plan for Medium and Long-term Education Reform and Development (2010–2020) released in July 2010 [35]. In early 2012, the formal description about the University ran as follows:

South University of Science and Technology of China (SUSTC) (In English, the University was named by President Zhu as South University of Science and Technology of China. In 2016, the English name was officially changed to Southern University of Science and Technology in the term of the second president Professor Shiyi Chen.) is a higher education institution built with new thinking and mechanism in the backdrop of Chinese higher education reform and development and by the Shenzhen Municipal People's Government to implement the directives of "The Plan outline of the national

mid-term and long term education reform and development” and “The plan outline of the Pearl River Delta reform and development” (2008–2020).

SUSTC is an experiment in comprehensive reform for Chinese higher education and carries the significant mission to explore for an education model in China that cultivates innovative talent. . . SUSTC shall borrow from the education models of the world-class universities, innovate the system and mechanism for its operation. . . with goals and self-positioning to become an international high-level research university, and to become a key base for major scientific and technological research and the cultivation of excellent and innovative talents. (SUSTC, 2012)

Whether it is “truly outstanding talent” in Academician Qian’s terms or “real masters”, “excellent and innovative talent” in President Zhu’s terms, excellence and innovation have become the two key words that direct pathways for the education reform efforts at SUSTech, with the educational goals of raising leading scientists and engineers for the future. To realize this mission, the University decision-makers chose general education, which is intended to be both broad-based and individualized, as an important mechanism for coordinating curriculum, pedagogy, and administration. The characteristic of being broad-based was widely accepted at the time, thanks to China’s general education experiments in the former decades. The concept of individualized education arises from the belief that innovative talents should be able to think independently and ‘out of the box’, a quality not traditionally fostered by the basic education in China, where exams dictate what students learn and why, and students learn by drills and memorization of knowledge.

In response, SUSTech educators needed to address, first, in the education process how to help students find their real interests, increase their motivation to learn, and grow individually; and second, how to support students’ individual learning needs. In practice, they have found that the key is to guide students to find their own path based on knowing themselves and discovering their true passion. Personal commitment leads to engaged learning and thus to excellence. By devoting the first year or two of college to general education before deciding on a major, SUSTech students can make a choice rather than relying on a poorly informed decision about a major before entering college. To a certain extent, the experiment at SUSTech embodies the development of individual subjectivity and the cultivation of personhood.

The guiding principles of innovation and excellence permeate not only the pursuit of educational excellence but also the institutional growth of SUSTech. Since its birth, SUSTech has aimed to develop into a world-class university in a remarkably short period of time by breaking free from the constraints of established Chinese universities and by drawing inspiration from the best practices of excellent universities around the world. The opportunity to establish the university from scratch in the reform-minded and prosperous City of Shenzhen proved to be an advantage for SUSTech to create a high-level system that successfully supports its education ideas [36]. When President Zhu finished his term in September 2014, SUSTech had 107 faculty members in place, about 1000 undergraduate students, and 16 undergraduate degree programs.

During the term of President Shiyi Chen (2015–2020), SUSTech advanced upon the foundation laid by President Zhu. By the end of 2020, when President Chen finished his service, SUSTech had about 1000 faculty members, most of whom have extensive international backgrounds (50% tenure-line, close to 50% research track, and about 100 teaching track faculty members); 4374 undergraduate students, 3186 graduate students; 34 undergraduate degree programs that cover sciences, engineering, business, life science, and medicine; 8 master’s degree programs; 4 doctoral degree programs; and a revenue about 10 times of the 2014 revenue. The numbers demonstrate the leaping forward progress of the university, and quality is never neglected. All tenure-line faculty members are PhD holders, with more than 90% of them having overseas education and work experience, more than 60% of them from the world’s top 100 universities and about 28% hold a foreign passport. English is the instructional language on campus. The faculty body is capable of teaching in English,

conducting world-class research aided by international exchanges and collaboration, and is comfortable with student advising.

The success of young SUSTech is attested by rankings. According to the 2021 World University Ranking by Times Higher Education, SUSTech was ranked No. 8 among mainland Chinese universities with the highest publication quality in China and ranked 250–300 worldwide. In the QS 2021 World University Ranking, SUSTech was No. 14 among mainland Chinese universities and No. 1 in the student–faculty ratio. In the Shanghai Ranking 2020 for mainland Chinese universities, SUSTech was No. 8 for high-level academic hires. In *Nature Index 2020*, SUSTech ranked 15th in China, and 61st in the world.

The academic excellence of the faculty body and the elevated institutional reputation through world rankings reinforced the legitimacy of SUSTech’s educational innovation in the marketplace. Over the years, SUSTech has attracted students with better academic preparation and greater understanding of what SUSTech offers. By 2020, SUSTech students came from 22 provinces/directly administrated cities all over China. They are selected through a combined score consisting of the National College Entrance Examination score (60% of the total), a SUSTech administrated examination score (25% computer-based, multiple-choice examination and 5% interview), and high school performance record (10%). According to their standardized National College Entrance Examination scores, the students admitted by SUSTech are in the top 10% of high school graduates, and students enrolled from 10 out of the 22 provinces/directly administrated cities are in the top 1%. When they graduate, 1/3 of them go to overseas graduate programs, 1/3 to domestic graduate programs, and 1/3 to work in companies. Since the graduation of the first cohort, the University has adopted the practice of publishing reports or interviews of excellent graduates that review the trajectory of their college years, highlighting the connection of their personal growth and accomplishments with individual exploration enabled by university opportunities and resources. By giving special publicity to these high-achieving students, SUSTech sets examples for the student body to learn from and emulate. The students’ stories also attract prospective students who are drawn to the freedom and independence of a SUSTech education, and along with their parents, promote SUSTech’s market recognition, which in turn reinforces the innovative education efforts at SUSTech. By the summer of 2020, SUSTech had only six graduating classes. It awaits the test of time to see whether its goal of cultivating innovative talent to become leading scientists and engineers is to be fulfilled.

In retrospect, many factors have contributed to the miraculous success of SUSTech, which include, but are not limited to, the generous financial support from the municipal government, the continuous commitment of university leadership, the national ambition to develop world-class universities, and the overall ethos of the public in favor of aligning Chinese universities with the world’s top universities. SUSTech is the first mainland Chinese university in the People’s Republic of China to establish a collective Board of Regents for the presidential search, to reverse the brain-drain trend by hiring more than 90% of faculty members from around the world, and to adopt a college admission assessment mechanism that does not rely solely on the National College Entrance Examination. Many factors and institutional mechanisms support SUSTech in successfully implementing the talent cultivation goals articulated by older generations of educators [37]. The opportunity to start a university from scratch with no historical burden enables SUSTech to apply the most up-to-date knowledge about how to build a university for the future. General education functions as a lynch pin in SUSTech’s reform system and is linked to a variety of education mechanisms that perhaps develop separately at other institutions. To a certain extent, this study may argue that general education at SUSTech is both significant and tactical, like a stored solution that finds its problem [38].

4.2. Implementation Dimension: A Continual Exploration and Adaptation

SUSTech, a STEM (Science, Technology, Engineering, and Mathematics) university, is viewed as a pioneer in cultivating future leading scientists and engineers and a testbed for

higher education reform in China. General education plays a vital role in SUSTech's reform efforts, and defining its scope and content has been a critical issue from the beginning. SUSTech's curriculum designers studied the experience of general education in American and European universities, as well as the nature of STEM learning, to inform their decisions.

In developing the curriculum, SUSTech combined the traditions of liberal education in Europe with the models of general education in the United States. This entailed an amalgamation of classical literature, philosophical discourse, historical knowledge, language proficiency, skill cultivation, and interdisciplinary cognition. As a result, a set of attributes that SUSTech aspires to cultivate within its undergraduates crystallized: extensive knowledge about science and the world, an in-depth understanding of humanity, society, and history, and an ethical consciousness coupled with a sense of social responsibility.

The inceptive STEM-centric phase: The first phase of general education curriculum development at SUSTech involved a proactive five-year period of exploration in which the university embraced its identity as a preeminent STEM institution, inspired in part by the California Institute of Technology model. General education during this phase prioritized a comprehensive understanding of the scientific domain embodied in courses in calculus, linear algebra, physics, chemistry, biology, and computer science.

While STEM knowledge was emphasized, SUSTech also aimed to foster students' overall development by expanding their knowledge of the world and enhancing their intrapersonal intelligence. Because SUSTech initially had a limited number of faculty members in the humanities and social sciences, the university had to explore innovative approaches to teaching general education. This involved carefully selecting MOOCs (Massive Open Online Courses) and offering interdisciplinary courses delivered by guest faculty, which formed the core of the humanities, arts, and social sciences (HASS) curriculum during this period.

The evolutionary elaboration phase: The subsequent phase of general education development at SUSTech was marked by the blossoming of HASS offerings, the introduction of English medium instruction, level-appropriate STEM courses, and the integration of co-curricular education at the residential colleges for whole-person development. With an enlarged cadre of faculty, expanded course offerings, and increasing interdisciplinarity, the contours of general education were rapidly expanding. At this stage, SUSTech's aspirations resonated with the Stanford University model. Formative milestones encompassed the establishment of pivotal centers, including the Center for the Humanities, the Center for Social Sciences, the Center for Higher Education Research, the Center for Language Education, and the Arts Center, which eventually merged to form the College of Humanities and Social Sciences. These centers were instrumental in adding depth, diversity, and structural coherence to SUSTech's general education landscape. In addition, tiered STEM courses were introduced to accommodate the varying entry levels of students and the requirements of different degree programs. An example of this is the division of the course of Calculus into Mathematical Analysis, Calculus A, and Calculus B, to accommodate different academic backgrounds. Offering bilingual and English-medium classes encouraged individual academic challenges and strengthened students' future competitiveness. This phase also witnessed innovation in the prescribed political and moral education modules, culminating in the merging of co-curricular undertakings within SUSTech's residential colleges and the participation of esteemed scholars on the theme of "China and Modern Science and Technology". General education in this phase emphasized a comprehensive and individualized STEM foundation, interdisciplinary HASS engagement, innovative pedagogical approaches, and integrated ethical education, promoting students' autonomy in pacing their learning journey and fostering interdisciplinary intersections.

