

## Digital Learning Tools (Institutional - Open) and Their Relationship to Educational Self-Effectiveness and Achievement in Online Learning Environments

Shoeb Saleh

The National Research Center for Giftedness and Creativity, King Faisal University,  
Saudi Arabia.

Department of Educational Technology, Faculty of Education, Sohag University.

Email: [sgsaleh@kfu.edu.sa](mailto:sgsaleh@kfu.edu.sa)

Rommel AlAli\*

The National Research Center for Giftedness and Creativity, King Faisal University,  
Saudi Arabia.

\*Correspondence: Email: [ralali@kfu.edu.sa](mailto:ralali@kfu.edu.sa)

### Abstract

The significance of distance education is inextricably linked to what it offers from various sources that facilitate learning in various ways that suit the learner's ability and meet his needs. Variety in the use of digital learning tools is characterized by strategies that raise the educational awareness of learners, present them with important enrichment information, foster a spirit of fair competition among them, and boost their productivity, promoting lifelong learning. In this context, this study aimed to determine the influence of variations in the use of digital learning tools on educational self-efficacy and the extent to which this is reflected in students' academic accomplishments in online learning settings. The research included descriptive, correlation, and comparative methods. The study sample comprised 563 randomly selected gifted and non-gifted university students from King Faisal University. A measure of educational self-efficacy in online learning environments was developed to collect data. The information was evaluated with descriptive statistics. According to the study's findings, diversity in the use of digital learning resources, educational self-efficacy, and academic accomplishment was found to have a positive and direct association. The growth in the diversity in the use of digital learning tools leads to a rise in educational self-efficacy, which has a favorable effect on students' academic progress. Due to the diversity of digital learning tools and gifted students, there are also statistically significant variances in the mean scores on the educational self-effectiveness scale. The research suggests encouraging and training students and instructors to utilize various digital learning tools. In

addition to performing additional studies in the future to evaluate the impact of the digital learning tools variable on other learning outcomes, it is recommended that additional research be conducted to examine the impact of the digital learning tools variable on other.

**Keywords:** Self-Effectiveness, Academic achievement, Digital learning tools, online learning

## 1. Introduction

The development of the distance education system was in response to the problems provided by the information and knowledge revolution of the modern period. The significance of distance learning is inextricably linked to the diversity of sources it gives for learning in ways that suit the learner's ability and meet his needs. Distance learning requires a set of services, media, computer programs, the telephone, and social networking sites, which are various audio-visual media specially prepared for this purpose, i.e., to deliver knowledge and skills to the learner in the shortest amount of time, with the least amount of effort, and the most significant amount of benefit. Due to this technology and digital aids and their services, using new technologies is no longer an option but a requirement (Affouneh, Salha, & Khlaif, 2020).

Digital Learning is an innovative teaching method for digital technologies and techniques used in the educational process, often known as Technology Enhanced Learning (TEL) or e-learning. Digital Learning Tools provide a comprehensive collection of capabilities on various platforms to aid all students with reading, writing, and communication. There are numerous digital tools and applications. Applications and programs for digital learning can be categorized into three categories: The first category consists of online learning management software and systems (such as Black Board, Schoology, and Moodle), which educational institutions use to manage the learning process. These are digital institutional learning tools. The second category includes open applications and programs for posting and sharing lessons, such as Slide Sharing, Outlook, and WordPress. Third, are remote communication applications and programs (such as Social Networks- Zoom- Microsoft Teams), also open applications (Al-Barakat et al., 2022).

Digital learning aids have been backed by numerous theories, including the constructivist theory, one of whose tenets is that learning is a constructive process by which the learner constructs knowledge when confronted with a problem or task.

Hence, it encourages using digital learning tools, which include arranging activity tasks at varying levels of difficulty, from the easiest to the most difficult, and requiring the learner to face challenges to accomplish the learning tasks (Al-Tabakh & Ismail, 2020). The behavioral theory also provided distinct support for using digital learning tools, as learning is constructed through supporting and reinforcing performances close to the desired behavior. Every cognitive content presented to the learner must meet conditions capable of evoking interest, tendencies, and incentives. The more a student's procedural replies are rewarded, the quicker they learn. Digital learning tools contain a broad diversity of audio-visual and intellectual stimuli that entertain learners while practicing them and permit them to repeat the activity to modify their behavior toward obtaining the intended objective (Al-Qahtani, 2019). In addition, the reinforcement theory gave clear justification for using digital learning aids. The more a learner's positive behavior is reinforced with moral rewards, the higher the learner's motivation to change educational settings. The notion of reinforcement promotes using digital learning tools by providing levels that allow the learner to progress from one level (an educational setting) to a higher one. In addition, reinforcement must be provided if the student engages in harmful conduct. It also gives learners excellent and negative feedback based on the educational situation (Santos, Bittencourt, & Vassileva, 2018). It focuses on the learner's internal cognitive processes, such as attention, perception, interpretation, processing, and decision-making, in light of which determines behavior and the gradient in presenting knowledge from simple to complex, and is therefore compatible with the processes of using digital learning tools (Abbas, 2019).

There is no doubt that the majority of the learning process occurs within the learner. The degree to which an individual believes in his Self-Effectiveness influences the construction of his self-concept, either favorably or adversely. Much research demonstrates that academic achievement is related to numerous characteristics, with Self-Efficacy being the most significant. People with a high level of Self-Efficacy are academically successful. A higher degree of achievement correlates with a higher level of Self-Effectiveness, and vice versa: a high level of Self-Effectiveness correlates with a high level of achievement. Bandura and Wood (1989), Rowand (1990), Finn and Frone (2004), Britner and Pajares (2006), Carroll et al. (2009), Arabiyat and Hamadna (2014).

Despite the ubiquitous use of digital media in learning processes, its role in academia and its significance for academic attainment have not been adequately investigated. A research void appeared during the Corona crisis when university learning methods in many countries went nearly exclusively digital. Most studies have found a correlation between student diversity, socioeconomic background, expectations of academic Self-Efficacy, and academic success (Pumptow & Brahm, 2021).

Numerous studies have emphasized the significance of incorporating digital learning tools into the educational process due to their influence on the development of cognitive achievement, learning efficiency, problem-solving skills, improving learning outcomes, skill performance, motivation for learning and achievement, and reducing cognitive burden (Bicen & Kocakoyun, 2018; Hassan, 2017; Khalifa & Al-Sebahi, 2021; Su & Cheng, 2015). The processes of utilizing digital learning tools are built on aspects that serve as a reference point for their design, including mechanics, dynamics, and emotions. Points, levels, leaderboards, badges, and quests are the mechanics. The dynamics include learning, involvement, competitiveness, difficulties, accomplishments, and rewards. Emotions include creativity, generosity, exploration, and others (Kelly, 2012).

The success of the distance learning system is contingent on a collection of factors complimenting one another. The primary aspects of these factors are the digital learning tools and the learners' educational self-efficacy and academic accomplishment. For the remote learning system to be effective and successful in transferring information to students, resulting in high academic performance rates, it is vital to examine the mutual influence of the variables and components of the system.

Let's consider the learning process's goal to be acquiring academic knowledge and skills. We must investigate the impact of the different dimensions of the distance learning system represented by digital learning tools (institutional - open) on educational Self-Efficacy and academic achievement. Thus, this study tries to address this primary question. What is the impact of the degree of diversity in digital learning tools (institutional - open) on educational Self-Effectiveness and the academic achievement rate of students?

The study also sought to answer the following sub-questions:

1. What is the relationship between digital learning tools, educational Self-Effectiveness, and academic achievement?
2. What is the effect of educational Self-Effectiveness on academic achievement?
3. What is the impact of diversity in using digital learning tools (institutional - open) on the degree of educational Self-Effectiveness?
4. Are there statistically significant differences between the average scores of the educational Self-Effectiveness scale due to digital learning tools (institutional - open), gender, and gifted and non-gifted students?

