Students' Intention to Learn and Academic Performance in the Blended Learning Environment: The Role of Artificial Intelligence Chatbots

Kobicheva Aleksandra* and Baranova Tatiana

St. Petersburg Peter the Great Polytechnic university, Saint-Petersburg, Russia
Email: kobicheva_am@spbstu.ru (K.A.); baranova_ta@spbstu.ru (B.T.)
*Corresponding author
Manuscript received July 14, 2023; revised August 29, 2023; accepted October 14, 2023; published June 13, 2024

***Abstract*—In the era of universal digitalization, new technologies and services are being created, among which we can highlight the development of chatbot technologies that can be effectively used in the educational process and that will be of interest to representatives of the younger generations. The current study aims to reveal the influence of artificial intelligence chatbot integration on students' intention to learn and their academic performance in the blended learning environment. The research framework includes 7 key indicators: Satisfaction (SAT), Perceived Usefulness (PU), Attitude (ATD), Subjective Norms (SN), and Perceived Behavioral Control (PBC), Continuance Intention to Learn (CIL) and academic performance (AP), which are evaluated in traditional blended learning setting (N=104) and blended learning based on artificial intelligence chatbot (N=107). For comparison we used the average scores, standard deviations (σ) of students on 23 items and student's t-test for independent samples. We also calculated Pearson correlation coefficient for all analyzed. The results of the current study confirmed the positive influence of artificial intelligence usage during the blended learning as it increases students' attitude, satisfaction and perceived usefulness which directly and highly affects the intention to continue learning and academic performance.**

***Keywords*—blended learning, artificial intelligence chatbot, students' intention to learn, academic performance**

I. Introduction

The COVID-19 pandemic has put modern education in front of the need for a quick and effective transformation of teaching in higher education using distance learning [1]. During the 2020/21, the majority (88.5%) of universities established the "blended learning" format. Russian universities also switched to a new format of education. Each learning format has its own advantages, but also makes specific tasks for teaching and learning [2–4], although the students' perceptions of higher education remain indistinct.

It should be noted that the problems of different formats of distance education in foreign and domestic literature were actively developed long before the pandemic [5], while the response to the emergency transition to distance education was a large number of new studies and publications [6]. As conclusions, the following are noted: the effectiveness of a combination of synchronous and asynchronous techniques for conducting classes, the formation of flexible learning trajectories [7]; increasing the motivation, involvement and control over the work of students improves the quality of distance education [8]; the positive impact of aspects such as the quality of website content, the responsiveness of interaction [9], also N. V. Tarasova and I. P. Pastukhova [10] note the need for the Russian Federation to use the relevant foreign experience of online and blended learning that has proven its effectiveness. Among existed technologies that can improve the effectiveness of the educational process are artificial intelligence (AI) chatbots. According to verified market research, the global artificial intelligence market in education is forecast to reach USD 10381.70 million by 2026, growing at a CAGR of 35.12% between 2021 and 2026 (AI market size and forecast in education 2020). In fact, UNESCO recently published its first-ever paper offering guidance and recommendations on how best to use AI technologies to achieve the highest educational outcomes (quotedfrom https://en.unesco.org/news/first-ever-consensus-artificial-exploration-and-education-published-unesco).
With an abundance of existing online services in the e-learning segment, chatbots seem to be a promising tool, since they can accompany each student individually, in accordance with his level and the chosen pace of mastering the material, making learning the most effective for each student.

In order to innovate the teaching and learning process, we developed an integrated blended learning model based on artificial intelligence chatbot for the course of Professional English (for law students). The user interface was developed using LandBot.io (https://landbot.io/). The main menu of the chatbot included the following elements—class schedule (schedule of face-to-face classes and classes in Teams with a link to a virtual room); materials (information on the main topics that students study within the course) and two assignments (a detailed description of each assignment, recommendations for completing the assignment, information about the deadlines for submitting papers and the form of assessment). After reading material or watching videos on topics, students were required to pass a topic comprehension test. Various methods were used for this, such as O/X quiz, multiple choice, and open-ended questions. Feedback was provided after each question, and it differed depending on whether the answer was correct or not. If the answer is incorrect, the study content is rearranged so that students can study again. Once the topic test is successful, students can move on to the next topic. Also, students could enter questions and see the answers in the chatbot through the user interface. When a question is entered in natural language, the natural language processing engine recognizes the intent and nature of the question, after which the most appropriate answer is selected and provided from the database of accumulated learning outcomes (Fig. 1). To introduce such

educational model into the curricular, the basic digital skills are needed for the undergraduate students.

