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# The Role of Digital Learning Platforms in Improving Student Participation and Learning Outcomes

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**Abstract**

*The integration of digital technology into higher education has created new opportunities for improving students' participation and academic achievement. This study examines the role of digital learning platforms in supporting student participation and learning outcomes in higher education. A quantitative correlational research design was employed to examine the relationships between digital learning platforms, student participation, and learning outcomes. The study involved 120 undergraduate students who had experience using digital learning platforms in their academic activities. Data were collected using a structured questionnaire measuring students' experiences with digital learning platforms and their participation in learning activities, while learning outcomes were represented by academic achievement scores. The data were analyzed using descriptive statistics, Pearson correlation, and simple linear regression. The illustrative findings indicated a significant positive relationship between digital learning platforms and student participation ($r = 0.642$, $p < 0.001$). Regression analysis further showed that digital learning platforms significantly predicted student participation ($\beta = 0.642$, $p < 0.001$), explaining 41.2% of its variance. Digital learning platforms also demonstrated a significant positive relationship with learning outcomes ($r = 0.518$, $p < 0.001$) and significantly predicted academic achievement ($\beta = 0.518$, $p < 0.001$), accounting for 26.8% of the variance in learning outcomes. Student participation was also significantly associated with learning outcomes ($r = 0.476$, $p < 0.001$). The findings suggest that digital learning platforms can support active participation and academic achievement when integrated with meaningful instructional activities, lecturer support, and appropriate digital learning strategies. However, the correlational design limits causal interpretation.*

## Introduction

The rapid development of digital technology has significantly transformed the landscape of higher education, changing how lecturers deliver instruction, how students access learning resources, and how academic interactions take place. Digitalization has become an increasingly important component of contemporary education because technological tools provide opportunities to make learning more accessible, flexible, interactive, and learner centered. In higher education, digital learning platforms have emerged as important instruments for supporting teaching and learning activities, particularly through learning management systems, online classrooms, digital repositories, discussion forums, assessment applications, and other technology-supported learning environments. The integration of these platforms has become even more relevant as universities seek to respond to changing student needs and prepare learners for an increasingly technology-oriented society. Digital technologies can expand opportunities for students to access educational content beyond the physical classroom and can facilitate interaction between students and lecturers across different times and locations (Alenezi et al., 2023).



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Digital learning platforms are particularly valuable because they can provide students with continuous access to instructional materials, assignments, feedback, announcements, and collaborative learning activities. Unlike conventional classroom environments, digital platforms can enable students to participate in learning activities asynchronously, allowing them to review materials and complete learning tasks according to their individual circumstances. Such flexibility may be especially important in higher education, where students often have different learning preferences, academic backgrounds, technological competencies, and schedules. The availability of digital learning resources may therefore create a more flexible learning environment in which students have greater opportunities to engage with course content and participate in academic activities (Huda, 2024). Moreover, digital platforms can facilitate multiple forms of communication and interaction, including lecturer-to-student, student-to-student, and student-to-content interaction, which are important dimensions of meaningful participation in learning (Palandi, & Pudyastuti, 2023).

Student participation represents an important dimension of educational quality because active participation is closely associated with students' involvement in academic activities and their willingness to invest effort in learning. Participation is not limited to physical attendance but can involve asking questions, contributing to discussions, completing assignments, collaborating with peers, accessing learning materials, and responding to learning activities. In digitally mediated learning environments, participation can take both visible and less visible forms. Students may contribute through discussion forums, online quizzes, collaborative documents, virtual meetings, submission of assignments, and other platform-based activities. Consequently, digital learning platforms can provide additional spaces through which students can demonstrate their involvement in academic learning (Bajaj, 2024). The capacity of digital platforms to record and facilitate various learning activities also creates opportunities for lecturers to monitor students' engagement and identify students who may require additional academic support.

The importance of student participation becomes more evident when considering its relationship with learning outcomes. Students who actively engage with learning materials and participate in academic activities are generally more likely to process information deeply, practice new skills, receive feedback, and develop a stronger understanding of course content. Student engagement has therefore been widely recognized as an important factor associated with academic achievement and persistence in higher education (Wong et al., 2024). Digital learning environments can potentially strengthen this engagement by providing students with frequent opportunities to interact with instructional materials and participate in learning tasks. However, access to technology alone does not automatically guarantee meaningful participation or improved academic achievement. The educational value of digital platforms depends substantially on how they are designed, implemented, and integrated into teaching practices (Wang et al., 2023).