To measure the impact of digital learning tools on academic achievement and the learner's self-efficacy, a set of demographic variables for the study sample had to be considered, such as the gender variable (male/female). Since Arab environments are closed cultures, it was necessary to acknowledge the differences between the sexes. The sample also comprised gifted and non-gifted children. Thus it was required to determine whether gifted pupils make greater use of digital learning resources. Among the variables are the learning tools that students use (institutional/open); thus, it was essential to determine if variations are owing to the variety of digital learning tool usage.

### **1.1. Literature Review**

Numerous studies have focused on using digital learning technologies to enhance the Self-Efficacy and academic accomplishment of students in online learning environments. These studies underline the value of students' access to digital learning materials outside the classroom. By creating successful practices for students' use of technology and stressing ongoing efforts to improve educational experiences for all students, access to technology can provide students with important educational possibilities (Arpaci, 2017; KewalRamani et al., 2018; Ramaila & Mpinga, 2022; Sailer, Murböck, & Fischer, 2021). Some research sought to determine the effect of the various digital learning unit patterns on the growth of cognitive and performance skills and their attitudes regarding the use of technology advancements (Al-Tabbakh, 2020; Atta, 2017; Faccia et al., 2021; Gouda, 2019).

Much research has examined the connection between self-regulated learning (SRL), the digital learning environment, academic achievement, and the impact of students' participation in digital learning activities on their academic performance (Bernacki et al., 2021; Bertheussen & Myrland, 2016; Neufeld, 2018; Pumptow & Brahm, 2021; Sutarni et al., 2021). According to some research, digital learning affects students' self-efficacy, motivation, anxiety, learning achievements, and educational success (Chen & Tu, 2021; Hung, Huang, & Hwang, 2014; Lin & Chen, 2017; Ozerbas & Erdogan, 2016; Shakarami, Khajehei, & Hajhashemi, 2013).

Although many studies have discussed and examined the components and tools of digital learning, their significance, characteristics, construction steps, application methods, and impact on the Self-Efficacy and academic achievement of learners, this study is the first to examine the relationship between these factors (Abulibdeh & Hassan, 2011; Hickson, 2016; Malureanu, Panisoara, & Lazar, 2021; Pumptow & Brahm, 2021). We found a scarcity of research on the nature of the link and mutual impacts between the diversity of employing digital learning resources (institutional - open), educational Self-Efficacy, and academic success in the remote learning system. According to the norm in the distance learning systems of most universities, students are permitted to be satisfied with the institutional system employed and imposed upon them (such as the Blackboard system), which may be adequate to achieve the maximum academic accomplishment scores. Other students, however, have the desire and propensity to enhance and broaden their usage of various open learning tools to acquire more knowledge and satisfy their love for research beyond expertise. Thus, this study aimed to determine the extent to which students are differentiated by their use of digital resources, as well as their influence on their educational effectiveness and academic accomplishment. The study of the dimensions and effects of the links between the components of the remote learning system is one of the essential pillars of this investigation.

## 1.2. Theoretical framework

Several studies have confirmed the impact of digital classrooms on academic success and the Self-Effectiveness of Internet technologies (Ozerbas & Erdogan, 2016).

These studies examined whether the learning environment created by digital classroom technologies affects the academic success and Self-Effectiveness of students' Internet technologies. Variety in digital learning tools is characterized by strategies that enhance learners' educational awareness, give helpful enrichment information, foster a culture of fair competition, boost their productivity, and promote lifelong learning. In addition, it facilitates the teacher's ability to monitor the learners' progress and provide relevant feedback, as well as the option of making the student activities and participating in the learning process, such as by assigning specific assignments. So he can acquire diverse educational experiences (Lee & Hammer, 2011). Components of digital learning tools in online learning environments enable learners to be placed in realistic settings where they can practice their abilities, receive quick feedback on their progress and accomplishments, and earn praise for overcoming a problem (Kapp, 2012).

There are numerous definitions of digital learning tools, the most prevalent being that they are digital resources that may be utilized to help the learning process and are uniquely specified and identified. Digital learning tools can also be described as simple digital media or resources that improve learning (Abdelbaset, 2011). The applications and programs of digital learning tools can be separated into two primary categories:

Institutional digital learning resources: Universities and educational institutions utilize digital learning management systems, such as the "JUSUR" system, which manages both the educational process and the content. The "TADARUS" system is one of the most popular online course and workout management systems. It was created by Harf Technologies to assist schools, universities, businesses, and training centers in providing access to scientific information and courses for the most significant number of learners at any time and from any location. The closed-source and public (commercial) "Blackboard" system provides numerous educational services, including adverts, calendars, assignments, grades, address books, educational files, references, and communication tools. Most Saudi universities use Blackboard, the world's top technology platform, to offer valuable online learning experiences, manage digital content, and integrate access to tools and information through an Internet-based integrated learning environment.



Second: Open digital learning tools consist of two sections: applications and programs for publishing and sharing lessons, which assist teachers and trainers in providing students with lessons and instructional resources. It does not require professors to have extensive experience administering e-learning, is confined to publishing content, and allows students to share content, such as videos, among themselves (Slide Share - Outlook - WordPress). The second category comprises remote communication applications and programs facilitating successful communication and information exchange. It is also for immediate and persistent communication between the teacher and pupils. The most popular programs are Facebook, WhatsApp, and Twitter. [Figure 1](#) demonstrates the various uses of digital learning tools.

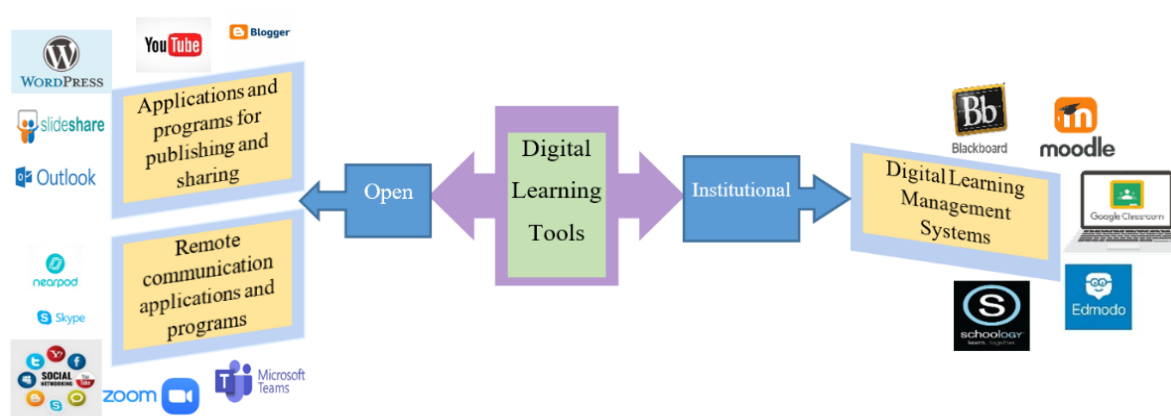


Figure 1. Digital learning tools technology

Self-Effectiveness is one of the most influential characteristics that influence an individual's behavior, contribute to its interpretation, and facilitate the creation of individual variations among learners. Although (Harris, 1990; Mandinach, 1984) demonstrate that Self-Efficacy influences the learner's selection of learning tasks and activities. It also affects the learner's consistent effort and determination to reach the goals he wants during the learning process. Based on Gathry's quote, Zeitoun (1999) asserts that the learner's success depends on his level of Self-Effectiveness in learning (we only learn what we do).

ICT integration promotes student engagement with peers and teachers, creating a satisfying learning experience (Altun, Kalayci, & Ümmühan, 2011; Snowball & Mostert, 2010; Wang, 2008). According to research, Internet Self-Efficacy is positively related to student success in web-based learning environments (DeTure,



2004; Joo, Bong, & Choi, 2000; Thompson, Meriac, & Cope, 2002). It has been discovered, for instance, that students with high Internet Self-Effectiveness have more vital information-seeking skills and learn more effectively than those with low Internet Self-Effectiveness (Tsai & Tsai, 2003).

