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Saltanat Abildina
Karaganda State University named after Ye.A.Buketov, Kazakhstan

Zhannat Sardarova
Abay Kazakh National Pedagogical University, Kazakhstan

Raikhan Ozgambayeva
Caspian University of Technologies and Engineering named after Sh. Yessenov (Yessenov University), Kazakhstan

Sholpan Janzakova
Atyrau University named after Khalel Dosmukhamedov, Kazakhstan

Almagul Kalykbayeva
Abay Kazakh National Pedagogical University, Kazakhstan

Almagul Bitikova
Caspian University of Technologies and Engineering named after Sh. Yessenov (Yessenov University), Kazakhstan

Eleonora Abdol
Atyrau University named after Khalel Dosmukhamedov, Kazakhstan

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The Effect of Variables Associated with the Digital Learning Environment on Students' Motivation and Attitudes

Saltanat Abildina, Zhannat Sardarova, Raikhan Ozgambayeva, Sholpan Janzakova, Almagul Kalykbayeva, Almagul Bitikova, Eleonora Abdol

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Abstract

The aim of this study is to determine the relationships between digital learning readiness, attitudes, academic motivation and attitudes of students studying in the department of educational sciences of a university in Kazakhstan in terms of some variables. The data of the study were obtained from 1st-4th grade students studying in the department of educational sciences of a university in Karaganda, Almaty, Aktau, Kazakhstan in the academic year 2021-2022 (N=261). Percentage, frequency, mean, Independent Samples t test, F test and Regression Analysis techniques were used to analyze the data. In the study, it was found that students' digital learning attitudes were positive and their digital learning readiness was at a moderate level. Digital learning readiness and attitudes of university students showed a significant difference according to gender variable. However, no difference was found in digital readiness and attitudes according to the class variable. Finally, according to the regression analyses, it was found that the participant university students' digital learning readiness and attitudes predicted their academic motivation and attitudes at a significant level.

Introduction

In the 21st century world, which is shaped by globalization, digitalization and digital information society, education is "a process that enables continuous learning, knowing knowledge, being knowledgeable, producing knowledge and living with knowledge" and "in the information society, individuals are expected to be creative, questioning, thinking and producing people" (Bozkurt, 2020). The changes in our perspective on the world (Kuhn, 2012) cause the understanding of learning and teaching to change and different paradigms to emerge in the field of education (Blaschke et al., 2021). The multidimensional nature of learning has resulted in the emergence of non-linear asymmetric learning approaches in digital environments and online networks (Erdogdu, 2021; Shoaib & Pitt, 2022; Wulansari et al., 2020; Zacher, 2020). Theories such as Connectivism (Downes, 2012; Siemens, 2004; Siemens, 2006) and Rhizomatic Learning (Cormier, 2008; Cormier, 2015) suggest that learning is not a linear and mechanical process; learners connect to networks or create their own learning networks in line with their learning needs.

In the digital information age, educational institutions have also had to reposition themselves in this transformation process (Akour & Alenezi, 2022; Amaniampong & Hartmann, 2023; Arnado et al., 2022; Duderstadt, 1998; Duderstadt, 2019). The change in learning processes actually shows a shift from teaching to learning; from a teacher-centered approach to a learning-centered approach. Education is not only a process that takes place between four walls, but actually a lifelong process. This understanding has required teachers to adopt roles that enrich knowledge, facilitate the learning process, and guide learners in the process of accessing knowledge rather than transferring knowledge. In the information age, it has emerged as a fact that learners contribute to the learning ecology not only as receivers and consumers of information, but also as producers. With digitalization, virtual online projections of the physical offline world have also started to be created, and with this trend, the concept of digital twin (Annand, 2007; El Saddik, 2018) has emerged. In addition to digital twins, digital online ecosystems (Guetl & Chang, 2008) have started to be used for educational purposes as individuals started to express themselves with the digital identities they created in online environments. Digital education is an umbrella concept that is an extension of online distance education and is used to define learning approaches that have emerged to meet new needs with developing technology as a whole and can often be defined with the concept of online distance education (Grand-Clement, 2017; Vander Ark, 2017).

The internet is at the center of digital education. The effective use of the Internet and the development of its possibilities are of prime importance in taking these steps. Internet-related technology has the capacity to change the system of learning and educational production in three important ways. First, while the current batch processing system offers many more teaching and learning possibilities, it is a system that can adapt its teaching style and be adapted to the individualized learning needs of the learner. Second, technology can help to make the learning system intelligent. Adaptive software responds to student activities, providing options, help and solutions to challenges. It can also provide feedback to teachers and trainers, allowing them to intervene, and this function can be set via the web. Third, internet-based technology has the capacity to shift learning production from the traditional hierarchy to a much more open network (Almeida, 2003; Eynon & Malmberg, 2021; Kerchner, 2013). With the Internet, ICTs are more than ever ready to serve all levels of education at a high level with the tremendous development in e-learning and learning technologies. New learning and educational technologies obviously have the capacity to offer new possibilities and opportunities that will change our lives. They can be realized as long as the pedagogical, technical, financial, administrative and socio-cultural dimensions of the issue are well analyzed (Sife et al., 2007). At this stage, it is critical to examine the competencies, qualifications and capabilities of the Internet, mobile communication networks, mobile communication devices, e-learning platforms, and other communication technologies related to learning and to determine the system quality well (Chiang, Boakye, & Tang, 2017).