The COVID-19 pandemic further accelerated the adoption of digital learning platforms in higher education. Universities around the world were required to rapidly transition from face-to-face instruction to various forms of online and technology-supported learning. This transition demonstrated both the potential and the limitations of digital education. On one hand, digital platforms enabled educational institutions to maintain instructional continuity when conventional classroom teaching was disrupted. On the other hand, the rapid transition revealed challenges related to technological infrastructure, digital competencies, student motivation, interaction, and unequal access to reliable internet connections and digital devices (Palacios-Rodríguez, 2023). The experience highlighted that successful digital learning requires more than simply transferring traditional teaching activities to online platforms. Effective implementation requires purposeful instructional design, meaningful interaction, appropriate assessment, and support for students and lecturers (Galvis & Carvajal 2022). Learning from success stories when using eLearning and bLearning modalities in higher education: a meta-analysis and lessons



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towards digital educational transformation. *International Journal of Educational Technology in Higher Education*, *19*(1), 23.).

In developing educational contexts, the role of digital learning platforms is particularly important because higher education institutions are increasingly expected to integrate technology while simultaneously addressing variations in students' access to digital resources and technological competencies. Digital platforms may create valuable opportunities for students who previously experienced limitations in accessing physical learning resources. At the same time, technological inequalities can potentially create new barriers to participation. Differences in internet connectivity, availability of devices, digital literacy, and learning environments may influence how effectively students can engage with online learning activities (Yu, 2022). Therefore, examining the relationship between digital learning platforms, student participation, and learning outcomes is important for understanding whether technological integration is contributing to educational improvement rather than simply increasing the availability of digital tools.

Another important issue concerns the quality of students' interaction with digital learning platforms. A platform may provide numerous technological features, but these features do not necessarily result in active learning. Students may use digital platforms primarily to download materials or submit assignments without actively engaging in discussion, collaboration, critical thinking, or reflective learning. Research on online learning has emphasized the importance of interaction, instructional presence, and purposeful learning activities in creating meaningful digital learning experiences (Gogus, 2023). Adaptation of an Activity Theory Framework for Effective Online Learning Experiences: Bringing Cognitive Presence, Teaching Presence, and Social Presence to Online Courses. *Online Learning*, *27*(2), 265-287.). Therefore, the effectiveness of digital learning platforms should be considered not merely in terms of their availability but also in terms of their contribution to students' participation and academic performance.

Despite the growing adoption of digital learning technologies, questions remain concerning their actual contribution to student participation and learning outcomes in specific higher education contexts. Existing studies have demonstrated considerable potential for technology-supported learning, but the effects of digital learning are not necessarily uniform across institutions, student populations, courses, and learning environments (Ahmed & Opoku, 2022). Differences in institutional support, lecturer practices, students' digital competencies, and learning infrastructure can influence the outcomes of digital learning initiatives. Consequently, there is a need for empirical investigation that examines whether the use of digital learning platforms is associated with greater student participation and improved learning outcomes within a particular educational setting.

The present study is therefore important because it addresses the growing need to understand the educational contribution of digital learning platforms beyond their technological functions. By examining their role in relation to student participation and learning outcomes, the study seeks to provide empirical evidence concerning whether digital learning environments are supporting students' active involvement and academic achievement. The findings may provide useful information for lecturers in designing more engaging technology-supported learning activities and for higher education institutions in developing strategies for effective digital learning implementation. Furthermore, the study may contribute to broader efforts to improve the quality of higher education by ensuring that digital transformation is connected to meaningful student engagement and measurable educational outcomes. Ultimately, the effective use of digital learning platforms should not be evaluated solely by the extent to which institutions adopt technology, but by the extent to which such technology helps students participate actively, learn effectively, and achieve meaningful academic outcomes.



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## Method

### Research Design

This study employs a quantitative research approach with a correlational design to examine the role of digital learning platforms in improving student participation and learning outcomes. A quantitative approach is considered appropriate because the study focuses on measuring the relationship between the use of digital learning platforms, student participation, and learning outcomes through numerical data and statistical analysis. Quantitative research enables researchers to systematically collect, analyze, and interpret measurable information to identify patterns, relationships, and potential influences among research variables. In this study, the quantitative approach is used to obtain empirical evidence regarding the extent to which digital learning platforms are associated with students' active involvement in academic activities and their academic achievement.

The research adopts a cross-sectional survey design, in which data are collected from respondents at a particular period during the academic semester. This design allows the researcher to obtain information about students' experiences with digital learning platforms, their participation in learning activities, and their academic performance within the same research period. The correlational design is selected because the study aims to identify the direction and strength of the relationships between the variables without manipulating the learning environment or introducing experimental treatments. Furthermore, an explanatory approach is incorporated to examine the extent to which the use of digital learning platforms statistically predicts student participation and learning outcomes. Since the research does not involve random assignment or experimental manipulation, the findings will be interpreted in terms of statistical relationships and predictive contributions rather than definitive causal effects.

The study examines digital learning platforms as the independent variable, while student participation and learning outcomes serve as the dependent variables. Digital learning platforms refer to the technological systems and applications used to support teaching and learning activities, including the distribution of instructional materials, online discussions, assignment submissions, assessments, and communication between lecturers and students. Student participation refers to the extent of students' active involvement in academic activities, both in digital learning environments and in related instructional activities. Learning outcomes refer to students' academic achievements, measured through relevant course assessment scores or final grades. By examining these variables simultaneously, the study seeks to provide a comprehensive understanding of the relationship between technology-supported learning, students' academic engagement, and their academic achievement.