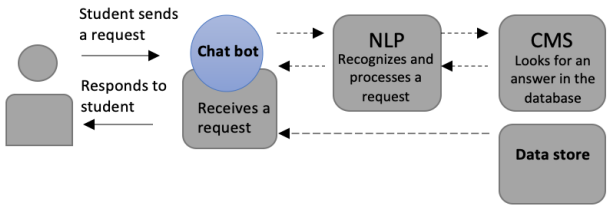

Fig. 1. The scheme of students' interaction with a chatbot.

The efficiency of courses based on artificial intelligence and their implications for motivational variables, academic performance, and psychological health require careful research and has not been studied comprehensively. Our study is intended to fill this research gap. Also, we expect that its theoretical and methodological developments will also benefit future researchers in this field.

The main goal of the current study is to reveal the influence of artificial intelligence chatbot integration on students' intention to learn and their academic performance in the blended learning environment. Thus, the article focuses on two main research questions:

1) Does students' continuance intention to learn differ in traditional blended learning classes and blended learning classes based on artificial intelligence chatbot?
2) Does students' academic performance differ in traditional blended learning classes and blended learning classes based on artificial intelligence chatbot?

II. Theoretical Background

A. Blended Learning

Blended learning combines distance and traditional face-to-face learning [11]. Blended learning has its own benefits, including learning flexibility [10], developing student engagement and motivation, and developing their self-management abilities [6–8]. Previous authors have indicated that blended learning has great potential for higher education [12].

According to Hrastinski [12], the definitions of blended learning most commonly used in scientific publications are given by Graham [13]: "blended learning systems combine face-to-face learning with machine learning" and Garrison and Kanuka [14]: "Thoughtful integration face-to-face teaching in a classroom with an online learning experience." In this way, blended learning combines aspects of each learning environment. During the COVID-19 pandemic, universities have implemented an online learning management system with access to reference and study materials. Blended learning is also titled the "new traditional model" or "new normal" [15-16].

Some studies look at approaches to online learning based on different proportions for face-to-face and online learning. Bernard, Borochowski, Schmid, Tamim and Abrami [17], for example, speak in their analysis of the effectiveness of an equal balance between face-to-face and online learning. Another study found that in blended learning, students prefer a larger proportion of the online format [18, 19]. However, there are studies that have found that the additional introduction of online sections can lead to an increased load for students and teachers [20].

However, despite all the advantages of blended learning, it is worth mentioning the problems that still have to be solved in the near future. With this type of learning, failures in the system are possible, which are difficult to foresee in advance, so the student can often be distracted from learning tasks by some extraneous activities [21]. The success of mastering the material depends on the motivation and discipline of the student himself.

B. Artificial Intelligence Chatbots in Education

A chatbot is a computer program that can "communicate" with a person in a normal language through text or voice, interacting with which is carried out through a simple, intuitive interface. There are two types of chatbots:

1) Based on a set of rules and pre-set and entered into the program algorithms for responding to user requests. These chatbots are the simplest and have significant limitations in use;
2) Based on the principles of machine learning (artificial intelligence methods that allow a computer program to learn independently, solving many similar problems in the process of interacting with a person) [22].

One of the modern areas of application of chatbots is education, and a lot of chatbots have already been created and used to help acquire and consolidate knowledge, as well as to test their assimilation. There are studies on the effectiveness of using chatbots in the educational process, during which it was found that most of the participants in the experiments studied, assimilated information and communicated with bots in the same way as if they were real people [23].

Moreover, based on the study of user communication with chatbots, researchers reported the emergence of a special sociotechnical system "User-Bot" as a system of approaches to the organization of work in the context of interaction between a person and chatbots [24].

Chatbots have many advantages over using other resources and, in particular, software applications: bots are easy to install without using the memory of a device, such as a smartphone; bot links are easier to distribute; it is easier to create and use, etc. [25].

