

Digital Learning Platforms and Language Skills Development: The Mediating Roles of Student Engagement and Self-Efficacy across Educational Levels

Miguel Angel Esbrí Montoliú*

Faculty of Law and Political Science, University of Panama, Panama.
Email: miguel.esbri@up.ac.pa

Agustin Torres-Rodríguez

Department of Basic Sciences, Instituto Tecnológico de Atitalaquia, Mexico.
Email: agustin_torres@uaeh.edu.mx

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Abstract: The growing adoption of digital learning platforms has transformed language education by creating interactive and flexible learning environments. This study examines the influence of digital learning platform use on language skills development while investigating the mediating roles of student engagement and student self-efficacy and the moderating role of educational level. Using a quantitative cross-sectional design, data were collected from 412 students through a structured questionnaire and analyzed using correlation, regression, mediation, and moderation analyses. The findings revealed that digital learning platform use positively affects student engagement, self-efficacy, and language skills development. Student engagement and self-efficacy were also found to significantly enhance language skills development. Furthermore, educational level significantly moderates the relationship between digital learning platform use and language skills development, indicating that the effectiveness of digital platforms varies across educational stages. Mediation analysis demonstrated that both student engagement and self-efficacy serve as significant mechanisms through which digital learning platforms improve language learning outcomes, with self-efficacy exhibiting a stronger indirect effect. The study contributes to the understanding of technology enhanced language learning by integrating technological, behavioral, psychological, and contextual factors within a single framework and offers practical insights for educational stakeholders seeking to improve language proficiency through digital learning environments.

Keywords. Digital Learning Platforms, Language Skills Development, Student Engagement, Student Self Efficacy, Technology Enhanced Learning.

1. Introduction

The swift progress of digital technologies has changed educational processes in all parts of the world making it possible to boost learning essential academic skills such as language skills development (Medvedeva et al., 2022). This process includes the process of acquiring reading, writing, speaking, and listening skills. Language skills development is regarded as the key part of learners' success in studying and future learning practices (Mikroyannidis, Perifanou & Economides, 2023). Language skills do influence educational performance as well as assisting in social participation, obtaining jobs, and personal growth. However, many educational systems still report serious problems in achieving high-level language competency in school learners. At the same time, the rise of digital learning platforms attracts the attention of educators and researchers as digital platforms provide a highly interactive, individualized, and

learner-centered environment that contributes highly to language acquisition (Sofikarim, Bali & Rached, 2023). The functions provided by digital learning platforms such as multimedia content, instant feedback, collaborative processes, gamification, and adaptive learning paths provide opportunities for obtaining knowledge that are difficult to achieve in the traditional studying process.

The importance of digital technologies for ensuring student engagement and improving learning efficiency has been noted in contemporary educational studies (Chowdhury et al., 2024). Student engagement stands for how much learners are involved in their education cognitively, emotionally, and behaviorally and is always considered to be a necessary condition for academic success. Digital education tools are unique because they may help stimulate student engagement through interactive activities, collaboration, and increased autonomy in learning (Alieto et al., 2024). Moreover, these tools may contribute to improving self-efficacy, which is understood as the belief in one's own ability to successfully complete a particular learning task. Self-efficacy is known to have a crucial impact on student motivation, persistence, and academic performance in general and language learning in particular (Al-khresheh, 2024). Though the influence of digital technologies on student engagement, self-efficacy, and academic achievement has been studied, the interconnections between the three concepts are not well described in contemporary literature.

While the research on digital platforms' educational value increases, empirical data on how this technology affects language capabilities is limited. Most studies explored the direct impact of technology on academic outcomes but did not analyze the effects of psychological and behavioral factors (Meng et al., 2023). Moreover, the effectiveness of digital learning platforms depends on the students' education level, as learners demonstrate different cognitive characteristics, preferences, and tech skills depending on their education level (Liu, Darvin & Ma, 2025). As a result, education level might affect the relationship between the use of digital platforms and language skills development. The analysis of the above issues is necessary, as there is the growing interest in the use of technology in education (Jovanović & Milosavljević, 2022). An elaborate exploration of mediation and moderation mechanisms will lead to better understanding of how students benefit from the use of digital learning opportunities.

Based on this, the current research study explores the impact of the use of digital learning platforms on language skills development among students while also focusing on the direct influence of engagement and self-efficacy along with the moderation role of the educational level. Since the present research relies on the information gathered from the respondents, the study makes it possible to assess the causes of both direct and indirect relationships among the above-mentioned variables to give a full account of language skills development in the context of digital learning. In particular, the aim of this study is to determine if the use of digital learning platforms contributes to the development of language skills and whether engagement and self-efficacy are the crucial factors for explaining these causes as well as if the educational level serves to modify these interrelationships. By bringing together the technological, psychological, and educational dimensions of the issue, this research study adds to the existing body of knowledge on digital education and provides practitioners with the necessary information on how to make the most of digital learning technologies in the area of language development.

2. Review of Literature

Digital learning platforms play a vital role in increasing the level of student engagement in an interactive, comfortable, and student-centered way (Fathi & Rahimi, 2026). Student engagement includes behavioral, cognitive, and emotional involvement in the learning process. According to the theory of constructivism, technology-enhanced learning platforms help learners to construct knowledge actively (Matsieli & Mutula, 2024). Considering using such characteristics as multimedia tools, gamification, interactive discussion boards, and instant feedback, learners get interested in the improvement of the engagement level. Research done in the past testified that digital learning environments made learning much more engaging and entertaining (Hossain, 2024). Additionally, digital learning platforms provide learners with more freedom and learner-centricity, which makes them engage in the learning process. In the context of language learning, having engaged learners is essential.

H1: Use of digital learning platforms positively influences student engagement.

Self-efficacy implies people's beliefs in their capability to execute particular actions successfully and attain the anticipated success (Al-khresheh, 2024). The principles of the Social Cognitive Theory assert that self-efficacy arises with the help of experiential learning, social involvement and provided feedback. Students can gain success thanks to digital learning platforms that implement techniques of personalized learning, practice supervision and immediate feedback mechanisms (Law, 2024). The obtained experience boosts the learners' self-assurance regarding academic performance. Prior research indicates that the context of technology-enhanced learning boosts students' self-efficacy as due to technological advancements the learners manage the process of learning independently and track their performance (Liu et al., 2025). Furthermore, students get acquainted with the environments that provide them with security and freedom to repeat their actions and practice without fear of retribution (Yang et al., 2026). In the process of learning a foreign language, higher self-efficacy can promote students' communicative engagement.