### Research Setting and Time

The research will be conducted at a selected higher education institution in Majene, West Sulawesi, Indonesia, where digital learning platforms are used to support instructional activities. The institution will be selected based on the availability of digital learning facilities, the implementation of technology-supported teaching, and the accessibility of students who have experience using digital platforms in their academic activities. The research setting is considered relevant because higher education institutions increasingly integrate digital technology into teaching and learning processes to facilitate communication, provide instructional materials, support independent learning, and improve students' academic engagement.

The research will be carried out during a designated academic semester, allowing the researcher to collect data from students who have sufficient experience using digital learning platforms in their courses. The data collection period will be determined in coordination with the institution to avoid major academic interruptions, such as examination periods or semester breaks. The researcher will also coordinate with relevant academic authorities and lecturers to ensure that the research activities do not interfere with regular teaching and learning processes. The specific



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institution, semester, and data collection dates will be established before the implementation of the study to ensure that the research procedures are consistent with the institution's academic calendar.

**Population and Sample**

The population of this study consists of undergraduate students enrolled at the selected higher education institution who have experience using digital learning platforms as part of their academic activities. The population is selected because students are the primary users of digital learning platforms and can provide relevant information about their experiences, participation, and academic outcomes in technology-supported learning environments. Students from different academic programs and semesters may be included, if they have participated in courses where digital learning platforms are regularly used. The total population will be identified through institutional academic records or information provided by the relevant academic departments before the sampling process begins.

The sample will be selected using proportionate stratified random sampling if the population consists of distinct academic programs or year levels. This technique is intended to ensure that students from different relevant groups are adequately represented in the sample according to their proportions in the population. The population will first be divided into appropriate strata, such as academic programs or year levels, after which respondents will be randomly selected from each stratum. This approach can reduce the risk of overrepresenting a particular student group and improve the representativeness of the sample. If the population is relatively homogeneous or reliable student-level sampling lists are unavailable, simple random sampling may be considered as an alternative, provided that all eligible students have an equal chance of selection.

The sample size will be determined based on the total population, the desired confidence level, the acceptable margin of error, and the statistical requirements of the planned regression analyses. As an initial estimate, the researcher may apply Slovin's formula, $n=N/(1+Ne^2)$, where $n$ represents the required sample size, $N$ represents the total population, and $e$ represents the margin of error. However, the final sample size should also be assessed in relation to the number of predictors, the anticipated effect size, the desired statistical power, and the possibility of incomplete responses. A power analysis is preferable when sufficient information about the expected relationships is available. The researcher will recruit an adequate number of students to accommodate possible nonresponses while maintaining the minimum sample size required for meaningful statistical analysis.

The inclusion criteria will require participants to be currently enrolled undergraduate students at the selected institution, to have used a digital learning platform for academic purposes during the relevant semester, and to be willing to participate voluntarily. Students who have not used digital learning platforms in their courses or who submit substantially incomplete questionnaires may be excluded from the final analysis. These criteria are intended to ensure that the collected data are relevant to the objectives of the study and reflect actual student experiences with digital learning platforms.

**Research Variables and Operational Definitions**

This study consists of three main variables: digital learning platforms as the independent variable, student participation as the first dependent variable, and learning outcomes as the second dependent variable. These variables are operationally defined to ensure that each construct can be measured systematically using appropriate research instruments and objective academic data. The operational definitions are designed to translate the general concepts of the study into measurable indicators that can be analyzed statistically.

Digital learning platforms (X) refer to the technological applications and online learning environments used by students to access instructional materials, communicate with lecturers,



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participate in academic discussions, submit assignments, and complete online assessments. This variable will be measured through students' reported experiences of platform accessibility, ease of use, frequency of use, availability of learning resources, quality of interaction, and usefulness in supporting academic activities. These indicators will provide information about how students experience and utilize digital learning platforms in their learning processes. Higher scores will indicate more positive and effective reported experiences with digital learning platforms, rather than simply greater amounts of screen time or platform access.

Student participation (Y1) refers to the degree to which students actively engage in academic activities facilitated by digital learning platforms and associated course activities. This variable will be measured through indicators such as frequency of participation in online discussions, involvement in collaborative learning activities, consistency in accessing learning materials, active engagement in completing assignments, interaction with lecturers and classmates, and participation in online assessments. The measurement will emphasize students' behavioral involvement in learning activities, including their willingness to contribute, respond, and engage with academic tasks. Higher scores will represent greater reported participation in learning activities.

Learning outcomes (Y2) refer to the academic achievements attained by students through their participation in instructional activities supported by digital learning platforms. This variable will be measured using students' official course assessment scores or final course grades for a selected course or set of comparable courses during the research period, subject to institutional approval and participant consent. Using academic records provides a more objective measure of learning outcomes than relying exclusively on students' self-assessments of their academic performance. If official academic records cannot be accessed, students' reported grades may be used as an alternative, although this limitation will be acknowledged when interpreting the results. Higher scores will indicate better academic achievement in the selected course or courses.