Individuals of the digital generation have advanced knowledge and skills related to information technologies compared to previous generations (Bennett, Maton, & Kervin, 2008; Lorenzo & Dziuban, 2006; Tonta, 2009) and can effectively use multiple media to their full potential (McMahon & Posspisil, 2005; Ozdemir, 2022). Individuals have developed multitasking skills (Bennett et al., 2008; McGlaynn, 2005, 14; McMahon & Pospisil, 2005, 421; Prensky, 2001; Veen, 2007, 3). Students engage in different activities while doing homework. Among previous generations, there were students who did homework in front of the television. Some researchers believe

that multitasking can lead to inefficient work with loss of concentration and cognitive "overload" as the brain switches between different stimuli (Bennett et al., 2008, 7; Spink, Cole, & Waller, 2008, 105), while others believe that multitasking can save time (Günüç, 2011, 2). Digital age learners find written texts boring. While they generally prefer multimedia materials such as pictures, audio, animation and video to obtain information, speed, visuality and entertainment are at the forefront in accessing information (Günüç, 2011; Prensky, 2001; Veen, 2007, 3). Students who grow up surrounded by technology prefer to research and learn through digital resources. They have a common perception and confidence that everything they need to do their homework can be obtained from online environments through internet resources. Today's students have more access to information than previous generations. However, it cannot be said that today's students have sufficient skills in finding, evaluating, using and presenting information (Lorenzo & Dziuban, 2006).

According to the European Parliament's "Key Qualifications Framework for Lifelong Learning", one of the main competences is digital competence (European Commission [EC], 2018). Digital competence: It refers to being able to use Information and Communication Technologies (ICT) at an adequate level and critically. It also defines the ability to use computer and internet technologies to obtain information and to use them to present, evaluate and store information. It refers to individuals' advancing their imagination competencies with ICT. It refers to being able to fulfill their legal obligations when using ICT and being able to use it systematically and inquisitively.

The children of the digital age are the individuals of the future society, which we can call the digital born or Generation Z. In this age, the educational methods, perspectives, behavioral patterns, scientific structures, life attitudes, habits and individual characteristics of individuals will be shaped according to the digital education they learn, and developed societies and countries that anticipate this change and transformation are of great interest. Therefore, digitalization of education has become a public policy and the most important part of education policy (Calvert, Jordan & Cocking, 2002; Tracey & Francesca, 2020). In this digital age, which we call the information age, technological developments affect the continuity of education and training and are seen as an integral part of the educational organization, which is the foundation of a changing society (Allcoat et al., 2021). The school is an open system that cannot be separated from its environment. For this reason, schools are among the institutions most affected by social change and transformation. The invention of the computer, the invention of the internet, the rapid spread of computer usage and many other technological developments have brought about a "digital revolution" not only in education but also in all other fields. The digital transformation brought about by this digital revolution is changing the functioning of educational institutions and educational stakeholders need to be prepared for this change and transformation and have the skills to manage it. The technological, social and economic developments that have emerged in the process of globalization have brought many developments in the field of education and the role of school stakeholders has changed in this direction, and we can say that the traditional role is insufficient (Greenhow, Robelia, & Hughes, 2009; Starkey, 2011).

The increasing demand for access to education and training with the opportunities offered by technology and the internet has replaced traditional educational environments with distance education applications. The rapid development in communication technology and the widespread use of the Internet have also increased digital learning opportunities. With the rapid development of the Internet and information communication technologies,

the Web offers a powerful, global, interactive, dynamic, economic and democratic learning and teaching opportunity (Khan, 1997).

The main difference between digital learning and traditional learning is the medium through which education is delivered. In digital learning, teacher and student are separated by cyberspace. There are many differences in terms of time and space independence, transfer, fast and effective learning, learning environment, ability and quality, flexibility, effectiveness, efficiency, utilization, investment and operation (Nalini et al., 2020; Peters, 2000). Unlike the traditional classroom environment, digital learning provides learners with many advantages that make e-learning environments attractive, such as flexibility, speed, time savings, reduced costs, and interactivity through information communication technologies and the internet. Traditional educational processes are often criticized and often found dysfunctional due to their structure, which requires a classroom environment that usually requires the instructor and participants to be in the same place at the same time (Bates, 1997; Oiry, 2009; Rifelino et al., 2022).