H2: Use of digital learning platforms positively influences student's self-efficacy.

The fact that student engagement is a key factor when it comes to students' success and learning effectiveness has been recognized for many years (Zamiri & Esmaeili, 2024). Students who are engaged show a higher level of attention, participation, motivation, and persistence in the completion of their educational tasks. According to active learning theories, meaningful learning happens only when students act cognitively and behaviorally (Noor et al., 2022). In language studies, engagement is connected with the development of reading, writing, speaking, and listening skills that are essential for the language learning process (Kohnke, Moorhouse & Zou, 2023). Research shows that students who are highly engaged in study are likely to spend more time interacting with learning materials, talking to peers, and taking part in classroom conversations (Shadiev & Wang, 2022). Therefore, this means that effective learning leads to sufficient language exposure and skills building. Besides, those who are emotionally engaged will be more interested and confident in the process of learning a language.

H3: Student engagement positively influences language skills development.

The concept of self-efficacy is crucial in determining students' academic performance, motivation, and success (Ng et al., 2023). According to the Social Cognitive Theory, people with a solid sense of self-efficacy tend to willingly accept difficult challenges, strive to maintain their efforts when times get tough and make use of appropriate strategies for learning. In terms of language learning, self-efficacy gives rise to students interested in practicing their language skills and prepared to put in their best efforts (Halkiopoulou & Gkintoni, 2024). It has been revealed that students with high levels of self-efficacy exhibit good results in reading comprehension, writing, speaking, and listening. They also manage to overcome problems related to learning languages better than their peers (Kohnke et al., 2023). In addition, self-efficacy can also serve as the key factor affecting motivation, which involves achievement (Liu & Ma, 2024). As language acquisition process requires continuous practice and perseverance, students with high self-efficacy level are more likely to learn languages well.

H4: Students' self-efficacy positively influences language skills development.

By using modern technological virtual learning environments with multiple options for learning activities, language learning education has obtained a new meaningful dimension (Ait Baha et al., 2024). It can be considered as a educational breakthrough because such platforms aim at an all-encompassing process of language acquisition through multimodal tools and inventive methods. According to Technology Acceptance Model, effective technologies can lead to successful learning due to their availability and usage. Digital technologies in language learning practice have given the chance for students to practice their reading, writing, speaking and listening skills during the process of learning through communicative engaging activities (Tzafilkou, Perifanou & Economides, 2023). The results from previous studies confirm that technology use is positively correlated with language proficiency level due to the efficiency of digital means in acquiring vocabulary and improving communication skills and language performance overall (Sofi-Karim et al., 2023). Also, virtual/online learning environments support non-stop learning processes, getting rid of the limits of space and time. Thus, by employing digital formats for learning, students can reach a higher level of language accomplishment.

H5: Use of digital learning platforms positively influences language skills development.

The educational background of learners is a key contextual factor that could determine the effectiveness of digital education (Mikroyannidis et al., 2023). Various educational levels usually mean different developmental levels, technological skills, learning autonomy, and practical experience. Educated individuals are believed to have better self-discipline and are more familiar with technologies (Hossain, 2024). Thus, they may have an advanced understanding of digital technologies and may use their features to achieve successful educational results. The reviewed literature indicates that effectiveness of educational tools may depend on such factors as age and educational context of learners, since learners differ in their learning potential and needs of support (Gabriel et al., 2022). Thus, advanced learners in a foreign language context could benefit from digital resources more since they are more adept in learning independently and interacting with the content.

H6: Educational level moderates the relationship between use of digital learning platform and language skills development.

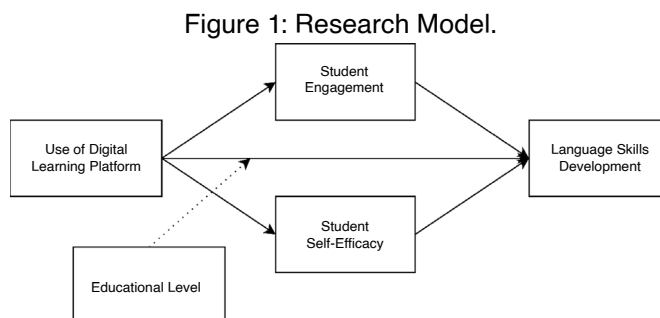
Student engagement is commonly regarded as a crucial link between the use of educational technology and learning outcomes (Alieto et al., 2024). Digital learning platforms provide interactive experiences that result in students' behavioral, emotional, and cognitive engagement in learning. Engaged students tend to be more active, invest more effort, and maintain persistence in their tasks. Existing studies indicate that technology does not enhance the results directly, but rather its impact is usually mediated through engagement (Hasumi & Chiu, 2024). The role of engagement in language learning is that it makes learners practice, cooperate and communicate frequently, which results in language proficiency. Thus, digital learning platforms enhance engagement, which, in turn, facilitates the development of language skills (Muftah, 2022). This viewpoint aligns with the engagement theory, which describes active engagement as a way in which learning technologies bring educational benefits to learners (Mah & Groß, 2024). Hence, it is anticipated that student engagement will act as a mediator in the relationship between the use of the digital learning platform and mastering language skills.

H7: Student engagement mediates the relationship between use of digital learning platforms and language skills development.

The concept of student self-efficacy also constitutes another important psychological mechanism for the impact of digital platforms on educational results (Zou et al., 2025). The digital environment makes it possible for learners to complete tasks, get instant feedback and enjoy tailored educational experiences, all of which helps to build confidence in one's own ability (Salas-Pilco, Yang & Zhang, 2022). According to the Social Cognitive Theory of Albert Bandura, self-efficacy is related to increased levels of motivation, perseverance, and academic performance. Past studies have shown that information and communication technologies help improve educational outcomes by promoting positive attitudes toward personal competence (Meng et al., 2023). In language learning situations, self-efficacy allows students to speak actively and boldly, use the new language forms unreservedly, and withstand learning difficulties (Alenezi, 2023). As a result, the advantages of digital education are not just direct but also creative, thanks to the enhanced self-efficacy. In the case of students with a heightened sense of self-efficacy who receive digital education, it can be expected that they will attain better language competence in the future.

H8: Student self-efficacy mediates the relationship between use of digital learning platform and language skills development.

The research model of this study is illustrated in Figure 1.