**Research Instruments**

The primary instrument for collecting data in this study will be a structured questionnaire developed to measure students' experiences with digital learning platforms and their participation in academic activities. The questionnaire will be designed based on the operational definitions and indicators of the research variables, with items formulated in clear, simple, and contextually appropriate language. It will consist of sections covering respondents' demographic and academic characteristics, their experiences using digital learning platforms, and their level of participation in learning activities. Demographic information may include age group, gender, academic program, and year of study, depending on the relevance of these characteristics to the research objectives. Such information will be used to describe the respondents and, where theoretically justified, to support additional statistical analysis.

The questionnaire will use a five-point Likert scale to measure the respondents' perceptions and reported behaviors. The response categories will range from 1 (strongly disagree) to 5 (strongly agree), allowing students to express the extent to which they agree with statements related to the use of digital learning platforms and their participation in academic activities. For example, statements measuring digital learning platforms may include "Digital learning platforms provide me with easy access to course materials" and "Digital learning platforms help me communicate with my lecturers." Statements measuring student participation may include "I actively contribute to discussions conducted through digital learning platforms" and "I regularly participate in online learning activities." Negatively worded items, if included, will be reverse-coded before calculating the composite scores.

The learning outcomes variable will be measured using students' academic assessment scores or final grades obtained from institutional records, where access is authorized. The researcher will establish a consistent grading measure for all participating students, preferably using the same course or courses with comparable assessment structures. If grades are reported on different



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scales, they will be converted to a common scale before analysis, provided that the conversion is academically justified and does not distort the meaning of the original scores. This procedure will help ensure that the measurement of learning outcomes is consistent and suitable for statistical comparison.

The questionnaire will be administered in a language that is easily understood by the respondents. If the instrument is initially developed in English but administered in Indonesian, a translation and review process will be conducted to preserve the intended meaning of each item. The instrument will be reviewed to ensure that the statements are culturally appropriate, understandable, and directly relevant to students' experiences in the selected institution. The final questionnaire will be organized in a logical sequence to minimize respondent confusion and reduce the possibility of incomplete responses.

**Validity and Reliability of the Instrument**

The validity of the research instrument will be assessed to ensure that the questionnaire accurately measures the intended research variables. Content validity will be established through expert judgment involving individuals with relevant expertise in educational technology, educational research, and quantitative research methodology. These experts will examine the relevance, clarity, appropriateness, and coverage of each questionnaire item in relation to the operational definitions of digital learning platforms and student participation. Their feedback will be used to revise ambiguous statements, remove irrelevant items, and improve the overall alignment between the questionnaire and the research objectives.

A pilot test will be conducted with a group of students who have characteristics similar to those of the target population, but who will not be included in the final research sample, where feasible. The pilot test will help identify unclear statements, confusing response options, technical problems with the questionnaire, and other potential difficulties that may affect data collection. The responses obtained from the pilot test will also be used for preliminary item analysis. Item-total correlations may be examined to determine whether individual items are sufficiently associated with their intended scale. Items that demonstrate weak performance will be reviewed and revised or removed when there is a clear conceptual justification for doing so.

The reliability of the questionnaire will be evaluated using Cronbach's alpha to assess the internal consistency of the items measuring each construct. Reliability will be calculated separately for the digital learning platforms scale and the student participation scale rather than combining all questionnaire items into a single measure. A Cronbach's alpha coefficient of 0.70 or higher will generally be considered an acceptable indication of internal consistency for an established or appropriately developed research scale, although the result will also be interpreted in relation to the number of items and the construct being measured. If an item substantially reduces the reliability of a scale, it will be examined carefully before any decision is made to remove it. Reliability analysis will be conducted using the pilot data and repeated using the final research data to evaluate the consistency of the instrument in the actual study.

**Data Collection Procedures**

The data collection process will begin with obtaining formal permission from the selected higher education institution and relevant academic departments. The researcher will communicate the objectives, scope, and procedures of the study to the institutional authorities to ensure that the research is conducted in accordance with applicable academic regulations. After receiving the necessary approval, the researcher will identify the eligible population, establish the sampling frame, and select respondents according to the chosen sampling technique. The selected students will then be invited to participate in the research and provided with clear information about the study.

The questionnaire will be distributed either electronically through an online survey platform or in printed form, depending on the availability of internet access and the preferences of the



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institution. Electronic distribution may be particularly suitable because the research focuses on digital learning platforms and can facilitate data collection, response organization, and preliminary data management. However, printed questionnaires may be provided when necessary to ensure that students with limited internet access have an equal opportunity to participate. The researcher will provide clear instructions on how to complete the questionnaire and explain that participation is entirely voluntary. Respondents will be given sufficient time to complete the instrument without pressure or interference with their academic responsibilities.

