sustainability

MDPI

Article

Assessing the Impact of Online-Learning Effectiveness and Benefits in Knowledge Management, the Antecedent of Online-Learning Strategies and Motivations: An Empirical Study

Tanaporn Hongsuchon [1], Ibrahiem M. M. El Emary [2], Taqwa Hariguna [3,*] and Eissa Mohammed Ali Qhal [4]

[1] Chulalongkorn Business School, Chulalongkorn University, Bangkok 10330, Thailand; tanaporn.h@chula.ac.th
[2] Computer Science and Systems IT Deanship, King Abdulaziz University, Jeddah 80200, Saudi Arabia; omary57@hotmail.com
[3] Departement of Information System, Universitas Amikom Purwokerto, Purwokerto Utara 53121, Jawa Tengah, Indonesia
[4] Administration Department, Applied College, Jazan University, Jazan 0114, Saudi Arabia; egohal@jazanu.edu.sa
* Correspondence: taqwa@amikompurwokerto.ac.id

Abstract: Online learning is one of the educational solutions for students during the COVID-19 pandemic. Worldwide, most universities have shifted much of their learning frameworks to an online learning model to limit physical interaction between people and slow the spread of COVID-19. The effectiveness of online learning depends on many factors, including student and instructor self-efficacy, attitudes, and confidence in using the technology involved; the educational strategies employed; the ability to monitor and evaluate educational outcomes; and student motivation, among many others. In this study, we analyzed how these factors were associated and impacted each other. We developed a comprehensive model after an extensive review of the relevant literature. The model was validated by applying partial least square regression to the data obtained by surveying 469 students who were enrolled in online education. The test results indicated that all the variables had a positive effect on the effectiveness of online learning. The effectiveness of online learning had a significant impact on the benefits of online learning. This showed that the more effective online learning was, the more benefits and positive outcomes the student experienced. The result of this research showed that learning objectives could enable universities to increase the effectiveness of students' online learning by motivating students to join online classes and developing appropriate learning strategies for their individual needs.

Keywords: online; learning technology; learning strategic; learning motivation; learning effectiveness; learning benefit

Citation: Hongsuchon, T.; Emary, I.M.M.E.; Hariguna, T.; Qhal, E.M.A. Assessing the Impact of Online-Learning Effectiveness and Benefits in Knowledge Management, the Antecedent of Online-Learning Strategies and Motivations: An Empirical Study. *Sustainability* **2022**, *14*, 2570. https://doi.org/10.3390/su14052570

Academic Editor: Michail Kalogiannakis

Received: 14 January 2022
Accepted: 21 February 2022
Published: 23 February 2022

1. Introduction

The global COVID-19 pandemic has impacted all sectors, including government, business, tourism, health, and education. Simultaneously, this outbreak has also changed the way these services are delivered, forcing many of them to develop effective online strategies. In the education sector, students have had to adapt to these rapid shifts to online platforms. Based on a report from UNESCO [1], 91% of universities have moved their "offline" learning online. Some governments and universities have even offered financial support to students in the form of subsidies, so they are able to access the internet and online learning platforms.

For students majoring in computer science, online learning concepts such as digital learning, MOOC, and blended learning concepts have been typical for some of their coursework. Nevertheless, it is still unfamiliar for students in other study programs that

have never been required to use any form of online learning. By definition, online learning is a method of distance learning using information technology infrastructures, including the use of digital applications, online learning software, and internet connectivity [2,3]. On the other hand, e-learning has employed online software platforms for virtual interaction in addition to regularly scheduled in-person instruction, online learning delivers real-time and pre-recorded instruction sessions using online learning software, removing the need for in-person instruction entirely. The concept of online learning today has affected the patterns and behaviors of students during the learning process [4], which can be particularly impacted by the effectiveness of the technology solutions implemented.

Online learning frameworks provide a space for students to access their education modules and coursework any time of day. Teachers and students can communicate without the barriers of a physical space and scheduled class times. This flexibility has had an impact on developments in the education sector [5]. Though online learning has been adopted as a result of the ongoing global COVID-19 pandemic, it also has provided opportunities to improve educational equality [6].

Due to the prolific spread of online learning during the current pandemic and our subsequent dependence on it during lockdowns and social distancing policies, online learning is likely here to stay. Even when the pandemic is over, online learning may provide enough benefits to be continued in a similar or evolving format [7,8]. Some approaches of online learning have been well-received by students and instructors [9,10], and it has also enabled students and instructors to have more influence in their learning activities [11–13].

According to the terminology, the effectiveness of online learning refers to improving student's abilities via the learning process while using digital media and connecting online. Two-way communication is still part of the online-learning process [11,12] and should be considered. Student characteristics also play an important role that should be studied further. In addition, the technological interface used during online learning should be examined further [14]. Prior research has shown that online learning has a crucial role in the evolution of education.

Several studies have investigated the effectiveness of online learning but have not considered the impact of student acceptance of online learning and whether they understand its benefits. This study examined the effectiveness of online learning and its benefits as they relate to supporting factors and their influences. We conducted our research during the COVID-19 pandemic with the goal of having a significant influence on students and instructors.

In this study, we integrated motivational and strategic parameters to examine the effectiveness of online learning and its benefits. Several researchers have analyzed the effectiveness of online learning using efficiency benchmarks, whereas others have explored student characteristics. However, our research combined the two and considered the internal factors from the stakeholders' perspective, such as attitudes and motivations, as well as external factors from the institutional perspective, such as environmental concerns and tracking. Furthermore, both perspectives are driven by the confidence in the applied technology [15,16]. Several previous studies have explored various external and internal factors and their impacts [17–21]. Using these as references, this study built and integrated nine factors that were used as parameters for the model, analyzed them using structural equation modeling (SEM), and verified the results using SmartPLS to determine the effectiveness of online learning.

In addition, this research also considered the technological solution alongside the internal and external aspect with the understanding that each impacts the effectiveness and perceived benefits of online learning. Furthermore, we considered the effectiveness of online learning as an aspect that affected the benefits. Two factors were used as mediators for the effectiveness of online learning whereas one mediator was considered for online learning benefits. The mediating variables assessed the degree of influence to which the

existing factors supported the performance and the effectiveness of online learning and its benefits.

2. Literature Review and Research Hypothesis

2.1. Online-Learning Self-Efficacy Terminology

Self-efficacy refers to a person's perception of their ability to perform to a standard of achievement or to attain their desired outcome, and this perception is based on their evaluation of their previous outcomes [22]. This terminology extends to the concept of online learning and is referred to as online-learning self-efficacy. It is based on the integration of two concepts. The first is computer self-efficacy, which involves the user's skill in using a computer and their belief that they can use it efficiently and effectively. The second is internet self-efficacy, which is similarly defined by the user's skill in using the internet as well as their belief that they can use it efficiently and effectively [23]. Therefore, online-learning self-efficacy can be defined as a user's actual skill as well as their perception of their ability to use online technology effectively and efficiently in the learning process [24]. Furthermore, when determining strategies for implementing online learning, it is necessary to standardize lesson plans and encourage students in their abilities to navigate novel learning methods [25]. Previous studies have shown that the concept of online-learning self-efficacy has a real and relevant effect on the outcomes of online-learning strategies [26], and it has impacted the success of online-learning implementation [27,28]. In addition, students who had better online learning self-efficacy had higher success rates in terms of their academic scores [29,30].