3. Methodology

The research employed a quantitative approach and cross-sectional survey design in order to investigate the relationship between digital learning platforms and the students' engagement, students' self-efficacy, educational level, and language skills development. The choice of the quantitative design was justified as the goal of the research was to test theoretical hypotheses and establish causal relationships of several constructs through the statistical analysis. The model proposed indicated direct and indirect effects including mediating and moderating mechanisms sought by the researcher. Cross-sectional design enabled the researchers to survey many respondents on one occasion, thus making it easier to explore how students felt and what experience they were provided (Sekaran & Bougie, 2016). The sample of respondents eliminated the students who did not use digital learning platform as a form of language learning. Since students who experience technology enhanced learning environment are the most relevant ones regarding the investigation of the efficiency of such platforms, the study included secondary level students so that it was possible to observe the influence of education level as the moderating variable.

In a bid to ensure proper representation of students across educational level, a stratified random sampling technique was used. The study's population was divided into two major strata, namely male students as well as female students. The respondents were picked from each stratum in proportions so as to enhance representation and minimize sampling bias. It should be noted that stratified random sampling method increased the chances of ensuring that the sample represented adequately differences in educational experience and use of technology across levels of schooling. This method was also apt for testing moderation effects involving educational level. The data was collected based on the use of a structured questionnaire that was administered using an online survey tool. The questionnaire was composed of closed ended items that were measured in a seven-point Likert scale starting from 1 (strongly disagree) to 7 (strongly agree). The instrument had five main constructs, namely, use of digital learning platforms, student engagement, student self-efficacy, educational level and language skills development. At each stage, all measurement items were adopted from known literature and adjusted so as to fit the context of digital language learning.

Before the primary data collection stage, specialists in the subject area, as well as education researchers, audited the questionnaire for content validity and clarity. A preliminary testing of the instrument was run with a group of students to detect potential areas of ambiguity and improve the wording of survey items. After having received the necessary official permission, the research team sent the links to the questionnaire to participate in schools. Students were let know about the study's purposes, the confidentiality of their responses, and their voluntary participation. The survey was open for about six weeks so that respondents would have enough time to complete the questionnaire.

Out of 450 questionnaires sent to eligible students of concerned institutions, 421 forms were filled and received back by the end of data collection. After the check for incomplete replies, missing data, and discrepancies in the answers, 9 questionnaires were removed from the databank. Thus, the final database contained 412 questionnaires that were taken into consideration during the analysis, which gives a response rate equal to 91.6%. The size of the sample is above the required number for multivariate statistics and hypothesis testing. There were no empty respondents recorded in the

data collected. According to the descriptive stats, all of the statistics were used, with a total of 412 valid answers recorded for all variables in the research. The distributions were acceptable as well.

The gathered information was analyzed with the help of JASP statistical software (Murad, Othman & Kamarudin, 2024). There were several stages of data analysis to get the essential examination of the model and hypotheses. The first stage of data analysis was the preparation of the descriptive statistics tables. The next step was the use of Pearson's correlation to find the connection between the variables. Third, multiple regression analysis was conducted to examine the direct effects hypothesized in H1 through H6. Finally, mediation analyses were conducted using the bootstrapping procedure available in JASP to assess the indirect effects of student engagement and student self-efficacy.

4. Data Analysis and Results

This study highlights the characteristics of the participants. Out of 412 respondents, 214 are females (51.9%) and 198 are males (48.1%). In terms of their age distribution, most respondents are 17 years old (37.4%) followed by those that are 18 (34.0%) and those who are 16 years old (28.6%). Looking at the academic level of students, Grade 11 students are the biggest group (34.5%) compared to Grade 10 students (33.5%) and Grade 12 students (32.0%). In terms of their experience with digital learning systems, 36.2% of them have been using these systems for the last one to two years while 26.9% have been using them for three to four years. Majority of students use these systems actively with 33.7% of them using the system five to six times a week and 26.5% of them using it daily. All these demographics are shown in Table 1.

Table 1: Demographics.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	198	48.1
	Female	214	51.9
Age Group	16 years	118	28.6
	17 years	154	37.4
	18 years	140	34
Grade Level	Grade 10	138	33.5
	Grade 11	142	34.5
	Grade 12	132	32
Duration of Digital Learning Platform Use	Less than 1 year	74	18
	1–2 years	149	36.2
	3–4 years	111	26.9
	More than 4 years	78	18.9
Frequency of Platform Use per Week	1–2 times	56	13.6
	3–4 times	108	26.2
	5–6 times	139	33.7
	Daily	109	26.5
Total		412	100

Additionally, the study provides descriptive statistics based on 412 valid members of the sample, which means that we obtained no missing data. The means vary from 4.425 to 4.833 on the 7-point scale, which shows positive perceptions of respondents

about digital platforms used for learning, student engagement, self-efficacy, educational status, and language skill development. In terms of the means, the highest mean is associated with self-efficacy ($M=4.833$, $SD=1.062$), while engagement ranks second ($M=4.701$, $SD=1.047$) and language skill development the third ($M=4.607$, $SD=1.009$). The standard deviation differs from 1.009 to 1.066.

The skewness and kurtosis of the values are, respectively, -0.111 and 0.131 , and -0.344 and 0.531 , which means that all values lie within the interval ± 2 and are therefore approximately normally distributed (Sekaran & Bougie, 2016). Besides, the minimum and maximum values suggest that respondents managed to use the 7-point scale fully. The descriptive statistics demonstrate positive attitudes of respondents and allow concluding that results meet the requirements for further correlation, regression, moderation, and mediation analyses. The findings are presented in Table 2.

Table 2: Descriptive Statistics.

Statistic	UDLP	SE	SSE	EL	LSD
Valid	412	412	412	412	412
Missing	0	0	0	0	0
Mean	4.425	4.701	4.833	4.563	4.607
Std. Deviation	1.014	1.047	1.062	1.066	1.009
Skewness	-0.111	0.071	-0.041	0.131	0.049
Std. Error of Skewness	0.120	0.120	0.120	0.120	0.120
Kurtosis	0.531	-0.145	-0.344	-0.316	0.058
Std. Error of Kurtosis	0.240	0.240	0.240	0.240	0.240
Minimum	1.000	2.000	2.000	2.000	2.000
Maximum	7.000	7.000	7.000	7.000	7.000
UDLP = Use of Digital Learning Platforms, LSD = Language Skills Development, SE = Student Engagement and SSE = Student Self-Efficacy					

Accordingly, the study also presents the Pearson correlation coefficients among the study variables (Benesty et al., 2009). The results indicate that all relationships are positive and statistically significant at the 0.001 level, suggesting that increases in one variable are associated with increases in the related variable. The use of digital learning platforms (UDLP) exhibited a significant positive relationship with student engagement (SE) ($r = 0.590$, $p < .001$), student self-efficacy (SSE) ($r = 0.599$, $p < .001$), educational level (EL) ($r = 0.516$, $p < .001$), and language skills development (LSD) ($r = 0.544$, $p < .001$). These findings suggest that greater use of digital learning platforms is associated with higher levels of engagement, self-efficacy, and language skills development among students.

