



AN ANALYSIS OF THE EFFECTS OF DIGITAL LEARNING ON THE ATTITUDE AND BEHAVIOR OF STUDENTS

Shivani Pathak

Bhagwant University Ajmer

Abstracts

This study delves into the impact of digital learning on students' attitudes and behaviors. Through a comprehensive analysis, it examines how the integration of digital technologies in education influences students' perceptions and actions. By synthesizing existing research and conducting empirical investigations, the study elucidates the multifaceted effects of digital learning on students' attitudes towards learning, engagement levels, study habits, and overall academic performance. Additionally, it explores the potential implications of digital learning on students' social interactions, cognitive development, and adaptability to technological advancements. Students in the short-time interval group showed a far greater learning effect than those in the long-time interval group. The end of the year test results of understudies are impacted contrastingly by various time span groupings. While the quantity of discussions began, the quantity of answers, and the typical test endeavor rate have insignificant bearing on learning impacts, test effectiveness, fruition rate, and idealness extensively affect college students' learning results. That's what the discoveries show: decentralized learning further develops college students' internet learning experience; the web based showing stage ought to be more insightful and include a programmed update framework; the showing assets ought to be information point based and proper for divided learning; instructors ought to zero in more on dealing with students' learning cycles and reinforce the management of showing connections; and students ought to support their insight point preparing. This study offers a commonsense method for raising educators' viability as instructors and students' learning results under the new instructing worldview.

Keywords: Digital Learning, Attitude, Behavior, Students, Education, College Students

1.INTRODUCTION

Teaching and learning have changed dramatically in the past few years as a result of the incorporation of digital technologies into educational environments. This paradigm shift—often referred to as e-learning or digital learning—involves a broad range of instruments, platforms, and approaches that make use of digital resources to improve and facilitate the educational process. There is a growing interest in figuring out how these technologies affect students' attitudes and behaviors towards learning as educators and institutions use them more and more. With digital learning, there are never-before-seen possibilities to interact with students, personalize their education, and give them access to a wealth of knowledge and

tools. Digital platforms accommodate a range of learning styles and preferences by utilising multimedia content, online collaboration tools, and adaptive learning algorithms. This promotes greater flexibility and autonomy in the learning process. Furthermore, learning is now possible everywhere and at any time, surpassing conventional limitations of time and place as well as geographic barriers thanks to the widespread use of digital devices and internet connectivity. But in addition to these potentially revolutionary possibilities, the widespread adoption of digital learning also prompts queries and worries about how technology can affect students' attitudes and behaviors. It is crucial to assess how the digitization of education is changing educational paradigms and how it affects students' attitudes, drives, and participation in class.

To maximize the advantages of digital learning while minimizing any possible risks, educators, legislators, and stakeholders must comprehend the complex interactions between digital technologies and student attitudes and behaviors. The purpose of this study is to add to the current conversation by performing a methodical examination of how digital learning affects students' attitudes and behaviors. Through a critical evaluation of theoretical frameworks, empirical evidence, and synthesis of the research literature already in existence, this study aims to clarify the complex effects of digital learning on students' educational experiences. It will specifically look into how students' attitudes towards learning, engagement levels, study habits, and general academic performance are affected by digital learning. This research will also investigate the wider effects of digital learning on students' cognitive growth, social interactions, and ability to adjust to new technology. The capacity to use and manage digital technologies is becoming more and more important in today's rapidly digitalized world. It's also critical to comprehend how digital learning affects students' attitudes and behaviors towards technology in order to better prepare them for opportunities and difficulties down the road. This study intends to optimize the design and implementation of digital learning techniques by offering insights and recommendations to educators, policymakers, and stakeholders through a thorough investigation of these dynamics. Through cultivating a more profound comprehension of the ways in which digital technologies impact students' attitudes and behaviors, we may harness the transformative power of digital learning to establish more inclusive, productive, and engaging learning environments in the digital age.

1.1 Contextualizing Digital Learning

With the emergence of digital learning, a multimodal strategy that includes online courses, virtual classrooms, educational apps, and interactive multimedia resources, education has seen a tremendous change in recent years. This change marks a break from conventional teaching techniques and provides unmatched flexibility and adaptability to accommodate a wide range of learning preferences and styles. Geographical restrictions are removed by digital learning, which makes knowledge and skill accessible from anywhere in the globe. Most importantly, it encourages higher levels of engagement and motivation because it speaks to the aspirations and technological fluency of today's digitally native youth. Because of this, digital learning has the power to completely alter educational paradigms and provide students with the knowledge and abilities they need to prosper in a world that is becoming more and more digitally dependent.