However, one of the main factors that determined the active creation and successful use of chatbots is the ubiquitous distribution of messengers—instant messaging services. The life of a modern person, especially a young one, is extremely active, so communication is transferred to instant messengers. These chat products are installed in smartphones in almost all the youth, whose speed of life is so high that social networks no longer meet the requirements.

Thus, new opportunities open up for teachers of educational institutions to establish quick contact with students and transmit information in a compressed form. Of course, not any educational process can be translated into the format of communication with a chatbot, but now there are many educational bots aimed at bringing brief dosed information to the user.

The information that is transmitted through the messenger must be structured in a certain way, and the transmitted messages should not be long. Chatbots also provide the

opportunity for user feedback with the developer of the program content. The presence of an educational chatbot on a teenager's or a young person's smartphone will correspond to the style and pace of his life, simplify the process of gaining knowledge and improve communication between him and the teacher [26].

Chatbot in the learning process can act as an excellent "organizer" of training meetings. It can find an interlocutor, select a convenient time for the meeting and give topics for discussion.

The chatbot can also be used for organizing events and training. It does an excellent job of supporting both corporate and external events. The chatbot, as usual, solves several tasks at once: informing, networking, collecting statistics and feedback. Thus, it becomes possible to see the program and timing of the conference, get the contact of the speaker or organizer. The chatbot allows the organizers to be in constant contact with the participants, instantly informing them about any changes (changing the speaker, rescheduling a speech or lunch, changing the audience) and promptly share the news.

C. Intention to Learn

Research on the use of information systems in education addresses various motivational variables to explain decisions to adopt and continue to use technology in education [27]. It is important to note that the initial acceptance of the use of technologies in the educational process, of course, did not necessarily mean the continued use of such technologies, as evidenced by situations where consumers recognized the technology, but later stopped using it. Such situations have led researchers to the question of consumer performance, namely, what influences the transition from adopting technologies to abandoning them. Representative models of the study were such as the Expectation-Confirmation Model (ECM) and the Theory of Planned Behavior (TPB). These models in this line of research argue that there is a psychological tool that inspires users to remain using technology and repurchase products.

There are studies based on the ECM model and its variations [28] that use metrics such as confirmation, perceived usefulness, and satisfaction to justify users' intentions to resume learning. The Theory of Planned Behavior (TPB) proposed by Ajzen [29] states that behavioral intention directly influences behavior. Behavioral intention refers to the intention of a person to follow a particular behavior. Behavioral intention is influenced by factors such as attitude, subjective norm, and perceived behavioral control. Behavioral intention is a good metric for measuring actual behavior [30].

For the current analysis, the following were identified as the main factors influencing the continuance intention to learn in a blended environment: satisfaction; perceived usefulness; attitude; subjective norm; perceived behavioral control. We did not consider confirmation separately, since this indicator directly affects satisfaction and perceived usefulness.

1) Satisfaction

Satisfactory learning theory is based on the theory of customer satisfaction put forward by Cardozo [31]. Satisfaction with learning is the effect of the procedures that took place during the learning periods in which the students participated. In addition, satisfaction is seen as a comparative outcome between expectation and perceived service, highlighting pleasure or discontentment [32]. In addition, according to the theory of satisfaction with learning, students are perceived as consumers of educational products and have the right to invest in any educational institution they like. Two decades ago, as a result of research, it was found that student satisfaction and positive learning outcomes were directly dependent on the quality of service, teaching and participation in the learning process [33]. Henning *et al.* [34] found that student loyalty is most influenced by two aspects—the quality of teaching and student satisfaction. Holdford and Reinders [35] in turn developed a three-dimensional model describing the quality of services provided. This model includes student opinions of school capacities, teacher skills, and administrative services. In subsequent work, Holford and Patkar [36] identified five components of student satisfaction. The elements of satisfaction are the quality of the environment, the quality of the learning process, the quality of service, the quality of the curriculum and the quality of teaching.

2) Perceived usefulness

Perceived usefulness is the extent to which a person believes that the use of a particular technology will increase his/her work performance. Perceived utility refers to "the degree to which an individual believes that the use of a particular technology will enhance his/her job performance" [37]. It is assumed that perceived utility is a direct factor influencing the behavioral intention to use the equipment of significance. Prior research shows that perceived utility is optimistically connected with intent to continue in the context of e-text, immediate messaging, mobile service, online travel assistances, e-learning, blogging learning and knowledge formation.