Student engagement was positively correlated with student self-efficacy ($r = 0.583$, $p < .001$), educational level ($r = 0.567$, $p < .001$), and language skills development ($r = 0.541$, $p < .001$). Similarly, student self-efficacy demonstrated significant positive relationships with educational level ($r = 0.640$, $p < .001$) and language skills development ($r = 0.568$, $p < .001$). Notably, the strongest correlation was observed between student self-efficacy and educational level ($r = 0.640$, $p < .001$), indicating a strong association between these constructs. Accordingly, the correlation coefficients ranged from 0.516 to 0.640, indicating moderate to strong positive relationships among all variables. Since none of the correlations exceeded the threshold of 0.80, multicollinearity is unlikely to be a concern. The findings are reported in Table 3.

Table 3: Pearson Correlations.

Variable	Correlated Variable	n	Pearson's r	p	Lower 95% CI	Upper 95% CI	Covariance
UDLP	SE	412	0.590***	< .001	0.523	0.649	0.626
UDLP	SSE	412	0.599***	< .001	0.534	0.658	0.646
UDLP	EL	412	0.516***	< .001	0.442	0.584	0.558
UDLP	LSD	412	0.544***	< .001	0.472	0.609	0.557
SE	SSE	412	0.583***	< .001	0.516	0.644	0.648
SE	EL	412	0.567***	< .001	0.498	0.629	0.633
SE	LSD	412	0.541***	< .001	0.469	0.606	0.571
SSE	EL	412	0.640***	< .001	0.579	0.694	0.725
SSE	LSD	412	0.568***	< .001	0.498	0.63	0.608
EL	LSD	412	0.570***	< .001	0.501	0.632	0.614
UDLP = Use of Digital Learning Platforms, LSD = Language Skills Development, SE = Student Engagement and SSE = Student Self-Efficacy							

The model summary was tested in this study and can be seen in Table 4. As per the results of this analysis, it was found that the model produced an R value of 0.678 which refers to the positive correlation among predictor variables and Language Skill Development (LSD). R^2 of 0.460 refers to the 46.0 percent variance in Language Skill Development explained through the use of digital learning platforms, students' engagement, students' self-efficacy, educational level, and interaction effect. The Adjusted R^2 of 0.453 is close enough to the R^2 value which means that the model still holds a good explaining power when it comes to the number of predictors included in the model. Additionally, the model resulted in the decrease in forecasting error shown by the RMSE falling from 1.009 in the null model (M_0) to 0.746 in the fitted model.

Table 4: Model Summary.

Model	R	R^2	Adjusted R^2	RMSE
M_0	0.000	0.000	0.000	1.009
M_1	0.678	0.460	0.453	0.746

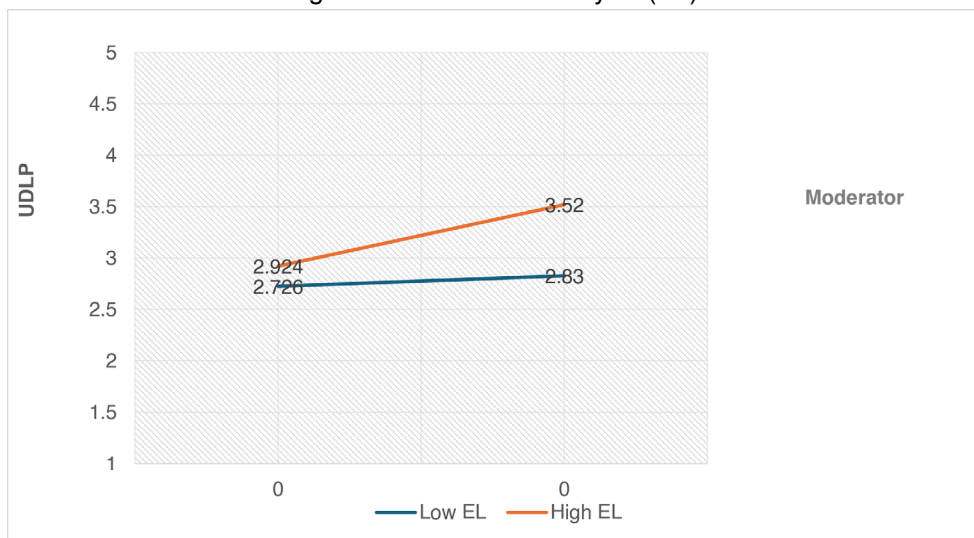
Moreover, ANOVA findings are presented in Table 5. The findings provide that regression analysis model is significant ($F(5, 406) = 69.12$, $p < .001$), which implies that the regression variables together have significant power in explaining variability in language learning. Regression sum of squares ($SS = 192.3$) is higher than it was presumably, while the residual sum of squares (226.0) corresponds to a variance that can't be explained. Mean square regression (38.469) exceeds mean square residual (0.557) substantially; thus, the resulting value of F is considerably big. Since the significance level is lower than 0.001, it is reasonable to reject a null hypothesis that means that the coefficients are equal to zero. Thus, the variables used in the analysis affect language acquisition.

Table 5: Analysis of Variance.

Model	Source	Sum of Squares	df	Mean Square	F	p
M_1	Regression	192.3	5	38.469	69.12	< .001
	Residual	226	406	0.557	—	—
	Total	418.3	411	—	—	—

In addition, the study performed a regression analysis on this data. The results of the regression analysis suggest that all six hypotheses of direct relationships were verified: the use of digital learning platforms (UDLP) significantly and positively affected students' engagement ($\beta = 0.318$, $p < .001$), and self-efficacy ($\beta = 0.382$, $p < .001$) (H1, H2). This means that the more often UDLP is applied, the more engaged and confident students are in their studies. At the same time, student engagement positively and significantly influenced the language skills development ($\beta = 0.149$, $p = .003$) while student self-efficacy had its substantial positive impact on language skills development, too ($\beta = 0.160$, $p = .003$), which supported H3 and H4. Moreover, the use of digital learning platforms had a direct impact on language skills development ($\beta = 0.175$, $p < .001$), which confirms H5. It is worth noting that self-efficacy turned out to be the most significant variable among the direct variables of the study. Lastly, the interaction term between the use of digital learning platforms and education level significantly influenced language skills development ($\beta = 0.123$, $p = .010$), confirming H6 and supporting the claim that education level has a moderating impact on the relationship between these two variables.