Therefore, we proposed the following hypothesis:

Hypothesis 1 (H1). *Online-learning self-efficacy has a positive and significant effect on online-learning strategies.*

2.2. Online-Learning Monitoring Terminology

Appropriate monitoring during online learning is crucial. It includes periodic reviews, evaluations, and feedback between stakeholders at key times to increase the effectiveness and quality of online learning [31]. Since the concept of online learning emphasizes independent study, regular assessments of the process are needed, even if they are not comprehensive. Previous research regarding the improvement of cognitive memory indicated that a strict monitoring process could increase efforts in building learning strategies as well as encouraging learning effectiveness and provided strong motivation for students [32]. In addition, previous research has also confirmed that better control impacted the effectiveness of the learning process on student outcomes [33].

Therefore, we proposed the following hypothesis:

Hypothesis 2 (H2). *Monitoring online learning regularly can provide a positive value and have a significant influence on online-learning strategies.*

2.3. Online-Learning Confidence in Technology Terminology

Rosenberg [34] described the concept of online learning as a learning process that uses the Internet and different solutions to increase knowledge and performance. ICT is conceptualized into four multidimensional constructs, namely advantage, compatibility, ease of use, and perception [35]. Achuthan et al. [36] explained that in the learning process, ICT not only supported reflective learning but could also improve students' abilities to learn and retain knowledge. Hu et al. [37] suggested that utilizing ICT supported student learning by exploring, following personalized learning, and increasing productivity with open-ended questions. The use of ICT has changed learning models, created new learning environments, and introduced new pedagogies to improve student learning outcomes. In-person learning environments dominated the sector prior to the COVID-19 pandemic, and these required students to attend lectures, work individually or in groups, and under-

take assessments based on knowledge; ICT had only limited impact [38]. However, the application of restrictions on outdoor activities and requiring social distancing has changed the learning environment for students and instructors [39]. Eickelmann et al. [40] suggested that it was beneficial to have collaboration between teachers and students in order to implement online learning methods that utilize ICT for learning and problem-solving. Shehzadi et al. [41] highlighted the impact of using ICT to improve student learning during a pandemic.

Therefore, we proposed the following hypothesis:

Hypothesis 3 (H3). *Online-learning confidence-in-technology has a positive and significant influence on strategic online learning.*

Hypothesis 4 (H4). *Online-learning confidence-in-technology has a positive and significant effect on motivation in online learning.*

2.4. Online-Learning Willpower Terminology

The concept of willpower in online learning refers to the students' desire to engage in online learning activities. It can also help students to overcome the inevitable difficulties that exist in online learning. In online-learning environments, the role of students is central. Students need a better understanding of the value of independence in the learning process whereas instructors act as movers, mediators, and motivators for students. Willpower is the ability to delay gratification and resist short-term temptations in order to achieve a long-term goal. Willpower in online learning has been found to shape the mentality of students to be more resilient and persistent and has a direct positive impact on student outcomes [42]. Previous research had empirically shown that students with significant life challenges, such as those with learning difficulties, physical disabilities, or disadvantaged backgrounds, may provide positive examples in terms of learning motivation. They have high levels of willpower to solve problems during their learning process. Furthermore, to increase motivation in learning, especially in online learning, students must possess understanding and strong willpower [43].

Therefore, we proposed the following hypothesis:

Hypothesis 5 (H5). *Online-learning willpower has a positive value and has a significant influence on online-learning motivation.*

2.5. Online-Learning Attitude Terminology

Attitude in educational terminology relates to the feelings and values students have towards the learning process. In online-learning terminology, it refers to the feelings and values students have towards online learning. Self-discipline may inform these values, so a positive attitude may result from that discipline. In addition, how these values relate to their feelings and a student's awareness of that relationship is crucial to influence of the student's attitude [44]. The methods used in online learning affect student attitudes. Previous students have reported that students' attitudes during the learning process have a significant and positive impact on students' motivations towards learning [45]. The higher the student's attitude towards learning, the higher the student's motivation, and vice versa. Furthermore, academic achievement has been efficiently achieved when students have had positive attitude scores [46].

Therefore, we proposed the following hypothesis:

Hypothesis 6 (H6). *Online-learning attitude has a positive and significant impact on motivation in online learning.*

2.6. Online-Learning Motivation Terminology

Theories that discuss motivation have been explored in previous research, including the theory of motivation in learning. Learning motivation has been described as the drive, whether internally or externally inspired, to initiate or maintain an intention to complete a learning task to achieve a valued outcome. Motivation is an important variable that enables students and teachers to achieve their academic commitment. Furthermore, motivation in the online-learning process is a key factor for knowledge transfer. Previous studies have confirmed the significant relationship between learning motivation and learning strategies [47]. Another study also indicated that students who had high motivation in learning, which was then supported with effective strategies and learning processes, increased their academic performance. [48]. Even students who may not have had previous academic success have improved their academic outcomes when they had high levels of motivation. Conversely, students with historical academic success and achievement that had low motivation had lower academic scores [49]. In online learning, motivation also played a central role in determining the effectiveness of the implementation of online learning itself [50]. Wang et al. [51] confirmed that there were positive values and significance between learning motivation, learning strategies, and learning effectiveness.

Therefore, we proposed the following hypothesis:

Hypothesis 7 (H7). *Online-learning motivation has a positive value and has significance for online-learning strategies.*

Hypothesis 8 (H8). *Online-learning motivation has a positive value and has a significant effect on online-learning effectiveness.*

2.7. Online-Learning Strategies and Online-Learning Effectiveness Terminology

In determining the effectiveness of a performance, an appropriate and well-planned strategy is needed. Strategic online learning has a strong influence on the effectiveness of online-learning outcomes. As shown by Lin et al. [52], the learning process must be followed by strategic learning tools to achieve effective learning. Furthermore, Deschenes et al. [53] showed that there was a significant relationship between strategic learning and learning effectiveness.

Therefore, we proposed the following hypothesis:

Hypothesis 9 (H9). *Online-learning strategies have a positive and significant effect on online-learning effectiveness.*

2.8. Online-Learning Effectiveness Terminology

The effectiveness of online learning is related to the insight and abilities of a person obtained through the learning process using certain learning media, such as MOOC, Moodle, Zoom, Google Meet, and others. Previous research has described the relationship between these variables. The effectiveness of a technology application influences the benefits obtained. In online learning, effective learning can provide benefits to students both directly and indirectly.

Therefore, we proposed the following hypothesis:

Hypothesis 10 (H10). *Online-learning effectiveness has a positive value, correlation, and significance to online-learning benefits.*

Overall, this study proposed ten hypotheses, as shown in Figure 1.