Self-Effectiveness is a student's belief in his adequacy and competence, which gives him self-confidence and the capacity to confront and overcome challenges in online learning environments. High Self-Effectiveness in online learning environments is characterized by a set of traits, including a high level of self-confidence, good future planning, perseverance, high ability in the face of obstacles, optimism, enthusiasm, and high ambition, an appropriate attribution method, and a tendency to attribute failure to a lack of effort (Ahmad, Yahaya, & Wahid, 2022; Aliya, 2019; Kuo et al., 2014; Malureanu et al., 2021; Nihad, 2016; Yavuzalp & Bahcivan, 2020).

1. **Initiation:** It is defined as the initiation of behavior or action and the ability to solve problems in distance learning environments, such as: brainstorming the problems raised through distance education platforms related to study topics and accessing distance education platforms some live digital models and drawings, which aids in the development and mastery of specific skills.
2. **Effort:** It symbolizes the effort to complete work and try to achieve it in distance learning environments, such as completing specified activities, assignments, and tasks directly related to the scientific information offered on distance learning platforms that promote scientific thinking.
3. **Flexibility:** It entails utilizing a variety of audio, text, video, image, and animation files to deliver scientific knowledge across distance education platforms. Examples of adaptability include employing methods and alternatives (audio-visual-audio-visual) and utilizing immediate and delayed feedback to reinforce correct responses and rectify incorrect ones.
4. **Perseverance:** It entails planning, executing, and completing tasks, as well as sticking to work until completion, such as seeking to take advantage of competitive educational opportunities with colleagues, which fosters a spirit of challenge and persistence, and anticipating the difficulties and obstacles in the learning process via distance learning platforms.

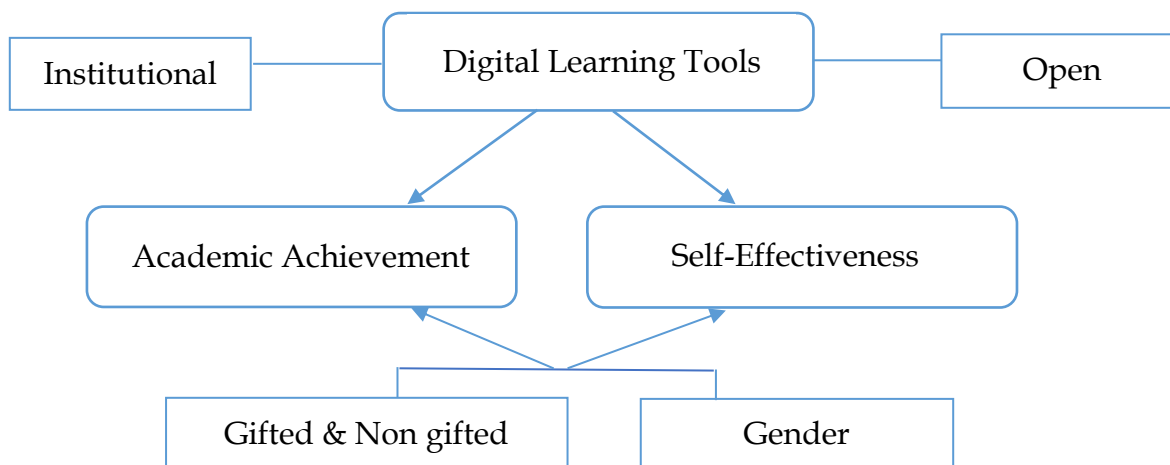


Figure 2. The theoretical model of the research

## 2. Methodology

The current study employed a descriptive, correlative, and comparative methodology to examine the quantitative interrelationships between phenomena using appropriate statistical methods, such as analysis of variance and the "T" test for the significance of differences between means, to achieve the research objectives. In addition to determining correlation coefficients between the study variables, the effect will be measured using the regression equation and other statistical approaches.

### 2.1. Population and sample

This study's sample consists of all gifted and non-gifted university students attending King Faisal University in Saudi Arabia during the academic year 2021/22. Talented students were identified by the Mawhiba Foundation, where they received programs for the gifted in pre-university education. They continue to receive help in the field of talent, so they are classed as gifted at the university. A random sample of 563 students was chosen for this investigation.

### 2.2. Instrument

Determine the relationship between the degree of diversity in digital learning tools (institutional - open) and students' educational Self-Efficacy and academic accomplishment rate. Researchers have created a Scale of Educational Self-Efficacy in Online Learning Environments after examining prior research and specifying the objective. After

determining the instrument's dimensions, the pieces are developed. The instrument has four dimensions: Initiation (I) (10 items), Effort (E) (12 items), Flexibility (F) (10 items), and Persistence (P) (12 items). The scale was used to examine the impact of digital learning tool variety (institutional - open) on students' educational Self-Efficacy and academic achievement. The final version of the document contained 44 items (Appendix D).

Validating the instrument's validity and reliability required three steps: (i) expert validation, (ii) pilot testing, and (iii) data analysis utilizing the Rasch Measurement Model. Nine experts from Saudi universities evaluated the construct and content validity of the instrument. Based on their feedback, specific instrument components were adjusted and reformed. After adjusting the instrument, a pilot test with 30 responders was conducted. Using the Rasch Measurement Model, the validity and dependability of the data were determined.

In the Rasch Model, the earliest indicator of construct validity was item polarity or point measure correlation. It indicates that the MNSQ infit analysis result should be between 0.4 and 1.5 and that the PTMEA value should be positive and between 0.2 and 1. In addition to the standardized fit statistic (Zstd) value with an acceptable range value  $-2ZSTD+2$ , additional factors must be considered when determining the misfit item (AlAli & Al-Barakat, 2022).

Using MNSQ values for the infit, the instrument's validity was determined, and the results indicated that the instrument had an adequate level of validity. According to MNSQ values, instrument validity scores fell within acceptable ranges. It conforms to the item polarity analysis based on PTMEA data. According to Appendix A, it has a suitable standardized fit statistic (Zstd) value.

It is also compatible with measurement calibration analysis. The results are consistent with the dimensionality analysis because the raw variance is explained by more than 40% of the measures, and the unexplained variance in the first comparison is less than 15. Appendix B indicates that the dimensionality data results are consistent with the Rasch model.

As demonstrated in Appendix C, the scale's reliability was tested using person reliability, the degree of reliability of individuals who responded to the instrument. In addition, the scale's item reliability was determined to determine the item's reliability.

As demonstrated in Appendix C, the study's findings indicate adequate dependability of the scale's components.

### 2.3. Study procedures

After developing a measure of educational Self-Efficacy in online learning environments, the study was administered to a sample of King Faisal University students enrolled in distance education courses. King Faisal University uses Blackboard as its institutional system to manage student distance-learning operations. This system has been adopted as the standard learning tool for all students; nevertheless, a subset of students may wish to broaden their knowledge through various open digital learning tools.

The study sample was followed throughout the semester. At the end of the semester, a scale of educational Self-Effectiveness in online learning environments was administered to determine whether there were differences in educational Self-Effectiveness and the extent to which this reflected on students' academic achievement due to the diversity in the use of other open digital learning tools.

### 2.4. Research Design

The development of the study design is the most crucial step in scientific research, as it leads to the precise selection of acceptable methods for conducting research, collecting data, and facilitating interpretation. This research intends to examine the impacts of variety in the usage of digital learning resources (institutional and open) on educational Self-Effectiveness and its impact on students' academic achievement in online learning settings. [Figure 3](#) depicts the research design.

