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Disaster Risk Reduction Education in School Geography Curriculum: Review and Outlook from a Perspective of China

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Abstract: In order to investigate the content evolution of Disaster Risk Reduction (DRR) in the school geography curriculum in China, this research used the five dimensions of DRR learning framework, namely knowledge, response, action, participation, and integration, as a platform and a conceptual premise upon which to review the primary and secondary school geography curriculum standards from 1986 to the present. Geography as a carrier subject had been an integration approach of DRR in the national curriculum in China. Using the method of qualitative content analysis with the support of the software NVivo 12, we came to the following results: the DRR-relevant content in the geography curriculum standards that used for analysis in this research had undergone constant changes and finally reached a relatively stable state; the changes of DRR-relevant contents in primary school, middle school, and high school curriculum presented different characteristics. In the future geography curriculum reform, it is necessary to realize that the term disaster does not describe the natural event per se, but instead its impact on/consequences for infrastructure and society. It is bound to add more DRR-relevant content that belongs to the “action” dimension and the ‘participation’ dimension, especially at the primary and middle school stages, and to systematically incorporate the DRR-relevant content of the “integration” dimension into the school geography curriculum.

Keywords: disaster risk reduction; school geography curriculum; geography curriculum standard; China; qualitative content analysis



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1. Introduction

Disaster Risk Reduction (DRR) has been identified as “the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events” [1]. The *Sendai Framework for Disaster Risk Reduction (SFDRR) 2015–2030* which was adopted at the Third United Nations World Conference on Disaster Risk Reduction points out that “disaster risk reduction is essential to achieve sustainable development” [2] (p. 13). Researches have demonstrated that the incorporation of DRR into formal education could be an effective way to reduce disaster risk [3]. Meanwhile, “to promote the incorporation of disaster risk knowledge, including disaster prevention, mitigation, preparedness, response, recovery and rehabilitation, in formal education at all levels” [2] (p. 15) is crucial to achieve the priority 1 of SFDRR.

The importance of Disaster Risk Reduction Education (DRRE) has been emphasized in several international agendas, frameworks, conferences, United Nation programs, etc. From *International Decade for Natural Disaster Reduction*, to *International Strategy for Disaster Reduction*, *Hyogo Framework for Action 2005–2015*, and *Sendai Framework for Disaster Risk Reduction 2015–2030*, it is widely acknowledged that education has a critical role in disaster risk reduction. DRRE has been in the limelight for several years, and the teaching and learning researches carried out around DRRE have achieved fruitful results [4–8]. The

concept of a systematic, coherent, and implementable DRRE is illustrated through five dimensions of DRR learning (Table 1) [9] (pp. 24–27). The integration of DRR into the school curriculum may be the best way to ensure that DRRE in schools can be sustained [10]. Infusing DRR across the curriculum involves determining the key DRR-related knowledge, skills, and attitudes that students need to acquire and identifying the potential of each subject to carry and deliver those learning needs [9] (p. 61). DRR can be integrated as a stand-alone subject of its own, or it can be introduced within a carrier subject such as geography, civic education, and geology, and it can also be mainstreamed in different subject matter [11].

Table 1. Five dimensions of DRR learning.

Category	Definition
Knowledge	This dimension concerns developing an understanding of the science and mechanisms of natural hazards such as cyclones, tsunamis, and volcanic eruptions
Response	This dimension includes familiarization with hazard early warning signs and signals, instruction in evacuation or sheltering procedures, drills and exercises, familiarization with basic first aid and the contents of a first aid kit, health and safety measures, and guidance on how to stay safe after a hazard has subsided
Action	This dimension seeks to encourage learners to act and be proactive in mitigating risk through a thorough examination of the elements at work in the fundamental disaster risk formula, which is $Disaster\ Risk = \frac{Natural\ Hazard \times Vulnerability}{Capacity\ of\ Societal\ System}$
Participation	This dimension engages learners in processes of resilience building in their own community through grassroots level initiatives, identifying hazards, developing resilience action plans, and implementing those plans
Integration	This dimension places emphasis on blending the structural elements, such as school buildings and facilities, and non-structural elements, such as school disaster management and school policy development, so that the school becomes a DRR learning community or organization oriented towards building a culture of safety and resilience

Due to the complicated geological and climate conditions, China is one of the most countries with respect to frequent and severe natural disasters [12]. Natural disasters in China are characterized by diverse types, wide scope of distribution, high frequency, and huge losses. China has experienced almost all kinds of natural disasters, from earthquakes, landslides, and debris flow, to typhoons, floods, and drought, through to forest fire, sandstorms and severe snowstorms [13]. More than 70 percent of Chinese cities and more than 50 percent of the Chinese population are living in areas vulnerable to serious earthquakes, meteorological, geological, or marine disasters [14]. China's remarkable monsoon climate has caused frequent meteorological disasters, and as China lies right in the region where the Eurasian, Pacific, and Indian Ocean plates meet, it suffers from frequent earthquakes due to still-active tectonic movements [15,16]. According to China's Ministry of Emergency Management (MEM), in 2019, the direct economic losses caused by various natural disasters in China were 327 billion Yuan [17]. Natural disasters have had a wide and far-reaching impact on Chinese society and left a very profound mark on the evolution of Chinese civilization. Therefore, while China has accumulated certain experience in DRRE, it also needs to constantly update and improve the system and content of its own DRRE.