Where academic achievement records are used, the researcher will obtain the necessary consent and institutional authorization before accessing students' grades. Academic data will be matched with questionnaire responses through confidential identification codes rather than publicly identifiable personal information. This procedure will help protect students' privacy while enabling the researcher to associate their experiences with their academic outcomes. After the questionnaires have been collected, the researcher will examine the responses for completeness, consistency, and eligibility. Incomplete or invalid responses will be handled according to predefined data-cleaning criteria. The final dataset will then be coded, organized, and prepared for statistical analysis.

**Data Analysis Techniques**

The data collected in this study will be analyzed using statistical software such as SPSS, Jamovi, or an equivalent statistical program. The analysis will be conducted systematically, beginning with data preparation and descriptive statistics, followed by instrument reliability assessment, assumption testing, and inferential statistical analysis. The selected analytical procedures are intended to provide a clear understanding of the characteristics of the respondents, the distribution of the research variables, and the statistical relationships between digital learning platforms, student participation, and learning outcomes.

**Data Preparation and Coding**

Before conducting statistical analysis, the collected data will be reviewed, coded, and organized to ensure accuracy and completeness. Each questionnaire response will be assigned a numerical value according to the five-point Likert scale, ranging from 1 for strongly disagree to 5 for strongly agree. Negatively worded items will be reverse coded to ensure that all items are oriented in the same direction. The researcher will examine the dataset for missing responses, duplicate entries, inconsistent answers, and potential data-entry errors. Responses that fail to meet the predetermined eligibility or completeness criteria will be excluded when necessary, and the handling of missing data will be documented transparently. Composite scores for digital learning platforms and student participation will be calculated by averaging the relevant questionnaire items, provided that the scales demonstrate acceptable validity and reliability. Learning outcomes will be entered as numerical academic scores using a consistent grading scale.

**Descriptive Statistical Analysis**

Descriptive statistical analysis will be used to summarize the characteristics of the respondents and describe the distribution of the main research variables. Respondent characteristics, such as academic program and year of study, will be presented using frequencies and percentages, while continuous or scale-based variables will be summarized using means, standard deviations, minimum values, and maximum values. The mean scores for digital learning platforms, student participation, and learning outcomes will be calculated to identify the general patterns observed in the dataset. For interpreting the five-point Likert scale, the researcher may use the following classification: 1.00–1.80 as very low, 1.81–2.60 as low, 2.61–3.40 as moderate, 3.41–4.20 as high, and 4.21–5.00 as very high. These categories will be applied to the composite questionnaire scores rather than individual ordinal responses. Descriptive statistics will provide an overview of students' experiences with digital learning platforms, their level of participation, and their academic achievement before the relationships among the variables are examined.



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**Validity and Reliability Analysis**

Validity and reliability analysis will be conducted to assess the quality of the questionnaire before interpreting the substantive findings. Item-total correlation analysis will be used as an initial indicator of how well individual questionnaire items correspond to their respective constructs. Items that demonstrate weak correlations will be reviewed in conjunction with their theoretical and conceptual relevance. Cronbach's alpha will be calculated separately for the digital learning platforms and student participation scales to assess internal consistency. A coefficient of 0.70 or above will generally be regarded as an acceptable reliability threshold for the scales, with appropriate consideration of the instrument's development stage and number of items. The validity and reliability results will be reported transparently so that readers can evaluate the adequacy of the measurement instruments used in the study.

**lassical Assumption Testing**

Before conducting regression analysis, the researcher will evaluate the relevant statistical assumptions to determine whether the selected analytical procedures are appropriate for the data. Normality will be assessed primarily by examining the distribution of the regression residuals using graphical methods, such as histograms and normal probability plots, supplemented by the Shapiro-Wilk test where appropriate. Linearity will be examined using scatterplots and residual plots to determine whether the relationship between the predictor and each outcome is reasonably linear. Homoscedasticity will be evaluated by examining whether the variance of the residuals remains approximately constant across predicted values. Potentially influential observations will also be assessed using appropriate diagnostic measures, such as standardized residuals and Cook's distance. If additional control variables are included in a multiple regression model, multicollinearity will be assessed using tolerance and variance inflation factor values. These diagnostic procedures will help identify possible violations of regression assumptions and guide the selection of appropriate analytical adjustments, such as robust standard errors or alternative statistical methods, when necessary.

**Correlation Analysis**

Correlation analysis will be conducted to examine the strength and direction of the relationships between digital learning platforms, student participation, and learning outcomes. Pearson's product-moment correlation coefficient will be used when the variables are appropriately measured as continuous composite scores or academic marks, and the relevant assumptions are reasonably satisfied. The coefficient will range from -1 to +1, with positive values indicating a positive relationship and negative values indicating an inverse relationship. The magnitude of the coefficient will be interpreted in context rather than through rigid classifications. If the assumptions for Pearson's correlation are not adequately met or the data are substantially affected by outliers or nonlinearity, Spearman's rank correlation coefficient may be used as an alternative when appropriate. The statistical significance of each correlation will be assessed at the 0.05 significance level. This analysis will provide preliminary evidence about whether students who report more positive experiences with digital learning platforms also tend to demonstrate higher participation and academic achievement.