Traditional methods and traditional classroom environments are insufficient to meet increasing educational demands (Sims, 2021; Aslan, 2011). The desire of the information age individual to learn by accessing information, the obsolescence of information in a very short time and the necessity of renewal, the demands of the personnel of the institutions to constantly renew their knowledge and skills make continuous learning, in short, lifelong learning compulsory. Lifelong learning, the obsolescence of information and the desire for continuous renewal and the renewal of knowledge and skills and the educational opportunities offered to almost all age groups increase the demand for training. Despite this increasing demand, only a small portion of the demand is met due to inadequacies in trained personnel and infrastructure (Corbett & Spinello, 2004; Solove, 2004). It has become widespread that the constraints in traditional education can be solved by digital learning methods due to their flexible and time- and place-independent nature through information and communication technologies. In this context, digital learning processes are capable of solving all these disadvantages. The reasons such as the rapid development, widespread use, low cost and ubiquitous accessibility of the Internet and information communication technologies have started a digital learning transformation process by affecting not only people's lifestyles but also institutions. Tools, materials and environments in education have also had to adapt to these changes in technology (Tejasvee et al., 2021).

In order to design an effective digital learning environment, the issues of how the instructional content will be created, how it will be distributed, and which components will be needed come to the fore. The components of this learning include how students will interact with other students and teachers, how they will access instructional resources, how assignments will be submitted, how the course will be evaluated, how feedback will be provided, and what kind of help will be offered to students (Debeer et al., 2021; Decherchi et al., 2012; Sousa, Cruz & Martins, 2017). Bruce et al. (2008) discussed the categories of digital learning tools in five dimensions: rapid e-learning tools, aggregation and distribution tools, media tools, simulation tools and e-learning development tools. University students, who constitute the target audience of digital learning, are important building blocks in this learning ecosystem. The learner-oriented structure of digital learning has enabled students to manage and plan the learning process. In this context, students can determine the content, purpose, duration and speed of the subject

they want to learn in line with their own interests and skills. In digital learning, preparing a learning environment that takes into account the individual characteristics of students is among the most important issues (Hiltz & Turoff, 2005; Noskova, Pavlova & Yakovleva, 2021). A digital learning program prepared for learners' preferences and learning styles positively affects motivation. Motivation, in turn, affects attendance and active participation in education, positive perception and learning success in a chain. In this context, student affective factors come to the fore. Gaining positive affective characteristics of students towards digital learning is also very important for academic success (Faridah et al., 2020; Lin et al., 2017; Noor et al., 2022; Van Loon, Ros & Martens, 2012).

Since the technology dimension of digital learning is very strong, the skills of the target audience in using computers and related technologies should be well analyzed and computer and technology training should be provided when necessary (Ho, Kuo & Lin, 2010; Sousa & Rocha, 2019). Adapting students to education before the digital learning process begins, determining their thoughts and expectations, enriching the content related to digital learning, providing communication and interaction, timely feedback and practices that will enable learners to actively participate in the e-learning process significantly affect student motivation (Khan, 2005; Martin, Stamper & Flowers, 2020). Oliver (2001) defines readiness for digital learning as a structure consisting of the ability to use technological tools, access to technological tools, technology literacy and self-regulated learning dimensions. Mcvay (2001) tried to explain students' readiness for online learning with their behaviors and attitudes in the online learning environment and pointed out the importance of students' readiness for online learning. One of the variables that are very effective in the success of digital learning activities is students' readiness and attitude levels towards digital learning (Ibrahim, Silong & Samah, 2012; Oliver, 2001).

There has been a transformation in the field of education with the effective use of digital learning technologies in educational activities. Thus, the form of education that has been provided in certain time periods and in certain places for centuries has transformed into a learner-centered flexible learning structure that can be accessed from anywhere that offers time and space flexibility. Especially in higher education, the lack of capacity in the field of educational sciences, the desire of people to constantly renew their knowledge, skills or learn, and the demand for training of prospective teachers make digital learning applications more attractive. In addition, it is rapidly becoming widespread due to its flexible structure that offers time and space independence, equal opportunity and low cost (Badia et al., 2014; Perrotta, 2013). In addition to these advantages, problems such as communication, interaction, sense of classroom community, timely feedback, sense of distance, poor design of course content and materials, and lack of sufficient technological knowledge of the learner are frequently encountered. In this context, in order to ensure academic success, it is important that the instructional management system and course content and materials are designed in a way that addresses these problems of learners.

Cognitive, affective and psychomotor domains in which learning takes place are important issues that both the traditional education system and e-learning emphasize. It is known that there are many studies on the cognitive domain in the literature, but there are not enough studies on the affective domain due to many difficulties and limitations (O'regan, 2003; Santos, 2016). However, the fact that affective input characteristics have the power to explain 25% of academic achievement shows that affective characteristics should be emphasized more and more

studies are needed (Boyce, 2001; Stronge, 2013). The fact that digital learning is presented in an electronic environment, students and teachers are not necessarily face-to-face, communication, interaction, timely feedback, sense of belonging, sense of distance and the lack of sufficient technological knowledge or prior knowledge of the learner negatively affect the learner. This will also affect the learner's affective characteristics such as interest, attitude, and motivation towards digital learning processes. The effective realization of digital learning is associated with the learner's positive attitude towards the lessons. Since the responsibility of learning is largely on the student with its learner-centered structure, the student's desire and attitude towards learning in electronic environment gains importance. Therefore, more effective digital learning environments can be created by knowing students' attitudes and motivation towards digital learning and the reasons affecting this (Capone & Lepore, 2022; Trust, Maloy & Edwards, 2022). For the successful realization of digital learning processes, first students and then teachers, who are the key people who will adapt learning environments to e-learning platforms, should be ready for this issue. Therefore, in this study, digital learning readiness and attitudes of university students were examined in terms of their relationship with academic motivation and attitudes.