4.3. Structural Dimension: A Whole-Institution Approach

SUSTech takes an innovative and systematic approach to undergraduate education by carefully integrating general education courses with subject-specific content from different academic departments. This harmonious integration not only provides students with a

range of intellectually stimulating learning experiences, but also creates a deep sense of coherence throughout their academic journey. Characterized by a comprehensive, institution-wide structure, SUSTech's approach to undergraduate education underscores its commitment to nurturing well-rounded and capable graduates. This institutional philosophy manifests itself in the design of a four-year general education framework with special emphasis on the pivotal first year of study and the incorporation of residential college structures that prove to be powerful catalysts for students' holistic development. In addition, SUSTech employs a mixed-class course system that caters to both domestic and international students, which is a marked departure from the prevalent separate international college model adopted by other prominent Chinese universities.

Central to SUSTech's general education scheme is the pivotal first year, during which students begin their academic journey by enrolling in general education courses. This foundational phase not only stimulates intellectual curiosity, but also gives students the privilege of choosing a major at the end of their first year. A cornerstone of the general education curriculum is the STEM module, which takes on special importance during this initial stage of study. This module consists of a constellation of courses that include calculus, linear algebra, physics, chemistry, biology, and computer science—each of which is carefully tailored to meet the requirements of the various majors and serves as a foundation from which students can explore their academic interests and identify possible directions to help them make informed decisions about which major to pursue. The curriculum also includes a selection of general education courses offered by each degree program. These courses have been intentionally designed to extend beyond the boundaries of the chosen major and serve as a solid foundation for future interdisciplinary exploration, strengthening students' capacity for interdisciplinary innovation. After deciding on a major, students have the option of taking the science elective at their own pace.

In consonance with SUSTech's holistic vision, students must complete credit hours in the humanities module, the social sciences module, and the music and arts module. The humanities courses promote an understanding of a variety of classical Chinese and Western literary works and encourage students to critically interpret and analyze elements such as genres, thematic nuances, and historical contexts. By situating the humanities disciplines in their historical and cultural contexts, students are able to use this knowledge for creative thinking and effective problem solving. Courses in the Social Sciences module aim to provide an understanding of social and cultural diversity, social science theories, research methods, and the art of social research. This curriculum fosters critical thinking skills by training students to observe and analyze social phenomena with a discerning eye. The music and arts module emphasizes an appreciation of artistic expression and provides students with opportunities to interpret both traditional and contemporary artistic expressions. The module not only teaches interpretive skills, but also encourages student engagement with art forms such as music, drama, dance, and fine arts. Through this multi-faceted curricular approach, SUSTech students receive a comprehensive education that combines STEM fundamentals, language skills, humanistic insights, social science perspectives, and a cultivated appreciation for the arts. These interdisciplinary encounters foster the development of creativity, critical thinking, and problem-solving skills and prepare students for the diverse challenges of their future careers.

The essence of SUSTech education lies in the seamless interplay of general education and discipline-specific learning, resulting in a comprehensive and cohesive learning experience. This harmonization enables students to apply their acquired knowledge and skills both within and outside their chosen disciplines and to develop solutions to real-world problems in a variety of contexts. This integration, in turn, leads to holistic personal, professional, ethical, and intellectual development. The institutionalized system of general education supports students' development in their chosen fields of study and beyond by providing them with required and elective courses that promote the acquisition of comprehensive knowledge and skills, advance the development of a growth-oriented mindset, and facilitate holistic personal maturation.

Complementing this educational paradigm are the residential colleges that serve as focal points for students' holistic development. These residence colleges go beyond mere housing and become the core of students' personal and communal development. In this supportive environment, students participate in interactive, extracurricular learning activities and mature cognitively, emotionally, and socially. Each SUSTech student is assigned to a residential college and is matched with a faculty advisor through a mutual selection process. These college life advisors, who are distinguished faculty members themselves, provide advice drawn from their academic backgrounds and life experiences, and often serve as exemplary role models for their advisees. To facilitate this interactive type of college education, SUSTech maintains a favorable faculty–student ratio of 1 to 10 to ensure that each student receives the attention and support they need.

The mission of SUSTech's residential colleges extends beyond the functions of housing and personal counseling to educating students to become proactive agents who can contribute positively to society. The colleges are crucibles that foster students' social development by having all students participate in various social practice projects. These initiatives are an integral part of the moral education module within the general education curriculum and are worth five credits. In collaboration with academic units, the residential colleges design and implement hands-on learning experiences that provide students with a conducive environment to explore their interests, enhance their self-awareness, promote social responsibility, and provide them with lifelong learning skills through collaborative learning, extracurricular engagement, special interest groups, and joint endeavors. The residential colleges are also crucibles for esthetic education, which manifests itself in the various student clubs and societies in the areas of chorus, theater, dance, folk music, symphony, and fine arts. Each residential college maintains its own constellation of clubs and encourages students to cultivate their sense of beauty in various artistic dimensions.

The particular structural dimension of SUSTech's general education focuses on an all-encompassing institution-wide framework. This structural innovation underpins a commitment to comprehensive student development that is supported by the residential college paradigm that promotes holistic student development. SUSTech's overarching ethos is complemented by a course system that accommodates both domestic and international students. SUSTech's general education model is characterized by its flexibility, offering students the freedom to choose courses and classes taught in both bilingual and English formats. In a departure from the traditional approach, SUSTech does not mandate the completion of the entire general education package within the first year. Instead, students are free to take the general education courses in any semester, with the exception of the GE science module, English and Chinese writing courses, and courses required by the Ministry of Education. This academic flexibility is underpinned by the principle that "all courses are open to all students in all programs". This approach gives students the opportunity to design their own knowledge framework and shape their learning path according to their individual needs.

4.4. Pedagogical Dimension: A Student-Centered Approach

In discussions of general education, less attention is paid to the pedagogical aspect compared to curriculum design. However, pedagogy plays a critical role in establishing an emotional and intellectual connection between students and their educational experiences. At SUSTech, general education is underpinned by a student-centered pedagogical approach in which various components harmonize to create an integrated learning environment.

At the core of SUSTech's educational framework are carefully structured courses within the science module. These courses are strategically designed to provide step-by-step challenges that are aligned with the mathematical prerequisites of the various majors. This curriculum serves a dual purpose: it encourages students to explore their potential and prepares them for specialized courses of study. Courses in physics, chemistry, biology, and computer science are carefully tailored to different levels of complexity and address the specific pedagogical goals and content intricacies of each area. Advanced courses are

closely aligned with their respective disciplines, while subjects less related to upcoming academic paths are designed to foster a broader understanding and engagement with scientific and technological fields.

In the humanities, social sciences, arts, and foreign languages, SUSTech employs innovative and student-centered teaching methods. These approaches foster versatile problem-solving skills, effective communication, and the transfer of knowledge to new contexts. Small class sizes are maintained in language courses to meet individual learning needs and promote meaningful interactions with instructors and fellow students. Interdisciplinary general education courses such as “Language and Science”, “Interdisciplinary Solutions to Engineering and Social Problems”, “Art Design from Theory to Practice”, “Science in Science Fiction”, and “Innovative Space Design” are designed to challenge students’ understanding of real-world challenges, foster hidden talents and interests, increase self-confidence, and stimulate introspective thinking.

These pedagogical strategies transform the various components of general education at SUSTech into a coherent body of knowledge that promotes advanced cognitive skills. Students’ academic journeys are linked to critical issues that are supported by wise advising and careful mentoring. Academic planning, career development, course selection, choice of a major, research initiatives, social practices, internships, and senior theses are enclosed in a framework of thoughtful advising. The declaration of a major takes on special significance, allowing students to refine their choices and solidify aspirations. Comprehensive support mechanisms facilitate exploration during the freshman year, with STEM courses and introductory offerings providing the foundation for an informed choice. SUSTech’s overarching philosophy accommodates missteps and redirections, with courses for graduation and major declaration spanning both semesters, providing flexibility for up to six years to graduate.

At the heart of SUSTech’s general education structure is the dual-advisor system, which provides personalized and comprehensive support. Each student is served by two advisors: a college advisor during general education and an academic advisor when deciding on a major. Residential college advisors guide students towards discerning decisions during major declaration. College advisors assist with course selection prior to deciding on a major and continue to provide academic advising after a student has decided on a major. Faculty mentoring in the residential colleges may take a variety of forms, but it is accompanied by a minimum advising load of 50 h per year and a clearly defined advising protocol. Each of SUSTech’s six residential colleges consists of faculty members from different departments and organizes a range of activities to facilitate the transition of new advisors into their roles and to foster communities of practice to promote effective student advising. A “College Advisor of the Year” Award is presented each year to recognize outstanding advising performance.