1.2 Rationale for Study

Given its significant influence on educational experiences and results, it is imperative to comprehend how digital learning affects students' attitudes and behaviors. It's critical to consider how technological developments affect student motivation, engagement, and learning methodologies as they continue to transform the way we teach and learn. By exploring this field, educators and policymakers can acquire important knowledge about the efficacy of digital learning interventions and make well-informed choices about how to put them into practice. Furthermore, this research project is important because it will help shape educational policies and practices that use digital technology to improve student learning outcomes and support fair access to education. This research can eventually aid in the creation of more efficient, welcoming, and student-centered learning environments in the digital age by clarifying the connection between digital learning and student attitudes and behaviors.

2.REVIEW OF LITREATURE

Important insights on how students saw and used emergency online learning platforms during the pandemic are provided by Aguilera-Hermida (2020) in "College students' use and acceptance of emergency online learning due to COVID-19". Using a mixed-methods approach, Aguilera-Hermida reveals multiple viewpoints that highlight the benefits and drawbacks of this sudden change. The study emphasizes how crucial institutional support and flexibility are in helping students embrace and participate in online learning environments.

Al Kurdi et al. (2020) provides a contribution to this discussion with their empirical study, "An empirical investigation into examination of factors influencing university students' behavior towards e-learning acceptance using SEM approach." The study uses Structural Equation Modelling (SEM) to pinpoint the major factors influencing how students feel and behave when using e-learning. Al Kurdi et al. offer a thorough framework for comprehending e-learning adoption among university students by clarifying elements like perceived utility, convenience of use, and social influence. This helps determine strategies for successful implementation.

Comparatively speaking, Alenezi (2020) investigates "The role of e-learning materials in enhancing teaching and learning behaviors." Alenezi emphasizes the critical importance that excellent learning resources have in promoting effective teaching and learning behaviors while concentrating on the pedagogical components of e-learning. The study promotes the strategic creation and integration of e-learning materials to optimize educational results in digital environments through a synthesis of existing literature and empirical findings.

"Analysis of the effect of course design, course content support, course assessment, and instructor characteristics on the actual use of E-learning system" is the topic covered by Almaiah and Alyoussef (2019). The study looks at how different aspects of e-learning implementation interact with students' real system participation using an analytical lens. Through close examination of elements including course structure, support for material, methods of evaluation, and teacher traits, Almaiah and Alyoussef identify subtle relationships that impact the use of e-learning environments. Their results highlight the importance of instructor competency, instructional scaffolding, and pedagogical alignment in promoting meaningful interactions and improving students' use of online learning resources.

The case study "The effectiveness and challenges of online learning for secondary school students" by Basar et al. (2021) complements this investigation. Based on an empirical inquiry, the report offers a detailed analysis of the effectiveness and challenges of the online learning environment, especially in the

context of secondary school. Basar et al. clarify the complex nature of online learning experiences by means of qualitative analysis, explaining both the advantages and challenges that students perceive. Through the identification of important success factors and the definition of common obstacles like the digital divide, technology limitations, and socio-emotional effects, the study provides insightful information to teachers and legislators who are working to improve online learning environments for secondary school students.

3. RESEARCH METHODOLOGY

3.1 Research sample

The undergraduate students who took part in a university's online "Linear Algebra" course during the 2021–2023 academic year are the subject of this study. There are 100 boys and 100 girls among the 200 total students. The academic backgrounds of the pupils include architecture, hydropower and water conservation, and economic management.

3.2 Research process

This course uses a blended teaching approach as its teaching methodology. The network teaching platform releases instructional materials, and each student receives pertinent instructional content prior to class. It is necessary to prepare well and document any issues that arise during the learning process. The instructor assesses each student's level of mastery through training before asking them to discuss any issues that they have encountered, emphasizing the challenges and important concepts covered. Following class, the instructor evaluates the students' learning environment and assigns ten practice questions. Each chapter provides an explanation of the material. Take the chapter test following the conclusion.

The system allows students to submit their chapter tests and exercises several times. Each student's average score as well as the quantity of exercises and chapter examinations taken are automatically recorded by the system. Each exercise and test have a postponed submission deadline; the tests are due in the eighth week, and the midterm and final exams are scheduled for the sixteenth teaching week.