3) Attitude

Attitude is derived from an assessment of behavioral outcomes in accordance with the anticipations and whether those consequences are appropriate or not [28], i.e., the valuation of the benefits or disadvantages of certain behaviors. When a person supposes that the outcome of participating in a behavior is suitable or inacceptable, positive or negative attitudes are formed correspondingly. Then, behavioral intention is affected.

4) The subjective norm

The subjective norm reflects how a person perceives social pressure, whether he behaves according to it. Social pressure comes from significant others, their attitudes and expectations, and the degree of compliance. It is assumed that the degree of approval from a significant environment allows you to influence a person, influencing his behavioral characteristics [30].

5) Perceived behavioral control

Perceived behavioral control reflects people's self-image regarding their capability to follow certain behaviors. In some works, this is expressed as an attainable level of behavior performance [35]. High perceived behavioral control indicates that individuals have a strong ability to

follow certain behaviors and also that they have more associated resources and abilities. Perceived behavioral control touches not only behavioral intentions, but behavior itself.

III. Materials and Methods

A. Research Model

The research framework includes 7 key indicators: Satisfaction (SAT), Perceived Usefulness (PU), Attitude (ATD), Subjective Norms (SN), and Perceived Behavioral Control (PBC), Continuance Intention to Learn (CIL) and Academic Performance (AP), which are evaluated in traditional blended learning setting and blended learning based on artificial intelligence chatbot.

B. Data Collection

The participants were a sample of 211 undergraduate students who were studying Professional English course based on blended learning approach in the fall semesters of 2021–2022. From a statistical point of view, the sample consisted of 97 males (45.97%) and 114 females (54.03%), with ages ranging from 21 to 24. Totally 8 groups of students studying legal sciences took part in the experiment. 4 groups of students studied professional English in the traditional blended learning setting (control group; N=104) while another 4 groups studied the same discipline in the blended learning setting based on artificial intelligence chatbot (experiment group; N=107). For students from the experiment group an additional 20 min online session was conducted to show how the chatbot is working and which functions it has.

Initial testing was conducted to reveal the level of professional English level and divide groups in appropriate way. The testing was conducted partly through the online platform Moodle—being developed for the St. Petersburg Polytechnic University (Listening, Reading, Writing)—and partly via seminars (Speaking). The final testing was at the end of the semester.

Data on continuance intention to learn were collected over one month at the end of the semester. The questionnaire was intended to determine the students' continuance intention to learn in blended format and included 19 items on 6 main factors: satisfaction (SAT), perceived usefulness (PU), attitude (ATD), subjective norms (SN), perceived behavioral control (PBC) and continuance intention to learn (CIL) (e.g. "My overall experience with blended learning was very satisfied", "I believe that using blended learning technologies would improve my ability to learn", "Using blended learning in my coursework would be a pleasant experience", "Most people who are important to me think that it would be fine to use a blended learning technology for university courses", "I have sufficient extent of control to make a decision to adopt blended learning") measured by five-point Likert scale. The items for questionnaire were adopted from previous studies [31].

C. Data Analysis

To compare students' scores on continuance intention to learn and academic performance in blended environment (the differences between control and experiment groups), we used the average scores, standard deviations (σ) of students on 19 items (CIL) and AP results (4 items - Listening, Reading, Writing, Speaking) and student's t-test for independent samples (see Table A1). We also calculated Pearson correlation coefficient for all analyzed indicators.

IV. Results

A. Validity Testing

According to the normality test with the skewness and kurtosis values on each variable, the observed data was normally distributed (skewness scores were between −0.781 to −0.213 and kurtosis values were from −0.916 to 3.511). In this study, the value of Cronbach's α for each variable ranged from 0.858 to 0.927, which indicates a high reliability of the questionnaire and internal consistency between latent variables. Table 1 demonstrates the loading factor, C.R., and AVE, that were calculated to evaluate the convergence validity.