The subject of the study is to examine the impact of digital learning environment and related variables on students' motivation and attitudes in the light of studies conducted in Kazakhstan. The aim of this study is to clarify the concept of digital learning at the university level and to examine the impact of individual factors (demographic characteristics) as well as students' readiness and attitudes in the digital learning environment on their academic motivation and academic attitudes. In the study, it is aimed to reach the students of educational sciences departments of universities in Almaty and to reach the digital learning environment, perceptions about it and related variables. In accordance with the scope of the research, the following sub-problems were formed in order to examine the relationships of students' affective factors such as attitude and motivation towards digital learning?

- What is the level of digital learning readiness and attitudes of university students?
- What is the level of academic motivation and attitudes of university students?
- Do university students' readiness and attitudes towards digital learning differ according to gender?
- Do university students' academic motivation and attitudes differ according to gender?
- Do university students' readiness and attitudes towards digital learning differ according to grade level?
- Do university students' academic motivation and attitudes differ according to grade level?
- To what extent do university students' readiness and attitudes towards digital learning affect their academic motivation and attitudes?

Method

In this study, correlational research and causal comparison methods were applied to determine the relationship between student affective factors, student attitude and motivation in digital learning. The research population consists of students studying in the departments of educational sciences at universities in Kazakhstan. The study was conducted with undergraduate students enrolled in the educational sciences departments of universities in Karaganda, Almaty, Aktau. The students to be surveyed were selected by random sampling method. In this widely used technique, the principle is to include everyone who responded to the questionnaire in the sample. The most easily found subject is the most ideal one. The process of finding subjects continues until the desired sample size

is reached (Stratton, 2013). For the online application of the survey, the survey questions were prepared in Google Forms and sent to 390 undergraduate students by e-mail. Online feedback was received from 240 students. 35 of the questionnaires were considered invalid because they were half-filled and 205 online questionnaires were accepted as valid. On the other hand, 56 face-to-face surveys were conducted with the students of some universities. In this study, a total of 261 measurement tools were evaluated as a result of online and face-to-face surveys.

Data Collection Tools

The questionnaire developed as a data collection tool in the study consisted of two parts. The first part includes demographic information with 6 items that will descriptively reveal students' personal and digital learning information and their use of information communication technologies. The second part consisted of items related to student affective factors such as attitude and motivation dimensions. It also consisted of questions to determine the expectations, competencies and opinions of university students in the digital learning process. The rating of the variables was based on 5-point Likert-type expressions (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree) showing the respondents' degree of agreement with the most appropriate option between 1 and 5 for each judgment.

Attitude Scale towards Digital Technologies

In order to measure students' attitudes towards digital technologies, the "Attitude Towards Digital Technologies Scale" developed by Cabı (2015) was adapted into Kazakh by the researchers and its reliability and validity were tested again. Exploratory and confirmatory factor analyses were applied to examine the construct validity of the Attitude scale used for the purpose of the study. As a result of the analysis, an 8-factor structure was obtained. The 8 factors were named as "competence", "social networks", "use of technology in class", "interest in technology", "technology for me", "negative aspects", "recreational use" and "conscious use" respectively. The total variance percentage of all factors was found to be 54.56. The internal consistency coefficients of the eight factors of the scale were reported to vary between 0.90 and 0.72. The overall reliability coefficient of the scale was 0.90 and the Spearman Brown two-half test correlation of the scale was calculated between 0.73 and 0.86. Cronbach's Alpha coefficient was used to examine the reliability level of the Attitude Scale in relation to internal consistency. Alpha coefficient of 0.70 and higher indicates that the reliability of the scale is at a sufficient level. The Cronbach's alpha coefficient calculated for the attitude towards digital learning scale was 0.90. In this scale, analyses can be made over the total score averages. A high mean score means that attitudes towards digital learning are high.

Academic Motivation Scale

The Academic Motivation Scale was developed by Vallerand et al. (1992) based on autonomy theory. It is a 7-point Likert-type scale with a total of 28 items. The scale consists of 7 different sub-dimensions. These dimensions are: 3 intrinsic motivation, 3 extrinsic motivation and 1 amotivation. Each of these dimensions consists of four

items. These dimensions are respectively: Intrinsic Motivation Knowing (IMBI), Intrinsic Motivation Achieving (IMBA), Intrinsic Motivation Acting (IMA), Extrinsic Motivation Recognition (DMT), Extrinsic Motivation Self-Proving (DMKI), Extrinsic Motivation Regulating (DMD), and Amotivation (MS). The scores obtained from the subtests vary between 4-28. A high average score in each subtest indicates that the individual has a high score in that dimension. The items are graded between 1 (not at all) and 7 (exactly) and the participants mark among these grades. The amotivation dimension is inverse to the other dimensions. However, during scoring, items in this dimension are scored like other items. Therefore, there are no reverse scored items in the scale. The items of the dimensions other than this dimension are positive. When it is desired to obtain a single and general motivation value from the scale, the item scores belonging to the amotivation dimension should be excluded from the whole test score. In order to test the reliability of the Kazakh version of the scale, Cronbach's alpha values of the subtests were calculated between .73 and .89, and Cronbach's alpha value of the total score of the scale was calculated as .88. The Cronbach alpha value of the original form of the scale was found between .83 and .86 by (Vallerand et al., 1992). There is a similarity between the related Cronbach's alpha values. The Academic Motivation Scale is a scale that can be administered to large groups both in a short time and easily.