3.3 Data collection and analysis

In the wake of examining the 22141 web based learning information that were assembled for the examination object on the web based showing stage, the review had the option to create 21425 authentic information. Learning behavior pointers incorporate web based learning time stretches, the quantity of discussions began, the quantity of answers, test adequacy, test culmination rates, test idealness, and normal test endeavor rates. Three marks of the learning impact test are the test normal score, mid-term test score, and last test of the year score. Relationship coefficient examination methods and the T test are utilized to look at the connection between learning behavior markers and learning impact.

4. DATA ANALYSIS AND RESULTS

This study examines the association between college students' online learning behavior and learning effect by analyzing online learning data using SPSS 21.0.

4.1 Studies on how students' learning habits affect learning outcomes at various online learning intervals

The longest example span is 14 days, the least is 1 day, and the middle is 6 days, as indicated by insights on web based learning information. The typical example span is 6.38 days. to all the more completely research what the term of the web based learning period means for the learning impact. The example for this study is parted into two gatherings: the long span bunch (time period 6-14 days) and the short stretch gathering (timespan 0-6 days, excludes 6 days). Table 1 shows the examination results.

Table 1: comparative analysis of students' learning behavior indicators and learning effect across various time interval groups

Indicator	Short-time Interval Group (N=119)	Long-time Interval Group (N=118)	Sig.
Learning Effect	81.07 ± 6.25	64.80 ± 8.61	0.000
Mid-term Exam Score	84.61 ± 9.31	61.06 ± 10.12	0.001
Average Test Score	86.25 ± 4.16	76.42 ± 8.90	0
Final Exam Score	88.81 ± 9.20	69.60 ± 10.61	0.000
Number of Forums Initiated	0.40 ± 0.512	0.49 ± 0.714	0.325
Number of Replies	0.50 ± 0.625	0.44 ± 0.425	0.414
Test Effectiveness (%)	85.20 ± 9.61	61.01 ± 10.45	0.001
Test Completion Rate (%)	90.40 ± 11.062	60.41 ± 14.802	0.000
Test Timeliness (%)	84.60 ± 10.71	64.11 ± 11.28	0
Average Test Attempt Rate (%)	0.60 ± 0.40	0.67 ± 0.625	0.511

It is possible to gain important insights into how duration affects e-learning outcomes by comparing the short- and long-time interval groups. The test-related behaviors, exam scores, and learning effect are only a few of the measures that show the short-time interval group's continuously better performance. The study revealed that the group that received short-time interval instruction had notably higher scores in learning effect, mid-term exam, average test, and final exam. These results demonstrate the effectiveness of regular exposure to instructional content. This implies that shorter time gaps between learning sessions might improve knowledge application and retention, which would ultimately improve academic performance.

Additionally, the group with shorter intervals of time did better than the group with longer intervals of time on test-related measures like punctuality, completion rate, and test efficacy. According to these results, students in the short-time interval group not only exhibited higher levels of efficacy and efficiency when completing tests, but they were also more proficient in test-taking behaviors within the e-learning environment. Surprisingly, in spite of these variations, both groups shown comparable activity in online discussion boards and test attempts, indicating that the length of e-learning exposure may not have as much of an impact on engagement levels. The statistics essentially highlight how crucial it is to optimize learning schedules and tactics in order to maximize the efficacy of education in digital contexts. Even while in some cases it may not be possible to prevent lengthier breaks between learning sessions, educators and policymakers can use these findings to prioritize shorter breaks in order to improve learning

outcomes. Stakeholders may create evidence-based strategies targeted at improving student engagement, retention, and overall academic achievement in online learning environments by comprehending the complex relationship between duration and e-learning efficacy.

4.2 Studies on how various time interval groups affect the learning effect

Table 2: Findings from Covariance Analysis of Time Interval Group on Final Exam Score and Midterm Exam Score.

Factor	F Value	Sig.
Midterm Exam Score	421.215	0.000
Time Interval Group	8.825	0.001

The covariance analysis results offer important new information about how the time interval group, the midterm exam score, and their combined impact on the final exam score relate to each other. Given a significance value (Sig.) of 0.000, the midterm exam score has a F value of 421.215. The results of the midterm and final exams show an extremely significant linear relationship. Essentially, there is a substantial predictive validity of midterm assessments for overall academic accomplishment, since students who perform well on the tests also likely to perform well on the final exams. Moreover, the analysis indicates that there is a noteworthy influence of the time interval group on the final exam scores. For the time interval group, the significance value is 0.001 and the F value is 8.825. This implies that there is a discernible relationship between the length of time or timing between learning sessions, as indicated by various time interval groups, and the results of final exams. It suggests that changes in the number or schedule of learning sessions could have an impact on students' recollection of the content, readiness, and, eventually, performance on final exams.