China has integrated DRR into the national school geography curriculum at all levels since 1986. Although UNESCO (United Nations Educational, Scientific and Cultural Organization) and UNICEF (United Nations Children's Fund) have conducted research on the integration of DRR in school curricula of 30 countries, China has not been included [9,18]. At the same time, there are a variety of studies on the school geography curriculum in China, but they have not been specifically analyzed from the perspective of DRRE. Given the above situation, this paper examines how DRR is transmitted through geography education by investigating the content evolution and integration approach of DRR in the Chinese school geography curriculum. Meanwhile, it helps clarify how DRRE is anchored

in the national geography curriculum and how DRRE is contextualized in the specific context of China; both of these outcomes will contribute to the enrichment of DRRE literature, which so far contains little empirical research on China.

2. Materials and Methods

Since the founding of the People's Republic of China in 1949, the geography curriculum in basic education has undergone several changes. In the early years of the People's Republic of China, the primary and secondary geography curriculum system before the People's Republic of China was temporarily adopted, which is the fifth grade of primary school learned domestic geography and the sixth grade learned foreign geography. In the first and second year of middle and high schools, domestic geography was studied, and in the third year, foreign geography was studied.

The *Primary and Secondary School Geography Syllabus (Draft)* was formally promulgated by the Ministry of Education of the People's Republic of China (MoE PRC) and implemented in June 1956. According to the syllabus, the fifth grade of primary school studied the Earth and Chinese Geography, and the sixth grade of primary school studied Chinese Geography and World Geography. Meanwhile, the middle school geography curriculum is dominated by Physical Geography, and the high school geography curriculum is dominated by Economic Geography. The *Full-time Secondary School Geography Syllabus* issued in 1963 stipulated that the knowledge of maps, topography, and atmosphere prepared for Regional Geography should be taught first, followed by the teaching of Chinese Geography. At the same time, World Geography was moved to the first year of high school, and the sequence of the specific content was: Earth Science, Physical Geography of all continents, and the geographical profiles of major countries.

During the Cultural Revolution (1966–1976), the geography curriculum in primary and middle schools were seriously damaged, making a generation of Chinese teenagers basically “geographical blind”. After the ten-year turmoil, the *Middle School Teaching Plan for Full-time Ten-year Schools (Trial Draft)* was promulgated in 1978, which stipulated that Chinese Geography should be set in the first grade and World Geography in the second grade of middle school. In the same year, the *Middle School Geography Syllabus (Draft)* was promulgated, which stipulated that the curriculum of Chinese Geography in the first year of middle school should first teach the earth and map, then the general situation of Chinese Geography, the geography of China's regions, provinces and counties, and finally teach China's natural resources and their utilization. The curriculum of World Geography in the second year of middle school should begin with the general situation of World Geography, followed by the geography of continents, oceans, and major countries. In 1981, the MoE PRC issued the *Revised Opinions on the Trial Draft of the Teaching Plan for Full-time five-year Secondary Schools* and the *Teaching Plan for Full-time six-year Key Secondary Schools (Trial Draft)*, and the geography curriculum was re-opened in high schools. The geography curriculum of five-year secondary schools was set in the first year of high school, and the geography curriculum of six-year secondary schools was set in the second year of high school, mainly studying human beings and geographical environment. Thus, the new system of learning general geography knowledge in primary school, regional geography in middle school, and human and geographical environment in high school have been preliminarily formed.

In terms of the Opinions on the Adjustment of the Current Teaching Plan of Ordinary High Schools and the Full-time Secondary Schools Geography Syllabus (Revised Version) promulgated in 1990, the geography curriculum of secondary schools has been adjusted accordingly. In high school, geography was set in the first grade, focusing on the systematic geography learning of the relationship between humans and the environment. The geography curriculum contents include the increase of earth temperature, the destruction of the ozone layer, acid rain, debris flow, and the new trend of humanities and economic geography at home and abroad at that time. In addition, an elective geography curriculum was added to the third grade of high school to teach regional geography of China and major

foreign countries. In 1992, the revised High School Geography Syllabus was promulgated and incorporated the Agenda 21, which promulgated at the United Nations Conference on Environment & Development in Rio de Janeiro, Brazil in 1992, and sustainable development strategies into it to keep pace with the time. In 1993, the Nine-year Compulsory Middle School Geography Syllabus was promulgated and implemented, stipulating that geography should be set in the first and second grades to learn the basic knowledge of earth and map, and the basic knowledge of World Geography and Chinese Geography.

In 2001, the Compulsory Education Geography Curriculum Standard (Experimental Draft) was tried out in some areas and popularized in 2005. The General High School Geography Curriculum Standard (Experiment) was published in 2003 and implemented nationwide. Middle school geography was still dominated by the regional geography of the World Geography and Chinese Geography. The compulsory part of high school geography still took systematic geography, human–environment coordination, and sustainable development as the main line, and organically integrated physical geography, human geography, and regional geography.

In 2011, the MoE PRC promulgated the revised version of *Compulsory Education Geography Curriculum Standard (2011 Edition)*, stipulating that the earth and map, World Geography, Chinese Geography and local geography were the four components of the middle school geography curriculum. In 2017, the MoE PRC issued the *General High School Geography Curriculum Standard (2017 Edition)*, which made a breakthrough in constructing the geography curriculum dominated by key geographical competencies and dividing the high school geography curriculum into three types: compulsory curriculum, optional compulsory curriculum, and optional curriculum. The compulsory curriculum included two modules, namely Geography 1 and Geography 2. The optional compulsory curriculum consisted of three modules, namely, physical geography, regional development and resources, environment, and national security. The optional curriculum included nine modules, namely, fundamentals of astronomy, marine geography, natural disasters and prevention, tourist geography, urban and rural planning, political geography, application of geographic information technology, and field geography practice.