Table 1. Validity testing results of variables considered

Indicator	Items	Factor loadings	α	C.R.	AVE
SAT	3	0.795–0.817	0.882	0.889	0.790
PU	3	0.804–0.821	0.895	0.910	0.816
ATD	3	0.869–0.899	0.901	0.911	0.889
SN	3	0.817–0.839	0.889	0.910	0.756
PBC	4	0.904–0.917	0.927	0.949	0.889
CIL	3	0.833–0.859	0.858	0.918	0.788
AP	4	0.901–0.918	0.911	0.906	0.819

The AVE indicators were from 0.756 to 0,889, the loading factor scores – from 0.795 to 0,918, and C.R. values – from 0.889 to 0.949, that confirms the high convergent validity for this model.

B. Continuance Intention to Learn Indicators

To identify the role of artificial intelligence chatbot we conducted a descriptive statistic on all measures and compared the indicators of both groups of students using a pair sample t-test. The results on the continuance intention to learn are presented in Table 2.

Table 2. Descriptive statistics on continuance intention to learn results

Measures	Control group		Experiment		t-test results
	M	SD	M	SD	
SAT	3.11	0.97	3.33	0.91	t=1.89*
PU	3.04	0.82	3.60	0.89	t=2.56*
ATD	3.22	0.95	3.41	0.85	t=1.91*
SN	3.31	0.93	3.44	0.95	t=1.72
PBC	3.48	0.84	3.42	0.90	t=1.36
CIL	3.56	0.93	3.85	0.88	t=2.08*

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

Results from Table 2 showed that students from experiment group had significantly higher indicators of satisfaction, perceived usefulness, attitude and continuance intention to learn in comparison to students from control group ($p < 0.05$). Thus, the results indicated the positive influence of artificial intelligence chatbot integration into the blended learning course on students' intention to continue learning.

C. Academic Performance

The results on academic performance are presented in Table 3.

Table 3. Descriptive statistics on academic performance results

Measures	Control group		Experiment group		t-test results
	M	SD	M	SD	
Listening	15.58	2.02	16.71	1.94	t=2.24*
Reading	16.88	1.85	17.44	1.97	t=1.78*
Writing	17.2	1.94	17.27	1.88	t=0.76
Speaking	16.91	1.78	17.02	1.95	t=1.01

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

According to results, students from experiment group wrote the final testing on Professional English much better than students from control group. Experiment group students' results on Listening and Reading were significantly higher than results of control group students ($p < 0.05$), so it can be concluded that artificial intelligence chatbot also positively influenced these indicators of students' Professional English proficiency.

D. Correlation Analysis

Also, we conducted a Pearson correlation analysis to reveal the relationship between all considered indicators in control and experiment groups.

According to Table 4, the correlation analysis revealed a positive correlation between all the indicators considered. It was a strong relationship between satisfaction, perceived usefulness, attitude and continuance intention to learn, especially in experiment group. Thus, we can conclude that these indicators are key in determining the continuance intention to learn. At the same time, the relationship between subjective norms, perceived behavioral control and continuance intention to learn was weak in both groups. Also, it is important to note that the continuance intention to learn has a substantial influence on academic performance in both groups ($p < 0.01$), that confirms the importance of this indicator for efficient educational process.

Table 4. Correlation analysis results

		SAT	PU	ATD	SN	PBC	CIL	AP
Control group	SAT	1						
	PU	0.26	1					
	ATD	0.35*	0.32*	1				
	SN	0.17	0.23	0.20	1			
	PBC	0.24	0.21	0.19	0.29*	1		
	CIL	0.39**	0.49**	0.57***	0.24	0.25	1	
	AP	0.40*	0.28*	0.35*	0.21	0.17	0.42**	1
Experimental group	SAT	1						
	PU	0.28*	1					
	ATD	0.33*	0.31*	1				
	SN	0.21	0.24	0.18	1			
	PBC	0.18	0.20	0.25	0.32*	1		
	CIL	0.51**	0.44**	0.60***	0.27	0.25	1	
	AP	0.37*	0.29*	0.36*	0.16	0.22	0.43*	1

V. Discussion

The analysis of publications allows us to conclude that the increased interest in the problems of online and blended education as well as technologies integration, which has developed in the context of the pandemic, is aimed at solving not only short-term difficulties that arose in an extreme situation, but also in the long term and is based on the idea of the future development of the educational environment. For further contribution we conducted the current study.