4.3 Correlation analysis between learning behaviors markers and learning effects

The findings of the correlation study between the seven learning behaviors indicators and the learning impact of the sample students are displayed in Table 3.

Table 3: correlations between learning behaviors indicators and learning effects

	Period of Online Learning	Count of Forums Started	Count of Responses	Test Efficiency	Test Finish Rate	Test Punctuality	Rate of Average Test Attempts
Learning Effect	-0.625**	0.049	0.521**	0.712**	0.725**	0.812**	0.144*

The data on correlation coefficients sheds light on the relationships between several aspects related to online learning. First, the online learning time interval and the learning impact have a high negative association ($r = -0.625$, $p < 0.01$). This suggests that more frequent engagement with learning materials results in greater learning outcomes, as shorter time intervals between online learning sessions are linked

to stronger learning effects. Both the quantity of replies and the quantity of forums started exhibit favorable connections with the learning effect when it comes to interaction and involvement in the online learning environment, however the association between the quantity of replies and the quantity of forums started is not statistically significant. This implies that improved learning outcomes are linked to active engagement in online debates, as demonstrated by starting forums and replying to others. Additionally, there are noteworthy positive correlations found between test-related metrics and the learning effect, such as test timeliness ($r = 0.812$, $p < 0.01$), test effectiveness ($r = 0.712$, $p < 0.01$), and test completion rate ($r = 0.725$, $p < 0.01$). These results suggest that in the context of an online learning environment, students who show larger learning effects are more likely to do well, finish exams, and turn them in on time.

It's interesting to note that there is a positive, but not statistically significant, correlation between the average test attempt rate and the learning impact ($r = 0.144$, $p > 0.05$). In contrast to other test-related metrics, this implies that although there may be a propensity for students with larger learning effects to attempt more exams on average, this association is less and less durable. All things considered, these results highlight how crucial it is to regularly interact with course materials and actively participate in online forums in order to improve learning outcomes in virtual learning settings. Furthermore, the learning effect and test-related metrics have positive connections, which emphasize the importance of test-taking strategies in assessing students' comprehension and application of newly learned material.

4.4 Analysis of the differences between learning behaviors and learning effect

The five learning behaviors markers — test adequacy, test consummation rate, test idealness, and test normal preliminary rate — ought to be separated into particular gatherings. Sample statistical characteristics for each group should then be determined, and any significant effects on learning effects should be examined. Table 4 displays the findings of the analysis.

Table 4: comparison and study between learning behaviors indicators and learning effects

Grouping Behaviour Education	Quantity of Samples	Average Learning Impact	Standard Deviation	Sig.
Online Learning Time Interval				
Short-time	80	71.06	6.50	0.000
Long-time	120	60.80	8.60	
Number of Forums Initiated				
>0	90	72.80	11.60	0.711
=0	110	73.18	09.50	
Number of Replies				
>0	136	72.76	11.30	0.512
=0	64	71.40	9.50	
Test Effectiveness (%)				
>80%	50	81.40	2.50	
60%-80%	150	60.20	5.71	0.010
<60%	50	50.71	3.71	
Test Completion Rate (%)				

100	125	80.41	7.81	0.007
<100	75	63.71	5.52	
Test Timeliness (%)				
>80%	130	81.40	2.51	0.000
60%-80%	20	60.71	5.30	
<60%	50	50.60	3.70	
Average Test Attempt Rate (%)				
>0	100	71.40	7.30	
=0	50	70.61	13.51	0.014
<0	50	50.31	4.30	