In China, curriculum standards are required to be used uniformly throughout the whole country and play a crucial role in the pedagogical practice as they provide the basis for the compilation of textbooks, the guidance for teachers' teaching, and the criteria for examination assessments. Geography has been a compulsory subject in China's primary, middle and high schools since 1986. Since 1988, geography in primary schools has been integrated into the social subject, while geography in secondary schools has been taught as an independent subject. Therefore, geography curriculum standards of primary and secondary schools from 1986 to the present were chosen for analysis (Table 2).

Table 2. Geography curriculum standards for analysis.

School Stage	Geography Curriculum Standards	Issue Time
Primary school	Full-time primary school geography syllabus	1986
	Nine-year compulsory full-time primary school social syllabus (first draft)	1988
	Nine-year compulsory full-time primary school social syllabus (trial draft)	1992
	Full-time compulsory education morality and society curriculum standard (experimental draft)	2001
	Compulsory education morality society curriculum standard (2011 edition)	2011
Middle school	Full-time secondary school geography syllabus	1986
	Nine-year compulsory full-time middle school geography syllabus (first draft)	1988
	Full-time secondary school geography syllabus (revised edition)	1990
	Nine-year compulsory full-time middle school geography syllabus (trial draft)	1992
	Nine-year compulsory full-time middle school geography syllabus (revised trial draft)	2000
	Full-time compulsory education geography curriculum standard (experimental draft)	2001
	Compulsory education geography curriculum standard (2011 edition)	2011
High school	Full-time secondary school geography syllabus	1986
	Full-time secondary school geography syllabus (revised edition)	1990
	Full-time general high school geography syllabus (trial draft)	1996
	Full-time general high school geography syllabus (revised trial draft)	2000
	Full-time general high school geography curriculum standard (experimental draft)	2003
	General high school geography curriculum standard (2017 edition)	2017

(Source: [19–26]).

Qualitative content analysis (QCA) is a method for systematically describing the meaning of qualitative material [27] (p. 1). Generally, a wide range of qualitative materials includes all sorts of texts, from newspaper articles to transcripts of interviews and from descriptions of pictures to written recollections [28]. It is also known as a method of analyzing documents [29]. QCA is a suitable method for describing qualitative material that requires some degree of interpretation [27] (p. 2). This is done by classifying parts of qualitative material as instances of the categories of a coding frame [27] (p. 8).

To investigate the question of how DRR is transmitted through geography education in China, this study used the five dimensions of the DRR learning framework (Table 1), which was extracted from a comprehensive mapping and analysis of DRR curricula globally co-sponsored by UNESCO and UNICEF [18], as a platform and a conceptual premise upon which to review the geography curriculum standards of primary and secondary schools from 1986 to the present in China. A qualitative content analysis was conducted with the support of the software NVivo 12. Based on the theoretical framework, we established the main deductive categories, including five categories (Table 2). The geography curriculum standards were then deductively coded for the analysis.

3. Results

3.1. Integrating DRR into the Geography Curriculum Standards

As explained above, the geography curriculum standards of primary and secondary schools from 1986 to the present in China were analyzed following the five dimensions of DRR learning framework (Table 1).

Our analysis of the first dimension (“knowledge” dimension, see Table 3) indicates that it accounts for the largest proportion among all the five dimensions. The DRR-relevant contents in the primary school geography curriculum standards, which belong to the ‘knowledge’ dimension, was only the flood of the Yellow River in the 1986 edition [19] (pp. 36–44). As for the 1988 and 1992 editions [20] (pp. 171–180), no DRR-relevant contents could belong to this dimension. The 2001 edition [21] was expanded to cover the understanding of major natural disasters that have occurred in China. While, the 2011 edition [24] specifically pointed out the need to understand the two natural disasters that often occurred in China, earthquakes, and floods.

The DRR-relevant contents in the 1986 [19] (pp. 248–290) and 1990 [19] (pp. 315–365) editions of the middle school geography curriculum standards, were earthquakes, floods, ice floods, droughts, and typhoons in China, and earthquakes, volcanic eruptions, cold waves, and hurricanes that occurred in some countries and regions in the world, and could be subordinate to the “knowledge” dimension. In the 1988 [19] (pp. 291–314), 1992 [19] (pp. 389–434), and 2000 [19] (pp. 455–489) editions of the middle school geography curriculum standards, DRR-relevant contents which could belong to the “knowledge” dimension included earthquakes, volcanic eruptions, typhoons, droughts and desertification in some countries and regions in the world; volcanic and seismic zones, typhoons, cold waves, droughts, floods, and debris flows in China. The DRR-relevant contents in the 2001 edition [22] of middle school geography curriculum standard that could be categorized as “knowledge” dimension were simplified into the distribution of volcanoes and earthquakes in the world, associating with the basic characteristics of a certain country’s natural environment to point out the unique natural geographic phenomena and natural disasters, and the main reasons for their formation. On the basis of the 2001 edition, the 2011 edition [25] added the content of understanding that China is a country with frequent natural disasters.

Table 3. “Knowledge” dimension in the geography curriculum standards.