At SUSTech, there is an additional layer of mentoring provided by academic advisors who offer guidance and supervision specifically related to degree programs. In some cases, college advisors also serve as academic advisors for students in their respective departments. Hence, the term “dual” applies to both students and advisors: students have dual advisors, while faculty members undertake the dual responsibility of general college life advising and discipline-specific academic advising. Both college advisors and academic advisors act as mentors with a comprehensive understanding of student development. They work closely with residential colleges, academic departments, and administrative offices to provide students with individualized and effective advising.

4.5. Integrative Dimension: Enriching the Educational Experience through a Holistic, Immersive Approach

The integrative dimension of SUSTech’s general education reflects the institution’s commitment to creating a diverse and connected learning environment. This dimension includes the integration of student research, study-abroad programs, and a new engineering education system that pushes the boundaries of general education.

A. Student research

Involving students in research projects is an important component of SUSTech's general education curriculum, even though it is not a required course. Undergraduate research, which includes independent investigations or research that contributes original findings to specific areas, is an integral part of SUSTech's pedagogical approach. SUSTech offers a wide range of opportunities for student involvement in research and encourages engagement through a variety of channels, forms, and methods. Students are encouraged to explore their research interests in depth and engage in dialogue with their advisors. Following required approvals, advisors facilitate early participation in laboratory observations to foster a hands-on, experiential understanding of critical thinking and problem-solving methods.

Many students subsequently embark on independent explorations by formulating their own research questions. These endeavors are supported by their advisors and can be pursued in a variety of ways, including undergraduate research projects offered by their respective departments, College Students Innovation and Entrepreneurship Projects, and other independent student research initiatives. It is common for SUSTech undergraduates to participate in their advisors' research teams, allowing them to engage in research under the guidance and supervision of experienced researchers. Some students even discover their interests and potential career paths through these research experiences, with initial results often being incorporated into their senior theses.

Following the declaration of their majors, conducting research projects under the guidance of advisors becomes a mandatory part of the degree program to foster a scholarly inquiry process that involves investigating, evaluating, creating, and disseminating knowledge or work aligned with the practices of the respective disciplines. Collaboration among students from different disciplines in undergraduate research is actively encouraged at SUSTech. The College Students Innovation and Entrepreneurship Projects program plays an important role in selecting, funding, and supporting approximately 120 undergraduate research projects each year, involving approximately 400 students. These projects emphasize originality, innovation, and in some cases, entrepreneurship, leading to the publication of research results in prestigious academic journals or the transformation of results into entrepreneurial products.

From an educational standpoint, engaging in research offers unique opportunities for students to learn and apply scientific principles. Through active participation in research, students develop scholarly thinking, hone their exploration and communication skills, and gain experience in project management, problem solving, research budgeting, proposal writing, and the complete research process. Additionally, research experiences have the potential to reshape students' perceptions of science and significantly influence their future career. Ultimately, undergraduate research at SUSTech serves not only to deepen students' academic understanding in their chosen disciplines but also to enable them to acquire a comprehensive skill set and broaden their horizons, preparing them for a successful future in their respective fields.

B. Study-abroad programs

Study-abroad programs are an important component of SUSTech's general education. One of the key objectives of undergraduate education at SUSTech is to equip students with the essential qualities they need to become global-minded and pioneering scientists and engineers in the future. Studying abroad serves as a crucial pillar and mechanism to foster students' global outlook. The study-abroad programs offered at SUSTech encompass a wide range of options, including summer/winter programs, research camps, semester/year-long exchange programs, and dual degree programs. Since their inception in 2015, more than 2000 students have participated in and benefited from these programs.

These study-abroad programs have a wide variety in terms of their objectives, content focus, duration, formats, partner institutions, and disciplinary areas. At the university level, comprehensive support and encouragement are provided to undergraduate students throughout their study-abroad journey. This support includes assistance with scholarship

applications, selection of partner universities, project design, development and confirmation of study plans, credit transfer processes, and opportunities for sharing experiences upon return. The benefits of participating in study-abroad programs go beyond enhancing global awareness and academic learning. They also encompass the development of leadership skills, personal growth, and the acquisition of greater cultural competence.

Analysis of students' self-reports following their completion of study-abroad programs reveals significant progress in several areas. These developments include, but are not limited to, improved academic skills, language acquisition, deeper understanding of scientific concepts, enhanced academic planning skills, self-discovery, social identity formation, critical thinking, and emotional growth. These findings underscore the transformative impact of study-abroad experiences on SUSTech undergraduate students.

C. New engineering education system

The integration of a new engineering education system at SUSTech plays a crucial role in expanding the scope of general education beyond traditional boundaries. As a STEM-focused university, SUSTech attracts a significant number of students to its engineering programs. The adoption of the new engineering education mode serves as a driving force for the advancement and innovation of undergraduate general education at the institution.

Under this educational approach, students are given more autonomy to shape their individual knowledge and skill structure. They have access to abundant resources and interdisciplinary learning opportunities that allow them to define their own learning content and pace. The new engineering education model goes beyond traditional approaches by placing a strong emphasis on addressing complex societal needs. It recognizes the importance of understanding the needs of people and society, which requires a comprehensive and integrative approach that goes beyond discipline-specific education.

The general education modules, particularly in the humanities, social sciences, arts, ethics, integrative residential college education, and student research project schemes, collectively contribute to preparing engineering students to benefit fully from the new engineering education at SUSTech. These modules promote a holistic and coherent learning experience that enables students to engage with diverse perspectives and develop the skills needed to meet the challenges of the 21st century.

By integrating general education with the new engineering education system, SUSTech creates a student-centered and future-oriented approach that effectively addresses societal, environmental, and technological challenges. This integration creates a novel paradigm for college learning that promotes curricular coherence, interdisciplinary connections, and a focus on imagination, creativity, and innovation.

Over a decade of rigorous experimentation and development, SUSTech has developed an innovative and comprehensive general education system that incorporates multiple components. This system seamlessly integrates a well-rounded curriculum, individualized curricula, and an integrated residential college education. Its primary goal is to foster students' exploration of their inherent capabilities, cultivate their ability to think beyond their specialized areas, and equip them with essential skills for lifelong learning and critical thinking. Noteworthy characteristics of SUSTech's general education include its institution-wide approach, seamless integration with students' major declaration and learning processes, student-centered pedagogy, a versatile residential college co-curriculum system, and an extensive support system.

5. Discussions

In China, the last decade has witnessed a significant rise in higher education programs focusing on general/liberal education, which adopt a holistic educational philosophy and aim to equip lifelong learners with integrated knowledge and a sense of social responsibility. This shift represents a departure from the traditional utilitarian Chinese curricula that prioritized specialized professional training [39]. It also displays some of the reform efforts by education leaders to overhaul China's higher education institutions. The general education curriculum plays a pivotal role in instilling educational values and aspirations,

incorporating perspectives from various stakeholders, and encompassing social, cultural, economic, and governmental factors [27].

In response to these evolving global trends and the aspiration of becoming a world-class university, the case university of this study has embarked on a comprehensive and innovative journey to establish a robust general education system. Over the course of a decade, SUSTech has undertaken rigorous experimentation and development to create a holistic educational experience for its undergraduate students. This system integrates various components to provide students with a well-rounded education that extends beyond their specialized areas of study. The primary focus of SUSTech's general education approach is to foster students' exploration of their inherent capabilities and nurture their critical thinking skills. This is accomplished through the implementation of a well-rounded curriculum, personalized learning, and an integrated co-curricular education.

SUSTech's general education system stands out due to its institution-wide approach, which ensures that the principles and goals of general education permeate every facet of the university. The system seamlessly aligns with students' major declaration and learning processes, creating a cohesive educational pathway that connects different disciplines and areas of study. By adopting a student-centered pedagogy, SUSTech empowers students to actively shape their learning experiences and align their education with their individual interests and aspirations.

Complementing the academic aspects of general education, SUSTech enhances the overall educational experience through its residential college co-curricular system. This system provides students with a versatile platform for experiential learning, leadership development, and cultural immersion. Through a wide range of co-curricular activities, students broaden their perspectives, expand their networks, and develop essential life skills that complement their academic endeavors.

Students are supported throughout their general education journey by a comprehensive support system provided by SUSTech. This includes a 1:10 to 11 faculty-to-student ratio, faculty time protected by on-campus housing, and mentoring, guidance, and resources from advisors who help students in navigating their academic and personal development. This is to ensure that students receive the support they need to maximize their general education experience and reach their full potential.

In examining the implementation of general education at SUSTech, the theoretical framework proposed by Bolman and Deal (1991) in their four frames of organizational thought—the structural, human resources, political, and symbolic frames—provides a valuable lens [33].

From a structural frame perspective, SUSTech's general education system takes an institution-wide approach that ensures that the principles and goals of general education permeate every facet of the university. This structural design allows for a cohesive and interconnected educational journey that is integrated with students' major declaration and learning processes. By embracing a student-centered pedagogy, SUSTech empowers students to actively shape their learning experiences and align their education with their individual interests and aspirations.

From a human resources frame perspective, SUSTech's general education system emphasizes personalized study plans that enable students to make choices and explore interdisciplinary perspectives. This approach recognizes the interdependence between individuals and organizations and provides students with abundant resources and opportunities to engage in interdisciplinary learning and to determine their own learning content and pace. The system promotes the development of critical thinking, analytical skills, and informed value judgments, and encourages personal and professional growth supported by formal organizational structures.

From a political frame perspective, SUSTech's general education system has been consistently maintained by university leadership and recognizes the diverse perspectives and needs of stakeholders. The system encourages collaboration among different academic departments, facilitates interdisciplinary learning, and promotes a holistic educational

experience. The residential college co-curricular system, serving as a symbol of the political frame, provides students with a platform to engage in experiential learning, leadership development, and cultural immersion. This system promotes social and intellectual growth by integrating domestic and international students into a unified educational environment. By embracing this inclusive approach, SUSTech enhances students' understanding of different perspectives and cultivates a collaborative spirit, laying the foundation for a well-rounded education.