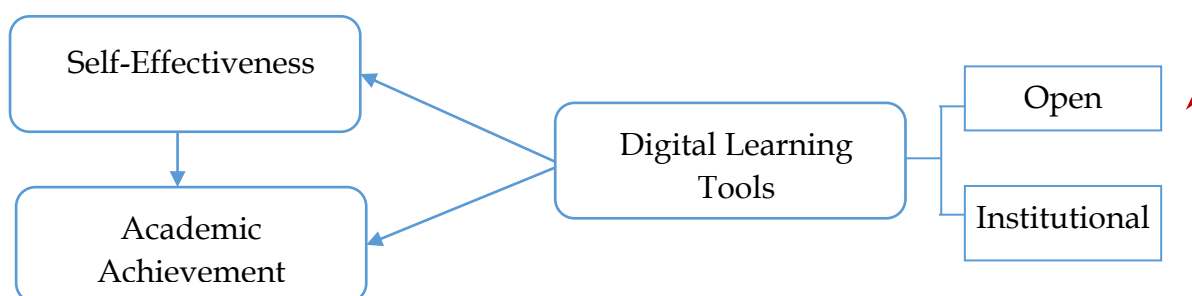


Figure 3. Research Design

## 2.5. Data Analysis

As a correlation coefficient between variables, Statistical Package for the Social Sciences (SPSS) was utilized for data analysis to assess the association between digital learning tools, educational Self-Efficacy, and academic accomplishment. Means and standard deviations were also calculated to determine the differences in the average scores of the educational Self-Effectiveness test. Regression analysis is also utilized to determine the relationship between educational Self-Efficacy and academic accomplishment. In addition, to confirm the construct validity, Rasch model analysis was undertaken using Winsteps software, version 3.68.2, because it allowed for estimating an individual's ability and the difficulty and discrimination coefficients for items.

## 3. Results

What is the relationship between digital learning tools, educational self-efficacy, and academic success? Using the Pearson correlation coefficient. The association between digital learning tools, educational Self-Efficacy, and intellectual accomplishment is depicted in [Table 1](#).

Table 1. The correlation coefficient between study variables.

		Digital learning tools	Self-Effectiveness	Achievement
Digital learning tools	Pearson Correlation	1	.591**	.380**
	Sig. (2-tailed)		.000	.007
Self-Effectiveness	Pearson Correlation	.591**	1	.784**
	Sig. (2-tailed)	.000		.000
Achievement	Pearson Correlation	.380**	.784**	1
	Sig. (2-tailed)	.007	.000	

There is a statistically significant association between digital learning tools, educational Self-Efficacy, and academic accomplishment, as shown in [Table 1](#). The correlation coefficient between digital learning tools and educational Self-Efficacy is 0.59 and statistically significant, as shown in [Table 1](#). Notably, the correlation coefficient between digital learning tools and academic accomplishment is 0.38. The connection between educational Self-Efficacy and academic achievement is 0.78 and statistically significant.

Research suggests that digital learning tools, educational Self-Efficacy, and academic accomplishment are positively related. Increasing digital learning tools contribute to increased educational Self-Efficacy and academic success.

To answer the second question: How does educational Self-Efficacy impact academic performance?

Table 2 displays the Standard regression coefficients and variance explained values, F value, and statistical significance for the Self-Efficacy on academic achievement regression study.

Table 2. Regression analysis of Self-Effectiveness on academic achievement

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	Coefficients	Std. Error			
1 (Constant)	1.537	.537		-2.860	.006
Self-Effectiveness	1.369	.157	.784	8.748	.000
R	.784				
R Square	.615				
F	76.525				.000
df	1				

Table 2 demonstrates statistically significant variations between the study's overall scores on the entire instrument. It also reveals the form of the prediction equation:  $\text{Success} = 1.537 + 1.369X$  (Self-Effectiveness). This suggests that a rise in educational Self-Efficacy is associated with increased academic accomplishment. Although evaluating the impact of educational Self-Efficacy using beta is difficult, it is straightforward to interpret the educational Self-Efficacy coefficient using Z-scores for both dependent and independent variables. Hence, the average value of achievement is  $0.784X$  (Self-Effectiveness). In addition, Table 2 displays a linear correlation coefficient of 0.78 for the overall Educational Self-Efficacy instrument. In addition, the estimate of the dependent variable (academic attainment) is 61.5% accurate. In addition, it demonstrates the suitability of the data's regression line in contrast to the null hypothesis, which argues that "the regression line does not fit the presented data." The regression line's analysis of variance test value is 76.525 at a significance level of 0.000, which is less than 0.05. Hence, the regression line corresponds to the data.

To respond to the third question: What effect does the variety of digital learning resources have on the level of educational Self-Efficacy and academic accomplishment of students?

Table 3 displays the Standard regression coefficients and their statistical significance. Variance explained values, and F value and its significance for the regression analysis of the effect of digital learning tool diversity on Self-Efficacy.

Table 3. Regression analysis of diversity in the use of digital learning tools on Self-Effectiveness

	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		Coefficients	Std. Error	Beta		
1	(Constant)	1.957	.226		8.676	.000
	Digital Learning Tools	.412	.063	.687	6.554	.000
	R	.687				
	R Square	.472				
	F	42.951				.000
	df	1				

Table 3 demonstrates statistically significant variations between the study's overall scores on the entire instrument. It also indicates that the form of the prediction equation is educational Self-Efficacy = 1.95 + 0.41 X. (digital learning tools). This implies that increasing the number of digital learning resources increases Educational Self-Efficacy. Although it is difficult to comprehend the influence of digital learning tools using the beta, it is straightforward to interpret the coefficient using Z-score for both dependent and independent variables. Thus, the mean value of Educational Self-Efficacy equals 0.6875X (digital learning tools). In addition, the table displays a linear correlation coefficient of 0.68 for the overall Educational Self-Efficacy instrument. It also reveals that the estimation of the dependent variable (academic attainment) is 47.2% accurate. In addition, it demonstrates the suitability of the data's regression line in contrast to the null hypothesis, which argues that "the regression line does not fit the presented data." The regression line's analysis of variance test value is 42,951 at a significance level of 0.000, which is less than 0.05. Hence, the regression line corresponds to the data.

To answer the fourth question; Are there statistically significant differences between the average scores of the educational Self-Effectiveness instrument due to the use of digital learning tools, gender, and gifted and non-gifted students?



Table 4. The means and standard deviation about diversity in using digital learning tools.

			N	Mean	Std. Deviation
Diversity in the use of digital learning tools	Educational Self-Effectiveness instrument	1 program	393	2.6000	.24847
		2 program	242	3.2070	.25014
		3 program	122	3.4316	.25831
		More than 4 program	387	3.6000	.25676
		Total	1144		

Table 4 shows that the highest mean value response of students in the Educational Self-Effectiveness instrument about diversity in the use of digital learning tools is for more than 4 programs, where the mean is (3.60).

Table 5. Results of analysis of variance of differences between the means of respondents on the scale

variance source			Sum of Squares	df	Mean Square	F	Sig.
Diversity in the use of digital learning tools	Educational Self-Effectiveness instrument	Between Groups	2.430	5	.486		
		Within Groups	57.284	146	.392	1.239	.029
		Total	59.714	151			

Table 5 shows statistically significant differences in all dimensions of the Educational Self-Effectiveness instrument based on diversity in using digital learning tools. The significance level is less than 0.05.

Table 6. Results of the T-test for differences between means of respondents on the scale.

Variable and instrument			No.	Mean	S. D.	T value	Sig.
Students	Educational Self-Effectiveness instrument	Gifted	156	.36056	3.4000	.243	.034
		Non-gifted	407	.34173	3.4296		
Gender	Educational Self-Effectiveness instrument	Male	231	.31449	3.3762	1.057	.309
		Female	332	.37185	3.4448		

In Table 6, the value of ( $t = 0.243$ ) for all dimensions indicates a statistically significant difference for the differences among the means, where the significance threshold is less than (0.05). (0.05). In other words, there are statistically significant variations among the sample responses on the educational Self-Effectiveness test according to gifted and non-gifted students in favor of talented students. The value of ( $t = 1.057$ ) for all dimensions indicates no statistically significant difference between the means if the significance threshold is more excellent than (0.05). (0.05). In other

words, there are no statistically significant differences among the sample responses on the educational Self-Effectiveness test according to gender.