The conducted analysis of two groups of students determined that artificial intelligence chatbot had a positive influence on students' continuance intention to learn as it showed a significant difference in indicators between experiment and control groups. Also, the substantial difference was revealed in the results of satisfaction, perceived usefulness and attitude, which were the most contributing factors for continuance intention to learn according to the correlation analysis. As consequence we can conclude that students who studied the course based on artificial intelligence chatbot found the course to be a pleasant experience, were more satisfied than students who studied in traditional blended learning environment and felt motivated to continue learning. Moreover, students from the experiment group overperformed students from the control group that is consistent with the previous studies [29, 37]. These findings can be explained by the higher indicators of satisfaction, perceived usefulness, attitude and continuance intention to learn as according to the Pearson correlation analysis these indicators have positive and strong correlation with students' academic performance. Thus, based on the results gained, it can be suggested for educational managers and teachers to introduce courses based on artificial intelligence chatbot for increasing the efficiency of educational process and creating a supporting and motivational environment.

The main difference of this study from previous works is the developed approach to research and evaluate students' continuance intention to learn, namely the integration of two models—ECM [28] and TPB [29]. In many studies [33–36], the proposed models are more often used in the field of trade and are used to analyze customer behavior. In the field of education, these models are used much less often.

VI. Conclusion

This research was aimed at examining students' intention to learn and academic performance results in a blended environment based on the intelligence chatbot and compare them with the results of students studying in traditional blended learning environment.

The research framework included 7 key indicators: Satisfaction (SAT), Perceived Usefulness (PU), Attitude (ATD), Subjective Norms (SN), and Perceived Behavioral Control (PBC), Continuance Intention to Learn (CIL) and Academic Performance (AP), which were evaluated in traditional blended learning setting (N=104) and blended

learning based on artificial intelligence chatbot (N=107). For comparison we used the average scores, standard deviations (σ) of students on 23 items and student's t-test for independent samples. We also calculated Pearson correlation coefficient for all analyzed.

The results of the current study confirmed the positive influence of artificial intelligence usage during the blended learning as it increases students' attitude, satisfaction and perceived usefulness which directly and highly affects the intention to continue learning and academic performance.

The contribution of this study to the educational field lies in its comprehensive examination of blended learning based on the artificial intelligence chatbot and its role for educational process. The results of the current study confirmed the positive influence of artificial intelligence usage during the blended learning as it increases students' attitude, satisfaction and perceived usefulness which directly and highly affects the intention to continue learning and academic performance.

As for limitations, the sample included students of only one country and humanitarian fields of study, thus other groups of students could have their own features, and their continuance intention results in blended environment may differ. In the future we are planning to conduct similar research with students from several foreign universities to confirm or expand the existing findings.

Appendix

Table A1. Students measured "to what extent do you agree or disagree with the following statements"

No.	Construct	Scale
1	Satisfaction	SAT 1 My overall experience with blended learning was very satisfied SAT 2 My overall experience with blended learning was very pleased SAT 3 My overall experience with blended learning was very contended
2	Perceived usefulness	PU 1 I believe that using blended learning technologies would improve my ability to learn PU 2 I believe that blended learning technologies would allow me to get my work done more quickly PU 3 I believe that blended format would be useful for my learning
3	Attitude	ATD 1 I would like my coursework more if I used blended learning ATD 2 Using blended learning in my coursework would be a pleasant experience ATD 3 Using blended learning in my coursework would be a wise idea
4	Subjective norms	SN 1 Most people who are important to me think that it would be fine to use a blended learning technology for university courses SN 2 I think other students in my classes would be willing to adopt a blended learning technology SN 3 Most people who are important to me would approve of using a blended learning technology for university courses
5	Perceived behavioral control	PBC 1 I have sufficient extent of knowledge to use blended learning PBC 2 I have sufficient extent of control to make a decision to adopt blended learning PBC 3 I have sufficient extent of self-confidence to make a decision to adopt blended learning PBC 4 I would be able to use the blended learning system well for learning process
5	Continuance intention to learn in blended environment	CIL 1 I will strongly recommend that others use blended learning CIL 2 I intend to learn in blended format in the future CLIL 3 I prefer to learn in blended format.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Conceptualization, A.K. and T.B.; methodology, A.K.; software, T.B.; validation, T.B.; formal analysis, A.K.; investigation, A.K..; resources, T.B.; data curation, T.B.; writing—original draft preparation, A.K.; writing—review and editing, A.K.; supervision, A.K.; project administration, T.B..; funding acquisition, A.K. All authors have read and agreed to the published version of the manuscript.