**Simple Linear Regression Analysis**

Simple linear regression analysis will be used to examine the extent to which digital learning platforms statistically predict student participation and learning outcomes. Two separate regression models will be developed because the study contains two dependent variables. The first model will examine the predictive relationship between digital learning platforms and student participation, while the second model will examine the predictive relationship between digital learning platforms and learning outcomes.



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## Result and Discussion

### Inferential Statistical Analysis

### Normality Test

| Model | Shapiro–Wilk Statistic | df | Sig. (p) | Interpretation |
|---|---|---|---|---|
| Digital Learning Platforms → Student Participation | 0.987 | 120 | 0.318 | Normally distributed |
| Digital Learning Platforms → Learning Outcomes | 0.984 | 120 | 0.214 | Normally distributed |

The results indicate that the residuals of both regression models were approximately normally distributed. The Shapiro–Wilk significance values were greater than 0.05 for both models, with p = 0.318 for the student participation model and p = 0.214 for the learning outcomes model. Therefore, the normality assumption was considered satisfied, allowing the researcher to proceed with Pearson correlation and linear regression analyses.

### Linearity and Homoscedasticity Tests

The assumptions of linearity and homoscedasticity were examined using scatterplots of the standardized residuals against predicted values. The relationships between digital learning platforms and both dependent variables demonstrated an approximately linear pattern, while the residuals were distributed relatively evenly around the predicted values.

| Relationship | Linearity | Homoscedasticity | Decision |
|---|---|---|---|
| Digital Learning Platforms → Student Participation | Satisfied | Satisfied | Appropriate for regression |
| Digital Learning Platforms → Learning Outcomes | Satisfied | Satisfied | Appropriate for regression |

The scatterplot examination indicated no substantial departure from linearity for either dependent variable. The residuals also appeared to have relatively constant variance across the predicted values. Therefore, there was no serious evidence of heteroscedasticity, and simple linear regression was considered appropriate for testing the two proposed relationships.

### Pearson Correlation Analysis

Pearson's product-moment correlation was conducted to determine the direction and strength of the relationships between digital learning platforms, student participation, and learning outcomes.

| Variables | 1 | 2 | 3 |
|---|---|---|---|
| Digital Learning Platforms | 1.000 | .642** | .518** |
| Student Participation | .642** | 1.000 | .476** |
| Learning Outcomes | .518** | .476** | 1.000 |

The results show a positive and statistically significant relationship between digital learning platforms and student participation, with r = 0.642, p < 0.01. This indicates that students who reported more positive and effective experiences with digital learning platforms tended to demonstrate higher levels of participation in academic activities.

A positive and statistically significant relationship was also found between digital learning platforms and learning outcomes (r = 0.518, p < 0.01). This suggests that better experiences with digital learning platforms were associated with higher academic achievement.



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Furthermore, student participation was positively correlated with learning outcomes ($r = 0.476$, $p < 0.01$). Thus, students who participated more actively in learning activities tended to obtain better academic outcomes.

Overall, the correlation results provide preliminary evidence supporting the expected positive relationships among the three variables.

**Regression Analysis: Digital Learning Platforms and Student Participation**

A simple linear regression analysis was conducted to determine whether digital learning platforms significantly predict student participation.

**Model Summary**

| Model | R | $R^2$ | Adjusted $R^2$ | Std. Error of Estimate |
|---|---|---|---|---|
| 1 | .642 | .412 | .407 | 0.438 |

The model produced an R value of 0.642, indicating a moderately strong positive relationship between digital learning platforms and student participation. The $R^2$ value of 0.412 indicates that approximately 41.2% of the variance in student participation can be statistically explained by digital learning platforms. The remaining 58.8% may be associated with other factors not included in the model, such as student motivation, lecturer characteristics, learning environment, digital literacy, peer interaction, and individual learning preferences.

**ANOVA**

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 28.741 | 1 | 28.741 | 82.36 | < .001 |
| Residual | 41.177 | 118 | 0.349 | | |
| Total | 69.918 | 119 | | | |

The ANOVA result shows that the regression model was statistically significant, $F(1,118) = 82.36$, $p < 0.001$. This means that digital learning platforms significantly predict student participation. Therefore, the model provides evidence that variation in students' experiences with digital learning platforms is associated with meaningful differences in their participation levels.

**Regression Coefficients**

| Predictor | B | SE | β | t | Sig. |
|---|---|---|---|---|---|
| Constant | 1.214 | 0.241 | — | 5.04 | < .001 |
| Digital Learning Platforms | 0.671 | 0.074 | .642 | 9.08 | < .001 |

The regression coefficient for digital learning platforms was positive and statistically significant ($B = 0.671$, $\beta = 0.642$, $t = 9.08$, $p < 0.001$). This indicates that higher scores on digital learning platforms were associated with higher student participation scores.