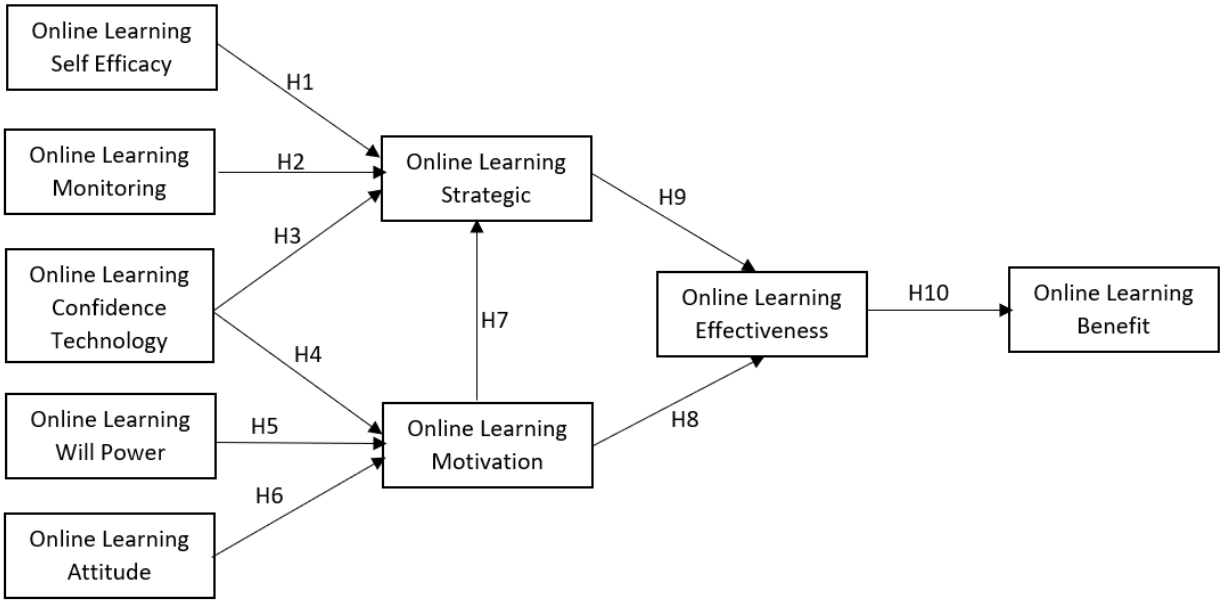

Figure 1. Research model.

3. Research Method

The method applied in this research was quantitative. To collect data, an online questionnaire was distributed online via a Google form. The software used to analyze the data was SmartPLS 2.0. SEM-PLS was used to confirm the reliability and validity of the study. The examination of the hypotheses was conducted based using bootstrapping.

3.1. Instruments

To assess self-efficacy in online learning, this study used the theory of general self-efficacy. This theory was first proposed by Jerusalem et al. [54]. General self-efficacy theory has been widely used due to being easy to understand and having few question items. Previous research has confirmed that the coefficients in this theory are strong and reliable. The values range from 0.75 to 0.91. In addition, its validity has also been confirmed.

When determining the quality of the indicator for each variable used to measure willpower in an online learning environment, this study employed Zimmerman's self-regulation theory [55]. This was also the indicator used to assess online-learning effectiveness.

Furthermore, to measure the variables in online-learning motivation, this study used the theory of motivation strategies. This theory has specifically been used in determining basic concepts in the learning process. It was proposed by [56]. Many previous studies have confirmed that this theory has a high degree of reliability and validity. The intrinsic value in this theory was the main concept used to measure online-learning motivation. A strong motivation is an inherent part of intrinsic value.

For strategic online learning, this study used concepts that were used in previous research, such as "a good plan", the suitability of the existing material, the method used, and the integration of the concept of learning with existing technology.

This study measured the online-learning process with the software used, among others; Zoom, Google Meet, Microsoft Team, MOOC, Moodle, and others. These tools are popular and currently used in the online-learning process.

To generate relevant data, this study used concepts that have been used by previous researchers regarding student acceptance of online learning [57]. During the COVID-19 pandemic, we found that most learning processes at all levels of education were conducted online. Therefore, the items used in the questionnaire for this study were modified and adapted based on theoretical standards and literature that had been studied in depth.

3.2. Data Analysis and Results

This study used data collected from online surveys. The questionnaire was distributed to students who were enrolled in online learning and was carried out from February 2021 to August 2021. The data sample included students from several universities that had implemented online learning. Levels of study varied, including bachelor's, master's, and doctoral programs. When selecting students as respondents, we assumed that, in general, students would not have much difficulty engaging in online learning activities, so we assumed that would minimize the occurrence of sampling bias. This study collected 474 responses and validated 469 responses to continue on to the next stage. Based on the definition of Hair et al. [58], a sampling population of 469 (n = 469) was acceptable. The standard for conducting quantitative studies is a sample size of 300. The description of the demographic data from the survey is shown in Table 1:

Table 1. Student demographics.

Variables	Category	Frequency	Percentage
Gender	Male	243	51.81
	Female	226	48.19
Education program level	Undergraduate program	210	44.78
	Master program	154	32.84
	Doctoral program	105	22.39
Online learning tools	Smartphone	255	54.37
	Computer/PC	125	26.65
	Tablet	89	18.98
Online learning media	Google Meet	132	28.14
	Microsoft Teams	99	21.11
	Zoom	196	41.79
	Others	42	8.96

Table 1 shows the demographic information of the respondents. There were 51.81% (n = 243) male respondents and 48.19% (n = 226) of female respondents. In addition, there were 44.78% (n = 210) respondents in undergraduate programs, 32.84% (n = 154) in master's programs, and 22.39% (n = 105) in doctoral programs. Furthermore, online learning tools included 54.37% (n = 255) using a smart phone, 26.65% (n = 125) using a computer or PC, and 18.98% (n = 89) using a tablet. For the media used in learning, 28.14% (n = 132) used Google meet, 21.11% (n = 99) used Microsoft Teams, 41.79% (n = 196) used Zoom, and 8.96% (n = 42) used other media as learning media.

4. Result

In this study, we used SmartPLS, version 2.0, to validate and ensure that the questionnaire items met reliability standards. Furthermore, the partial least square regression was used to evaluate the equation model. It was also used to analyze the data and calculate the correlations between the variables. In this research, we defined and integrated the variables, namely online-learning self-efficacy, online-learning monitoring, online-learning confidence-in-technology, online-learning willpower, online-learning attitude, online-learning strategies, online-learning motivation, online-learning effectiveness, and online-learning benefits. All existing variables were analyzed and calculated to determine whether these variables had a positive impact and value.

4.1. Reliability and Validity Analysis

SEM with the partial-least-square method was used in this study to analyze the hypotheses and data with high accuracy. This method involved two phases, namely, the evaluation phase of the internal model and the analysis of the external model.

The assessment of the outer model was conducted in three stages, namely reliability analysis. It processed the convergent validity and determined the discriminant validity.

The test results showed that all existing components had a value above 0.7, which indicated that they met the criteria of composite reliability. Therefore, we fulfilled the aspects of construct reliability. Furthermore, the outer model also described convergent validity, where the indicators used were the values of the loading factor and AVE. To confirm the validity of the convergence, the AVE value and the load factor must be greater than 0.5 [59].

The load factor value of this study was from 0.70 to 0.91. Meanwhile, the AVE value was 0.63 to 0.77. Therefore, to determine discriminant validity, the indicator used was the latest item in each construct, which had to be of greater value than the loading factor in each construct [60]. The square root of AVE can also be used, and its value must be greater than the configuration. Based on Tables 2–4, we determined that the discriminatory validity in this study had been met.

Table 2. Analysis of the reliability and validity of convergence.