Attitude Toward School Scale

The Attitude Toward School Scale developed by McCoach (2002) is a scale consisting of attitude towards school, academic self, attitude towards school, motivation/self-control and peer relations sub-dimensions. The adaptation, validity and reliability studies of this scale to Kazakh culture were conducted by the researchers. Attitude Toward School Scale consists of 6 items. The scale is graded using a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree". The researchers found the Cronbach Alpha internal consistency coefficient of the scale to be ".86". A higher score on the scale means that students have a positive attitude towards school.

Digital Learning Readiness Scale

In order to measure the digital learning readiness and dispositions of university students, the Kazakh adapted form of the measurement tool developed by Hung et al. (2010), which consists of 18 questions under 5 factors, was used. This scale developed by Hung et al. (2010) has been one of the most widely accepted and used scales in the literature. The 5 different dimensions in the original form of the SLLS were defined as self-directed learning (OzGud), motivation for learning (OgrMot), learner control (OgrKont), computer and internet self-efficacy (BI-OY) and online communication self-efficacy (CI-OY). There are a total of 18 items in the scale, with 3, 5, 3, 4 and 3 items under each factor respectively. The scale has a 5-point Likert-type rating as (1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree, (5) strongly agree. A total score or average score can be obtained from this scale. The reliability coefficient for the sub-dimensions of the digital learning readiness scale varies between 0.76 and 0.87. The reliability coefficient for the whole scale was calculated as 0.84.

Data Analysis

SPSS package program was used for data analysis. Parametric statistical techniques were used since the data on

digital learning readiness and attitudes and academic motivation and attitudes of university students met the assumptions of normal distribution. Averages were also used to determine the levels of participants' digital learning readiness and attitudes and academic motivation and attitudes. The t-test technique was used to analyze digital learning readiness and attitudes, academic motivation and attitudes according to gender. F test technique was used to compare these variables according to grade level. Finally, multiple regression technique was used to analyze the relationships between digital learning readiness and attitudes and academic motivation and attitudes.

Findings

According to Table 1, the mean score of university students' attitudes towards digital learning was found to be 3.87 with a standard deviation of 0.72. According to this mean value, it can be said that university students from the field of educational sciences have positive attitudes towards digital learning.

Table 1. Descriptive Analysis of University Students' Attitude Scores Towards Digital Learning

	N	Minimum	Maximum	Mean	Std. Deviation
Attitude Towards Digital Learning	261	1.00	5.00	3.87	0.72

According to Table 2, the mean score of the digital learning readiness scale of university students was calculated as 3.63 and the standard deviation as 0.77. According to this mean value, it is understood that the participant university students' readiness for digital learning is partially above the average.

Table 2. Descriptive Analysis of University Students' Digital Learning Readiness

	N	Minimum	Maximum	Mean	Std. Deviation
Digital Learning Readiness	261	1.50	5.00	3.63	0.77

Table 3 shows the mean scores of university students in the subscales of the motivation scale. According to the analyses, the arithmetic mean values were calculated as 5.41 in intrinsic motivation for achievement subscale; 5.11 in intrinsic motivation for achievement; 3.90 in intrinsic motivation for experiencing stimulation; 4.02 in introjected extrinsic motivation; 4.17 in extrinsic motivation; 5.63 in determined extrinsic motivation; 1.97 in amotivation; and finally 4.87 in total scores of the motivation scale. According to this mean value, it was found that the motivation levels of university students were at a medium level, whereas their amotivation levels were at a low level.

Table 3. Descriptive Analysis of Academic Motivation Scores of University Students

	N	Min.	Max.	Mean	Std. Deviation
Intrinsic Motivation to Know	261	1.00	7.00	5.41	1.43
Intrinsic Motivation for Success	261	1.00	7.00	5.11	1.42
Intrinsic Motivation to Experience Stimulation	261	1.00	7.00	4.90	1.51
Extrinsic Motivation Reflected Inward	261	1.00	7.00	4.02	1.47

	N	Min.	Max.	Mean	Std. Deviation
Extrinsic Motivation-External Regulation	261	1.00	7.00	4.17	1.21
Identified Extrinsic Motivation	261	1.00	7.00	5.63	1.22
Lack of motivation	261	1.00	7.00	1.97	1.28
Total Motivation	261	1.25	7.00	4.87	1.10

According to Table 4, the mean score of the attitudes towards school scale of the university students was calculated as 3.69, with a standard deviation of 0.66. According to this mean value, it is understood that the attitudes of the participant university students towards school are partially above the average.