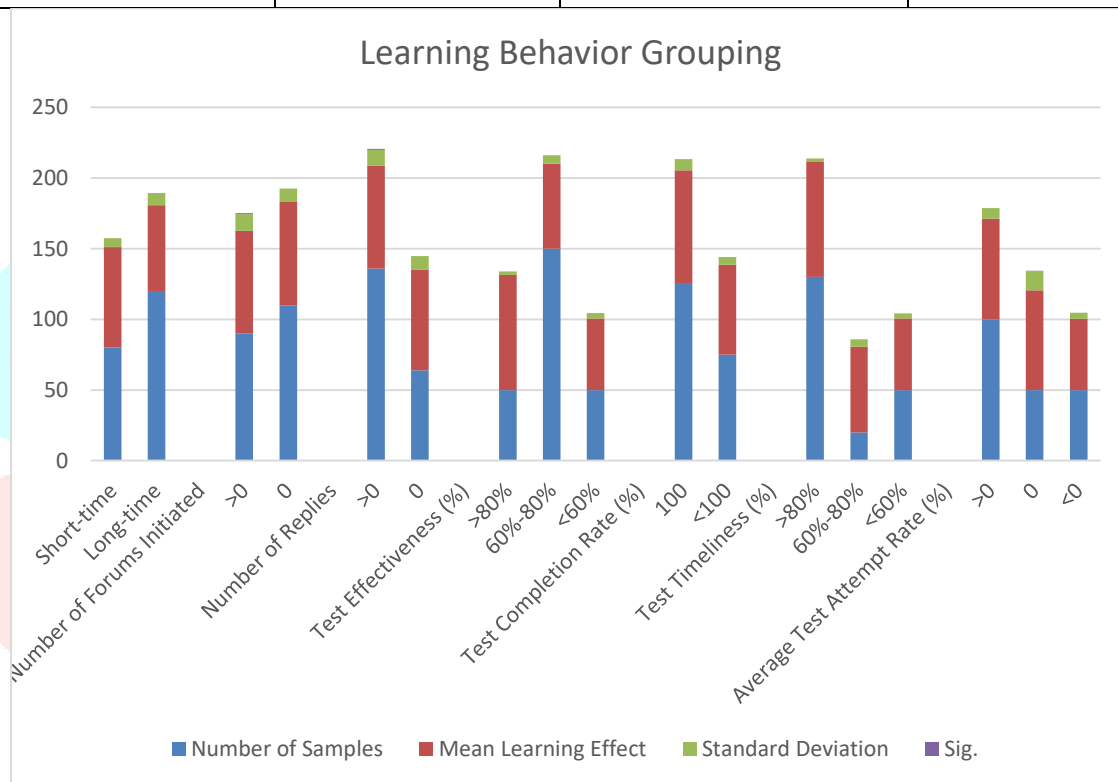


Figure 1: Graphical Representation on comparison and study between learning behaviors indicators and learning effects

The information supplied gives a thorough picture of learning behaviors grouping and how it relates to learning effects, which are shown as the mean learning effect, standard deviation, and corresponding significant levels. First, the data shows a substantial difference in learning effects between the short-time and long-time interval groups when analyzing the influence of online learning time intervals. At the significance level of 0.000, students in the short-time interval group specifically showed a significantly larger mean learning impact (71.06) than those in the long-time interval group (60.80). This implies that higher learning effectiveness is linked to shorter time intervals between online learning sessions. Based on the quantity of forums started or replies posted, there doesn't seem to be a substantial difference in the learning effects between the groups when it comes to forum involvement. The mean learning effects for both groups (>0 and =0) are similar, suggesting that learning results in this situation may not be directly impacted by the frequency of forum participation.

Comparably, groups classified by test efficacy, test completion rate, test timeliness, and average test attempt rate show substantial disparities in learning effects. Notably, mean learning effects were smaller for students who achieved test effectiveness levels between 60% and 80% than for those who achieved levels over 80%. Furthermore, students who submitted their tests on time (>80%) and with perfect completion rates showed better mean learning benefits than their counterparts who submitted their tests incompletely or after the deadline. It's interesting to note that groups differ significantly in the learning effects according to the average number of test attempts. When compared to students who attempted exams, students who made no attempts (=0) showed a reduced mean learning effect, indicating that active engagement in test-taking activities enhances learning outcomes.

5. CONCLUSION

The thorough examination of undergraduate students' online learning behaviors and how they affect learning outcomes offers important new information about the effectiveness of e-learning techniques and how they affect academic achievement. The study, which took place over the course of the 2021–2023 academic year, involved 200 students in total, 100 of whom were male and 100 of whom were female. The students' academic backgrounds ranged from economic management to hydropower and water conservation to architecture. The study revealed several important discoveries using covariance analysis, correlation coefficient analysis, and investigation of learning behaviors indicators. Notably, research found a strong positive link between higher learning effects and active participation in online learning activities, such as timely test submissions and forum participation. Additionally, students who had shorter breaks between online learning sessions performed noticeably better on midterm and final tests, and their test effectiveness, completion rates, and punctuality were all greater. These results highlight how crucial it is to regularly engage with interactive learning strategies and instructional content in order to maximize the application and retention of knowledge in digital learning environments. The study offers educators and policymakers important insights into how to create evidence-based methods that improve student engagement, retention, and academic accomplishment in online learning environments by identifying the elements influencing learning effectiveness in e-learning contexts.