From a symbolic frame perspective, SUSTech's general education system acknowledges the social and cultural dimensions of education. The system incorporates various mechanisms identified as successful practice in the world's top colleges and universities, including residential colleges, dual-advisor mentorship, freedom in course selection and major declaration, the integration of general and major education, and student research support. These elements play a significant role in shaping students' perceptions and contributing to their overall educational experience. By incorporating rituals and shared experiences, SUSTech creates an inclusive and supportive environment that goes beyond mere rules and policies. This fosters a strong sense of belonging and identity among students and enhances their engagement and personal growth.

While SUSTech's general education system represents an innovative and comprehensive approach, there are areas that require attention and improvement. Striking a balance between general education and major-related studies is crucial, as faculty concerns about the heavy load of general education courses and their potential impact on specialized learning should be addressed. Clear communication of learning outcomes is essential to enhance student engagement and motivation. Additionally, adopting a comprehensive and systematic assessment framework that encompasses the entire general education system will provide valuable insights into its effectiveness and facilitate continuous improvement.

SUSTech's implementation of general education serves as an innovative and pioneering experiment in the Chinese higher education landscape. By bridging the gap between general and specialized education, SUSTech prepares its students to become self-directed thinkers capable of making informed decisions based on broad knowledge and reasoned ideas. The university's commitment to general education aligns with the national demand for innovative talents and its dedication to educating a new generation of leaders for scientific and technological advancements.

6. Conclusions

SUSTech's journey in developing and implementing a robust general education system implies the importance of taking an institution-wide approach and adopting an innovation-centered perspective. By ensuring the integration of general education principles and goals across all aspects of the university, SUSTech creates a cohesive and interconnected educational pathway for students. The innovation-centered approach at SUSTech imparts a liberal sense to general education by empowering students to become self-directed thinkers with inquiring minds and the intellectual tools to think independently. By focusing on awakening students' self-awareness, interests, passions, and visions for the future, SUSTech cultivates students who are able to make personal decisions based on broad knowledge, well-reasoned ideas, and values.

This case study of SUSTech also demonstrates the importance of educational ideas of institutional leadership, organizational support, systematic design, concerted effort, and financial support in creating a successful general education system. While the specific pathway of SUSTech may not be easily duplicated in other universities, it can serve as a reference point, an inspiration, and a catalyst for fundamental and systemic reform and innovation in the broader higher education landscape. By sharing the implementation of general education at SUSTech, this case study makes an original contribution to the practice of general education, both among Chinese universities and globally. It serves as a stimulus for open discussions among researchers and practitioners in higher education

and promotes the exploration of innovative approaches to general education that meet the evolving needs of students and society.

In conclusion, this case study of SUSTech's general education system demonstrates the importance of an institution-wide approach, an innovation-centered perspective, and the integration of broad-based and individualized learning. Lessons learned from the SUSTech experience contribute to the broader discourse on general education and can inspire universities to transform their educational practices and prepare students to become innovative, self-directed thinkers capable of meeting the challenges of the future.

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References

1. Hayhoe, R. *China's Universities, 1895–1995: A Century of Cultural Conflict*; Garland: New York, NY, USA, 1996.
2. Yang, J. *University General Education Curriculum: Reference and Enlightenment*; Shanghai Jiaotong University Press: Shanghai, China, 2009.
3. Chen, X. *Searching for a General Education Model in the University—A Case Study of the Yuanpei Program in Peking University*; Education Science Press: Beijing, China, 2008.
4. Cao, L. The Significance and Practice of General Education in China: The Case of Tsinghua University. In *Experiences in Liberal Arts and Science Education from America, Europe, and Asia: A Dialogue across Continents*; Kirby, W.C., van der Wender, M., Eds.; Palgrave Macmillan: New York, NY, USA, 2016; pp. 33–46.
5. Ma, Y. Liberal Arts (General) Education in Chinese Universities: Concepts and Practices. *Chin. Educ. Soc.* **2018**, *51*, 1–8. [CrossRef]
6. Boyle, M. Global liberation education: Theorizing emergence and variability. *Res. Comp. Int. Educ.* **2019**, *14*, 231–248. [CrossRef]
7. Yan, K.; Zhang, Y. The tensions of general education reform in China. *Asia Pac. Educ. Rev.* **2022**, *23*, 1–12. [CrossRef]
8. Cheng, B.; Zhang, D. Cultivating citizens with confusion cosmopolitanism: Defining the purpose of liberal arts education in the Asian context. *Front. Educ. China* **2020**, *15*, 564–587. [CrossRef]
9. Newton, R.R. Tensions and models in general education planning. *J. Gen. Educ.* **2000**, *49*, 165–181. [CrossRef]
10. Peterson, P. Liberal education in the global perspective. *Int. High. Educ.* **2011**, *62*, 10–11. [CrossRef]
11. Banta, T.W.; Mzumara, H.R. Assessing information literacy and technological competence. In *Assessing Student Achievement in General Education*; Banta, T.W., Ed.; Jossey-Bass: San Francisco, CA, USA, 2007; pp. 30–34.
12. Bresciani, M.J. *Assessing Student Learning in General Education: Good Practice Case Studies*; Anker Publishing Company: Bolton, MA, USA, 2007.
13. Wehlburg, C.M. Integrated general education: A brief look back. *New Dir. Teach. Learn.* **2010**, *2021*, 3–11. [CrossRef]
14. Association of American Colleges and Universities. What Is Liberal Education? 2020. Available online: <http://www.aacu.org/leap/what-is-a-liberal-education> (accessed on 10 October 2022).
15. Gaston, P. *General Education Transformed: How We Can, Why We Must*; Association of American Colleges and Universities: Washington, DC, USA, 2015.
16. Bok, D. *Higher Education in America*; Princeton University Press: Princeton, NJ, USA, 2013.
17. Lewis, H.R. *Excellence without a Soul: How a Great University Forgot Education*; Public Affairs: New York, NY, USA, 2006.
18. Rhodes, T. General education reform processes: A national and international perspective. In *Transforming Institutional Culture in Higher Education: A Process Approach to General Education Reform*; Gano-Phillips, S., Barnett, R.W., Eds.; Atwood: Madison, WI, USA, 2010; pp. 239–257.
19. Menand, L. *The Marketplace of Ideas: Reform and Resistance in the American University*; W.W. Norton: New York, NY, USA, 2010.
20. Walker, D.F.; Soltis, J.F. *Curriculum and Aims*; Teachers College Press: New York, NY, USA, 1997.

21. Aldegether, R.A. What Every Student Should Know: General Education Requirements in Undergraduate Education. *World J. Educ.* **2015**, *5*, 8–14. [CrossRef]
22. Rothblatt, S. General education on the American campus: A historical introduction in brief. In *Cultural Literacy and the Idea of General Education*; Westbury, I., Purves, A.C., Eds.; National Society for the Study of Education: Chicago, IL, USA, 1988; pp. 9–28.
23. Collins, R. Some comparative principles of educational stratification. *Harv. Educ. Rev.* **1977**, *47*, 1–27. [CrossRef]
24. Allen, M.J. *Assessing General Education Programs*; Wiley/Jossey-Bass: San Francisco, CA, USA, 2006.
25. Bennett, W. *To Reclaim a Legacy: A Report on the Humanities in Higher Education*; National Endowment for the Humanities: Washington, DC, USA, 1984.
26. Hanstedt, P. *General Education Essentials: A Guide for College Faculty*; Jossey-Bass: San Francisco, CA, USA, 2012.
27. Zai, R., III. Reframing General Education. *J. Gen. Educ.* **2015**, *64*, 196–217. [CrossRef]
28. Ewell, P. *General Education and the Assessment Reform Agenda*; Association of American Colleges and Universities: Washington, DC, USA, 2004.
29. Bauerlein, M. The State of General Education. *Chronicle of Higher Education*. 2009. Available online: <http://chronicle.com/blogs/brainstorm/the-state-of-general-education/7899> (accessed on 15 April 2020).
30. Mintz, S. Transforming General Education. *Inside Higher Education*. 2020. Available online: <https://www.insidehighered.com/blogs/higher-ed-gamma/transforming-gen-ed> (accessed on 30 August 2022).
31. Katz, S.N. Liberal education on the ropes. *Chron. High. Educ.* **2005**, *51*, B6–B9.
32. Flaherty, C. Variations on a Theme: Colleges Look to “Pathways” to Enhance General Education. 2014. Available online: <https://www.insidehighered.com/news/2014/01/27/colleges-look-pathways-enhance-general-education> (accessed on 10 October 2022).
33. Bolman, L.G.; Deal, T.E. *Reframing Organizations: Artistry, Choice, and Leadership*; Jossey-Bass: San Francisco, CA, USA, 1991.
34. Yin, R.K. *Case Study Research: Design and Methods*; Sage: Newcastle upon Tyne, UK, 2009.
35. China Central Government. *Outline of China’s National Plan for Medium and Long-term Education Reform and Development*; China Legal Publishing House: Beijing, China, 2010.
36. Chen, S. The role of a rising university in an emerging international metropolis. In *The University at the Crossroads to a Sustainable Future*; Weber, L.E., van der Zwaan, B., Eds.; The Glion Colloquium: Geneva, Switzerland, 2020; pp. 79–88.
37. Pan, Y.; Lu, Y.; Han, Z.; Lv, W.; Wu, J. Twenty Years of Exploration and Practice in Cultivating Top Innovative Talents. *Chin. Univ. Teach.* **2005**, *11*, 21–23.
38. Cohen, M.; March, J.; Olsen, J. A Garbage Can Model of Organizational Choice. *Adm. Sci. Q.* **1972**, *17*, 1–25. [CrossRef]
39. Godwin, K.A.; Pickus, N. China’s Opportunity: Recommendations for Liberal Arts Innovation. *Int. High. Educ.* **2018**, *93*, 27–28. [CrossRef]

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Article

Using Big Data for Educational Decisions: Lessons from the Literature for Developing Nations

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Abstract: Educational leaders from developing countries may be tasked with using big data to help inform educational decisions. Although many researchers have explored how to use big data or datasets to help solve educational problems, few studies have articulated how educational researchers and leaders from developing nations can use big data to make educational decisions. This study provides a literature review and takes a position to help educational leaders from developing nations use big data to make educational decisions and understand the strengths and weaknesses of using data to drive decision making. Moreover, this study addresses how datasets may be limited and how educational leaders can understand these limitations when using big data.