Table 4. Descriptive Analysis of Academic Attitude Scores of University Students

	N	Minimum	Maximum	Mean	Std. Deviation
Attitude Towards School Scale	261	1.91	5.00	3.69	0.66

Table 5 shows the t-test analyses performed on the attitudes towards digital learning scores of university students according to their gender. According to the analysis, a t value of 2.28 was calculated between the mean scores of the two groups. According to this value, a significant difference was found between the digital learning attitudes of male and female students ($p<0.05$). According to the mean scores, it was seen that male students' attitudes towards digital learning were higher and positive.

Table 5. Distribution of University Students' Attitude Scores towards Digital Learning by Gender

	Gender	N	Mean	Std. Deviation	t	p
Attitude Towards	Female	164	3.79	0.71	-2.28	0.023
Digital Learning	Male	97	4.00	0.71		

Table 6 shows the t-test analyses performed on the digital learning readiness scale scores of university students according to their gender.

Table 6. Distribution of Digital Learning Readiness of University Students by Gender

	Gender	N	Mean	Std. Deviation	t	p
Digital Learning	Female	164	3.49	0.78	-1.99	0.04
Readiness Scale	Male	97	3.79	0.75		

According to the analysis, a t value of 1.99 was calculated between the mean scores of the two groups. According to this value, there was a significant difference between the digital learning readiness of male and female students ($p<0.05$). According to the mean scores, it was seen that male students' digital learning readiness was at a higher level.

Table 7 shows the t-test analyses performed on the motivation scale scores of university students according to their gender. According to the analyses, t values of 1.86 in intrinsic motivation for achievement subscale; 1.54 t

value in intrinsic motivation for achievement; 1.76 t value in intrinsic motivation for experiencing stimulation; 0.39 t value in introjected extrinsic motivation; 0.67 t value in extrinsic motivation; 1.90 t value in identified extrinsic motivation; 2.17 t value in amotivation and finally 1.45 t value in total scores of the motivation scale were calculated. According to this value, a significant difference was found only in the amotivation subscale according to gender ($p<0.05$). According to the mean scores, it was seen that male students had a higher level of amotivation.

Table 7. Distribution of Academic Motivation Scores of University Students by Gender

	Gender	N	Mean	Std. Deviation	t	p
Intrinsic Motivation to Know	Female	164	5.53	1.30	1.861	0.06
	Male	97	5.19	1.62		
Intrinsic Motivation for Success	Female	164	5.21	1.31	1.54	0.12
	Male	97	4.93	1.56		
Intrinsic Motivation to Experience Stimulation	Female	164	5.03	1.40	1.76	0.08
	Male	97	4.69	1.67		
Extrinsic Motivation Reflected Inward	Female	164	4.05	1.45	0.39	0.69
	Male	97	3.98	1.51		
Extrinsic Motivation-External Regulation	Female	164	4.14	1.24	-0.67	0.50
	Male	97	4.24	1.17		
Identified Extrinsic Motivation	Female	164	5.74	1.12	1.90	0.05
	Male	97	5.45	1.36		
Lack of motivation	Female	164	1.84	1.10	-2.17	0.03
	Male	97	2.19	1.51		
Total Motivation	Female	164	4.95	1.01	1.45	0.14
	Male	97	4.75	1.23		

Table 8 shows the t-test analyses performed on the attitudes towards school scores of university students according to their gender. According to the analysis, a t value of 1.17 was calculated between the mean scores of the two groups. No significant difference was found between students' attitudes towards school according to gender ($p>0.05$).

Table 8. Distribution of Academic Attitude Scores of University Students by Gender

	Gender	N	Mean	Std. Deviation	t	p
Attitude towards school	Female	164	3.65	0.67	-1.17	0.13
	Male	97	3.76	0.63		

Table 9 shows the F test analyses performed on the attitudes towards digital learning scores of university students according to their grade levels. According to the analysis, an F value of 1.68 was calculated between the mean scores of the two groups. This value showed that there was no significant difference between the digital learning attitudes of the students in terms of grade level ($p>0.05$).

Table 9. Distribution of University Students' Attitude Scores Towards Digital Learning According to Class Level

	Class Level	N	Mean	Std. Deviation	F	p
Attitude Towards Digital Learning	1	65	3.73	0.77	1.68	0.17
	2	75	3.97	0.64		
	3	78	3.83	0.64		
	4	43	3.97	0.85		

Table 10 shows the F test analyses performed on the digital learning readiness scores of university students according to their grade levels. According to the analysis, an F value of 0.72 was calculated between the mean scores of the two groups. This value showed that there was no significant difference between the digital learning readiness of the students in terms of grade level ($p>0.05$).