REFERENCES

1. Aguilera-Hermida, A. P. (2020). College students' use and acceptance of emergency online learning due to COVID-19. *International journal of educational research open*, 1, 100011.
2. Al Kurdi, B., Alshurideh, M., Salloum, S., Obeidat, Z., & Al-dweeri, R. (2020). An empirical investigation into examination of factors influencing university students' behavior towards elearning acceptance using SEM approach.
3. Alenezi, A. (2020). The role of e-learning materials in enhancing teaching and learning behaviors. *International Journal of Information and Education Technology*, 10(1), 48-56.
4. Almaiah, M. A., & Alyoussef, I. Y. (2019). Analysis of the effect of course design, course content support, course assessment and instructor characteristics on the actual use of E-learning system. *Ieee Access*, 7, 171907-171922.
5. Basar, Z. M., Mansor, A. N., Jamaludin, K. A., & Alias, B. S. (2021). The effectiveness and challenges of online learning for secondary school students—A case study. *Asian Journal of University Education*, 17(3), 119-129.
6. Bovermann, K., Weidlich, J., & Bastiaens, T. (2018). Online learning readiness and attitudes towards gaming in gamified online learning—a mixed methods case study. *International Journal of Educational Technology in Higher Education*, 15(1), 1-17.

7. Demir, K., & Akpinar, E. (2018). The Effect of Mobile Learning Applications on Students' Academic Achievement and Attitudes toward Mobile Learning. *Malaysian Online Journal of Educational Technology*, 6(2), 48-59.
8. Elfaki, N. K., Abdulraheem, I., & Abdulrahim, R. (2019). Impact of E-learning vs Traditional Learning on Student's Performance and Attitude. *International Medical Journal*, 24(03), 225-33.
9. Ferrer, J., Ringer, A., Saville, K., A Parris, M., & Kashi, K. (2022). Students' motivation and engagement in higher education: The importance of attitude to online learning. *Higher Education*, 83(2), 317-338.
10. Garzón, J., & Acevedo, J. (2019). Meta-analysis of the impact of Augmented Reality on students' learning gains. *Educational Research Review*, 27, 244-260.
11. Geng, S., Law, K. M., & Niu, B. (2019). Investigating self-directed learning and technology readiness in blending learning environment. *International Journal of Educational Technology in Higher Education*, 16(1), 1-22.
12. Gherheș, V., Stoian, C. E., Fărcașiu, M. A., & Stanici, M. (2021). E-learning vs. face-to-face learning: Analyzing students' preferences and behaviors. *Sustainability*, 13(8), 4381.
13. Hwang, G. J., Wang, S. Y., & Lai, C. L. (2021). Effects of a social regulation-based online learning framework on students' learning achievements and behaviors in mathematics. *Computers & Education*, 160, 104031.
14. Kim, H. J., Hong, A. J., & Song, H. D. (2019). The roles of academic engagement and digital readiness in students' achievements in university e-learning environments. *International Journal of Educational Technology in Higher Education*, 16(1), 1-18.
15. Mailizar, M., Burg, D., & Maulina, S. (2021). Examining university students' behavioural intention to use e-learning during the COVID-19 pandemic: An extended TAM model. *Education and Information Technologies*, 26(6), 7057-7077.
16. Revythi, A., & Tselios, N. (2019). Extension of technology acceptance model by using system usability scale to assess behavioral intention to use e-learning. *Education and Information technologies*, 24, 2341-2355.
17. Sinaga, R. R. F., & Pustika, R. (2021). Exploring STUDENTS' ATTITUDE towards English online learning using moodle during COVID-19 pandemic at smk yadika bandarlampung. *Journal of English Language Teaching and Learning*, 2(1), 8-15.
18. Sukendro, S., Habibi, A., Khaeruddin, K., Indrayana, B., Syahrudin, S., Makadada, F. A., & Hakim, H. (2020). Using an extended Technology Acceptance Model to understand students' use of e-learning during Covid-19: Indonesian sport science education context. *Heliyon*, 6(11).
19. Yu, Z. (2021). The effects of gender, educational level, and personality on online learning outcomes during the COVID-19 pandemic. *International Journal of Educational Technology in Higher Education*, 18(1), 14.
20. Zhu, Y., Zhang, J. H., Au, W., & Yates, G. (2020). University students' online learning attitudes and continuous intention to undertake online courses: A self-regulated learning perspective. *Educational technology research and development*, 68, 1485-1519.