References

[1] E. M. Aucejo, J. French, M. P. U. Araya, and B. Zafar, "The impact of COVID-19 on student experiences and expectations: Evidence from a survey," *Journal of Public Economics*, vol. 191. doi: 10.1016/j.jpubeco.2020.104271

[2] T. A. Baranova, A. M. Kobicheva, and E. Y. Tokareva, "Effects of an integrated learning approach on students' outcomes in St. Petersburg Polytechnic University," *ACM International Conference Proceeding Series*, pp. 77–81, 2019. doi.org/10.1145/3369199.3369245

[3] M. Adnan and K. Anwar, "Online learning amid the COVID-19 pandemic: Students' perspectives," *Journal of Pedagogical Sociology and Psychology*, vol. 2, no. 1, pp. 45–51, 2020. https://doi.org/10.33902/JPSP. 2020261309

[4] T. K. Burki, "COVID-19: consequences for higher education," *The Lancet Oncology*, vol. 21, no. 6, p. 758, 2020.

[5] A. W. Bates, *Technology, E-learning and Distance Education* (2nd ed.), New York: Routledge-Falmer, 2005.

[6] N. F. Knapp, "Increasing interaction in a flipped online classroom through video conferencing," *TechTrends*, vol. 62, no. 6, pp. 618–624, 2018. DOI: 10.1007/s11528-018-0336-z

[7] S. Mare and A. T. Mutezo, "The Effectiveness of E-tutoring in an Open and Distance E-learning Environment: Evidence from the University of South Africa," *Open Learning: The Journal of Open, Distance and e-Learning*, pp. 1–17, 2020. DOI: 10.1080/02680513.2020.1717941

[8] P. Raviolo, "Interazioni e-tutor-studenti e successo formativo: un'analisi dei dati nel contesto dell'educazione superiore online," *Excellence and Innovation in Learning and Teaching*, vol. 5, no. 2, 2020.

[9] E. Chen, K.Kaczmarek, and H. Ohyama, "Student perceptions of distance learning strategies during COVID-19," *Journal of Dental Education*, vol. 1–2, 2020. DOI: 10.1002/jdd.12339

[10] N. V. Tarasova and I. P. Pastuhova, "The impact of distance education on educational outcomes. How does the transfer of the educational process to a distance mode affect educational results now and will affect in the future?" 2020.

[11] A. Bhattacherjee, "Understanding information systems continuance: An expectation-confirmation model," *MIS Quarterly*, pp. 351–370, 2021.

[12] S. Hrastinski, "What do we mean by blended learning?" *TechTrends*, vol. 63, no. 5, pp. 564–569, 2019.

[13] C. R. Graham, "Blended learning systems," *The Handbook of Blended Learning: Global Perspectives, Local Designs*, vol. 1, pp. 3–21, 2006.

[14] D. Garrison and H. Kanuka, "Blended learning: Uncovering its transformative potential in higher education," *The Internet and Higher Education*, vol. 7, pp. 95–105, 2004. 10.1016/j.iheduc.2004.02.001

[15] C. Dziuban, C. R. Graham, P. D. Moskal, A. Norberg, and N. Sicilia, "Blended learning: The new normal and emerging technologies," *International Journal of Educational Technology in Higher Education*, vol. 15, no. 1, pp. 1–16, 2018.

[16] R. M. Bernard, E. Borokhovski, R. F. Schmid, R. M. Tamim, and P. C. Abrami, "A meta-analysis of blended learning and technology use in higher education: From the general to the applied," *Journal of Computing in Higher Educati*on, vol. 26, no. 1, pp. 87–122, 2014.