Table 10. Distribution of Digital Learning Readiness of University Students by Grade Level

	Class Level	N	Mean	Std. Deviation	F	p
Digital Learning Readiness	1	65	3.55	0.75	0.72	0.54
	2	75	3.62	0.74		
	3	78	3.63	0.79		
	4	43	3.77	0.82		

Table 11 shows the F test analyses performed on the motivation scale scores of university students according to their grade levels. According to the analyses, F values of 1.40 in intrinsic motivation for achievement subscale; 1.36 F value in intrinsic motivation for achievement; 1.06 F value in intrinsic motivation for experiencing stimulation; 1.15 F value in introjected extrinsic motivation; 1.30 F value in extrinsic motivation; 3.00 F value in identified extrinsic motivation; 1.06 F value in motivation and finally 2.13 F values were calculated in the total scores of the motivation scale. According to this value, a significant difference was found only in the identified extrinsic motivation subscale according to grade level ($p<0.05$). According to the Scheffe test analysis, it was seen that the extrinsic motivation of the 1st grade students was higher than the other grade levels.

Table 11. Distribution of Academic Motivation Scores of University Students According to Class Level

	Class Level	N	Mean	Std. Deviation	F	p
Intrinsic Motivation to Know	1	65	5.64	1.35	1.40	0.24
	2	75	5.50	1.35		
	3	78	5.27	1.50		
	4	43	5.14	1.54		
Intrinsic Motivation for Success	1	65	5.28	1.45	1.36	0.25
	2	75	5.25	1.23		
	3	78	4.99	1.54		
	4	43	4.82	1.41		
Intrinsic Motivation to	1	65	5.07	1.55	1.02	0.38

	Class Level	N	Mean	Std. Deviation	F	p
Experience Stimulation	2	75	5.04	1.43		
	3	78	4.73	1.62		
	4	43	4.72	1.39		
Extrinsic Motivation	1	65	4.20	1.42	1.15	0.33
Reflected Inward	2	75	4.11	1.49		
	3	78	3.98	1.59		
	4	43	3.69	1.27		
Extrinsic Motivation-	1	65	4.41	1.23	1.30	0.27
External Regulation	2	75	4.19	1.11		
	3	78	4.04	1.28		
	4	43	4.05	1.20		
Identified Extrinsic	1	65	5.88	1.28	3.00	0.03
Motivation	2	75	5.78	1.07		
	3	78	5.49	1.30		
	4	43	5.26	1.14		
Lack of motivation	1	65	1.73	1.22	1.08	0.36
	2	75	2.07	1.25		
	3	78	2.00	1.35		
	4	43	2.09	1.25		
Total Motivation	1	65	5.08	1.15	2.13	0.10
	2	75	4.98	1.00		
	3	78	4.75	1.19		
	4	43	4.61	0.98		

When the table is examined, it is understood that the regression model developed to test the effect of university students' readiness and attitudes towards digital learning on academic motivation scores is statistically significant R=0.29; R2=0.08; p<0.001. Readiness and attitudes towards digital learning explain approximately 8% of the total variance in academic motivation scores. When the significance values of the calculated standardized path coefficients are examined, it is understood that only readiness for digital learning is a significant predictor of academic motivation (β=0.49; p<0.001).

Table 12. Regression Analysis Results to determine the Effect of Digital Learning Variables on Academic Motivation

Variables Related to Digital Learning	β	Std. Error	Standardized β	t	p
(Constant)	3.80	0.38		10.04	0.00
Attitude towards digital learning	0.18	0.12	0.12	1.56	0.12
Digital Learning Readiness	0.49	0.11	0.34	4.48	0.00

R=0.29; R^2= 0.08; F= 11.32; p<0.05

When Table 13 is examined, it is understood that the regression model developed to test the effect of university students' readiness and attitudes towards digital learning on academic attitude scores is statistically significant ($R=0.33$; $R^2=0.11$; $p<0.001$). Readiness and attitudes towards digital learning explain approximately 11% of the total variance in academic attitude scores. When the significance values of the calculated standardized path coefficients are examined, it is understood that only readiness for digital learning is a significant predictor of academic attitude ($\beta=0.70$; $p<0.001$).

Table 13. Regression Analysis Results to determine the Effect of digital Learning Variables on Academic Attitude

Variables Related to Digital Learning	β	Std. Error	Standardized β	t	p
(Constant)	3.32	0.48		6.91	0.00
Attitude towards digital learning	0.19	0.15	0.10	1.30	0.19
Digital Learning Readiness	0.70	0.14	0.38	5.05	0.00

$R=0.33$; $R^2= 0.11$; $F= 15.57$; $p<0.05$

Discussion and Conclusion

In this study, the effects of students' readiness and attitudes towards digital learning environment on motivation and affective characteristics towards teaching-learning process were examined with a relational approach in terms of some variables. According to the research findings, pre-service teacher university students' attitudes towards digital learning were found to be positive and their digital learning readiness was found to be above average. Having information about students' satisfaction levels in digital learning environment is important in the context of revealing students' thoughts about their educational experiences (Gülbahar, 2012). Student satisfaction and positive attitudes in digital learning environment is an important variable in determining the success or failure of students, courses and programs (Bolliger & Martindale, 2004). Therefore, students' level of readiness for online learning and their level of satisfaction, high motivation and academic achievement are factors that affect each other. In a study, it was found that graduate students scored high in the sub-dimensions of self-directed learning, learner control and motivation in digital learning environments (Ünal, Şanlıer & Şengil, 2021).