Issue Time	Primary School	Middle School	High School
1986	The flood of the Yellow River	The earthquake distribution in China; Ice flood of the Yellow River; The relationship between the plum rains, summer drought, and agricultural production in the middle and lower reaches of the Yangtze River; The southern coastal area of China is the area with the most typhoon landfall; World volcanic and seismic zones; Volcanoes and earthquakes in Japan; Volcanoes and earthquakes in the Malay Archipelago; Volcanoes and earthquakes in the Apennine Mountains; Impacts of cold waves and hurricanes on North America and their relationship with topography; Volcanoes and earthquakes in Central America; Volcanoes and earthquakes in Chile	Earthquake: the occurrence, magnitude, and intensity of earthquakes; the distribution and prediction of earthquakes
Issue Time	Primary School	Middle School	High School
1988	None	World seismic zones; Earthquakes, volcanoes, and typhoons in Japan; Volcanoes and earthquakes in the Malay Archipelago; The drought and desertification in Sub-Saharan Africa; The distribution of seismic zones and volcanoes in China; The season and influence range of cold waves and typhoons in China	
Issue Time	Middle School	High School	
1990	The earthquake distribution in China; Ice flood of the Yellow River; The relationship between the plum rains, summer drought, and agricultural production in the middle and lower reaches of the Yangtze River; The southern coastal area of China is the area with the most typhoon landfall; World volcanic and seismic zones; Volcanoes and earthquakes in Japan; Volcanoes and earthquakes in the Malay Archipelago; Volcanoes and earthquakes in the Apennine Mountains; Impacts of cold waves and hurricanes on North America and their relationship with topography; Volcanoes and earthquakes in Central America; Volcanoes and earthquakes in Chile	Earthquake: the occurrence, magnitude, and intensity of earthquakes; the distribution and prediction of earthquakes; The drought, waterlogging, and salinization in the North China Plain; The relationship between the plum rains, summer drought, and agricultural production in the middle and lower reaches of the Yangtze River; The southern coastal area of China is the area with the most typhoon landfall	
Issue Time	Primary School	Middle School	High School
1992	None	World volcanic and seismic zones; Volcanoes and earthquakes in Japan; Volcanoes and earthquakes in the Malay Archipelago; The drought and desertification in Sub-Saharan Africa; China is a country prone to earthquakes; The distribution of China’s major seismic zones; Severe weather, drought, flood (including debris flow in mountainous areas), cold wave, typhoon and their effects on production and life in China	
Issue Time		High School	
1996		None	
Issue Time	Middle School	High School	
2000	Know the world volcanic and seismic zones; Know the mountains, volcanoes, earthquakes, humid climate, and typhoons in Japan; Know the earthquakes and volcanoes in the Malay Archipelago; Understand the drought and desertification in Africa; Know the distribution of China’s major seismic zones		None
Issue Time	Primary School	Middle School	
2001	Understand the major natural disasters that have occurred in China, and understand the irresistible side of nature	Know the relationship between the distribution of world famous mountain series, volcanoes, earthquakes, and plate movements; According to maps, data, and the basic characteristics of a certain country’s natural environment, point out the unique natural geographic phenomena and natural disasters, and briefly explain the main reasons for their formation	

Table 3. Cont.

Issue Time	Primary School	Middle School	High School
Issue Time		High School	
2003		Taking a certain natural disaster as an example, briefly describe the main reasons for its occurrence; Use examples to understand the application of remote sensing in disaster monitoring; The types and distribution of major natural disasters; List the main types of natural disasters; Use examples to briefly describe the main characteristics of natural disasters; Use maps to illustrate the distribution of world's major natural disaster zones; Major natural disasters in China; Use maps to point out the regional distribution of major natural disasters in China; Briefly describe the occurrence mechanism and process of geological and geomorphological disasters such as earthquakes, debris flows, and landslides; Analyze the causes of meteorological disasters such as typhoons, cold waves, droughts, and floods	
Issue Time	Primary School	Middle School	
2011	Understand earthquakes, floods, and other major natural disasters that have occurred in China, and understand the irresistible side of nature	Know the basic viewpoints of plate tectonics theory, and tell the relationship between the distribution of world-famous mountain series, volcanoes, earthquakes, and plate movements; Understand that China is a country with frequent natural disasters; According to the data, analyze the natural disasters and environmental problems in a certain area	
Issue Time		High School	
2017		Use data to explain the causes of common natural disasters; Use diagrams to analyze the impact of air-sea interaction on the global water and heat balance, and explain the impact of El Niño and La Niña on global climate and human activities; Explain the types of natural disasters; Explain the causes of geological disasters such as earthquakes, debris flows, and landslides; Analyze the causes of meteorological disasters such as typhoons, cold waves, droughts, floods, and storm surges; Use charts and data to explain the spatial distribution of major natural disasters in the world	

The DRR-relevant contents in the high school geography curriculum standards, which belong to the 'knowledge' dimension, were the occurrence, magnitude, intensity distribution, and prediction of the 1986 edition [19] (pp. 248–290), while, the 1990 edition [19] (pp. 315–365) added the drought, waterlogging and salinization in the North China Plain, the relationship between the plum rains, summer drought and agricultural production in the middle and lower reaches of the Yangtze River, and the typhoon landfalls in the southern coastal area of China. As for the 1996 [19] (pp. 438–454) and 2000 [19] (pp. 490–507) editions, no DRR-relevant contents could belong to the "knowledge" dimension. The 2003 edition was more extensive, including not only the types and distribution of major natural disasters in the world, but also the mechanism and occurrence process of geological and geomorphological disasters in China, and the causes of meteorological disasters in China. Based on the 2003 edition [23], the 2017 edition [26] had included the following DRR-relevant contents which could belong to the "knowledge" dimension: the causes of the world's major natural disasters, the impact of air-sea interaction on the global water and heat balance, and the impact of El Niño and La Niña on global climate and human activities.

We then analyzed the second dimension ("response" dimension, see Table 4) and the third dimension ("action" dimension, see Table 5). The "response" dimension ranked third in terms of proportion, but the DRR-relevant contents were only a quarter of the 'knowledge' dimension. In the 1988 edition [19] (pp. 291–314) of the middle school geography curriculum standard, listening to the weather forecast and paying attention to the occurrence and prevention of local disastrous weather could belong to the 'response' dimension. In addition, there were no DRR-relevant contents of the 'response' dimension in the geography curriculum standards of each primary and secondary school from 1986 to 1992. The DRR-relevant contents in the primary school geography curriculum standard that could belong to the "response" dimension, the 2001 [21] and 2011 [24] editions have added the following contents: learning the methods of self-preservation and mutual assistance in the face of natural disasters and developing corresponding abilities; carrying out escape simulation activities.