Construct	Measurement Items	Factor Loading/Coefficient (t-Value)	AVE	Composite Reliability	Cronbach's Alpha
Online Learning Benefit (LBE)	LBE1	0.88	0.68	0.86	0.75
	LBE2	0.86			
	LBE3	0.71			
Online-learning effectiveness (LEF)	LEF1	0.83	0.76	0.90	0.84
	LEF2	0.88			
	LEF3	0.90			
Online-learning motivation (LMT)	LMT1	0.86	0.77	0.91	0.85
	LMT2	0.91			
	LMT3	0.85			
Online-learning strategies (LST)	LST1	0.90	0.75	0.90	0.84
	LST2	0.87			
	LST3	0.83			
Online-learning attitude (OLA)	OLA1	0.89	0.75	0.90	0.84
	OLA2	0.83			
	OLA3	0.87			
Online-learning confidence-in-technology (OLC)	OLC1	0.87	0.69	0.87	0.76
	OLC2	0.71			
	OLC3	0.89			
Online-learning monitoring (OLM)	OLM1	0.88	0.75	0.89	0.83
	OLM2	0.91			
	OLM3	0.79			
Online-learning self-efficacy (OLS)	OLS1	0.79	0.64	0.84	0.73
	OLS2	0.81			
	OLS3	0.89			
Online-learning willpower (OLW)	OLW1	0.91	0.69	0.87	0.77
	OLW2	0.84			
	OLW3	0.73			

Table 2 shows the value of AVE, CR, and Cronbach's Alpha in each construct. It is greater than 0.6. Meanwhile, the value of loading factor in each measurement is greater than 0.7. The result shows that the data has been passed the standard of reliability and convergence validity.

Indicator for discriminant validity is using correlation matrix. The square root of AVE should have a greater value than the correlations among constructs, as seen on Table 3. The concept of cross-loading can be another option. Table 4 shows that the value of the loading factor should be greater than cross-loading. Tables 3 and 4 indicate that they have discriminant validity.

Table 3. Correlation matrix.

	LBE	LEF	LMT	LST	OLA	OLC	OLM	OLS	OLW
LBE	**0.82**								
LEF	0.82	**0.87**							
LMT	0.81	0.80	**0.88**						
LST	0.80	0.84	0.86	**0.87**					
OLA	0.69	0.63	0.78	0.81	**0.87**				
OLC	0.76	0.79	0.85	0.79	0.72	**0.83**			
OLM	0.81	0.85	0.81	0.76	0.63	0.83	**0.86**		
OLS	0.71	0.59	0.69	0.57	0.56	0.69	0.75	**0.79**	
OLW	0.75	0.75	0.80	0.74	0.64	0.81	0.80	0.79	**0.83**

Note: The bold numbers in the diagonal row are square roots of the AVE. Off-diagonal elements are the correlations among constructs.

Table 4. Cross-loading.

	LBE	LEF	LMT	LST	OLA	OLC	OLM	OLS	OLW
LBE1	0.88	0.76	0.87	0.66	0.54	0.79	0.78	0.63	0.74
LBE2	0.86	0.68	0.74	0.63	0.57	0.75	0.91	0.73	0.79
LBE3	0.71	0.54	0.59	0.71	0.63	0.55	0.50	0.36	0.53
LEF1	0.63	0.83	0.72	0.65	0.51	0.62	0.69	0.46	0.57
LEF2	0.77	0.88	0.78	0.71	0.55	0.73	0.78	0.52	0.69
LEF3	0.72	0.90	0.80	0.83	0.57	0.72	0.76	0.58	0.69
LMT1	0.88	0.76	0.87	0.66	0.54	0.79	0.78	0.63	0.74
LMT2	0.79	0.89	0.91	0.79	0.62	0.73	0.88	0.61	0.67
LMT3	0.72	0.65	0.85	0.77	0.89	0.72	0.67	0.59	0.69
LST1	0.61	0.63	0.68	0.90	0.78	0.64	0.57	0.39	0.57
LST2	0.74	0.59	0.72	0.87	0.78	0.68	0.61	0.48	0.63
LST3	0.72	0.90	0.80	0.83	0.57	0.72	0.76	0.58	0.69
OLA1	0.72	0.65	0.85	0.79	0.89	0.72	0.67	0.59	0.69
OLA2	0.51	0.48	0.55	0.59	0.83	0.58	0.47	0.42	0.43
OLA3	0.52	0.44	0.55	0.70	0.87	0.55	0.43	0.39	0.47
OLC1	0.78	0.70	0.73	0.65	0.53	0.87	0.77	0.65	0.91
OLC2	0.51	0.53	0.57	0.62	0.75	0.71	0.46	0.39	0.47
OLC3	0.81	0.73	0.78	0.69	0.55	0.89	0.80	0.66	0.75
OLM1	0.79	0.89	0.91	0.79	0.62	0.73	0.88	0.61	0.69
OLM2	0.86	0.68	0.74	0.63	0.57	0.75	0.91	0.73	0.79
OLM3	0.69	0.55	0.57	0.47	0.39	0.67	0.79	0.61	0.73
OLS1	0.41	0.23	0.35	0.28	0.39	0.41	0.40	0.69	0.49
OLS2	0.45	0.41	0.48	0.38	0.43	0.48	0.52	0.81	0.49
OLS3	0.75	0.66	0.72	0.60	0.49	0.69	0.77	0.89	0.82
OLW1	0.78	0.70	0.73	0.65	0.53	0.87	0.77	0.65	0.91
OLW2	0.75	0.65	0.71	0.59	0.51	0.69	0.77	0.87	0.84
OLW3	0.57	0.49	0.54	0.59	0.57	0.57	0.53	0.39	0.73

4.2. Hypothesis Result

In testing the hypotheses, the validation of the inner model used bootstrapping to estimate the significance of each path coefficient. In addition, bootstrapping was also used to determine the t-value. A hypothesis was accepted if the t-value was greater than 1.95. From the results of the analysis, we found that the proposed hypotheses were accepted. It meant that they had a significant impact. In detail, the results of the hypothesis are presented in Table 5. It shows the path coefficient and t-value for each variable.

Table 5. Hypotheses results.

Hypothesis	Path	Standardized Path Coefficient	t-Value	Result
H1	OLS → LST	0.29 ***	2.14	Accepted
H2	OLM → LST	0.24 ***	2.29	Accepted
H3	OLC → LST	0.28 ***	1.99	Accepted
H4	OLC → LMT	0.36 ***	2.96	Accepted
H5	OLW → LMT	0.26 ***	2.55	Accepted
H6	OLA → LMT	0.34 ***	4.68	Accepted
H7	LMT → LST	0.71 ***	4.96	Accepted
H8	LMT → LEF	0.60 ***	5.89	Accepted
H9	LST → LEF	0.32 ***	3.04	Accepted
H10	LEF → LBE	0.81 ***	23.6	Accepted

Note: *** p-value < 0.001.

Table 5 and Figure 2 present the results of the analysis of the 10 existing hypotheses. Based on the results of hypothesis testing, we found that hypotheses 1 and 2 were acceptable. It showed that online-learning self-efficacy and online-learning monitoring have a positive effect on online-learning strategies (H1 and H2; OLS → LST = 0.29 ***, t-value = 2.149; OLM → LST. = 0.24 ***, t-value = 2.149; OLM → LST. = 0.24 ***, t-value = 2.297). Likewise, online-learning confidence-in-technology was shown to have a significant impact on online-learning strategies and motivation. H3 and H4 were accepted (H3 and H4; OLC → LST = 0.28 ***, t-value = 1.992; OLC -> LMT = 0.36 ***, t-value = 2955). Online-learning willpower and online-learning attitude variables had a significant influence on online-learning motivation. Therefore, H5 and H6 were accepted (H5 and H6; OLW → LMT = 0.26 ***, t-value = 2.547; OLA → LMT = 0.34 ***, t-value = 4.681).