Keywords: education; datasets; big data; decision making; developing nations; equity

1. Introduction

Although its definition continues to change as the technological ecosystem changes, big data can be referred to as “data that is so large, fast or complex that it’s difficult or impossible to process using traditional methods” [1] (para. 1). Famed data analytics guru Doug Laney conceptualized big data into three Vs: volume, velocity, and variety. Volume refers to how organizations gather data from a variety of sources, including computers, smart devices, cameras, social media platforms, and many others. In education settings, educators often gather data from student interactions with curricular materials across many of these sources, not to mention the data gathered by educational leaders at the school, district, region, or national level. The second V, velocity, refers to the growth of the Internet’s integration with everyday devices and processes, such as e-books with embedded Internet resources. The velocity of big data requires organizations to be nimble and flexible, as data can be captured—or lost—at unprecedented speed, if the organization has adequate data collection and storage capacity. Finally, the third V—variety—implies that data can come in many different formats, from traditional databases of information in columns and rows to highly disorganized and unstructured data [2], such as multimedia, global positioning system (GPS) information, or Microsoft PowerPoint files. This variety places educational organizations in difficult positions, as educational organizations are resistant to change given their bureaucratic nature, with many organizations only able to analyze more traditional data in traditional ways.

Despite the traditional nature of education, the era of big data has arrived in the field of education on a global scale. As the Internet became widely available to educational organizations in the 1990s and online education has exploded in growth and popularity since 2000, many educational leaders and policymakers now have access to more data than ever before [3]. As a result, both governments and educational organizations have made considerable efforts to use large datasets to make educational decisions, including those

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related to curriculum and instruction, program development, policy advocating, resource allocation, and countless other educational decisions [4–7].

However, as data is continuously created, collected, and analyzed by educational researchers, those collecting it may reach a point of diminishing returns: How much data is too much? And in an era where nearly everything can be observed and digitally documented, when do educators reach a point of data exhaustion and overload? In a discussion of big data in business circles, data analysts often say you cannot manage what you do not measure [8], but surely the inverse is also true: You cannot measure what you cannot manage. Educational leaders and policymakers face this challenge in many aspects of their operations, as many educational systems in developing nations may be in their nascent stages of conceptualizing data collection, much less engaging with big data analytics.

Moreover, the utility of big data requires both a technical expertise and a level of communication that many bureaucratic educational organizations simply may not possess, especially in under-resourced developing nations. Here, educational organizations in developing nations are placed in an interesting position, as data is now more available than ever from a wide variety of sources and stakeholders, and this data could prove transformative in the efforts that organizations make to become more efficient and effective for their students. However, developing nations with limited human and financial capital, complex bureaucratic organizations, and limited technical capacity may need to catch up to the speed in which big data has advanced and will continue to do so.

Additionally, the arrival of neoliberal policies and agendas in many developing nations has placed educational organizations in difficult positions regarding the country- and local-level allocation of resources, both human and financial. Core tenets of neoliberalism—including the privatization of public functions, the deregulation of industry, and reductions in spending on public initiatives—has been felt in educational contexts within developed and developing nations. As a result, many developing nations may have limited human and financial resources than their peers, with this stratification and inequity exacerbated by neoliberal policies enacted by national or local governments.

From here, this discourse provides an overview of how educational organizations have strategically utilized and benefited from data-driven decision-making using large educational data sets. Additionally, this review will outline several drawbacks and ethical concerns of using big data sets in education, including how uncertainties in human and financial capacity as well as limited technological capability may hinder developing nations who desire big data to make decisions but are not in the position to do so. Furthermore, accountability systems at the national, state, and local levels within developed nations have become more technologically advanced as data continues to become increasingly available and abundant. Subsequently, educational leaders and policymakers from developing nations must understand how big data sets have been used in the past and how these leaders can develop the organizational capacity to use the data to improve the lives of students and the communities to which they belong.

2. Benefits of Big Data in Education

Research has suggested that the appropriate engagement with big data can be a force for educational equity, evidenced by countless studies where educational stakeholders have engaged with complex data sets to identify equity gaps and improve teaching and learning and student outcomes [3–7,9–14]. The benefits of big data utility are multifarious, and the following sections will outline several crucial benefits for developing nations seeking the ability to make large-scale data-informed decisions.

2.1. Individualization through Data-Informed Teaching and Learning

As many researchers argue, the primary function of education is teaching and learning, and many scholars have pointed to the utility of big data as a driver of the improvement of teaching and learning at all levels of education. Schildkamp et al. reasoned that as schools

are increasingly held more accountable for student learning, countless school districts in developed nations have used local or regional data sets to improve the manner in which students are oriented with curricular materials and how teachers are prepared for the classroom by post-secondary institutions [13]. Nazarenko and Khronusova explained that there are “incredible opportunities for individualization and personalization of the student’s path to content mastery based on adaptive learning or competency-based education” [15] (p. 676), as schools in developed nations often have access to increasingly technologically advanced modes of content delivery, and thus access to even more data to make even more decisions.

Moreover, Nazarenko and Khronusova have explained that teachers and administrators would likely have ample data to target educational inequities, such as the challenges faced by students with disabilities. Here, the authors reasoned that schools could provide “targeted interventions to improve student’s success and to reduce overall costs to students and institutions” [15] (p. 676). In the Australian context, the national government has engaged with big data analytics to provide teachers and administrators with information to personalize learning to align with national policies related to teacher and school effectiveness, including the stemming of educational inequities [16].

Wang went into further detail, explaining that schools can move far beyond “student demographics, test scores, and psychological questionnaires” toward more fine-grained data collection methods, such as “computer mouse clicks, number of attempts, learning browsing patterns, online chats, discussion forum participations, and visual and facial reactions” [3] (p. 382). Although these approaches require technologically mediated education, the technology exists to equip classrooms with cameras and tracking devices to allow teachers to understand when students are on task and how efficient and effective their teaching style is for diverse learners [3]. Furthermore, the expansion of mobile devices and “bring your own device” initiatives has greatly expanded the walls of the classroom, allowing schools to understand not only which technologies are best for student learning and teaching by faculty, but administrators can also understand which type of hardware is most conducive to effective teaching and learning [3,6]. This insight can be facilitated by capturing and analyzing big data to inform a wide variety of teaching and learning subjects such as student attention, teacher effectiveness, relationship development, assessment types and strategies, and a plethora of others.

2.2. Broader Generalizability

Big data can also facilitate opportunities for the cross-organizational analysis of educational functions, as many researchers have suggested that big data allows for greater generalizability so that other organizations can learn from each other, especially if these organizations serve similar populations in similar geographic areas [3,17].

For instance, Crossley specifically spoke about how data can be transferred internationally to allow educational research in one nation to inform the policies and practices of education in another nation. This can be an especially important technique for developing nations where human and financial resources are limited. As Crossley explained, “With references to my own work in Kenya and Tanzania . . . carried out by African researchers, perhaps in partnership with international colleagues, has much to offer, if a greater proportion of educational reform initiatives are to be translated into successful practice” [17] (p. 22). In this instance, developing nations were able to learn from each other’s big data and recapture limited human and financial resources related to big data capture and analysis.

Wang also spoke to the nature of big data as facilitating generalizability, as they argued that big data often informs educational policy through mass communication over websites and through social media. As an emerging form of big data, educational policymakers can now understand public sentiment and access trend-related data to best understand how students, teachers, and other stakeholders feel toward educational policies or identify educational inequities [3]. Wang argued that this form of big data allows for generalizability, as the internet and communication technologies allow many different stakeholders to have

a public-facing voice on issues facing educational institutions [3]. Although beyond the traditional student demographics and test scores to inform policy, Wang suggested that innovative and new forms of communication can allow for educational leaders to analyze big data to generalize public sentiment and inform educational policy toward equity [3].

2.3. Accountability and Measurement

Many regions and developing nations often lean on big data for accountability and measurement purposes [6,13]. At the higher education level, Macfadyen et al. reasoned that, “in the complex systems of higher education, current performance assessment and accountability policies may be the forces driving the continued focus on high-stakes testing as a means of producing comparative institutional data, despite the well-articulated weakness of such an approach for understanding student learning” [18] (p. 18). Here, although the authors point to perhaps an over-reliance on big data, many institutions of higher education often tie big data to assessment and accountability policies, for better or worse.