Table 4. “Response” dimension in the geography curriculum standards.

Issue Time	Primary School	Middle School	High School
1986	None	None	None
Issue Time	Primary School	Middle School	
1988	None	Listen to the weather forecast and pay attention to the occurrence and prevention of local disastrous weather	
Issue Time	Middle School	High School	
1990	None	None	
Issue Time	Primary School	Middle School	
1992	None	None	
Issue Time	High School		
1996	Understand the importance of monitoring and prevention of meteorological disasters such as cold waves, dry hot winds, typhoons, rainstorm, and gale; Understand the importance of monitoring and prevention of geological disasters such as earthquakes, volcanic eruptions, landslides, and debris flows		
Issue Time	Middle School	High School	
2000	None	Understand the importance of monitoring and prevention of meteorological disasters such as cold waves, dry hot winds, typhoons, rainstorm, and gale; Understand the importance of monitoring and prevention of geological disasters such as earthquakes, volcanic eruptions, landslides, and debris flows	
Issue Time	Primary School	Middle School	
2001	Learn the methods of self-preservation and mutual assistance in the face of natural disasters, and develop corresponding abilities	Conduct a self-rescue exercise against a sudden natural disaster	
Issue Time	High School		
2003	Use examples to understand the application of remote sensing in disaster monitoring; Set up an extracurricular monitoring team to develop plans and carry out activities for natural disasters that frequently occur in the local area; Use examples to illustrate the role of geographic information technology in natural disaster prediction, disaster monitoring, and assessment; Take one or two natural disasters as examples and enumerate appropriate response methods or emergency measures		
Issue Time	Primary School	Middle School	
2011	Learn the methods of self-protection and mutual assistance in natural disasters; Carry out escape simulation activities	None	
Issue Time	High School		
2017	Understand disaster avoidance and prevention measures; Use examples to illustrate the precursors and forecasting methods of certain natural disasters; Take one or two natural disasters such as earthquakes as examples to enumerate the appropriate response methods or emergency measures; Use examples to illustrate the role of geographic information technology in natural disaster prediction, disaster monitoring, and assessment		

Table 5. “Action” dimension in the geography curriculum standards.

Issue Time	Primary School	Middle School	High School
1986	Management of the Yellow River	Radical management and comprehensive development of the Yellow River’s floods; Radical management of the Haihe River; Management of the Huaihe River	None
Issue Time	Primary School	Middle School	High School
1988	None	None	
Issue Time	Middle School	High School	
1990	Radical management and comprehensive development of the Yellow River’s floods; Radical management of the Haihe River; Management of the Huaihe River	None	
Issue Time	Primary School	Middle School	High School
1992	None	Prevention and management of soil erosion, sandstorms, droughts, and floods; Management of the Yellow River, Haihe River, and Liaohe River	
Issue Time	Middle School	High School	
1996	Understand the hazards of meteorological disasters such as cold waves, dry hot winds, typhoons, rainstorm, and gale; Understand the hazards of geological disasters such as earthquakes, volcanic eruptions, landslides, and debris flows		
Issue Time	Primary School	Middle School	High School
2000	Know the flood control, development, and utilization of the Yangtze River; Know the comprehensive management of drought, waterlogging, salinization, and sandstorm in the North China Plain	Understand the hazards of meteorological disasters such as cold waves, dry hot winds, typhoons, rainstorm, and gale; Understand the hazards of geological disasters such as earthquakes, volcanic eruptions, landslides, and debris flows	
Issue Time	Primary School	Middle School	High School
2001	Collect typical examples of major natural disasters from media reports and understand their huge destructiveness	Analyze the consequences of major natural disasters and environmental problems in a certain area based on data	
Issue Time	Primary School	Middle School	High School
2003	Give examples of the major hazards caused by biological disasters such as insect plague and rat plague; Use data to explain the impact of human activities on natural disasters; Take a natural disaster as an example and briefly describe its hazards; Compare the regional differences in the damage degree caused by the same natural disaster; Use examples to illustrate the characteristics of the natural environment in areas prone to natural disasters in China		
Issue Time	Primary School	Middle School	High School
2011	Collect typical examples of major natural disasters such as earthquakes and floods to understand the huge destructiveness of natural disasters	Analyze the impact of natural resources and natural disasters on the society and economy of the hometown with examples	
Issue Time	Primary School	Middle School	High School
2017	Explain the impact of natural disasters on human society; Explain the hazards of geological disasters such as earthquakes, debris flows, and landslides; Analyze the hazards of meteorological disasters such as typhoons, cold waves, droughts, floods, and storm surges; Illustrate the hazards of biological disasters such as insect plague and rat plague with examples; Illustrate the impact of human activities on natural disasters with examples; Compare the regional differences in the damage degree caused by the same natural disaster; Use examples to illustrate the characteristics of the natural environment in areas prone to natural disasters in China		

The DRR-relevant contents in the middle school geography curriculum standards that could belong to the “response” dimension only appeared in the 2001 edition [22], which was conducting a self-rescue exercise against a sudden natural disaster. The DRR-relevant contents in the high school geography curriculum standards that could be classified into the “response” dimension were the same in the 1996 edition [19] (pp. 438–454) and 2000 edition [19] (pp. 490–507), including understanding the importance of monitoring and prevention of meteorological disasters and geological disasters. Compared with the previous editions, the 2003 [23] edition has undergone major changes. It was proposed that it was no longer only to understand the hazards caused by certain disasters but to illustrate the role of geographic information technology in natural disaster prediction, monitoring, and evaluation, and to take one or two natural disasters as examples and enumerate appropriate response methods or emergency measures. On the basis of the 2003 edition, the 2017 edition [26] added the following contents: understand disaster avoidance and prevention measures; use examples to illustrate the precursors and forecasting methods of certain natural disasters.