[17] C. J. Asarta and J. R. Schmidt, "The choice of reduced seat time in a blended course," *The Internet and Higher Education*, vol. 27, pp. 24–31, 2015.

[18] L. P. Hilliard and M. K. Stewart, "Time well spent: Creating a community of inquiry in blended first-year writing courses," *Internet and Higher Education*, vol. 41, pp. 11–24, 2019. doi: 10.1016/j.iheduc.2018.11.002

[19] R. Owston and D. N. York, "The nagging question when designing blended courses: Does the proportion of time devoted to online activities matter?" *The Inter-net and Higher Education*, vol. 36, pp. 22–32, 2018.

[20] D. R. Garrison and N. D. Vaughan, *Blended Learning in Higher Education: Framework, Principles, and Guidelines*, John Wiley & Sons, 2008.

[21] L. George-Walker and M. Keeffe, "Self-determined blended learning: a case study of blended learning design," *Higher Education Research & Development*, vol. 29, no. 1, pp. 1–13, 2010. DOI: 10.1080/07294360903277380

[22] L. K. Fryer, M. Ainley, A. Thompson, A. Gibson, and Z. Sherlock, "Stimulating and sustaining interest in a language course: An experimental comparison of chatbot and human task partners," *Computers in Human Behavior*, vol. 75, pp. 461–468, 2017.

[23] C. W. Okonkwo and A. Ade-Ibijola, "Chatbots applications in education: A systematic review," *Computers and Education: Artificial Intelligence*, vol. 2, 100033, 2021.

[24] J. Q. Pérez, T. Daradoumis, and J. M. M. Puig, "Rediscovering the use of chatbots in education: A systematic literature review," *Computer Applications in Engineering Education*, vol. 28, no. 6, pp. 1549–1565, 2020.

[25] P. Smutny and P. Schreiberova, "Chatbots for learning: A review of educational chatbots for the facebook messenger," *Computers & Education*, vol. 151, 103862, 2020.

[26] W. Villegas-Ch, A. Arias-Navarrete, and X. Palacios-Pacheco, "Proposal of an architecture for the integration of a chatbot with artificial intelligence in a smart campus for the improvement of learning," *Sustainability*, vol. 12, no. 4, p. 1500, 2020.

[27] Y. Ding, "Looking forward: The role of hope in information system continuance," *Computers in Human Behavior*, vol. 91, pp. 127–137, 2019.

[28] F. Tiyar and H. Khoshsima, "Understanding students' satisfaction and continuance intention of e-learning: Application of expectation–confirmation model," *World Journal on Educational Technology*, vol. 7, p. 157, 2015. 10.18844/wjet.v7i3.159.

[29] I. Ajzen, "From intentions to actions: A theory of planned behavior," *SSSP Springer Series in Social Psychology*, 1985, Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-69746-3_2

[30] J. Hirano, K. Kishi, S. Narupiti, K. Choocharukul, and T. Nakatsuji, "Influence of daily SNS usage on the collection of disaster information and people's behavior during a flood," *Asian transport studies*, vol. 3, no. 2, pp. 171–186, 2014.

[31] R. Cardozo, "An experimental study of customer effort, expectation and satisfaction," *Journal of Marketing Research*, vol. 2, no. 3, pp. 244–249, 1965.

[32] R. L. Oliver, "Whence consumer loyalty?" *Journal of Marketing*, vol. 63, pp. 33–44, 1999.

[33] P. T. Knight, "Summative assessment in higher education: Practices in disarray," *Studies in Higher Education*, vol. 27, no. 3, pp. 275–286, 2002.

[34] T. Hennig, M. F. Langer, and U. Hansen, "Modeling and managing student loyalty," *Journal of Service Research*, vol. 3, no. 4, pp. 331–344, 2001

[35] D. Holdford and T. Reinders, "Development of an rument to assess student perceptions of the quality of pharmaceutical education," *American Journal of Pharmaceutical Education*, vol. 65, pp. 125–31, 2001.

[36] D. Holford and A. Patkar, "Identification of service quality dimensions of pharmaceutical education," *American Journal of Pharmaceutical Education*, vol. 67, no. 4, Article 108, 2003.

[37] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, no. 3, pp. 319–340, 1989.

Copyright © 2024 by the authors. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (CC BY 4.0).