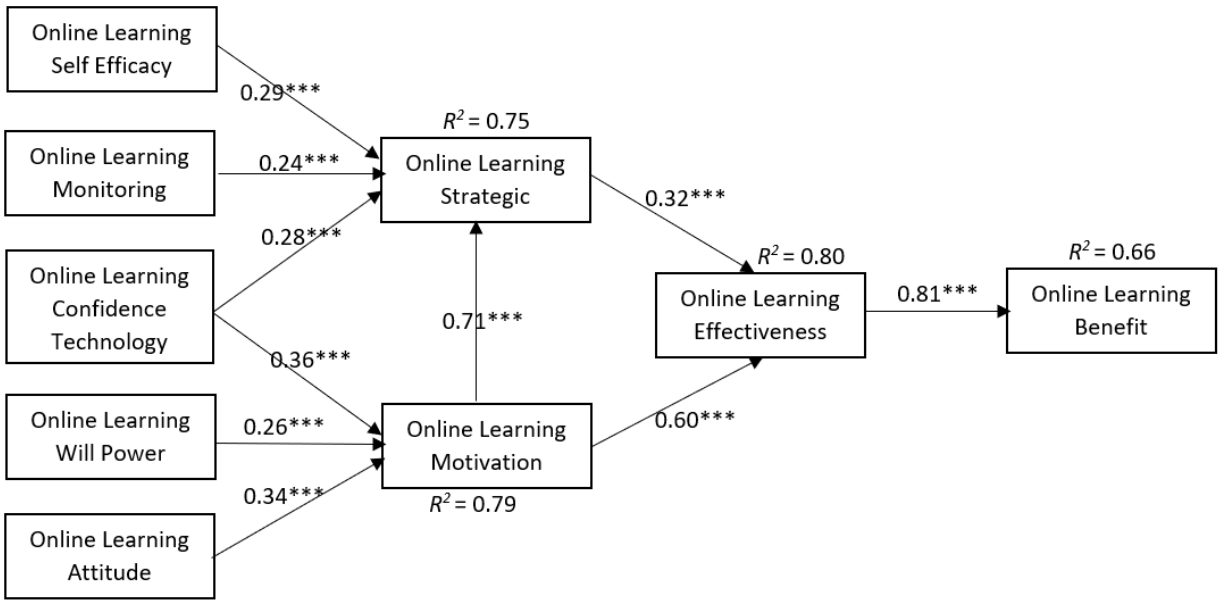

Figure 2. Result of a structural model. Note: *** p-value < 0.001.

The results of the analysis also showed that there was a positive influence between online-learning motivation and strategies with online-learning effectiveness. In other words, H7 and H8 were accepted (H7 and H8; LMT → LST = 0.71 ***, t-value = 4.963; LMT → LEF = 0.60 ***, t-value = 5.898). The relationship between online-learning strategies and online-learning effectiveness showed a significant effect between the two variables. It meant that H9 was accepted (H9; LST → LEF = 0.32 ***, t-value = 3.042). The last hypothesis was 10. H10 showed that there was a strong positive influence between the effectiveness

and the benefits of online learning. Therefore, H10 was accepted (H10; LEF → LBE = 0.81 ***, t-value = 23,615).

5. Discussion

Based on our hypotheses testing, online-learning self-efficacy had a positive effect on strategic online learning and had an effect on online-learning effectiveness. This finding was relevant to the findings of previous studies [22,23,26]. If students had high self-efficacy and familiarity with appropriate, complete, and comprehensive learning strategies, they increased their learning effectiveness. Therefore, online-learning self-efficacy for students was an important aspect that should be considered in the development of online learning environments [24]. In addition to being influenced by good behavior, online-learning self-efficacy also affected subsequent behavior. Student self-efficacy could not be achieved if students had poor learning outcomes that were ongoing. Bandura [22] asserted that self-efficacy was a person's belief in their abilities to complete a task. Instructors and teachers must be able to adapt to student needs, such as providing learning content with a reasonable level of difficulty that can be gradually adjusted. This is one way to help students feel more confident in their abilities. In addition, giving awards to students for their achievements can increase their confidence.

Previous learning models have attributed a significant amount of weight to the location and method of learning. However, since learning is no longer limited by space and time and has become more focused on the concept of learning than teaching [25], the learning-oriented teaching model may be a more appropriate model to implement. In addition to student performance, other things that should be considered to increase students' self-confidence are students' self-awareness and emotions. Universities and teachers should employ diverse learning assessments to explore the potential of students in various fields and use those results to encourage multidimensional and multilevel training goals related to their cognitive and emotional needs as well as their skills [61].

The results of our hypotheses testing also indicated that online-learning monitoring had a positive effect on strategic online learning and indirectly affected online-learning effectiveness. This finding aligned with the findings of previous studies [31,32,62]. Monitoring face-to-face learning has typically been conducted directly and effectively by teachers in the classroom, but the COVID-19 pandemic changes the learning paradigm. To ensure the safety and health of students, learning activities were shifted to a virtual learning environment where students experienced difficulties in communication and learning [33]. Students' lack of familiarity with online learning technology was one of the causes of their decreased desire to learn. This also affected a learning environment that was less conducive and effective for the development of online-learning strategies so that it affected the effectiveness of online learning [63,64].

Increased online-learning monitoring can be conducted using external monitoring, where the instructor's role is an important part of this monitoring process. Teachers have typically been expected to actively participate during online learning, such as providing quick responses to student questions, organizing forum activities, communicating with students, and understanding the conditions of student learning [65]. In addition to external monitoring, internal monitoring requires students to check-in with their own learning needs and goals. They need to define the conditions and learning strategies that are suitable for their learning styles and needs. The online learning platform should not only function to monitor study time, accept assignments, provide course progress, and class interactions. The perceived benefits of online-learning monitoring have been achieved when students were confident in their self-assessments and explained their learning situation by writing down their daily self-assessment activities [66].

Tests for online-learning confidence-in-technology showed a positive influence on both online-learning strategies and motivation and indirectly on online-learning effectiveness mediated by online-learning strategies and online-learning motivation. Innovations in technology require all individuals to adapt and take advantage of its benefits [34]. In online

learning, improving student skills in ICT affected their learning capabilities and increased their knowledge [35]. ICT should change the way teachers deliver learning and education by providing students with a variety of learning opportunities. By using ICT, students can expand their knowledge by seeking additional information and personalized creativity. The results also showed that the four dimensions of ICT as a driving factor had a significant impact on students' online-learning effectiveness. The findings also revealed that the effectiveness of online learning had a positive effect on the perceived benefits of online learning by students, such as increasing students' skills and knowledge as well as students' perceived satisfaction in using online learning platforms. The results of this study found that online-learning confidence was the most significant antecedent to the effectiveness of online learning mediated by online-learning motivation. To achieve effective online learning, students' motivation is required. Students should also be involved in selecting online-learning strategies that are suitable for their learning needs.

The hypotheses testing indicated that online-learning willpower had a positive influence on online-learning motivation. It also had a significant, indirect impact on online-learning effectiveness mediated by online-learning strategies and motivation [42]. The ability of students to learn independently was influential on learning behavior. During this pandemic, student motivation has been an important factor in supporting student success in online learning. Low willpower can make it difficult to overcome the difficulties that arise during the online-learning process. Lack of clear goals for students can affect motivation, along with ineffective learning strategies, and will ultimately affect learning effectiveness [43]. Therefore, it is important to build good study habits and online-learning willpower in students. As stated by Fitch and Ravlin [67], the great power that dominates life is a habit. A good study environment and study habits will help students become more familiar with online learning models, to gain a better understanding of network technologies, and to decide which is the best learning method for them.