Although the proportion of the “action” dimension ranked second among all the five dimensions, its DRR-relevant contents were reduced by half compared with the ‘knowledge’ dimension. The DRR-relevant contents in the primary school geography curriculum standards, which belong to the ‘action’ dimension, was only the management of the Yellow River flood in the 1986 edition [19] (pp. 36–44). As for the 1988 and 1992 editions [20] (pp. 171–180), no DRR-relevant contents could belong to this dimension. The DRR-relevant contents in the 2001 edition [21] were to collect typical examples of major natural disasters from media reports and to understand their huge destructiveness. While, in the 2011 edition [24], the major natural disasters were specified as earthquakes and floods.

The DRR-relevant contents in the 1986 [19] (pp. 248–290) and 1990 [19] (pp. 315–365) editions of the middle school geography curriculum standards, which were radical management of the Haihe River and the Huaihe River and comprehensive development of the Yellow River, could be subordinate to the ‘action’ dimension. There were no DRR-relevant contents in the 1988 edition [19] (pp. 291–314). In the 1992 edition [19] (pp. 389–434), the following DRR-relevant contents could belong to the “action” dimension: the prevention and management of soil erosion, sandstorms, droughts, and floods; the management of the Yellow River, Haihe River, and Liaohe River. In the 2000 edition [19] (pp. 455–489), the following DRR-relevant contents could belong to the “action” dimension: the development and utilization of the Yangtze River; the comprehensive management of drought, waterlogging, salinization, and sandstorm in the North China Plain. The 2001 edition [22] was quite different from the previous editions. It was changed to analyze the consequences of major natural disasters and environmental problems in a certain area based on data. The 2011 edition [25] further changed to analyze the impact of natural resources and natural disasters on the society and economy of the hometown with examples.

In the 1986 edition [19] (pp. 248–290) and the 1990 edition [19] (pp. 315–365) high school geography curriculum standards, there were no DRR-relevant contents that could be classified to the “action” dimension. The following DRR-relevant contents in the 1996 edition [19] (pp. 438–454) and the 2000 edition [19] (pp. 490–507) high school geography curriculum standards could be classified into the “action” dimension: the hazards of meteorological disasters such as cold waves, dry hot winds, typhoons, rainstorm, and gale; the hazards of geological disasters such as earthquakes, volcanic eruptions, landslides and debris flows. The DRR-relevant contents in the 2003 edition [23] high school geography curriculum standard that could be classified into the “action” dimension, including the following contents: give examples of the major hazards caused by biological disasters such as insect plague and rat plague; use data to explain the impact of human activities on natural disasters; take a natural disaster as an example and briefly describe its hazards; compare the regional differences in the damage degree caused by the same natural disaster; use examples to illustrate the characteristics of the natural environment in areas prone

to natural disasters in China. Based on the 2003 edition, the 2017 edition [26] added the following DRR-relevant contents that could be part of the “action” dimension: explain the impact of natural disasters on human society; explain the hazards of geological disasters such as earthquakes, debris flows and landslides; analyze the hazards of meteorological disasters such as typhoons, cold waves, droughts, floods and storm surges.

Finally, we analyzed the fourth dimension (“participation” dimension, see Table 6) and the fifth dimension (“integration” dimension, see Table 7). The participation dimension doesn’t exist until the new millennium (2001). The proportion of the “participation” dimension ranked the fourth, but DRR-relevant contents in all editions of the primary and secondary school geography curriculum standards from 1986 to 2000 could not be included in this dimension. In the 2001 edition [21] and the 2011 [24] edition of the primary school geography curriculum standards, only the appreciation of the value of solidarity and mutual help among people in distress could belong to the “participation” dimension. In the 2001 edition [22] and the 2011 edition [25] middle school geography curriculum standards, the following DRR-relevant contents could belong to the “participation” dimension: understand the successful experience of regional environmental protection and resource development and utilization; introducing the major natural disasters, disaster prevention and mitigation measures, and existing problems in the hometown. The DRR-relevant contents in the 2003 edition [23] high school geography curriculum standard, which was the major achievements in disaster prevention and mitigation in China that could be classified into the “participation” dimension. The following DRR-relevant contents in the 2017 edition high school geography standard that could be included in the “participation” dimension were: create simulated scenarios of natural disasters to guide students to establish a scientific view of disasters and awareness of disaster reduction; explore the disaster prevention and reduction measures that should be taken before, during and after a disaster.

Table 6. “Participation” dimension in the geography curriculum standards.

Issue Time	Primary School	Middle School
2001	Appreciate the value of solidarity and mutual help among people in distress	Understand the successful experience of regional environmental protection and resource development and utilization; Introduce the major natural disasters, disaster prevention and mitigation measures, and existing problems in the hometown
Issue Time	High School	
2003	Give examples of major achievements in disaster prevention and mitigation in China	
Issue Time	Primary School	Middle School
2011	Appreciate the value of solidarity and mutual help among people in distress	Understand the successful experience of regional environmental protection and resource development and utilization
Issue Time	High School	
2017	Create simulated scenarios of natural disasters to guide students to establish a scientific view of disasters and awareness of disaster reduction, and explore the disaster prevention and reduction measures that should be taken before, during, and after a disaster	

Table 7. “Integration” dimension in the geography curriculum standards.