Likewise, Schildkamp et al. reasoned that big data allows teachers and administrators to review and confirm that they are measuring student learning, tying that learning to educational objectives and measurements, and demonstrating accountability to local, state, or national mandates and policies, many of which may be tied to important sources of educational funding [13]. Big data also gives teachers and administrators insight into current practices to improve their accountability toward educational policies, in turn allowing for educational leaders to provide educational interventions for students and support services for educators to improve the overall education system [13]. For instance, Kraft et al. analyzed administrative data from New York City school districts to learn that school safety and academic expectations were associated with lower levels of teacher turnover and higher levels of student achievement, suggesting that individual school data may be nuanced, but when combined with larger data sets, policy decisions can be made easier and in more generalizable terms [10]. These authors all emphasize the point that educational leaders need to first have well-defined goals and data available to track progress toward those goals, rendering it incredibly important for educational leaders to either be adept data managers and analysts, or to employ a team who can perform data management and analysis tasks to inform leadership [10,13].

2.4. Strategic Budget Allocation

Schildkamp et al. focused on how big data and data-driven decision-making can also inform budgetary decisions, especially on a large scale. As many national governments often disseminate resources from the national level to the regional or local level, it is critical that governments and school districts access data and explore equity gaps to disseminate funds and improve schools and communities in low-income areas [13]. Studies related to teacher turnover have found that some school districts may need to allocate budgetary resources to recruit and retain high-quality teachers, an insight only gleaned from the analysis of a large administrative data set in one of the most populous cities in the world, New York [10].

Additionally, the European Commission also gathers data from many E.U. member nations to inform how developed and developing nations can allocate budgetary resources to provide educational interventions for teachers and students, as well as understand where education systems need to be developed in both populous urban areas or rural areas [9]. Of the European Commission’s strategic goals, E.U. member nations have shared data to arrive at literacy goals in primary and secondary schools and post-secondary achievement goals that have allowed individual institutions and nations to strategically allocate funds to support those initiatives [9]. Crossley’s transnational work also speaks to the European Commission, as many E.U. member nations have seen the benefit of big data sharing agreements to better allocate financial resources and improve student outcomes at multiple levels [17].

3. Drawbacks of Big Data in Education

As there are countless benefits to capturing and analyzing big data and the educational context, developing nations should be particularly concerned with the many drawbacks with regard to big data and education. As many developing nations have limited resources, both human and financial, it is critical to understand the type and sculpt of big data that would best serve a particular region or an entire developing nation. As many big data initiatives take years or decades to launch, developing nations should heed these warnings as they relate to big data and educational decision-making.

3.1. Size and Overwhelm Paralysis

Even though educators should be able to make better decisions with more data, two of the three vs. of big data—namely velocity and volume—pose challenges for educational organizations, especially in developing nations that do not possess the human and financial capacity to handle the velocity and volume of data. Sagioglu and Sinanc argued that big data implementations need to be planned carefully and with an eye toward growth, as humans have generated more digital data since 2010 than ever existed in the thousands of years previous [19]. The authors cautioned that the size of the data can be confusing, and the technical expertise of staff can be limiting, leading to a sense of overwhelm paralysis. This results in a wealth of data collection but little analysis, and without any aim towards decision-making and practicable outcomes [19]. Additionally, Sagioglu and Sinanc asserted that organizations must have the capacity to store data in the first place and the ability to organize that data in a way where multiple stakeholders can access and interpret the data accurately. In developing nations, there may not be the physical or cloud storage capacity to gather and analyze data in a timely manner, positioning these nations in a perpetual deficit state [19].

Nazarenko and Khronusova echoed many of Sagioglu and Sinanc’s concerns, suggesting that educational organizations must prepare years or decades in advance to support the type of data storage that is necessary for big data decision-making [15]. The authors also explained that without clear goals and educational outcomes, many under-resourced schools and educational organizations will struggle with understanding what data to gather, where to gather it from, how much to gather, and when data collection stops and data analysis starts [15]. Moreover, Nazarenko and Khronusova explained that it is increasingly common to be in a perpetual state of data collection without the expertise to analyze it. Educational organizations often experience difficulties when recruiting and retaining high-quality data analysts who are technically trained to analyze millions or billions of data points across many different data types and formats [15]. As a result, organizations may realize a sense of overwhelm paralysis with regard to the volume of data, the velocity of data, and the staff and planning to execute their goals. Additionally, without well-defined goals, many educational organizations may gather data that does not serve the mission or vision of the organization or does not substantially inform how educational leaders can improve the organization [15,19].

3.2. Permissions, Consent, and Privacy Concerns

Collecting and analyzing data is one element of using big data to make education decisions. Yet, before the data is gathered—especially at public entities and in countries with data protection laws—educational organizations must procure permissions and consent, while ensuring the private nature and confidentiality of most or all data. In this regard, cybersecurity and the safety of big data is paramount for educational organizations [14].

Regarding data storage, Wang asserted that “there is no shortage of concerns over how to store, process, and access student learning data while preventing those data from being abused or misused . . . ” while “student learning data are collected and stored in different silos—school district offices, online learning systems, and mobile devices—that are not connected to one another” [3] (p. 383). Additionally, Wang argued that “the growth of the Internet outpaces laws and regulations. To date, there has been a lack of Institutional

Review Board Protocols or federal regulations that protect human participants in large-scale social experiments on the Internet” [3] (p. 383). Here, educational organizations seeking to make decisions using big data are likely going to face privacy- and cybersecurity-related challenges [14], even if those challenges are mitigated at the beginning of the process because of the speed in which technology and the Internet advances.

Regarding student privacy, Nazarenko and Khronusova explained that “much information about student’s behavior is classified like personal data that cannot be collected without special permissions. Moreover, tracking of student’s activity needs to be expanded by their personal information, such as temperament type. However, many students are not interested in providing this kind of information” to their institution [15] (p. 678). Here, there are not only challenges with permissions and consent policies related to data, but there is no guarantee that individual stakeholders such as students will consent to have their data gathered, possibly straining relationships between students, teachers, and their educational organizations.

There is also the issue of how permission and consent and safety policies are communicated to stakeholders. Williamson argued that many members of educational organizations have no interest in or knowledge of big data, possibly confusing stakeholders regarding big data and its utility [14]. Similarly, Dishon explained that when education is so data-driven, both students and teachers may not know what data has been collected, by whom, and for what purpose [20]. This sense of confusion could deter educational stakeholders from engaging with big data policies and contribute to their uncertainty about what data is being collected and analyzed, possibly producing a feeling of surveillance which has been found to negatively impact teaching, learning, and a sense of belonging [3,14,20].

3.3. *Data as a Dehumanizing Force in Education*

Although big data inherently requires human input to exist, researchers have long criticized the fact that humans often use big data in dehumanizing ways, resulting in students, teachers, administrators, and other stakeholders feeling powerless and less autonomous in their education experiences. Nazarenko and Khronusova explained that at the post-secondary level, where class sizes may be larger, the lack of personal education and discussion between students and lecturers may be marginalized and replaced by an emphasis on big data to inform teaching strategies and practices, many of which may be automated and Internet-based [15]. Here, Nazarenko and Khronusova argued that students may unintentionally experience depression and a feeling of social isolation if their process and educational experience is too reliant on big data and too separated from human interaction with their teachers [15].

Dishon also argued that educational environments should be personalized to the point that data-driven decision-making does not infringe upon one’s sense of a naturalistic learning environment [20]. However, as teachers and administrators continue to use data to make informed decisions, stakeholders may begin feeling as if they are numbers and not people, placing a wedge between a student and their teacher and eroding trust within this important relationship [20]. Similarly, Johnson reasoned that as educational organizations and individual teachers gather data to make decisions, students may feel that their privacy is violated to the point where they do not feel as if they are individual learners. Johnson continued by saying that big data can contribute to “relationships [that] can easily be seen as contributing to a collectivization of subject, where all are treated identically based on the assumption that they are all ‘typical’ students” [21] (p. 5), resulting in students feeling unnecessarily homogenized and unimportant.

Perhaps most importantly, big data and its ability to accomplish educational goals has been known to historically marginalize communities of color and those belonging to underrepresented groups. In this way, big data can be seen as a tool of educational inequity and not the other way around. In their discussion of big data and Australian education systems, Buchanan and McPherson described this phenomenon as the “datafication of the learner” [16] (p. 30). This datafication can weaken student-teacher and school-community

relationships, thus marginalizing many stakeholders [16]. In a discussion of the critical use of big data toward racial equity, Gillborn et al. explained:

Quantitative data is often used to shut down, silence, and belittle equity work. Whenever governments, employers, or educators are challenged on their poor performance in relation to an under-represented group, they will typically reach for statistics in an effort to show that they are really much better than you might think. [22] (pp. 174–175)

Here, the authors reason that many school systems' underserved students of color or other groups and the use of big data can be a mechanism of masking educational inequities instead of identifying equity gaps and stemming them [22]. Moreover, Gillborn et al. suggested that the way in which communities of color and other marginalized groups are not engaged with data collection and analysis further marginalizes these communities, placing the students in a position of being surveilled without being served [22].

3.4. *Is Equity Possible?*

As with any data-driven decision-making, the data itself can be flawed, and the deductions made from the data can be equally problematic. First, developing nations will likely encounter challenges gathering accurate data on their people, particularly as race, gender, and socioeconomic status is concerned. Many developing countries have social and religious systems that discriminate against people from certain racial and ethnic backgrounds [4,23], while other countries marginalize people from Queer backgrounds [24]. Here, many developing nations may not have leadership that values human beings equally or equitably, leading to large datasets that are incomplete or inauthentic according to someone's true, authentic identity.