#### 4. Discussion

In light of the proliferation and extension of digital learning tools in most educational institutions, numerous universities want to regulate them by selecting a learning management system to facilitate and manage their learning processes. These digital tools are known as institutional learning tools, and all university students utilize them following particular official and regulatory procedures. The students at these universities can also use extra digital learning resources called "open." Therefore, the purpose of the present study was to determine the effect of institutional and open variety in using digital learning tools on both educational Self-Efficacy and academic accomplishment in online learning environments.

Diversity in the use of digital learning resources, educational Self-Efficacy, and academic accomplishment was found to have a positive, direct relationship, as indicated by the study's findings. This can be explained by the fact that the self's nature perpetually satisfies its desire for variety. Hence, when the degree of diversity in digital learning tools increases, the individual's educational self-efficacy increases, which is reflected favorably in the learner's academic accomplishment. Where digital transformation processes in education have provided innovative ways and possibilities of active synchronous and asynchronous interaction with content and learners, which opens up new horizons for students to conduct research, think critically, and create more opportunities to excel in online learning environments. This study's findings are congruent with those of [Bernacki et al. \(2021\)](#); [Sutarni et al. \(2021\)](#).

The studies also demonstrated that educational Self-Efficacy influences academic accomplishment. This implies that a higher level of educational Self-Efficacy is associated with higher intellectual accomplishment in online learning environments. This can be explained by how a person's Self-Effectiveness beliefs influence numerous conduct elements. Self-Effectiveness influences how an individual chooses the activities in which he engages, the effort he expends to achieve his goals, and the perseverance he demonstrates when confronted with hurdles. Self-Effectiveness also influences the kind

of tasks that are addressed. The guy consistently engages in endeavors he once believed he could achieve, even though his current abilities do not qualify him.

Nonetheless, he avoids activities he believes he cannot complete. In addition, self-efficacy influences an individual's techniques and approaches to achieving his objectives (Zimmerman, 2002). Artino (2012) further confirmed that academic self-efficacy contributes to enhanced performance in course-related tasks, making the academic performance of students with high academic self-efficacy superior to that of their peers with low academic Self-Efficacy. Research has found a positive association between academic self-efficacy and accomplishment, which this study confirms (Barnes, 2010; Witt-Rose, 2003).

The study's results demonstrated that the variety of digital learning resources utilized affected the degree of educational self-efficacy. This implies that increasing digital learning tools increases learners' educational self-efficacy in online learning environments. This can be explained by the fact that the nature of educational self-effectiveness processes is based on a set of principal dimensions, such as initiative, which is defined as the initiation of behavior or action, the ability to solve problems in distance learning environments, the flexibility to take advantage of diversity in the provision of scientific content through distance education platforms, perseverance in planning, implementing, and completing tasks, and striving for excellence. All of them are processes that require the learner to deepen and diversify their exploitation and use of all forms of different digital learning tools to meet the requirements of the various pillars of educational self-efficacy, and the results of this study are consistent with those of the previous research (Al-Tabbakh, 2020; Faccia et al., 2021).

Due to the range of digital learning resources, the results also revealed statistically significant disparities between the average scores on the educational self-efficacy measure. This can be explained by the fact that the diversity of digital learning resources and tools created a kind of increased desire for a continuous presence in front of the various platforms of the distance learning system, which in turn created in the learners a high desire to focus and delve deeply into their fields of study, increasing their passion for research and access to the knowledge and skills associated with their specialties. These results align with those of a study (Suwaidan & Al-Zuhairi, 2015).

The study's results demonstrated statistically significant differences between the average scores of gifted and non-gifted students on the educational self-efficacy scale in favor of gifted students. This can be explained by the fact that the government of the Kingdom of Saudi Arabia pays special attention to the care of the gifted through the establishment of a general administration for the gifted to formulate policies for educational services and procedures for their implementation, thereby assisting them in acquiring advantages such as curiosity, fluency, flexibility, a high capacity for imagination, and a love of discovery. The findings also revealed no statistically significant variations between the average scores on the educational self-efficacy scale based on gender, which is consistent with the findings of a previous study (AlAli & Saleh, 2022).

## 5. Conclusion and future directions

This study aimed to develop a measure of educational self-efficacy. It focused on the extent to which it is affected by the diversity in the use of various digital learning tools, as well as the extent to which this is reflected in students' academic achievement in online learning environments. This study's applicability was restricted to a sample of King Faisal University students in the Kingdom of Saudi Arabia. In light of the findings, the study suggests providing all equipment related to multimedia labs to encourage further use of digital learning tools, focusing on the development of educational self-efficacy in online learning environments through cognitive reinforcement, verbal persuasion, alternative experiences, emotional arousal, and other methods and sources, and training teachers. The study recommends continuing to move toward future trends and studies in this regard, such as measuring the impact of the digital learning tools variable on other learning outcomes, such as learning time, efficiency, or completion rate, and curriculum engineering and development in light of digital learning requirements.

**Data Availability Statement:** The authors declare that all other data supporting the findings of this study are available within the article.

**Acknowledgments:** The authors thank the Deanship of Scientific Research at King Faisal University, Saudi Arabia, for the financial support under Annual research grant number GRANT1525.

**Conflicts of Interest:** On behalf of all authors, the corresponding author states that there is no conflict of interest.

**Funding:** This work was financially supported by the Deanship of Scientific Research, King Faisal University, Saudi Arabia [grant number GRANT1525].

## References

- Abbas, A. (2019). *The effect of different elements of digital competitive games (individual / group) on developing the skills of designing and producing web pages and achievement motivation among middle school students.* (Master's thesis). South Valley University.
- Abdelbaset, A. (2011). *Digital Learning Units a New Technology in Education.* Cairo: The world of books.
- Abulibdeh, E. S., & Hassan, S. S. S. (2011). E-learning interactions, information technology self efficacy and student achievement at the University of Sharjah, UAE. *Australasian Journal of Educational Technology*, 27(6). <https://doi.org/10.14742/ajet.926>
- Affouneh, S., Salha, S., & Khlaif, Z. N. (2020). Designing quality e-learning environments for emergency remote teaching in coronavirus crisis. *Interdisciplinary Journal of Virtual Learning in Medical Sciences*, 11(2), 135-137. <https://doi.org/10.30476/ijvlms.2020.86120.1033>
- Ahmad, N. L., Yahaya, R., & Wahid, H. A. (2022). Teacher's Motivation on the Use of Virtual Learning Environment (VLE): The Effect of Social Factors, Self-Effectiveness and Technological Support. *International Journal of Academic Research in Progressive Education and Development*, 11(2), 140-156. <https://doi.org/10.6007/IJARPED/v11-i2/13109>
- Al-Barakat, A. A., Al-Hassan, O. M., AlAli, R. M., Al-Hassan, M. a. M., & Al sharief, R. A. (2022). Role of female teachers of childhood education in directing children towards effective use of smart devices. *Education and Information Technologies*, 1-23. <https://doi.org/10.1007/s10639-022-11481-y>
- Al-Qahtani, K. (2019). Designing an e-learning environment based on the combination of interactive activities and digital game stimuli to develop some life skills for kindergarten children. *International Interdisciplinary Journal of Education*, 8(3), 88-110. [http://ijoe.org/v8/IJJOE\\_07\\_03\\_08\\_2019.pdf](http://ijoe.org/v8/IJJOE_07_03_08_2019.pdf)