Issue Time	High School
2003	Look forward to the long-term prospect that human beings use high technology to seek advantages and avoid disadvantages

There were few DRR-relevant contents that could be classified to the “integration” dimension. Only the 2003 edition [23] high school geography curriculum standard contained DRR-relevant contents that could be classified to the “integration” dimension, which was the long-term prospect that human beings use high technology to seek advantages and avoid disadvantages. There was no DRR-relevant content belonging to the “integration” dimension in other editions of the primary and secondary geography curriculum standards.

3.2. The Evolution of DRR-Relavant Contents in the Geography Curriculum Standards

The DRR-relevant content in the geography curriculum standards that used in this research had undergone constant changes and finally reached a relatively stable state. Through the analysis of the coding results in NVivo 12 (see Figure 1), it could be seen that the 1986 edition of the primary and secondary school geography curriculum standards all contained DRR-relevant contents. After the primary and middle school geography curriculum reform in 1988, the DRR-relevant contents in the primary school geography curriculum standards were no longer included, while in the middle school geography curriculum, standards were greatly reduced. The curriculum reform of middle school curriculum reform in 1990 made the DRR-relevant contents in the geography curriculum standards of middle school and high school reach an amount similar to the DRR-relevant contents in the primary and secondary school geography curriculum standards of the 1986 edition. After the primary and middle school curriculum reform in 1992, the DRR-relevant contents were still not included in the primary school geography curriculum standard, and the DRR-relevant contents in the middle school geography curriculum standard were reduced. In 1996, the curriculum reform made the DRR-relevant contents in the 1996 edition of the high school geography curriculum standard equivalent to the DRR-relevant contents in the 1990 edition of the high school curriculum standard. After the secondary school curriculum reform in 2000, the DRR-relevant contents in the middle school geography curriculum standard had been greatly reduced, while the DRR-relevant contents in the high school geography curriculum standard had not changed. The geography curriculum reforms carried out for primary and middle school in 2001 and for high school in 2003 were very important because so far, a relatively stable DRR-relevant content system had been formed in the primary and secondary school geography curriculum standards. In view of this, the revision of the geography curriculum standard carried out for primary and middle school 2011 and for high school in 2017 was all fine-tuning on the basis of the 2001 edition and 2003 edition geography curriculum standards.

Through the analysis of the evolution of DRR-relevant contents in the geography curriculum standards that used in this research in different school stages (see Table 8), it can be seen that the changes of DRR-relevant contents in primary school, middle school and high school curriculum presented different characteristics. At the primary school stage, the DRR-relevant content in the geography curriculum standards was too thin. The 1986 edition of the primary school geography curriculum standard still contained a small amount of DRR-relevant contents. From 1988 to 2001, although several primary school geography curriculum reforms were carried out during this period, the DRR-relevant content has not been included, which made DRR disappear from the primary school geography curriculum for 13 years. In the 2001 edition and the 2011 edition of the primary school geography curriculum standards, there were DRR-relevant contents involving four dimensions, but there was only one code entry under each dimension. At the middle school stage, the DRR-relevant content in the geography curriculum standards emphasized too much on knowledge. In the 1986 edition and the 1990 edition of the middle school geography curriculum standards, there were as many as 11 DRR-relevant content-coding items belonging to the “knowledge” dimension. Curriculum reforms carried out from 1992 to 2011 made the number of DRR-relevant content-coding items that belonged to the “knowledge” dimension in the middle school geography curriculum standards gradually reduced, but they still accounted for the highest proportion among all the five dimensions. At the high school stage, the DRR-relevant content in the geography curriculum standards

gradually became comprehensive and balanced along with the curriculum reform. The DRR-relevant contents in the 1986 edition and the 1990 edition of the high school geography curriculum standards only belonged to the “knowledge” dimension and did not belong to the other four dimensions. However, in the 1996 edition and the 2000 edition of the high school geography curriculum standards, the composition of DRR-relevant content was still unbalanced and only had DRR-relevant contents that belonged to the “response” dimension and the “action” dimension. With the implementation of the high school curriculum reform in 2003, the DRR-relevant contents in the high school geography curriculum standard involved all five dimensions, and the number of coding items of the DRR-relevant content belonged to the “knowledge” dimension, the “response” dimension and the “action” dimension also increased. When it came to the 2017 edition of the high school geography curriculum standard, the DRR-relevant content basically covered all five dimensions, and the number of coding items in each dimension tended to be balanced.