When discussing how data can inform decision-making, Macfadyen et al. called for the need for a more effective overall assessment paradigm in education, as many data driven decisions are made using incomplete data and may inform targeted interventions that are not timely or efficient enough [18]. Similarly, Nazarenko and Khronusova asserted that some forms of data are much easier to collect than others, comparing electronic standardized test data to word-of-mouth communication [15]. The authors argued that word of mouth communication may be essential in understanding how educational organizations can implement change, but "verified data collection of this kind is practically impossible" [15] (p. 678).

Johnson backpedaled in their discussion of the integrity of big data, explaining that data mining and the problems with big data go deeper than poor methodology [21]. Johnson claimed that an inherent feature of science in technology is how data collection instruments and strategies are weaved into "a complex web of technical and social interdependencies," [21] (p. 7), such as administrator priorities, changing student demographics, and unsteady influxes of human and financial resources. Johnson, therefore, argued that "Design intent and assumptions about user behavior are especially significant sources of embedded values in technologies" [21] (p. 7), suggesting that educational leaders and policymakers must understand who implemented the data collection measures and which specific social forces may have influenced those approaches.

Regarding data driven decision making, Crossley raised important questions, including whether researchers "should ask whose capacity will be strengthened by new initiatives, whose values and approaches to research will be prioritized, whose modalities will be applied—and do these meet local needs, priorities and agendas?" [17] (p. 22). Using the European Union and the United Kingdom as an example, Crossley questioned the value of "expensive big science approaches to social research that are increasingly favored in the UK" and whether such approaches "have the best potential to foster the strengthening of research capacity within low-income countries" [17] (p. 22). Here, Crossley understood that what may be good for one educational organization or context may not be good for another, yet it may be tempting for developing nations and developed nations to overgeneralize

data and its implications when individual data initiatives are best for a certain educational context [17].

Buchanan and McPherson elaborated on this false sense of data integrity when discussing Australia's national testing program to evaluate primary and secondary student progress and teaching effectiveness [16]. In their critique of Australia's national testing plan, the authors suggested that Australia had modeled their high stakes testing program against those from other developed nations, but such a strategy was not best for Australia, which is famous for its stark contrast between rural and urban school districts [16]. In all, Buchanan and McPherson argued that the primary justification for the testing program was to formalize some sort of mechanism that measures and produces good teaching, but the program ultimately equated "student achievement to a crude test result," [16] (p. 31), which did little to inform Australia's idiosyncratic school system at both the regional and national levels.

In U.S. contexts, Gillborn et al. criticized common uses of big data, again targeting national testing programs as Buchanan and McPherson did [22]. With a critical lens toward racial equity, Gillborn et al. argued that "National testing programs, such as the No Child Left Behind (NCLB) reforms in the US and the use of school performance tables in England, have popularized the idea that numbers can be used to expose (and change) failing schools" [22] (p. 161). However, as the authors reason, "commentaries [on these programs] rarely include any detail about the relatively small samples," [22] (p. 161), in some instances numbering only 200, yet the results were being generalized across tens of thousands of schools. In this regard, Gillborn et al. implied that data can be flawed or not measure what it is intended to measure, while the interpretation and implementation of that data to inform policy and practice can be equally harmful [22]. Furthermore, such neoliberal policies have redirected public resources to private sectors, impacting public educational funding and increasing the equity gap between low- and high-income communities, as well as exacerbating racial equity gaps in U.S. contexts [22].

3.5. *Can Data Be Captured and Used at All?*

As mentioned earlier, many educational organizations struggle to procure the necessary human and financial resources to capture and analyze big data. A plethora of research has asserted that one of the largest challenges facing educational organizations is recruiting and retaining high-quality staff to manage big data and perform data analytics [15,17]. In this case, educational organizations often compete with the private sector for personnel fluent in quantitative methods and machine learning. As Macfadyen et al. argued, "it may not be surprising, then, that globally, education lags behind all other sectors in harnessing the power of analytics," as "a preliminary analysis indicates that educational institutions simply lack the practical, technical and financial capacity to effectively gather, manage and mine big data," [18] (p. 22).

Moreover, as bureaucracies, educational organizations resist change and innovation, often embracing an organizational culture that clings to prior methods of operation [4,6,15,17]. Macfadyen et al. reasoned that "there is recognition that even where technological competence and data exist, simple presentation of the facts (the potential power of analytics), no matter how accurate and authoritative, may not be enough to overcome institutional resistance" [18] (p. 22). This resistance comes in several forms, namely a cultural resistance that is established and perpetuated by organizational leadership, yet resistance also comes in the form of a lack of human or financial capacity to change [15,17], and a resistance to embrace big data due to an inability to strategically plan goals and initiatives to use big data [5,14,16,22].

3.6. *Turnover and Continuity*

Big data collection and analysis may be computerized and automated by developed nations or individual wealthy schools, but for many developing nations, the business of big data is human intensive. This context requires consistent and highly skilled staff to gather

and analyze data toward educational equity, with human beings able to understand nuanced educational inequities and paths toward remediating those inequities [14]. However, education has remained one of the fields with the highest turnover of personnel [10,18,25], meaning that the humanistic nature of big data collection and analysis is inherently inconsistent and continuously disrupted by teacher and administrator turnover at the primary, secondary, and post-secondary levels [14].

Macfadyen et al. outlined the unique problems facing the field of education because of leadership change, as educational organizations often adjust goals and strategic plans to align with new leadership, which implies that the collection and analysis of data is also likely to experience constant change toward new initiatives and future efficiencies [18]. Nguyen et al. echoed this sentiment, stating that teacher turnover often upsets data collection and analysis techniques, especially as teachers and administrators strive to meet accountability measures, whether at the regional or national level [25]. Often, individual schools must invest a considerable amount of human and financial capital to replace teachers, which then introduces new educational staff into a system and a potentially nuanced way of gathering individual student data [14].

Kraft et al.'s work suggested that teacher turnover was tied to student achievement data, also suggesting that as teachers leave the classroom, districts and school systems must track this teacher turnover and integrate this variable into big data sets to sufficiently control for this phenomenon and maintain the integrity of data-informed analyses [10]. Overall, research suggests that data collection and analysis is inherently humanistic, and teacher and administrator turnover at the primary, secondary, and postsecondary levels introduce changing variables (humans) into a complex system of big data, working against educational progress toward equity [5,7,25].

4. Uncertainties of Big Data in Education

Ultimately, considering the benefits and drawbacks from an era of big data in education that is already upon us, there are many uncertainties surrounding the future of the field. Perhaps most importantly, educational organizations must build the capacity to maintain pace with technology and the ever-looming threat of cybersecurity breaches and data loss. Unfortunately, government entities and educational organizations must work together to prepare for an uncertain future where one large data breach could threaten the very existence of a school and the data of countless stakeholders. Similarly, educational organizations should diligently capture data that does not require student or stakeholder consent, but these organizations should also develop a sense of trust between the organization and its community. Through establishing this trust, students and other stakeholders may be more interested in providing correct, robust data to allow the school or organization to make the best-informed decisions.

There is also the uncertainty of how big data can actually inform policy, or if big data will simply exist in the cloud or on a server without analysis, contextualization, and policy advocacy. Macfadyen et al. reasoned that, "the challenge of bringing about institution-wide change in such complex and anarchic adaptive systems may rightly be characterized as a 'wicked problem'— a problem that is complex, unpredictable, open ended, or intractable" [18] (p. 22). Here, the very nature of big data and the possibility of overwhelming paralysis or unsteady leadership could lead many big data initiatives down unclear pathways.

As of the writing of this review, many developing nations do not have big datasets nor the means to assemble them, and it is unclear whether developed nations will partner with developing nations to improve educational equity on a global scale. It often remains the responsibility of local or national governments to gather resources, learn from other nations, and launch big data initiatives. For example, in the Caribbean context, Charran et al. reasoned that literature on inclusive education in the Caribbean shows a deficit in the availability of special education services and resources and a lack of teacher training in special education [4]. Here, Charran et al. argued that the challenge for governments—

such as those of Caribbean nations—is creating education policies that detail specific educational interventions, such as providing appropriate special education services and mandatory teacher preparation for working with students with disabilities [4]. In this regard, government involvement is crucial, but without the necessary resources, developing nations may not be able to gather data, use it to identify interventions, and realize change, thus falling further behind developed nations [4].

Additionally, developing South Asian nations have also struggled with data collection and the public availability of data. Pakistan experienced considerable population growth in the 1980s and 1990s, resulting in consecutive decades of at least 4% population growth and comparable educational enrollment. However, Pakistan’s Ministry of Federal Education and Professional Training does not make large or longitudinal education data available to the general public, and the Ministry’s website does not house any large or longitudinal datasets at the primary, secondary, or postsecondary level [26]. As recent as 2013, Pakistani educational researchers have bemoaned the fact that Pakistani educational data is not available, claiming that, “To the best of our knowledge, there is none for Pakistan which uses a historical series of disaggregated data of education to investigate both level and growth effect of human capital on the economic growth” [27] (p. 384).

In the Middle East, ravaged by war and faltering national economies, Syria’s educational system has been in crisis for over a decade, partially resulting from little or no regular data collection and analysis. In a Syrian educational report from 2022, researchers suggested that data collection, disaggregation, and analysis was a primary factor in limiting Syrian educational progress. As the researchers wrote, “Data in Syria is not disaggregated by hub or geographical region, demonstrating a challenge with data integrity across Syria, both within and beyond the education” [28] (p. 12). Even though Syrian educational leaders have attempted to gather data systematically in recent years in order to “facilitate better coordination across the different hubs, including in terms of information management, this has not yielded robust results in terms of data and data analysis within the education sector” [27] (p. 12). Here, many developing nations have endured years or decades of struggles in terms of meeting the basic needs of their citizens, never mind embarking upon educational data collection and analysis projects to make better informed educational decisions.