Figure 2: Moderation Analysis (H6).



UDLP = Use of Digital Learning Platforms, LSD = Language Skills Development and EL = Educational Level.

At the same time, the study conducted a mediation analysis test. The findings demonstrated that the use of the digital learning platform is mediated by student engagement with a significant outcome ($\beta = 0.137$, $t = 4.477$, $p < .001$). The 95% confidence interval ranged from 0.077 to 0.197 and did not include zero which signifies the meaningfulness of indirect influence. Thus, H7 is supported. Likewise, the impact of digital learning platform use on the language skills development is mediated by student self-efficacy ($\beta = 0.175$, $t = 5.443$, $p < .001$). The confidence interval (0.112, 0.238) does not include zero proving the significant mediation effect. As a result, H8 also finds support (see Table 7).

Table 6: Regression Path Findings.

Model	Predictor	Outcome	Unstandardized Coefficient	Standard Error	Standardized Coefficient	t	p
H1	UDLP	SE	0.306	0.046	0.318	6.677	< .001
H2	UDLP	SSE	0.363	0.045	0.382	8.031	< .001
H3	SE	LSD	0.144	0.049	0.149	2.942	0.003
H4	SSE	LSD	0.152	0.051	0.160	2.960	0.003
H5	UDLP	LSD	0.175	0.050	0.175	3.477	< .001
H6	UDLP × EL	LSD	0.123	0.048	0.123	2.592	0.010
UDLP = Use of Digital Learning Platforms, LSD = Language Skills Development, SE = Student Engagement, SSE = Student Self-Efficacy and EL = Educational Level							

Table 7: Mediation Analysis.

Hypothesis	Indirect Path	Estimate	Std. Error	t-value	p	Lower 95% CI	Upper 95% CI
H7	UDLP → SE → LSD	0.137	0.031	4.477	< .001	0.077	0.197
H8	UDLP → SSE → LSD	0.175	0.032	5.443	< .001	0.112	0.238
UDLP = Use of Digital Learning Platforms, LSD = Language Skills Development, SE = Student Engagement and SSE = Student Self-Efficacy							

5. Discussion and Conclusion

This research indicates that digital learning platforms impact student engagement to a large extent ($\beta = 0.318$, $p < .001$), supporting H1. This means that students who actively participate in digital learning platforms are highly engaged cognitively, emotionally, and behaviorally. The implication of this relation is that digital technologies manage to create engaging learning conditions, prompting students to actively participate in the learning process (Matsieli & Mutula, 2024). The idea is in accordance with constructivist learning theory, which stresses the importance of learner involvement in the process of the construction of knowledge. Digital learning platforms provide students with multimedia content, communication forums, operational tasks, and activities, thereby creating possibilities for them to engage in learning (Shadiev & Wang, 2022). These features make the process of learning much more active for students, who now play an active role in the learning process instead of being just passive receivers of information. Immediate feedback and personalized learning experiences can further motivate students to be actively engaged in the learning process (Zou et al., 2025). The results correspond to previous educational technology studies which proved digital platforms as facilitators for increasing active involvement in education (Alenezi, 2023). Therefore, digital learning platforms appear to play a crucial role in fostering engagement, which represents an essential condition for effective language learning and academic success.

The outcomes indicate that digital learning platforms significantly enhance the self-efficacy of students ($\beta = 0.382$, $p < .001$), confirming H2. The correlation found in this case is among those with the most robust direct influence in the present investigation, which implies that digital learning experiences contribute considerably to enhancing students' self-assurance in terms of their educational capabilities. The importance of the discovered effect can be understood utilizing the framework of Social Cognitive Theory, which asserts that self-efficacy emerges due to experiences of successfully accomplishing various tasks, receiving positive feedback, and mastering skills (Hasumi

& Chiu, 2024). Using digital learning platforms provides learners with timely feedback, opportunities for individualized training, and ongoing performance evaluation that help students track their results (Zamiri & Esmaeili, 2024). By mastering certain tasks in the framework of online learning, learners increase their self-confidence concerning their academic endeavors. Additionally, digital environments often reduce the stress caused by traditional classes, as they give learners more independence in the learning, allowing them to return to the material whenever they want (Jovanović & Milosavljević, 2022). This is extremely valuable in the context of language learning because confidence is one of the vital aspects of communication, the expression of thoughts, or practicing unknown languages for students (Liu & Ma, 2024). Consequently, the findings suggest that digital learning platforms not only provide instructional support but also develop important psychological resources that enhance learning effectiveness and improve students' readiness to engage with language related tasks.

The outcomes of this study demonstrate that there is a positive relation between the level of student engagement and the development of foreign language skills ($\beta = 0.149$, $p = .003$) thus supporting the statement made in Hypothesis 3. Even though it should be noted that the effect is moderate, the results indicate that the engaged language learners generally benefit more than those who are not engaged in educational processes. This is in line with the theory of active learning as the latter suggests that fruitful learning process takes place only when students are interested and involved in learning activities (Tzafilkou et al., 2023). Engagement enhances the amount of attention, efforts and persistence applied to the tasks undertaken. In the realms of foreign language acquisition, engaged students are expected to read texts more attentively, join discussions, practice speaking and do written assignments (Chowdhury et al., 2024). It is an indication that various types of communicative situations provide students with the repeated use of structures and vocabulary that are vital for successful language acquisition (Dilekçi & Karatay, 2023). By fostering engagement, schools can create conditions that support continuous language practice and long term linguistic development.