The online-learning attitude also had a significant influence on online-learning motivation and indirectly had a positive effect on online-learning effectiveness mediated by online-learning motivation and strategies. These results were consistent with the conclusions of previous studies [68,69]. The long-distance education model continues to grow rapidly along with the development of infrastructure and learning information resources. Students have continued to learn during the pandemic when online-learning models have been the only option. Therefore, it is important to build and maintain a positive and focused attitude towards online learning to achieve maximum online-learning effectiveness. This leads to the benefits of online-learning models.

The results of the hypotheses tests showed that the effectiveness of online learning has a positive effect on the benefits of online learning. The benefits of online learning that were felt by students were the main determinants of the effectiveness of online learning. The more effective the online learning was for students, the greater the benefits the students perceived. Improving student performance and learning activities, completing the tasks easily and quickly with minimal effort, and providing a more effective learning process were some of the benefits that students experienced when studying online. When online learning meets student needs, students are more interactive and communicative, and they achieve better learning outcomes. In addition, an online-learning system saves time when searching for materials and saves on resources (e.g., paper, printer ink) and costs. Therefore, effective online learning confers greater benefits both directly and indirectly.

6. Conclusions

Strategic online learning and online-learning motivation had a positive effect on the effectiveness of online learning and had an impact on the benefits of online learning indirectly mediated by online-learning effectiveness. Our findings showed that highly motivated students could adopt online-learning strategies easily, effectively, efficiently, and comprehensively, and had higher online-learning effectiveness. By stimulating students' interest in learning, we motivate students to study online. Engaged interest encourages

students to adapt, develop learning strategies, and apply them in the online-learning environment. Meanwhile, instructors are expected to create an interesting and interactive learning environment with various learning models such as learning methods with games. In addition, teachers must be able to identify the type of learning content that their students require, so they also need to consider the type of learning content. Student activity in online learning is also needed. Students must be able to determine the learning goals they want to achieve. This is related to the practical steps that students need to take to achieve these goals [70].

The research conducted also found that online-learning strategies had a significant impact on the effectiveness of online learning. Therefore, students need to adopt effective and comprehensive learning strategies while studying online. Students should be able to develop a proper study plan and review the material before studying online. As Erenler [71] explained, during the learning process, students need to immediately adjust their plans if cannot be achieved. Fee [72] also explained that in the online-learning process, students must actively summarize what they have learned, establish good communication with classmates, and exchange online-learning experiences so that they can learn together.

Online learning is seen as a moderating variable of learning effectiveness and the factors that influence it. With or without an online learning experience, those two groups will be different in terms of learning effectiveness and influencing factors. It shows the importance of different online-learning experiences for students. Therefore, given the ever-changing trends, online learning should be continuously improved. Students who have no experience in online learning should be able to use online learning platforms and be able to solve any technical problems that they may encounter. They also need to communicate with the experienced students about the materials and abilities that need to be prepared and actively participate in online assignments, both formal and informal [73]. To achieve these learning objectives, students should develop learning strategies that are suitable for them in an online-learning environment. High online-learning motivation and choosing the right learning strategy for students increased students' effectiveness in online learning. Indirectly, the higher the online-learning effectiveness of students, the more benefits they obtained such as increased knowledge and learning processes, ease of communication, time and cost efficiency, and increased achievements of learning objectives.

7. Limitations and Future Directions

This study had limitations that may provide opportunities for more in-depth studies in the future. First, the efficiency of online learning can be influenced by other factors such as the physical environment, emotional health, and so on. Therefore, other variables could have been considered. Second, future research should involve students at the school level, as opposed to only students at the tertiary level, so the research can be implemented comprehensively at all levels of education. Third, the evaluation in future studies should not be limited to student perceptions. It should include the stakeholder groups in online learning, such as teachers and administrators, to address online-learning problems from various perspectives so that they are better understood. Finally, this research may support additional theoretical and experimental research on the effectiveness and the benefits of online learning, as well as other influencing factors.

Author Contributions: Conceptualization, T.H. (Taqwa Hariguna) and T.H. (Tanaporn Hongsuchon); methodology, T.H. (Taqwa Hariguna), I.M.M.E.E. and E.M.A.Q.; validation, T.H. (Taqwa Hariguna) and T.H. (Tanaporn Hongsuchon); formal analysis, I.M.M.E.E. and E.M.A.Q.; investigation, T.H. (Tanaporn Hongsuchon); writing—original draft preparation, T.H. (Taqwa Hariguna), T.H. (Tanaporn Hongsuchon), I.M.M.E.E. and E.M.A.Q.; writing—review and editing, T.H. (Taqwa Hariguna), T.H. (Tanaporn Hongsuchon), I.M.M.E.E. and E.M.A.Q.; visualization, T.H. (Taqwa Hariguna) and T.H. (Tanaporn Hongsuchon); supervision, T.H. (Taqwa Hariguna). All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Ethical review and approval was not required for this study on human participants in accordance with the local legislation and institutional requirements.