- Al-Tabakh, H. A. I., & Ismail, A. T. A. (2020). Designing a learning environment based on the interaction between the "competitive / cooperative" digital game stimulus pattern and the "single / multiple" challenge level and its impact on developing programming skills and problem solving among educational technology students. *The Educational Journal*, (77), 259-361.
- Al-Tabbakh, H. (2020). Designing a hologram-learning environment based on the timing of displaying "free/restricted" digital learning objects and its impact on developing the cognitive achievement in the biology course and the visual-spatial visualization skills of secondary school students. *Journal of the College of Education*, 77(1), 1-29.
- AlAli, R., & Al-Barakat, A. (2022). Using Structural Equation Modeling to Assess a Model for Measuring Creative Teaching Perceptions and Practices in Higher Education. *Education Sciences*, 12(10), 690. <https://doi.org/10.3390/educsci12100690>
- AlAli, R., & Saleh, S. (2022). Towards Constructing and Developing a Self-Efficacy Scale for Distance Learning and Verifying the Psychometric Properties. *Sustainability*, 14(20), 13212. <https://doi.org/10.3390/su142013212>
- Aliya, H. (2019). Self-Effectiveness and its relationship to the level of ambition among students of the General Diploma in Education at Al-Jouf University. *Journal of the Islamic University of Educational and Psychological Studies*, 27(2), 161-185. <https://journals.iugaza.edu.ps/index.php/IUGJEPS/article/view/3927>
- Altun, S. A., Kalayci, E., & Ümmühan, A. (2011). Integrating ICT at the Faculty Level: A Case Study. *TOJET: The Turkish Online Journal of Educational Technology*, 10(4), 230-240. <https://www.proquest.com/openview/33b39b89bda6c53f4255f606cd4149cd>
- Arabiyat, A., & Hamadna, B. (2014). Self-Effectiveness among secondary school students in the Bani Kenana area in the light of the variables of gender and achievement. *Journal of Educational and Psychological Sciences*, 15(1), 89-109. <https://doi.org/10.12785/jeps/150103>
- Arpaci, I. (2017). The role of self-efficacy in predicting use of distance education tools and learning management systems. *Turkish Online Journal of Distance Education*, 18(1), 52-62. <https://doi.org/10.17718/tojde.285715>
- Artino, A. R. (2012). Academic self-efficacy: from educational theory to instructional practice. *Perspectives on medical education*, 1, 76-85. <https://doi.org/10.1007/s40037-012-0012-5>



- Atta, M. (2017). The effect of the different design pattern of the QR code for some digital resources on students' achievement and their attitudes towards using mobile education. *Arab Research Journal in the Fields of Specific Education*, 8(8), 271-330. [https://raes.journals.ekb.eg/article\\_24224.html](https://raes.journals.ekb.eg/article_24224.html)
- Bandura, A., & Wood, R. (1989). Effect of perceived controllability and performance standards on self-regulation of complex decision making. *Journal of personality and social psychology*, 56(5), 805-814. <https://doi.org/10.1037//0022-3514.56.5.805>
- Barnes, M. J. (2010). *The influence of self-efficacy on reading achievement of General Educational Development (GED) and high school graduates enrolled in developmental reading skills courses in an urban community college system*. Northern Illinois University. <https://www.proquest.com/openview/2b4618fb52911908d2a8f4b193166a03>
- Bernacki, M. L., Vosicka, L., Utz, J. C., & Warren, C. B. (2021). Effects of digital learning skill training on the academic performance of undergraduates in science and mathematics. *Journal of Educational Psychology*, 113(6), 1107-1125. <https://doi.org/10.1037/edu0000485>
- Bertheussen, B. A., & Myrland, Ø. (2016). Relation between academic performance and students' engagement in digital learning activities. *Journal of Education for Business*, 91(3), 125-131. <https://doi.org/10.1080/08832323.2016.1140113>
- Bicen, H., & Kocakoyun, S. (2018). Perceptions of students for gamification approach: Kahoot as a case study. *International Journal of Emerging Technologies in Learning*, 13(2), 72-93. <http://doi.org/10.3991/ijet.v13i02.7467>
- Britner, S. L., & Pajares, F. (2006). Sources of science self-efficacy beliefs of middle school students. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, 43(5), 485-499. <https://doi.org/10.1002/tea.20131>
- Carroll, A., Houghton, S., Wood, R., Unsworth, K., Hattie, J., Gordon, L., & Bower, J. (2009). Self-efficacy and academic achievement in Australian high school students: The mediating effects of academic aspirations and delinquency. *Journal of adolescence*, 32(4), 797-817. <https://doi.org/10.1016/j.adolescence.2008.10.009>
- Chen, C.-C., & Tu, H.-Y. (2021). The effect of digital game-based learning on learning motivation and performance under social cognitive theory and entrepreneurial thinking. *Frontiers in psychology*, 12, 750711. <https://doi.org/10.3389/fpsyg.2021.750711>



- DeTure, M. (2004). Cognitive style and Self-Effectiveness: Predicting student success in online distance education. *American Journal of Distance Education*, 18(1), 21-38. [https://doi.org/10.1207/s15389286ajde1801\\_3](https://doi.org/10.1207/s15389286ajde1801_3)
- Faccia, C., Iacopino, M., Baroncellia, A., & Ciuccia, E. (2021). The rise of online teaching and digital learning during the health emergency from Covid-19 and teachers' working Self-Effectiveness: an Italian perspective. In *Proceedings of the Third Symposium on Psychology-Based Technologies (PSYCHOBIT2021), October 4-5, 2021, Naples, Italy*. CEUR Workshop Proceedings (CEUR-WS.org). <https://ceur-ws.org/Vol-3100/paper10.pdf>
- Finn, K. V., & Frone, M. R. (2004). Academic performance and cheating: Moderating role of school identification and self-efficacy. *The journal of educational research*, 97(3), 115-121. <https://doi.org/10.3200/JOER.97.3.115-121>
- Gouda, W. (2019). The effect of different patterns of digital learning units in developing the skills of designing electronic courses for preparatory stage teachers. *Mansoura College of Education Journal*, 105(3), 784-826. <https://search.emarefa.net/detail/BIM-1101574>
- Harris, K. R. (1990). Developing self-regulated learners: The role of private speech and self-instructions. *Educational psychologist*, 25(1), 35-49. [https://doi.org/10.1207/s15326985ep2501\\_4](https://doi.org/10.1207/s15326985ep2501_4)
- Hassan, A. (2017). *The effectiveness of electronic content in computer subject based on digital competitive games in developing achievement and learning efficiency among middle school students in the Kingdom of Saudi Arabia*. (Master's thesis). The Egyptian University for E-learning.
- Hickson, R. S. (2016). *The relationship between self-efficacy and teachers' ability to integrate technology*. Liberty University. <https://www.proquest.com/openview/e1b6fef06f05b42fe15b39fb7b780a15>
- Hung, C.-M., Huang, I., & Hwang, G.-J. (2014). Effects of digital game-based learning on students' self-efficacy, motivation, anxiety, and achievements in learning mathematics. *Journal of Computers in Education*, 1, 151-166. <https://doi.org/10.1007/s40692-014-0008-8>
- Joo, Y.-J., Bong, M., & Choi, H.-J. (2000). Self-efficacy for self-regulated learning, academic self-efficacy, and internet self-efficacy in web-based instruction. *Educational technology research and development*, 48, 5-17. <https://doi.org/10.1007/BF02313398>

- Kapp, K. M. (2012). *The Gamification of Learning and Instruction: Game-based Methods and Strategies for Training and Education*. Pfeiffer & Company. <https://dl.acm.org/doi/abs/10.5555/2378737>
- Kelly, T. (2012). *Real gamification mechanics require simplicity and, yes, game designers can do it*. TechCrunch. <https://techcrunch.com/2012/12/08/real-vs-fake-gamification-mechanics/>
- KewalRamani, A., Zhang, J., Wang, X., Rathbun, A., Corcoran, L., Diliberti, M., & Zhang, J. (2018). *Student Access to Digital Learning Resources outside of the Classroom*. NCEES 2017-098. National Center for Education Statistics. <https://www.learntechlib.org/p/190226/>
- Khalifa, A., & Al-Sebahi, H. (2021). The interaction between the intensity of digital game stimulus elements, the "superficial / deep" learning style, and its impact on the development of achievement and motivation towards learning among educational technology students. *Egyptian Society for Educational Technology*, 31(2), 203-293.
- Kuo, Y.-C., Walker, A. E., Belland, B. R., Schroder, K. E., & Kuo, Y.-T. (2014). A case study of integrating Interwise: Interaction, internet self-efficacy, and satisfaction in synchronous online learning environments. *International Review of Research in Open and Distributed Learning*, 15(1), 161-181. <https://doi.org/10.19173/irrodl.v15i1.1664>
- Lee, J. J., & Hammer, J. (2011). Gamification in education: What, how, why bother? *Academic exchange quarterly*, 15(2), 146. <https://www.researchgate.net/publication/258697764>
- Lin, M.-H., & Chen, H.-g. (2017). A study of the effects of digital learning on learning motivation and learning outcome. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(7), 3553-3564. <https://doi.org/10.12973/eurasia.2017.00744a>
- Malureanu, A., Panisoara, G., & Lazar, I. (2021). The relationship between self-confidence, self-efficacy, grit, usefulness, and ease of use of elearning platforms in corporate training during the COVID-19 pandemic. *Sustainability*, 13(12), 6633. <https://doi.org/10.3390/su13126633>
- Mandinach, E. B. (1984). The role of strategies planning and self-regulation in learning an Intellectual computer. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 45(6-A), 1693. <https://www.semanticscholar.org/paper/d42b5621ca0b09ab0c94e0103c66a599e922afc1>