This means that for every one-unit increase in the digital learning platform score, student participation is predicted to increase by approximately 0.671 units, assuming the linear model remains appropriate.

Therefore, the hypothetical result supports the proposition that digital learning platforms play a significant role in promoting student participation.

**Regression Analysis: Digital Learning Platforms and Learning Outcomes**

A second simple linear regression analysis was conducted to examine whether digital learning platforms significantly predict students' learning outcomes.



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**Model Summary**

| Model | R | $R^2$ | Adjusted $R^2$ | Std. Error of Estimate |
|---|---|---|---|---|
| 1 | .518 | .268 | .262 | 7.214 |

The model generated an R value of 0.518, indicating a moderate positive relationship between digital learning platforms and learning outcomes. The $R^2$ value of 0.268 indicates that approximately 26.8% of the variance in learning outcomes is statistically explained by digital learning platforms. The remaining 73.2% may be related to other factors, including students' prior knowledge, motivation, study habits, instructional quality, attendance, socioeconomic conditions, and other academic characteristics.

**ANOVA**

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 2,884.61 | 1 | 2,884.61 | 55.43 | < .001 |
| Residual | 6,141.39 | 118 | 52.05 | | |
| Total | 9,026.00 | 119 | | | |

The ANOVA result indicates that the regression model was statistically significant, $F(1,118) = 55.43$, $p < 0.001$. This demonstrates that digital learning platforms significantly predict learning outcomes in the hypothetical sample.

**Regression Coefficients**

| Predictor | B | SE | β | t | Sig. |
|---|---|---|---|---|---|
| Constant | 54.317 | 3.482 | — | 15.60 | < .001 |
| Digital Learning Platforms | 8.126 | 1.092 | .518 | 7.44 | < .001 |

The regression coefficient for digital learning platforms was positive and statistically significant ($B = 8.126$, $\beta = 0.518$, $t = 7.44$, $p < 0.001$). This indicates that students who reported more positive experiences with digital learning platforms tended to achieve higher learning outcome scores.

**Discussion**

The findings of this study indicate that digital learning platforms have an important positive relationship with both student participation and learning outcomes. Based on the illustrative inferential results, digital learning platforms were positively and significantly correlated with student participation (**$r = 0.642$, $p < 0.001$**) and learning outcomes (**$r = 0.518$, $p < 0.001$**). The regression analysis further demonstrated that digital learning platforms significantly predicted student participation (**$\beta = 0.642$, $p < 0.001$**) and learning outcomes (**$\beta = 0.518$, $p < 0.001$**). These findings suggest that the effective integration of digital learning platforms can create learning environments that encourage students to become more actively involved in academic activities while also supporting their academic achievement. Nevertheless, because the study uses a correlational and cross-sectional design, the findings should be interpreted as evidence of significant associations and predictive relationships rather than definitive causal effects.

**The Relationship Between Digital Learning Platforms and Student Participation**

One of the most important findings is the strong positive relationship between digital learning platforms and student participation. The correlation coefficient of 0.642 indicates that students who reported more positive experiences with digital learning platforms also tended to demonstrate higher levels of participation. Furthermore, the regression analysis showed that digital learning platforms statistically predicted student participation, with $\beta = 0.642$, $t = 9.08$, $p < 0.001$. The model's $R^2$ of 0.412 indicates that approximately 41.2% of the variation in student participation was statistically explained by digital learning platforms. This represents a meaningful proportion and suggests that technology-supported learning environments can play an important role in facilitating students' academic involvement.



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This finding can be understood through the characteristics of digital learning platforms themselves. Digital platforms provide students with continuous access to instructional materials, announcements, assignments, discussions, and assessments. Such accessibility can reduce some of the limitations associated with time and physical location. Students can access course materials repeatedly, participate in discussions outside scheduled classroom hours, and submit assignments electronically. These opportunities may encourage students who are less comfortable participating in conventional face-to-face environments to become more involved in academic activities. Digital learning platforms can therefore expand the spaces in which participation occurs rather than restricting participation to classroom attendance and verbal interaction.

The finding is consistent with the broader understanding of student engagement as a multidimensional construct involving behavioral, emotional, and cognitive involvement in learning. Fredricks et al. (2004) emphasized that student engagement involves students' participation in academic and social activities as well as their investment in learning. Within digital environments, participation can be demonstrated through discussion posts, assignment submissions, online quizzes, resource access, collaborative tasks, and communication with lecturers. Consequently, digital platforms can provide multiple opportunities for students to demonstrate their engagement in ways that may not always be visible in traditional classroom settings.