Informed Consent Statement: Written informed consent from the patients/participants was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researchers.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. UNESCO. *COVID-19 Educational Disruption and Response*; UNESCO: Paris, France, 2020.
2. Moore, D.R. E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning. *Educ. Technol. Res. Dev.* **2006**, *54*, 197–200. [CrossRef]
3. McDonald, E.W.; Boulton, J.L.; Davis, J.L. E-learning and nursing assessment skills and knowledge–An integrative review. *Nurse Educ. Today* **2018**, *66*, 166–174. [CrossRef] [PubMed]
4. Homan, S.R.; Wood, K. Taming the mega-lecture: Wireless quizzing. *Syllabus Sunnyvale Chatsworth* **2003**, *17*, 23–27.
5. Emran, M.A.; Shaalan, K. E-podium technology: A medium of managing knowledge at al buraimi university college via mlearning. In Proceedings of the 2nd BCS International IT Conference, Abu Dhabi, United Arab Emirates, 9–10 March 2014; pp. 1–4.
6. Tenório, T.; Bittencourt, I.I.; Isotani, S.; Silva, A.P. Does peer assessment in on-line learning environments work? A systematic review of the literature. *Comput. Hum. Behav.* **2016**, *64*, 94–107. [CrossRef]
7. Sheshasaayee, A.; Bee, M.N. Analyzing online learning effectiveness for knowledge society. In *Information Systems Design and Intelligent Applications*; Bhateja, V., Nguyen, B., Nguyen, N., Satapathy, S., Le, D.N., Eds.; Springer: Singapore, 2018; pp. 995–1002.
8. Panigrahi, R.; Srivastava, P.R.; Sharma, D. Online learning: Adoption, continuance, and learning outcome—A review of literature. *Int. J. Inform. Manag.* **2018**, *43*, 1–14. [CrossRef]
9. Al-Rahmi, W.M.; Alias, N.; Othman, M.S.; Alzahrani, A.I.; Alfarraj, O.; Saged, A.A. Use of e-learning by university students in Malaysian higher educational institutions: A case in Universiti Teknologi Malaysia. *IEEE Access* **2018**, *6*, 14268–14276. [CrossRef]
10. Al-Rahmi, W.M.; Yahaya, N.; Aldraiweesh, A.A.; Alamri, M.M.; Aljarboa, N.A.; Alturki, U. Integrating technology acceptance model with innovation diffusion theory: An empirical investigation on students' intention to use E-learning systems. *IEEE Access* **2019**, *7*, 26797–26809. [CrossRef]
11. Gunawan, I.; Hui, L.K.; Ma'sum, M.A. Enhancing learning effectiveness by using online learning management system. In Proceedings of the 6th International Conference on Education and Technology (ICET), Beijing, China, 18–20 June 2021; pp. 48–52.
12. Nguyen, P.H.; Tangworakitthaworn, P.; Gilbert, L. Individual learning effectiveness based on cognitive taxonomies and constructive alignment. In Proceedings of the IEEE Region 10 Conference (Tencon), Osaka, Japan, 16–19 November 2020; pp. 1002–1006.
13. Pee, L.G. Enhancing the learning effectiveness of ill-structured problem solving with online co-creation. *Stud. High. Educ.* **2020**, *45*, 2341–2355. [CrossRef]
14. Kintu, M.J.; Zhu, C.; Kagambe, E. Blended learning effectiveness: The relationship between student characteristics, design features and outcomes. *Int. J. Educ. Technol. High. Educ.* **2017**, *14*, 1–20. [CrossRef]
15. Wang, M.H.; Vogel, D.; Ran, W.J. Creating a performance-oriented e-learning environment: A design science approach. *Inf. Manag.* **2011**, *48*, 260–269. [CrossRef]
16. Hew, K.F.; Cheung, W.S. Students' and instructors' use of massive open online courses (MOOCs): Motivations and challenges. *Educ. Res. Rev.* **2014**, *12*, 45–58. [CrossRef]
17. Bryant, J.; Bates, A.J. Creating a constructivist online instructional environment. *TechTrends* **2015**, *59*, 17–22. [CrossRef]
18. Lee, M.C. Explaining and predicting users' continuance intention toward e-learning: An extension of the expectation–confirmation model. *Comput. Educ.* **2010**, *54*, 506–516. [CrossRef]
19. Lin, K.M. E-Learning continuance intention: Moderating effects of user e-learning experience. *Comput. Educ.* **2011**, *56*, 515–526. [CrossRef]
20. Huang, E.Y.; Lin, S.W.; Huang, T.K. What type of learning style leads to online participation in the mixed-mode e-learning environment? *A study of software usage instruction. Comput. Educ.* **2012**, *58*, 338–349.
21. Chu, T.H.; Chen, Y.Y. With good we become good: Understanding e-learning adoption by theory of planned behavior and group influences. *Comput. Educ.* **2016**, *92*, 37–52. [CrossRef]
22. Bandura, A. Self-efficacy: Toward a unifying theory of behavioral change. *Psychol. Rev.* **1977**, *84*, 191–215. [CrossRef]
23. Torkzadeh, G.; Van Dyke, T.P. Development and validation of an Internet self-efficacy scale. *Behav. Inform. Technol.* **2001**, *20*, 275–280. [CrossRef]
24. Saadé, R.G.; Kira, D. Computer anxiety in e-learning: The effect of computer self-efficacy. *J. Inform. Technol. Educ. Res.* **2009**, *8*, 177–191. [CrossRef]

25. Tucker, J.; Gentry, G. Developing an E-Learning strategy in higher education. In Proceedings of the SITE 2009–Society for Information Technology & Teacher Education International Conference, Charleston, SC, USA, 2–6 March 2009; pp. 2702–2707.
26. Wang, Y.; Peng, H.M.; Huang, R.H.; Hou, Y.; Wang, J. Characteristics of distance learners: Research on relationships of learning motivation, learning strategy, self-efficacy, attribution and learning results. *Open Learn. J. Open Distance Elearn.* **2008**, *23*, 17–28. [CrossRef]
27. Mahmud, B.H. Study on the impact of motivation, self-efficacy and learning strategies of faculty of education undergraduates studying ICT courses. In Proceedings of the 4th International Postgraduate Research Colloquium (IPRC) Proceedings, Bangkok, Thailand, 29 October 2009; pp. 59–80.
28. Yusuf, M. Investigating relationship between self-efficacy, achievement motivation, and self-regulated learning strategies of undergraduate Students: A study of integrated motivational models. *Procedia Soc. Behav. Sci.* **2011**, *15*, 2614–2617. [CrossRef]
29. De la Fuente, J.; Martínez-Vicente, J.M.; Peralta-Sánchez, F.J.; GarzónUmerenkova, A.; Vera, M.M.; Paoloni, P. Applying the SRL vs. ERL theory to the knowledge of achievement emotions in undergraduate university students. *Front. Psychol.* **2019**, *10*, 2070. [CrossRef] [PubMed]
30. Ahmadi, S. Academic self-esteem, academic self-efficacy and academic achievement: A path analysis. *J. Front. Psychol.* **2020**, *5*, 155.
31. Meyen, E.L.; Aust, R.J.; Bui, Y.N. Assessing and monitoring student progress in an E-learning personnel preparation environment. *Teach. Educ. Spec. Educ.* **2002**, *25*, 187–198. [CrossRef]
32. Dunlosky, J.; Kubat-Silman, A.K.; Christopher, H. Training monitoring skills improves older adults' self-paced associative learning. *Psychol. Aging* **2003**, *18*, 340–345. [CrossRef]
33. Zhang, H.J. Research on the relationship between English learning motivation. Self-monitoring and Test Score. *Ethnic Educ. Res.* **2005**, *6*, 66–71.
34. Rosenberg, M.J. *E-Learning: Strategies for Delivering Knowledge in the Digital Age*; McGraw-Hill: New York, NY, USA, 2001.
35. Bhat, S.A.; Bashir, M. Measuring ICT orientation: Scale development & validation. *Educ. Inf. Technol.* **2018**, *23*, 1123–1143.
36. Achuthan, K.; Francis, S.P.; Diwakar, S. Augmented reflective learning and knowledge retention perceived among students in classrooms involving virtual laboratories. *Educ. Inf. Technol.* **2017**, *22*, 2825–2855. [CrossRef]
37. Hu, X.; Yelland, N. An investigation of preservice early childhood teachers' adoption of ICT in a teaching practicum context in Hong Kong. *J. Early Child. Teach. Educ.* **2017**, *38*, 259–274. [CrossRef]
38. Fraillon, J.; Ainley, J.; Schulz, W.; Friedman, T.; Duckworth, D. *Preparing for Life in a Digital World: The IEA International Computer and Information Literacy Study 2018 International Report*; Springer: New York, NY, USA, 2019.
39. Huber, S.G.; Helm, C. COVID-19 and schooling: Evaluation, assessment and accountability in times of crises—Reacting quickly to explore key issues for policy, practice and research with the school barometer. *Educ. Assess. Eval. Account.* **2020**, *32*, 237–270. [CrossRef]
40. Eickelmann, B.; Gerick, J. Learning with digital media: Objectives in times of Corona and under special consideration of social Inequities. *Dtsch. Schule.* **2020**, *16*, 153–162.
41. Shehzadi, S.; Nisar, Q.A.; Hussain, M.S.; Basheer, M.F.; Hameed, W.U.; Chaudhry, N.I. The role of e-learning toward students' satisfaction and university brand image at educational institutes of Pakistan: A post-effect of COVID-19. *Asian Educ. Dev. Stud.* **2020**, *10*, 275–294. [CrossRef]
42. Miller, E.M.; Walton, G.M.; Dweck, C.S.; Job, V.; Trzesniewski, K.; McClure, S. Theories of willpower affect sustained learning. *PLoS ONE* **2012**, *7*, 38680. [CrossRef] [PubMed]
43. Moriña, A.; Molina, V.M.; Cortés-Vega, M.D. Voices from Spanish students with disabilities: Willpower and effort to survive university. *Eur. J. Spec. Needs Educ.* **2018**, *33*, 481–494. [CrossRef]
44. Koballa, T.R., Jr.; Crawley, F.E. The influence of attitude on science teaching and learning. *Sch. Sci. Math.* **1985**, *85*, 222–232. [CrossRef]
45. Chao, C.Y.; Chen, Y.T.; Chuang, K.Y. Exploring students' learning attitude and achievement in flipped learning supported computer aided design curriculum: A study in high school engineering education. *Comput. Appl. Eng. Educ.* **2015**, *23*, 514–526. [CrossRef]
46. Stefan, M.; Ciomos, F. The 8th and 9th grades students' attitude towards teaching and learning physics. *Acta Didact. Napocensia.* **2010**, *3*, 7–14.
47. Sedighi, F.; Zarafshan, M.A. Effects of attitude and motivation on the use of language learning strategies by Iranian EFL University students. *J. Soc. Sci. Humanit. Shiraz Univ.* **2007**, *23*, 71–80.
48. Megan, S.; Jennifer, H.C.; Stephanie, V.; Kyla, H. The relationship among middle school students' motivation orientations, learning strategies, and academic achievement. *Middle Grades Res. J.* **2013**, *8*, 1–12.
49. Nasser, O.; Majid, V. Motivation, attitude, and language learning. *Procedia Soc. Behav. Sci.* **2011**, *29*, 994–1000.
50. Özhan, Ş.Ç.; Kocadere, S.A. The effects of flow, emotional engagement, and motivation on success in a gamified online learning environment. *J. Educ. Comput. Res.* **2020**, *57*, 2006–2031. [CrossRef]
51. Wang, A.P.; Che, H.S. A research on the relationship between learning anxiety, learning attitude, motivation and test performance. *Psychol. Dev. Educ.* **2005**, *21*, 55–59.
52. Lin, C.H.; Zhang, Y.N.; Zheng, B.B. The roles of learning strategies and motivation in online language learning: A structural equation modeling analysis. *Comput. Educ.* **2017**, *113*, 75–85. [CrossRef]