- Neufeld, D. J. (2018). *An exploratory study of the impact of digital learning tools on student engagement, self-efficacy and ownership of learning*. (Doctoral dissertation). Memorial University of Newfoundland. <http://research.library.mun.ca/id/eprint/13222>
- Nihad, M. (2016). *A scale of general Self-Effectiveness*. Cairo: Anglo Library.
- Ozerbas, M. A., & Erdogan, B. H. (2016). The effect of the digital classroom on academic success and online technologies self-efficacy. *Journal of Educational Technology & Society*, 19(4), 203-212. <https://www.jstor.org/stable/jeductechsoci.19.4.203>
- Pumptow, M., & Brahm, T. (2021). Students' digital media self-efficacy and its importance for higher education institutions: development and validation of a survey instrument. *Technology, Knowledge and Learning*, 26, 555-575. <https://doi.org/10.1007/s10758-020-09463-5>
- Ramaila, S., & Mpinga, N. P. (2022). The Effect of Digital Learning on the Academic Achievement and Motivation of Natural Sciences Learners: A Case Study of a South African Independent School. *International Journal of Higher Education*, 11(7), 1-71. <https://doi.org/10.5430/ijhe.v11n7p71>
- Rowand, B. (1990). The differences between gifted lescents with high achievement and gifted adolescents with low achievements in the perception of academic efficacy, the concept of self and perceived performance and the effect of the variable of gender on efficacy. *Dissertation Abstract International*, 51(2), 479-488.
- Sailer, M., Murböck, J., & Fischer, F. (2021). Digital learning in schools: What does it take beyond digital technology? *Teaching and Teacher Education*, 103, 103346. <https://doi.org/10.1016/j.tate.2021.103346>
- Santos, W. O. d., Bittencourt, I. L., & Vassileva, J. (2018). Design of tailored gamified educational systems based on gamer types. In *Anais dos Workshops do Congresso Brasileiro de Informática na Educação* (Vol. 7, pp. 42-51). <http://ojs.sector3.com.br/index.php/wcbie/article/view/8208>
- Shakarami, A., Khajehei, H., & Hajhashemi, K. (2013). Digital self-efficacy and language learning enhancement in an online setting. *Journal of Basic and Applied Scientific Research (JBASR)*, 3(11), 80-84. <https://doi.org/10.2139/ssrn.2637404>
- Snowball, J., & Mostert, M. (2010). Introducing a learning management system in a large first year class: Impact on lecturers and students. *South African Journal of Higher Education*, 24(5), 818-831. <https://hdl.handle.net/10520/EJC37639>

- Su, C. H., & Cheng, C. H. (2015). A mobile gamification learning system for improving the learning motivation and achievements. *Journal of Computer Assisted Learning*, 31(3), 268-286. <https://doi.org/10.1111/jcal.12088>
- Sutarni, N., Ramdhany, M. A., Hufad, A., & Kurniawan, E. (2021). Self-regulated Learning and Digital Learning Environment: Its'effect on Academic Achievement During the Pandemic. *Cakrawala Pendidikan*, 40(2), 374-388. <https://doi.org/10.21831/cp.v40i2.40718>
- Suwaidan, S., & Al-Zuhairi, H. (2015). The impact of e-learning in the development of knowledge beyond the skills of students in the third phase of the curriculum and teaching methods. *Journal of the University of Anbar for Humanities*, 2, 358-406.
- Thompson, L. F., Meriac, J. P., & Cope, J. G. (2002). Motivating online performance: The influences of goal setting and Internet self-efficacy. *Social Science Computer Review*, 20(2), 149-160. <https://doi.org/10.1177/089443930202000205>
- Tsai, M.-J., & Tsai, C.-C. (2003). Information searching strategies in web-based science learning: the role of Internet self-efficacy. *Innovations in education and teaching international*, 40(1), 43-50. <https://doi.org/10.1080/1355800032000038822>
- Wang, Q. (2008). A generic model for guiding the integration of ICT into teaching and learning. *Innovations in education and teaching international*, 45(4), 411-419. <https://doi.org/10.1080/14703290802377307>
- Witt-Rose, D. L. (2003). *Student self-efficacy in college science: An investigation of gender, age, and academic achievement*. (Doctoral dissertation). University of Wisconsin-Stout. <http://www2.uwstout.edu/content/lib/thesis/2003/2003wittrosed.pdf>
- Yavuzalp, N., & Bahcivan, E. (2020). The online learning self-efficacy scale: Its adaptation into Turkish and interpretation according to various variables. *Turkish Online Journal of Distance Education*, 21(1), 31-44. <https://doi.org/10.17718/tojde.674388>
- Zeitoun, A. (1999). *Self-learning - a contemporary educational strategy*. Alif B Al-Adab, Damascus.
- Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into practice*, 41(2), 64-70. [https://doi.org/10.1207/s15430421tip4102\\_2](https://doi.org/10.1207/s15430421tip4102_2)

## Appendix A

Table A. Item Fit Analysis for the instrument.

items	Measure	Model SE	Infit		outfit		Pt-measure	
			MNSQ	ZSTD	MNSQ	ZSTD	CORR	EXP
E2	0.27	0.12	1.19	0.9	1.48	1.7	0.61	.41
P8	0.07	0.15	1.20	1.0	1.34	1.5	0.63	.33
I10	0.19	0.11	1.28	1.7	1.32	1.9	0.62	.40
F5	0.30	0.17	1.18	1.2	1.30	1.6	0.61	.29
P3	0.01	0.13	1.25	1.4	1.28	1.6	0.05	.36
E9	0.27	0.12	1.18	1.1	1.26	1.4	0.62	.40
I8	0.50	0.15	1.20	1.1	1.23	1.3	0.66	.33
P4	0.12	0.16	1.14	0.7	1.21	1.0	0.69	.30
P12	0.15	0.15	1.18	1.0	1.17	.9	0.62	.33
P11	0.11	0.14	1.16	1.1	1.18	1.2	0.63	.34
F9	0.58	0.17	1.15	0.9	1.16	1.0	0.76	.29
E10	0.04	0.17	1.16	0.8	1.14	.7	0.73	.29
E3	0.64	0.17	1.15	0.9	1.13	.8	0.79	.29
F1	0.14	0.12	1.14	1.0	1.09	.6	0.76	.40
P10	0.56	0.16	1.07	0.4	1.02	.2	0.74	.31
F10	0.28	0.14	1.00	0.1	1.06	.4	0.74	.33
P7	0.55	0.13	1.05	0.4	1.04	.3	0.61	.36
F3	0.10	0.16	1.03	0.2	1.03	.3	0.67	.31
P5	0.16	0.15	1.03	0.2	1.03	.2	0.67	.32
P2	0.80	0.19	1.02	0.2	1.01	.1	0.62	.25
P6	0.07	0.14	0.97	0.1	1.01	.1	0.72	.35
I7	0.52	0.14	1.00	0.0	1.00	.0	0.74	.33
F6	0.04	0.18	0.97	0.1	.99	.0	0.73	.28
F7	0.04	0.15	0.99	0.0	.93	.2	0.72	.31
F2	0.02	0.18	0.98	0.0	.98	.1	0.71	.27
P9	0.14	0.15	0.95	0.2	.96	.1	0.69	.33
E6	0.09	0.15	0.96	0.2	.95	.2	0.69	.33
I9	0.12	0.15	0.96	0.1	.92	.3	0.60	.32
I6	0.71	0.24	0.94	0.2	.95	.1	0.66	.21
I3	0.46	0.16	0.94	0.2	.89	.5	0.66	.29
F8	0.10	0.14	0.91	0.6	.92	.5	0.57	.35
E12	0.16	0.13	0.90	0.6	.91	.5	0.59	.38
I2	0.20	0.13	0.89	0.6	.91	.5	0.59	.38
I1	0.05	0.19	0.90	0.5	.88	.6	0.74	.25
E8	0.08	0.14	0.86	0.7	.85	.8	0.53	.34
E7	0.22	0.19	0.83	1.0	.84	.9	0.56	.26
I4	0.18	0.17	0.84	0.9	.80	1.0	0.54	.28
E4	0.09	0.15	0.83	0.9	.83	.9	0.56	.32
E5	0.06	0.12	0.80	1.3	.83	1.0	0.61	.41
E11	0.12	0.16	0.82	1.1	.83	1.1	0.57	.29
I5	0.43	0.13	0.80	1.3	.81	1.2	0.60	.38
F4	0.26	0.11	0.80	1.3	.78	1.4	0.58	.41
P1	0.11	0.14	0.74	1.7	.74	1.7	0.67	.34
E1	0.63	0.15	0.73	0.9	.72	.8	0.58	.32