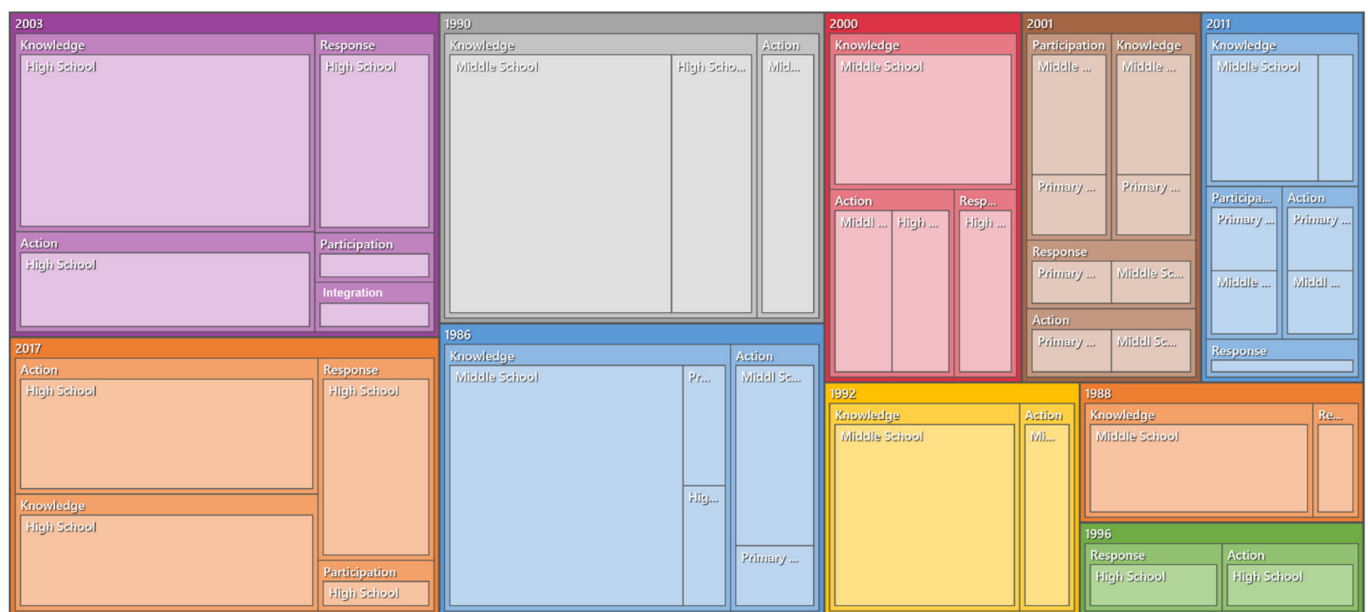


Figure 1. Coding results of DRR-relevant contents in the geography curriculum standards issued in different years (Source: Author).

Table 8. Statistics on DRR-relevant contents in the geography curriculum standards.

	Issue Time	Knowledge	Response	Action	Participation	Integration
Primary School	1986	1		1		
	2001	1	1	1	1	
	2011	1	1	1	1	
Middle School	1986	11		3		
	1988	5	1			
	1990	11		3		
	1992	7		2		
	2000	5		2		
	2001	2	1	1	2	
	2011	3	1	1	1	
High School	1986	1				
	1990	4				
	1996		2	2		
	2000		2	2		
	2003	10	4	5	1	1
	2017	6	4	7	1	

4. Discussion

In order to investigate the content evolution of DRR in the school geography curriculum in China, this research used the five dimensions of the DRR learning framework (Table 1) as a platform and a conceptual premise upon which to review the primary and secondary school geography curriculum standards from 1986 to the present. China has integrated DRR into the national school geography curriculum at all levels. Therefore, geography as a carrier subject had been an integration approach of DRR in the national curriculum in China [11]. Using the method of qualitative content analysis with the support of the software NVivo 12, we came to the following results: the DRR-relevant content in the geography curriculum standards that used for analysis in this research had undergone constant changes and finally reached a relatively stable state; at the primary school stage, the DRR-relevant content in the geography curriculum standards was too thin; at the middle school stage, the DRR-relevant content in the geography curriculum standards emphasized too much on knowledge; at the high school stage, the DRR-relevant content in the geography curriculum standards gradually became comprehensive and balanced along with the curriculum reform. In short, DRRE in China has ensured equal access to appropriate training and educational opportunities for children and vulnerable constituencies.

In the context of DRR, education is a critical driver because it conveys the essential fundamentals for risk-conscious and risk-mitigating actions among the population. Those responsible for education and research in the field of disaster education can be served to improve the level of education [30]. Geography aims to integrate the study of both natural and human realities and their interactions, focusing on spaces, places, and regions, addressing and questioning both short-term and long-term processes and their resultant patterns [31]. In this sense, when it comes to DRR education in school, the subject of Geography has an integrated “advantage” over most, if not all, and is critical to a more holistic understanding of processes, patterns, and trajectories that characterize the disrupted earth system. When disasters are investigated in the context of Geography, consideration must inevitably be given to the realm of overlap between Physical and Human Geography. It is thus necessary to not only perceive nature and culture merely as fields of objective investigation, but rather to also shift one’s focus onto the specific societal relationships and developments in which the meaning of the terms are formed and changed [32]. Through the previous analysis of the geography curriculum standards in China’s primary and secondary schools, it can be seen that the DRR-relevant content focused too much on natural disasters and paid little attention to the perceptions of societal vulnerability and resilience, which were the social part of DRR. A poor understanding of community resilience and the social dimensions of risk, the lack of a methodology to engage and empower resilience in society, and business-as-usual together limit the implementation of effective DRR and resilience-building strategies [33]. In the future geography curriculum reform, we should realize that the term disaster does not describe the natural event per se, but instead its impact on/consequences for infrastructure and society.

The participation of children is a valued proposition as it brings real and necessary benefit to DRR and resilience-building policies, programs, and strategies [34–38]. DRR education is effective at all stages of the crisis, but its impact is even more in preparation [30]. DRR education should be taught not only using textbooks but also through practical and experiential learning activities [39–43]. The acquired knowledge should be applied to the actual daily life environment. Teaching about disasters is not enough to promote risk awareness or action on the part of children. Academic DRR knowledge should be taught as part of a comprehensive package with disaster prevention and preparedness [3] (p. 66). Geography literacy makes students have good disaster response skills and find a solution for natural damage, and reduce its negative side effects [44]. Therefore, based on the previous analysis of the DRR-relevant content in Chinese school geography curriculum standards, it is necessary to add more DRR-relevant content that belongs to the “action” dimension and the “participation” dimension, especially at the primary and middle school stages. As far as the entire geography curriculum of primary and secondary schools is

concerned, the DRR-relevant content of the “integration” dimension is completely missing. Without political will and a strong engagement of key stakeholders in the drafting of the policy, the prospects of implementing disaster risk reduction integration into the education curriculum are weak [45–48]. In view of this, we are bound to systematically incorporate the DRR-relevant content of the “integration” dimension into the school geography curriculum in the next round of school geography curriculum reform.

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