53. Deschênes, M.F.; Goudreau, J.; Fernandez, N. Learning strategies used by undergraduate nursing students in the context of a digital educational strategy based on script concordance: A descriptive study. *Nurse Educ. Today* **2020**, *95*, 104607. [CrossRef] [PubMed]
54. Jerusalem, M.; Schwarzer, R. Self-efficacy as a resource factor in stress appraisal processes. In *Self-Efficacy: Thought Control of Action*; Schwarzer, R., Ed.; Hemisphere Publishing Corp: Washington, DC, USA, 1992; pp. 195–213.
55. Zimmerman, B.J. Becoming a self-regulated learner: An overview. *Theory Pract.* **2002**, *41*, 64–70. [CrossRef]
56. Pintrich, P.R.; Smith, D.A.F.; García, T.; McKeachie, W.J. *A Manual for the Use of the Motivated Strategies Questionnaire (MSLQ)*; University of Michigan, National Center for Research to Improve Post Secondary Teaching and Learning: Ann Arbor, MI, USA, 1991.
57. Knowles, E.; Kerkman, D. An investigation of students attitude and motivation toward online learning. *InSight Collect. Fac. Scholarsh.* **2007**, *2*, 70–80. [CrossRef]
58. Hair, J.F., Jr.; Black, W.C.; Babin, B.J.; Anderson, R.E. *Multivariate Data Analysis: A Global Perspective*, 7th ed.; Pearson Education International: Upper Saddle River, NJ, USA, 2010.
59. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [CrossRef]
60. Hair, J.F., Jr.; Hult, G.T.M.; Ringle, C.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*; Sage: Los Angeles, CA, USA, 2016.
61. Kiliç-Çakmak, E. Learning strategies and motivational factors predicting information literacy self-efficacy of e-learners. *Aust. J. Educ. Technol.* **2010**, *26*, 192–208. [CrossRef]
62. Zheng, C.; Liang, J.C.; Li, M.; Tsai, C. The relationship between English language learners' motivation and online self-regulation: A structural equation modelling approach. *System* **2018**, *76*, 144–157. [CrossRef]
63. May, M.; George, S.; Prévôt, P. TrAVis to enhance students' self-monitoring in online learning supported by computer-mediated communication tools. *Int. J. Comput. Inform. Syst. Ind. Manag. Appl.* **2011**, *3*, 623–634.
64. Rafart, M.A.; Bikfalvi, A.; Soler, J.; Poch, J. Impact of using automatic E-Learning correctors on teaching business subjects to engineers. *Int. J. Eng. Educ.* **2019**, *35*, 1630–1641.
65. Lee, P.M.; Tsui, W.H.; Hsiao, T.C. A low-cost scalable solution for monitoring affective state of students in E-learning environment using mouse and keystroke data. In *Intelligent Tutoring Systems*; Cerri, S.A., Clancey, W.J., Papadourakis, G., Panourgia, K., Eds.; Springer: Berlin, Germany, 2012; pp. 679–680.
66. Metz, D.; Karadgi, S.S.; Müller, U.J.; Grauer, M. Self-Learning monitoring and control of manufacturing processes based on rule induction and event processing. In Proceedings of the 4th International Conference on Information, Process, and Knowledge Management eKNOW, Valencia, Spain, 21–25 November 2012; pp. 78–85.
67. Fitch, J.L.; Ravlin, E.C. Willpower and perceived behavioral control: Intention-behavior relationship and post behavior attributions. *Soc. Behav. Pers. Int. J.* **2005**, *33*, 105–124. [CrossRef]
68. Sridharan, B.; Deng, H.; Kirk, J.; Brian, C. Structural equation modeling for evaluating the user perceptions of e-learning effectiveness in higher education. In Proceedings of the ECIS 2010: 18th European Conference on Information Systems, Pretoria, South Africa, 7–9 June 2010.
69. Tarhini, A.; Hone, K.; Liu, X. The effects of individual differences on e-learning users' behaviour in developing countries: A structural equation model. *Comput. Hum. Behav.* **2014**, *41*, 153–163. [CrossRef]
70. de Leeuw, R.A.; Logger, D.N.; Westerman, M.; Bretschneider, J.; Plomp, M.; Scheele, F. Influencing factors in the implementation of postgraduate medical e-learning: A thematic analysis. *BMC Med. Educ.* **2019**, *19*, 300. [CrossRef]
71. Erenler, H.H.T. A structural equation model to evaluate students' learning and satisfaction. *Comput. Appl. Eng. Educ.* **2020**, *28*, 254–267. [CrossRef]
72. Fee, K. Delivering E-learning: A complete strategy for design, application and assessment. *Dev. Learn. Organ.* **2013**, *27*, 40–52. [CrossRef]
73. So, W.W.N.; Chen, Y.; Wan, Z.H. Multimedia e-Learning and self-regulated science learning: A study of primary school learners' experiences and perceptions. *J. Sci. Educ. Technol.* **2019**, *28*, 508–522. [CrossRef]