## Appendix B

**Table B.** Item dimensionality of the instrument.

	Empirical		Modeled	
Total raw variance in observations	55.7	100%		100%
Raw variance explained by measures	11.7	21.0%		20.5%
Raw variance explained by persons	2.0	3.5%		3.4%
Raw variance explained by items	9.7	17.5%		17.1%
Raw unexplained variance (total)	44.0	79.0%	100%	79.5%
Unexplained variance in 1st contrast	5.9	10.7%	13.5%	
Unexplained variance in 2nd contrast	4.8	8.7%	11.0%	
Unexplained variance in 3rd contrast	3.7	6.6%	8.3%	
Unexplained variance in 4th contrast	3.3	5.9%	7.4%	
Unexplained variance in 5th contrast	2.8	5.1%	6.4%	

## Appendix C

**Table C.** Person and Item separation and reliability for the instrument.

	Score	Count	Measure	Error	Infit		Outfit	
					MNSQ	ZSTD	MNSQ	ZSTD
Mean	150.6	44.0	.22	.15	1.02	.2	1.02	.2
S.D	15.0	.0	.36	.01	.48	2.1	.45	2.0
Real rmse	.17							
Adj. sd	.31							
Separation	1.87							
Person reliability	0.78							
Mean	171.2	50.0	.00	.15	1.00	.0	1.02	.1
S.D	20.8	.0	.32	.02	.15	.8	.18	.9
Real rmse	.16							
Adj. sd	.28							
Separation	1.81							
Item reliability	0.77							

## Appendix D

**Table D.** Self-effectiveness of distance learning Scale

	(choosing the appropriate actions)	It happens				
		Items	Always	Often	Sometimes	Rarely
<b>First Dimension: Initiation</b>						
1	I am doing brainstorming processes for the problems through the distance education platforms and related to the academic subjects.					
2	Through distance learning platforms, I can access live digital models and drawings that help develop and master some skills.					
3	I believe that through distance learning platforms, I can be creative by responding to questions submitted electronically.					

<i>(choosing the appropriate actions)</i>		It happens				
Items		<i>Always</i>	<i>Often</i>	<i>Sometimes</i>	<i>Rarely</i>	<i>Never</i>
4	I enjoy topics and tasks across distance learning platforms that require new solutions					
5	Through distance learning platforms, I benefit from brief and clear instructions and opportunities to communicate with the teacher to solve problems and overcome obstacles.					
6	I can understand the data and arrange them for the problems related to the course through the distance learning platforms.					
7	I generate ideas to solve a problem with the academic topics presented through distance learning platforms.					
8	I'm putting a summary of solutions to some scientific issues raised through distance learning platforms					
9	I always make sure, through distance learning platforms, to evaluate how well I understand things.					
10	I make sure to evaluate the ways I used to handle errors across distance learning platforms					

---

***Second Dimension: The effort***

---

1	I do suggested activities in distance learning environments that encourage scientific thinking.					
2	I participate in discussion forums through distance education platforms that help in deepening my understanding of the academic content.					
3	I benefit from meaningful examples through distance education platforms that employ audio-visual stimuli and digital stories related to educational content.					
4	I follow the guidelines for suggested content and activities when participating in distance learning platforms.					
5	I carry out assignments and tasks related to the scientific content provided through distance learning platforms.					
6	I can complete the work assigned to me through distance learning platforms without guidance from anyone					
7	Through distance learning platforms, I seek to benefit from direct or indirect support services at all learning times					
8	Through distance learning platforms, I feel control over the learning process and that my success directly results from the effort expended.					

---



<i>(choosing the appropriate actions)</i>		It happens				
	Items	<i>Always</i>	<i>Often</i>	<i>Sometimes</i>	<i>Rarely</i>	<i>Never</i>
9	I am creating a mind map of the contents of the academic topics presented through the distance learning platforms					
10	I make sure to check the sub-learning goals across the distance learning platforms.					
11	I adhere to the specified time to achieve each goal or task through distance learning platforms					
12	I evaluate how effective I have been in the activities and processes of the learning process through distance learning platforms.					

---

***Third Dimension: Flexibility***

---

1	I take advantage of the diversity in providing scientific content through distance education platforms using audio, text, video, and static and animation graphics.					
2	I seek to interact with colleagues and professors and benefit from the content provided through distance education platforms.					
3	I expect educational courses through distance learning platforms to develop some practical life skills					
4	I seek to delve deeper into distance learning platforms using methods and alternatives (audio, visual, audio-visual)					
5	I try to make connections between the knowledge and concepts I learn through distance learning platforms					
6	I seek to take advantage of the educational experiences and situations offered through distance learning platforms to increase my chances of success					
7	Through distance learning platforms, I benefit from immediate and delayed feedback to support my correct responses and correct my incorrect answers.					
8	I sequence what I learn through distance learning platforms and link it with my previous knowledge.					
9	Through distance learning platforms, I constantly review the scientific course to discover the relationships between its parts					
10	I replicate learning methods that have proven effective across distance learning platforms in future learning topics and situations					

---

***Fourth Dimension: Perseverance***

---

1	Through distance learning platforms, I seek to link the preface of educational content with my previous experiences					
---	---	--	--	--	--	--

---

<i>(choosing the appropriate actions)</i>		It happens				
Items		<i>Always</i>	<i>Often</i>	<i>Sometimes</i>	<i>Rarely</i>	<i>Never</i>
2	Through distance learning platforms, I can reach the expected learning outcomes through the course objectives					
3	I seek through practical activities through distance learning platforms to engage in learning					
4	I believe that the electronic assessment programs offered to me through distance learning platforms are commensurate with my abilities					
5	I prefer challenging jobs through distance learning platforms					
6	Through distance learning platforms, I can learn pre and post-learning requirements and performance appraisal criteria to build positive expectations and achieve success.					
7	I seek through distance learning platforms to take advantage of competitive educational opportunities with my colleagues that generate a spirit of challenge and persistence.					
8	I have the desire and complete freedom to review part of the educational content, activities, and exercises at any time through the distance learning platforms.					
9	I create a time plan for assigned tasks/goals across distance learning platforms					
10	I plan and determine the time and effort that I will spend in accomplishing a task through distance learning platforms					
11	I anticipate the difficulties and obstacles that I may encounter in the learning process via distance learning platforms					
12	After completing an assignment via distance learning platforms, I review the parts that I find not yet satisfactory					