According to the study's findings, self-efficacy in students significantly impacts the provision of language skills ($\beta = 0.160$, $p = .003$). The positive relationship implies that students with high self-efficacy demonstrate better language learning achievements. This concept is related to the Social Learning Theory, according to which self-efficacy is seen as an important construct for the development of motivation, success, and persistence. Students with self-efficacy tend to complete learning tasks successfully, as they are more willing to face challenges, make attempts to overcome difficulties, and utilize successful learning techniques (Muftah, 2022). These characteristics are especially significant in the field of language learning, as success in this sphere requires students to constantly practice doing various activities (Law, 2024). Students with such self-efficacy do not hesitate to take part in various activities that involve communication, learn and use new words, and take active participation in reading and writing. This is how self-efficacious students see difficulties in learning language as challenges they can overcome and learn from mistakes. Moreover, self-efficacy creates a high level of intrinsic motivation in language learners, thus supporting the process of learning for a long time (Sayed et al., 2023). The results prove that self-efficacy is an important factor affecting language learning.

The findings illustrate that the utilization of digital learning platforms has an important positive influence on language skills learning ($\beta = 0.175$, $p < .001$), thus giving grounds for acceptance of hypothesis H5. This fact indicates that students who constantly use digital learning platforms report higher gains in the language competency formation. The results are also in line with the Technology Acceptance Model and literature on educational technologies, which state that useful technology tools can increase learning efficiency (Salas-Pilco et al., 2022). Digital learning platforms ensure students' access to multimedia materials, interactive tasks, language software, and communication tools for the purposes of practicing reading, writing, and speaking skills (Ng et al., 2023). Moreover, these platforms open unprecedented possibilities for the learners with respect to learning in the course of their everyday life outside of the classroom. The importance of this correlation means that the advantages of digital technologies go beyond learner satisfaction and engagement (Mah & Groß, 2024). Digital platforms provide learners with measurable improvements in language learning outcomes (Akour & Alenezi, 2022). The results emphasize that technology-enhanced learning environments are becoming more and more advantageous in modern education, providing one with the possibility to integrate digital platforms into language teaching process.

The results indicate that educational attainment plays an important moderating role in the relationship between digital platform use and language skills acquisition ($\beta = 0.123$, $p = .010$), which confirms Hypothesis 6. This observation implies that the success of digital platforms to foster language skills varies depending on students' education. In particular, a more positive impact of the use of digital platforms for language skills development is observed in students with higher education (Ait Baha et al., 2024). It can be assumed that students with higher education demonstrate a higher level of cognition, larger freedom in learning, and greater levels of digital literacy that will help them in their digital learning endeavors academically. Higher educational level entails more independence in learning and greater self-regulation (Yang et al., 2026). Moreover, it can be seen that educational attainment is an important contextual condition for the use of technology in learning. It can be argued that students with lower levels of education need more guidance and support in learning (Gabriel et al., 2022). Furthermore, faculty of higher education are less dependent than other levels of education in using digital resources (Nie, 2023). Thus, educational institutions should take into consideration the needs of their students when employing digital resources in education. Tailoring digital learning strategies according to educational level may improve the effectiveness of technology enhanced language instruction and maximize learning outcomes.

The mediation analysis results show that student engagement significantly mediates the connection between the use of digital platforms for learning and language skills development $\alpha = 0.137$, $t = 4.477$, $p < .001$, hence supporting H7. This result implies that digital learning platforms affect language skills development not only directly in terms of instructional value but also through increasing students' engagement in the learning process (Halkiopoulos & Gkintoni, 2024). The outcome provides empirical proof of the assertion that engagement is an important behavioral mechanism that connects the usage of technology with educational results. When students use digital learning platforms, their involvement in learning activities increases, thus contributing to their language skills (Liu & Ma, 2024). The finding supports the engagement theory, thus claiming that active involvement is one of the paths for achieving positive educational results. The interactivity in such digital platforms as multimedia, collaborative learning platforms,

and gamification contributes to the increase of students' motivation and involvement and thus results in more effective language learning (Huang, Wang & Zhang, 2024). Therefore, the value of digital learning technologies in education rests partly upon their ability to engage students. The results suggest that educators need to focus on creating attractive digital learning experience for students to support language development.

It has been shown that student confidence is a strong mediator between the use of the digital platform and language skills development ($\beta = 0.175$, $t = 5.443$, $p < .001$), thus confirming H8. The result of the indirect effect is statistically significant, as the confidence interval does not include zero, confirming the role of self-efficacy as a mediator. This indicates that the usefulness of digital platforms in the development of language skills lies in improving the students' confidence in their abilities (Fathi & Rahimi, 2026). Students develop their self-efficacy through the processes of effective learning, positive feedback received from the environment and possibility to advance according to their own learning pace (Kohnke et al., 2023). Thus, the use of digital learning platforms strengthens students' efficacy perceptions and contributes to their success in learning the language. The results are consistent with the principles of social cognitive theory, which states that self-efficacy is critical for learning behavior and performance (Noor et al., 2022). Students with high self-efficacy exhibit more persistence, motivation, willingness to engage in language activities. They are also more eager to participate in conversation practices, cope with difficulties posed by complicated assignments, and continue their learning despite challenges (Medvedeva et al., 2022). Therefore, the psychological advantages provided by the digital learning platform lead to language learning outcomes. Therefore, strengthening self-efficacy should be considered a key objective in the design and implementation of digital language learning environments.

5.1. Theoretical Implications

This research aims at making a contribution to the field of technology-enhanced learning by presenting a comprehensive framework that describes the process of how e-learning platforms impact the learners' achievement in terms of acquiring language skills through both direct and indirect methods. The results demonstrate that self-efficacy theory is being expanded, as the role of self-efficacy as a psychological mechanism connecting the use of e-learning platforms and success in learning languages has been established. In addition, engagement theory is developed through the discovery of the critical role of engagement in the process of acquiring languages through e-learning tools. The current findings point out the importance of self-efficacy and the role of students' beliefs in their capabilities in improving their learning outcomes. The results also highlight the importance of taking into consideration the level of education for evaluating the effectiveness of technology acceptance and e-learning, as well as how technology and e-learning differ in terms of effectiveness depending on the educational stage. Collectively, these findings contribute to theory by integrating technological, psychological, behavioral, and contextual perspectives into a comprehensive model of language skills development.