In all, educational organizations are operating in an increasingly complex and competitive environment where data is currency. Educational leaders are under increasing pressure to respond to shifts in national and local economies, as well as political and social change such as the growing need to increase access to education for low-income communities, communities of color, people with disabilities, and individuals from marginalized groups. Unfortunately, many developing nations serve large populations of marginalized people, and these are the very nations that could most benefit from big data initiatives to help educational organizations become more efficient and effective with fewer resources and more global competition for students and talent.

5. The Neoliberal Shift away from Educational Equity

In many nations, neoliberal policies and agendas have prioritized the growth of the private sector and the defunding of public goods, including educational services. Recent work has underscored the necessity for educational organizations to facilitate data collection and dataset construction initiatives [29], but these initiatives may prove futile if national or local-level governments are not supportive of educational initiatives or view privatization of education as preferable. Yet, a wealth of research has found that neoliberal education policies and practices often minoritize the neediest communities and students, including communities of color and communities from low-income backgrounds [30]. Although prevalent in developed nations such as the United States and members of the European Union, governments of developing nations have begun adopting neoliberal policies, leveraging data for supposed accountability purposes to justify a shift towards the privatization of educational services. Subsequently, socioeconomic and racial equity

gaps have emerged in many educational settings, bringing into question the purpose of using data for educational decision making if the aims of those decisions are to dismantle education systems that serve the most underserved in the name of neoliberalism [30].

6. Conclusions

Whether educational organizations are ready or not, big data is already changing the global education landscape and increasing opportunities for those nations who can leverage big data to make data driven decisions. For many developing nations, the adage “you can’t manage what you don’t measure,” may ring true, while many impoverished school districts simply cannot measure what they cannot manage. School leaders and teachers are already under enormous pressure as it is, so asking these stakeholders to develop big data sets to inform the work they do seems particularly onerous. Additionally, many developing nations may be struggling with national-level concerns such as war and economic challenges that render educational data collection and analysis a potential afterthought [4,26–28,31].

As a result, developing nations should work alongside developed nations to build the human, financial, and technological capacity necessary to chart a pathway toward big data fluency and utility. Within developed nations, educational leaders are already enlarging big data and performing transnational analyses of big data to inform educational change on a global scale [5,7,9,11,25,31]. However, comparisons of developed and developing nations may prove futile, as comparing nations is not only difficult but perhaps nonsensical given the vastly different geopolitical and social divides between nations. Understanding these divides, developed nations also have a responsibility to perform the necessary equity work to partner with developing nations to ensure that this educational change is on a truly global scale and that is inclusive of all nations and their students, schools, and communities.

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References

1. SAS Institute. Big Data: What It Is and Why It Matters. 2022. Available online: https://www.sas.com/en_us/insights/big-data/what-is-big-data.html (accessed on 12 January 2023).
2. SAS Institute. Big Data: Who Uses It. 2022. Available online: https://www.sas.com/en_us/insights/big-data/what-is-big-data.html#industries (accessed on 12 January 2023).
3. Wang, Y. Big Opportunities and Big Concerns of Big Data in Education. *Techtrends* **2016**, *60*, 381–384. [CrossRef]
4. Charran, C.; Sorrells, A.M.; Cooc, N. Quantitative Research Methods and Design for Investigating Inclusive Education in the Caribbean. In *Achieving Inclusive Education in the Caribbean and Beyond*; Springer: Berlin/Heidelberg, Germany, 2019; pp. 51–65.
5. Mandinach, E.B. A Perfect Time for Data Use: Using Data-Driven Decision Making to Inform Practice. *Educ. Psychol.* **2012**, *47*, 71–85. [CrossRef]
6. Mandinach, E.B.; Gummer, E. Data-Driven Decision Making: Components of the Enculturation of Data Use in Education. *Teach. Coll. Rec.* **2015**, *117*, 1–8. [CrossRef]
7. Schildkamp, K.; Poortman, C.; Luyten, H.; Ebbeler, J. Factors promoting and hindering data-based decision making in schools. *Sch. Eff. Sch. Improv.* **2017**, *28*, 242–258. [CrossRef]
8. McAfee, A.; Brynjolfsson, E. Big Data: The Management Revolution. *Harvard Business Review*. 2012. Available online: <https://hbr.org/2012/10/big-data-the-management-revolution> (accessed on 12 January 2023).
9. European Commission. European Education Area: Quality Education and Training for All. European Commission. 2022. Available online: <https://education.ec.europa.eu/> (accessed on 12 January 2023).

10. Kraft, M.A.; Marinell, W.H.; Yee, D.S.-W. School Organizational Contexts, Teacher Turnover, and Student Achievement. *Am. Educ. Res. J.* **2016**, *53*, 1411–1449. [CrossRef]
11. Meschi, E.; Scervini, F. A new dataset on educational inequality. *Empir. Econ.* **2014**, *47*, 695–716. [CrossRef]
12. Moore, R. Variation, context, and inequality: Comparing models of school effectiveness in two states in India. *Sch. Eff. Sch. Improv.* **2022**, *33*, 588–609. [CrossRef]
13. Schildkamp, K.; Lai, M.K.; Earl, L. (Eds.) *Data-Based Decision Making in Education: Challenges and Opportunities*; Springer Science & Business Media: Berlin/Heidelberg, Germany, 2012.
14. Williamson, B. *Big Data in Education: The Digital Future of Learning, Policy and Practice*; Sage: New York, NY, USA, 2017.
15. Nazarenko, M.A.; Khronusova, T.A. Big data in modern higher education: Benefits and criticism. In Proceedings of the 2017 International Conference: Quality Management, Transport and Information Security, Information Technologies, Saint Petersburg, Russia, 24–30 September 2017. [CrossRef]
16. Buchanan, R.; McPherson, A. Teachers and learners in a time of big data. *J. Philos. Sch.* **2019**, *6*, 26–43. [CrossRef]
17. Crossley, M. Global league tables, big data and the international transfer of educational research modalities. *Comp. Educ.* **2014**, *50*, 15–26. [CrossRef]
18. Macfadyen, L.P.; Dawson, S.; Pardo, A.; Gašević, D. Embracing Big Data in Complex Educational Systems: The Learning Analytics Imperative and the Policy Challenge. *Res. Pract. Assess.* **2014**, *9*, 17–28. Available online: <http://www.rpajournal.com/dev/wp-content/uploads/2014/10/A2.pdf> (accessed on 12 January 2023).
19. Sagirolu, S.; Sinanc, D. Big data: A review. In Proceedings of the 2013 International Conference on Collaboration Technologies and Systems (CTS), San Diego, CA, USA, 20–24 May 2013. [CrossRef]
20. Dishon, G. New data, old tensions: Big data, personalized learning, and the challenges of progressive education. *Theory Res. Educ.* **2017**, *15*, 272–289. [CrossRef]
21. Johnson, J.A. The Ethics of Big Data in Higher Education. *Int. Rev. Inf. Ethics* **2014**, *21*, 3–10. [CrossRef]
22. Gillborn, D.; Warmington, P.; Demack, S. QuantCrit: Education, policy, ‘Big Data’ and principles for a critical race theory of statistics. *Race Ethn. Educ.* **2018**, *21*, 158–179. [CrossRef]
23. Telles, E. *Pigmentocracies: Ethnicity, Race, and Color in Latin America*; University of North Carolina Press: Chapel Hill, ND, USA, 2014.
24. Yavuz, M.; Byrne, S. Center for Peace and Justice Education at Villanova University Violence Against the Queer Community in Turkey. *J. Peace Justice Stud.* **2021**, *30*, 102–125. [CrossRef]
25. Nguyen, T.D.; Pham, L.D.; Crouch, M.; Springer, M.G. The correlates of teacher turnover: An updated and expanded Meta-analysis of the literature. *Educ. Res. Rev.* **2020**, *31*, 100355. [CrossRef]
26. Pakistan Ministry of Federal Education and Professional Training. Pakistan’s Ministry of Federal Education and Professional Training. Government of Pakistan. 2023. Available online: <http://www.mofept.gov.pk/> (accessed on 17 January 2023).
27. Jalil, A.; Idrees, M. Modeling the impact of education on the economic growth: Evidence from aggregated and disaggregated time series data of Pakistan. *Econ. Model.* **2013**, *31*, 383–388. [CrossRef]
28. Qaddour, K.; Husain, S. Syria’s Education Crisis: A Sustainable Approach after 11 Years of Conflict. Middle Eastern Institute. 2022. Available online: <https://www.mei.edu/publications/syrias-education-crisis-sustainable-approach-after-11-years-conflict> (accessed on 17 January 2023).
29. Taylor, Z.W.; Kugiyi, J.; Charran, C.; Childs, J. Building Equitable Education Datasets for Developing Nations: Equity-Minded Data Collection and Disaggregation to Improve Schools, Districts, and Communities. *Educ. Sci.* **2023**, *13*, 348. [CrossRef]
30. St John, E.P.; Daun-Barnett, N.; Moronski-Chapman, K.M. *Public Policy and Higher Education: Strategies for Preparation, Access, and College Success*; Routledge: New York, NY, USA, 2018.
31. Taylor, Z.W. College Admissions for L2 Students: Comparing L1 and L2 Readability of Admissions Materials for U.S. Higher Education. *J. Coll. Access* **2020**, *5*, 54–67. Available online: <https://scholarworks.wmich.edu/jca/vol5/iss1/6> (accessed on 21 April 2023).

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