Digital learning provides students with flexibility in terms of where and when they learn. In the study conducted by Adams, Sumintono, Mohamed, and Noor (2018), it was found that students under the age of 30 felt more comfortable in the online environment because they interacted more with technology. This situation positively affects students' attitudes towards digital learning. In the literature, there are mainly findings that university students' attitudes towards digital learning are positive, but their readiness is low (Kibici & Sarikaya, 2021). Adewole Odeshi (2014) concluded that students find it easy to use digital learning tools and that they have a positive attitude towards e-learning because they think that it will be easy to use these tools to access information. In another study supporting these findings, Liaw, Huang, and Chen (2007) reported that participants found digital learning environments enjoyable and effective.

In another finding of the study, digital learning attitudes and readiness of university students were examined

according to their gender and grade level. According to the gender of the participant university students, their digital learning readiness differed in favor of males. On the other hand, digital learning attitudes did not differ according to gender and class variables. In a study conducted by Lyons (2012), it was found that there were significant differences between genders in terms of the components of student behavior in digital learning. Again, in terms of self-confidence and competence in digital learning, Akaslan and Law (2011) and Agboola (2006) concluded that males are more confident than females.

In fact, some studies have found that students in general have a high level of readiness for online learning. These studies also found that factors such as computer self-efficacy and internet self-efficacy are positively related to digital learning readiness (Zabadi & Al-Alawi, 2016). The higher frequency of computer and internet use among male students may have led to this result. However, more research is needed to fully understand the nature and extent of these differences. These researches and studies show that university students' readiness for digital learning is assessed in different dimensions and that they have different experiences in adapting to online learning processes. Developing skills such as self-directed learning, motivation and learner control can help students to be more successful in digital learning environments. In addition, teachers' use of practices that support online learning processes can also increase students' readiness.

The last finding of the study is the effect of university students' digital learning readiness and attitudes on their academic motivation and attitudes. According to the regression analysis, it was found that readiness, one of the variables related to the digital learning environment, significantly predicted academic motivation and attitudes. Salamat, Ahmad, Bakht, and Saifi (2018) conducted a study examining the effects of digital learning on students' academic learning at the university level. The aim here is to determine the level of university students' attitudes towards these learning environments, their learning abilities on these environments and their achievements. As a result of various analyses and tests, it was revealed that digital learning environments provide flexibility in saving and spreading time, provide the opportunity to successfully perform their studies without the need for other people, create stress-free and more comfortable study environments, and with the effect of all these, an overall success is achieved and motivation is increased. Adewole Odeshi (2014), in his study on students' attitudes towards digital learning, found that students' attitudes towards e-learning are positive and that the use of e-learning tools in the field of education will increase the efficiency and effectiveness of students.

As a result, affective learning products in these environments are related to the determination of whether students' attitudes and readiness towards digital learning tools have a positive or negative effect on digital learning environments, and the level and direction of the effect. Because high self-efficacy towards positive digital tools will enable students to easily adapt to lessons in digital environments. Interactive activities/studies can be organized to ensure positive attitudes and motivation towards learning in digital learning environments, to increase participation in lessons and to ensure more effective participation of students in the lesson/learning process. In teacher training institutions, more activities that will provide digital competencies should be included in the programs. Applications for the digital learning process should be supported by technology integration and affective learning products. Since the number of participants directly affects the study data, the same study can be conducted again by increasing the number of participants.

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Author Information

Saltanat Abildina
https://orcid.org/0000-0002-8324-8444
Karaganda State University named after Ye.A.Buketov
100028, 28 th University Street
Karaqanda, Kazakhstan
Contact e-mail: *salta-7069@mail.ru*

Zhannat Sardarova
https://orcid.org/0000-0002-5224-5371
Abay Kazakh National Pedagogical University
050000, 13 th Dostyk Street
Almaty, Kazakhstan

Raikhan Ozgambayeva
https://orcid.org/0000-0002-0722-3050
Caspian University of Technologies and Engineering named after Sh. Yessenov (Yessenov University)
130000, 32 microregion, Main building
Aktau, Kazakhstan

Sholpan Janzakova
https://orcid.org/0000-0002-9706-374X
Atyrau University named after Khalel Dosmukhamedov
060000, Atyrau, Studenchesky Ave.,1
Atyrau, Kazakhstan

Almagul Kalykbayeva
https://orcid.org/0000-0001-5214-9526
Abay Kazakh National Pedagogical University
050000, 13 th Dostyk Street
Almaty, Kazazhstan

Almagul Bitikova
https://orcid.org/0000-0001-7991-3272
Caspian University of Technologies and Engineering named after Sh. Yessenov (Yessenov University)
130000, 32 microregion, Main building
Aktau, Kazakhstan

Eleonora Abdol
https://orcid.org/0000-0003-4616-5110
Atyrau University named after Khalel Dosmukhamedov
060000, Atyrau, Studenchesky Ave.,1
Atyrau, Kazakhstan