5.2. Practical Implications

The outcomes provide significant implications for teachers, school leaders, course authors, and lawmakers interested in enhancing learning results through

technology. Firstly, the significant positive correlation between the use of digital learning technologies and the mastery of language suggests that educational entities should keep on investing in high quality digital learning infrastructure. A reasonable solution would be for schools to use digital technologies in language education since this would allow students to have interactive education experiences outside the classroom. Secondly, since student engagement plays a notable mediating role in the association of digital learning technology use with language learning development, it is wise for educators to create learning tasks encouraging students' active engagement in the learning process. To this aim, it is advisable to incorporate gamified tasks, collaborative projects, online discussion groups, multimedia materials, and instant feedback in the learning process. Thirdly, the important role of self-efficacy in leading to learning success indicates the need for teachers to create an encouraging learning environment conducive to building students' confidence. In this context, teachers should give students constructive feedback and assign them tasks of the right level of difficulty. Younger learners may require greater guidance and structured support, whereas students at higher educational levels may benefit from more autonomous and advanced digital learning experiences. Such differentiated approaches can maximize the educational benefits of digital learning platforms across diverse learner groups.

5.3. Limitations and Future Directions

Even though it offers important insights concerning the connections between digital learning platform usage, student engagement, self-efficacy, education level, and language proficiency development, there are some limitations to the provided research. The study is characterized by a cross-sectional research design, which creates obstacles to revealing causal relationships between the observed variables. The results reflect correlations only at a particular moment and cannot reveal variations in student attitudes. Furthermore, the research relies on data collected through a self-devised questionnaire that can be influenced by common method bias, social desirability bias, and subjective interpretation of the questions by the respondents. Moreover, the sample consists of students from a particular education sector, which can limit the transferability of the findings to other locations, jurisdictions, or cultures. Finally, although the proposed model explained a significant part of the variance in the development of language skills, several influencing variables such as motivation, digital literacy, teacher assistance, learning techniques, and socio-economic status were not mentioned. Future studies need to involve longitudinal or experimental modes of research to provide more solid evidence of causality. It would also be beneficial to examine some additional variables related to this topic. Furthermore, comparative studies across different countries, educational levels, and learning environments can enhance the external validity of the findings and provide broader implications for digital education practices.

References

- Ait Baha, T., El Hajji, M., Es-Saady, Y. & Fadili, H. (2024). The impact of educational chatbot on student learning experience. *Education and Information Technologies*, 29(8), pp. 10153–10176. doi: <https://doi.org/10.1007/s10639-023-12166-w>

- Akour, M. & Alenezi, M. (2022). Higher Education Future in the Era of Digital Transformation. *Education Sciences*, 12(11), pp. 784. doi: <https://doi.org/10.3390/educsci12110784>
- Al-khresheh, M. H. (2024). Bridging technology and pedagogy from a global lens: Teachers' perspectives on integrating ChatGPT in English language teaching. *Computers and Education: Artificial Intelligence*, 6, pp. 100218. doi: <https://doi.org/10.1016/j.caeai.2024.100218>
- Alenezi, M. (2023). Digital Learning and Digital Institution in Higher Education. *Education Sciences*, 13(1), pp. 88. doi: <https://doi.org/10.3390/educsci13010088>
- Alieto, E., Abequibel-Encarnacion, B., Estigoy, E., Balasa, K., Eijansantos, A. & Torres-Toukourmidis, A. (2024). Teaching inside a digital classroom: A quantitative analysis of attitude, technological competence and access among teachers across subject disciplines. *Heliyon*, 10(2), pp. e24282. doi: <https://doi.org/10.1016/j.heliyon.2024.e24282>
- Benesty, J., Chen, J., Huang, Y. & Cohen, I. (2009). Pearson Correlation Coefficient. In I. Cohen, Y. Huang, J. Chen, & J. Benesty (Eds.), *Noise Reduction in Speech Processing* (pp. 1–4). Springer Berlin Heidelberg. doi: https://doi.org/10.1007/978-3-642-00296-0_5
- Chowdhury, M., Dixon, L. Q., Kuo, L.-J., Donaldson, J. P., Eslami, Z., Viruru, R., et al. (2024). Digital game-based language learning for vocabulary development. *Computers and Education Open*, 6, pp. 100160. doi: <https://doi.org/10.1016/j.caeo.2024.100160>
- Dilekçi, A. & Karatay, H. (2023). The effects of the 21st century skills curriculum on the development of students' creative thinking skills. *Thinking Skills and Creativity*, 47, pp. 101229. doi: <https://doi.org/10.1016/j.tsc.2022.101229>
- Fathi, J. & Rahimi, M. (2026). Utilising artificial intelligence-enhanced writing mediation to develop academic writing skills in EFL learners: a qualitative study. *Computer Assisted Language Learning*, 39(1-2), pp. 263–302. doi: <https://doi.org/10.1080/09588221.2024.2374772>
- Gabriel, F., Marrone, R., Van Sebille, Y., Kovanovic, V. & de Laat, M. (2022). Digital education strategies around the world: practices and policies. *Irish Educational Studies*, 41(1), pp. 85–106. doi: <https://doi.org/10.1080/03323315.2021.2022513>
- Halkiopoulos, C. & Gkintoni, E. (2024). Leveraging AI in E-Learning: Personalized Learning and Adaptive Assessment through Cognitive Neuropsychology—A Systematic Analysis. *Electronics*, 13(18), pp. 3762. doi: <https://doi.org/10.3390/electronics13183762>
- Hasumi, T. & Chiu, M.-S. (2024). Technology-enhanced language learning in English language education: Performance analysis, core publications, and emerging trends. *Cogent Education*, 11(1), pp. 2346044. doi: <https://doi.org/10.1080/2331186X.2024.2346044>
- Hossain, K. I. (2024). Reviewing the role of culture in English language learning: Challenges and opportunities for educators. *Social Sciences & Humanities Open*, 9, pp. 100781. doi: <https://doi.org/10.1016/j.ssaho.2023.100781>
- Huang, F., Wang, Y. & Zhang, H. (2024). Modelling Generative AI Acceptance, Perceived Teachers' Enthusiasm and Self-Efficacy to English as a Foreign Language Learners' Well-Being in the Digital Era. *European Journal of Education*, 59(4), pp. e12770. doi: <https://doi.org/10.1111/ejed.12770>

- Jovanović, A. & Milosavljević, A. (2022). VoRtex Metaverse Platform for Gamified Collaborative Learning. *Electronics*, 11(3), pp. 317. doi: <https://doi.org/10.3390/electronics11030317>
- Kohnke, L., Moorhouse, B. L. & Zou, D. (2023). Exploring generative artificial intelligence preparedness among university language instructors: A case study. *Computers and Education: Artificial Intelligence*, 5, pp. 100156. doi: <https://doi.org/10.1016/j.caeai.2023.100156>
- Law, L. (2024). Application of generative artificial intelligence (GenAI) in language teaching and learning: A scoping literature review. *Computers and Education Open*, 6, pp. 100174. doi: <https://doi.org/10.1016/j.caeo.2024.100174>
- Liu, G. & Ma, C. (2024). Measuring EFL learners' use of ChatGPT in informal digital learning of English based on the technology acceptance model. *Innovation in Language Learning and Teaching*, 18(2), pp. 125–138. doi: <https://doi.org/10.1080/17501229.2023.2240316>
- Liu, G. L., Darwin, R. & Ma, C. (2025). Exploring AI-mediated informal digital learning of English (AI-IDLE): a mixed-method investigation of Chinese EFL learners' AI adoption and experiences. *Computer Assisted Language Learning*, 38(7), pp. 1632–1660. doi: <https://doi.org/10.1080/09588221.2024.2310288>
- Mah, D.-K. & Groß, N. (2024). Artificial intelligence in higher education: exploring faculty use, self-efficacy, distinct profiles, and professional development needs. *International Journal of Educational Technology in Higher Education*, 21(1), pp. 58. doi: <https://doi.org/10.1186/s41239-024-00490-1>
- Matsieli, M. & Mutula, S. (2024). COVID-19 and Digital Transformation in Higher Education Institutions: Towards Inclusive and Equitable Access to Quality Education. *Education Sciences*, 14(8), pp. 819. doi: <https://doi.org/10.3390/educsci14080819>
- Medvedeva, O. D., Rubtsova, A. V., Vilkova, A. V. & Ischenko, V. V. (2022). Digital Monitoring of Students' Soft Skills Development as an Interactive Method of Foreign Language Learning. *Education Sciences*, 12(8), pp. 506. doi: <https://doi.org/10.3390/educsci12080506>
- Meng, N., Dong, Y., Roehrs, D. & Luan, L. (2023). Tackle implementation challenges in project-based learning: a survey study of PBL e-learning platforms. *Educational technology research and development*, 71(3), pp. 1179–1207. doi: <https://doi.org/10.1007/s11423-023-10202-7>
- Mikroyannidis, A., Perifanou, M. & Economides, A. A. (2023). Developing a Sustainable Online Platform for Language Learning across Europe. *Computers*, 12(7), pp. 140. doi: <https://doi.org/10.3390/computers12070140>
- Muftah, M. (2022). Impact of social media on learning English language during the COVID-19 pandemic. *PSU Research Review*, 8(1), pp. 211–226. doi: <https://doi.org/10.1108/PRR-10-2021-0060>
- Murad, M., Othman, S. B. & Kamarudin, M. A. I. B. (2024). The Effect of Science & Technology Park, Market Segregation and Commercialization Support on Female Entrepreneurship in Pakistan: A Moderating Role of Economic Climate. *JWEE*, (1-2), pp. 40–65. doi: <https://doi.org/10.28934/jwee24.12.pp40-65>

- Ng, D. T. K., Leung, J. K. L., Su, J., Ng, R. C. W. & Chu, S. K. W. (2023). Teachers' AI digital competencies and twenty-first century skills in the post-pandemic world. *Educational technology research and development*, 71(1), pp. 137–161. doi: <https://doi.org/10.1007/s11423-023-10203-6>
- Nie, Y. (2023). Application of Multimodal Multimedia Information and Big Data Technology in Teaching Chinese as a Foreign Language Course. *International Journal of Digital Multimedia Broadcasting*, 2023(1), pp. 2257863. doi: <https://doi.org/10.1155/2023/2257863>
- Noor, U., Younas, M., Saleh Aldayel, H., Menhas, R. & Qingyu, X. (2022). Learning behavior, digital platforms for learning and its impact on university student's motivations and knowledge development. *Frontiers in Psychology*, 13, pp. 933974. doi: <https://doi.org/10.3389/fpsyg.2022.933974>
- Salas-Pilco, S. Z., Yang, Y. & Zhang, Z. (2022). Student engagement in online learning in Latin American higher education during the COVID-19 pandemic: A systematic review. *British Journal of Educational Technology*, 53(3), pp. 593–619. doi: <https://doi.org/10.1111/bjet.13190>
- Sayed, W. S., Noeman, A. M., Abdellatif, A., Abdelrazek, M., Badawy, M. G., Hamed, A., et al. (2023). AI-based adaptive personalized content presentation and exercises navigation for an effective and engaging E-learning platform. *Multimedia Tools and Applications*, 82(3), pp. 3303–3333. doi: <https://doi.org/10.1007/s11042-022-13076-8>
- Sekaran, U. & Bougie, R. (2016). *Research Methods for Business: A Skill Building Approach*. John Wiley & Sons. doi: <https://doi.org/10.5281/zenodo.15779003>
- Shadiev, R. & Wang, X. (2022). A Review of Research on Technology-Supported Language Learning and 21st Century Skills. *Frontiers in Psychology*, 13, pp. 897689. doi: <https://doi.org/10.3389/fpsyg.2022.897689>
- Sofi-Karim, M., Bali, A. O. & Rached, K. (2023). Online education via media platforms and applications as an innovative teaching method. *Education and Information Technologies*, 28(1), pp. 507–523. doi: <https://doi.org/10.1007/s10639-022-11188-0>
- Tzafilikou, K., Perifanou, M. & Economides, A. A. (2023). Assessing teachers' digital competence in primary and secondary education: Applying a new instrument to integrate pedagogical and professional elements for digital education. *Education and Information Technologies*, 28(12), pp. 16017–16040. doi: <https://doi.org/10.1007/s10639-023-11848-9>
- Yang, Y., Zhang, C., Zhang, S. & Shen, J. (2026). TikTok in higher education: a systematic review of disciplinary applications, learning outcomes, and implementation factors. *Interactive Learning Environments*, 34(5), pp. 3197–3217. doi: <https://doi.org/10.1080/10494820.2025.2564736>
- Zamiri, M. & Esmaeili, A. (2024). Strategies, Methods, and Supports for Developing Skills within Learning Communities: A Systematic Review of the Literature. *Administrative Sciences*, 14(9), pp. 231. doi: <https://doi.org/10.3390/admsci14090231>
- Zou, Y., Kuek, F., Feng, W. & Cheng, X. (2025). Digital learning in the 21st century: trends, challenges, and innovations in technology integration. *Frontiers in Education*, 10, pp. 1562391. doi: <https://doi.org/10.3389/feduc.2025.1562391>