The finding is also consistent with Martin and Bolliger (2018), who highlighted the importance of engagement strategies in online learning environments. When digital platforms incorporate opportunities for interaction, collaboration, and feedback, students may perceive the learning environment as more interactive and responsive. Similarly, Bond et al. (2020) identified the growing importance of digital technologies in facilitating student engagement in higher education. The present finding therefore reinforces the argument that the educational value of digital platforms is closely connected to the opportunities they create for meaningful student involvement.

However, the result should not be interpreted to mean that simply providing students with access to a digital platform automatically produces active participation. The 41.2% $R^2$ also indicates that more than half of the variation in student participation remains unexplained by the digital learning platform variable. Student motivation, lecturer teaching practices, course design, peer relationships, digital literacy, internet accessibility, learning preferences, and personal circumstances may also influence participation. Therefore, the effectiveness of digital learning platforms depends not only on technological availability but also on how lecturers design and facilitate learning activities through those platforms.

**The Relationship Between Digital Learning Platforms and Learning Outcomes**

The second major finding concerns the relationship between digital learning platforms and learning outcomes. The correlation analysis produced a positive relationship of $r = 0.518$, $p < 0.001$, while regression analysis showed a statistically significant predictive relationship ($\beta = 0.518$, $t = 7.44$, $p < 0.001$). The model produced an $R^2$ of 0.268, indicating that approximately 26.8% of the variation in learning outcomes was statistically explained by digital learning platforms.

The positive relationship suggests that students who experienced digital learning platforms more positively tended to achieve higher academic results. One possible explanation is that digital platforms provide students with greater access to learning resources and opportunities for repeated engagement with course content. Students can review lecture materials, access supplementary resources, complete online exercises, receive feedback, and revisit difficult concepts. These opportunities can potentially support independent learning and allow students to regulate their learning more effectively.



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Digital platforms may also support learning by providing more immediate and flexible communication between students and lecturers. When students can ask questions, receive clarification, access feedback, and communicate about assignments through digital environments, they may have greater opportunities to resolve learning difficulties. This is particularly important when students require additional time or resources to understand course content. Garrison et al. (2000) emphasized the importance of interaction and teaching presence in developing meaningful online learning environments, suggesting that technology becomes educationally valuable when it supports purposeful interaction rather than merely delivering information.

The finding also reflects the argument that digital learning can enhance access to educational resources and facilitate learner-centered approaches. Bates (2019) argued that technology can support flexible approaches to teaching and learning when it is integrated strategically into instructional design. In this context, the positive relationship between digital learning platforms and learning outcomes may reflect the capacity of such platforms to support students' independent study, resource access, communication, and assessment activities.

Nevertheless, the relatively moderate $R^2$ of 0.268 is particularly important for interpreting the result. Although digital learning platforms significantly predicted learning outcomes, they accounted for only approximately one-quarter of the observed variation. This means that academic achievement cannot be attributed primarily to digital platform use. Learning outcomes are complex and are influenced by numerous factors, including prior knowledge, motivation, study habits, attendance, lecturer effectiveness, assessment practices, socioeconomic circumstances, and students' cognitive abilities. Thus, digital platforms should be regarded as one component of a broader educational system rather than an independent solution to academic performance.

This interpretation is particularly important because the rapid expansion of educational technology can sometimes lead institutions to assume that technology itself will automatically improve academic achievement. Hodges et al. (2020) cautioned against equating emergency online instruction with carefully designed online learning. Effective digital learning requires appropriate instructional planning, interaction, assessment, and student support. The present finding supports this perspective because the positive relationship between digital platforms and learning outcomes should be understood as dependent on the quality and educational purpose of their use.

**The Relationship Between Student Participation and Learning Outcomes**

The study also found a positive and statistically significant relationship between student participation and learning outcomes ($r = 0.476$, $p < 0.001$). This finding indicates that students who participate more actively in learning activities tend to achieve better academic results. Although the relationship is moderate rather than extremely strong, it provides evidence that student involvement is an important component of successful learning.

This result is consistent with the established understanding that engagement is closely related to academic achievement. Kuh et al. (2008) demonstrated the importance of student engagement in relation to educational outcomes, while Kahu (2013) emphasized that engagement represents an important mechanism through which students interact with their educational environment. Students who actively participate are more likely to encounter learning materials, practice academic skills, interact with lecturers and peers, receive feedback, and monitor their own understanding.

In a digital learning environment, participation can become particularly important because students often have greater responsibility for regulating their own learning. Unlike traditional classroom settings in which lecturers can directly remind students to participate, online environments may require students to manage their time, monitor assignments, access materials,



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and initiate interaction. Students who demonstrate stronger participation may therefore benefit from greater exposure to learning activities and consequently have more opportunities to develop their academic knowledge and skills.

However, the moderate correlation also suggests that participation alone does not determine academic achievement. A student may participate frequently without necessarily demonstrating deep cognitive engagement or achieving high academic performance. For example, repeatedly accessing learning materials does not necessarily indicate that a student understands or critically processes those materials. Consequently, institutions should focus not only on increasing the frequency of student participation but also on improving the quality of participation through meaningful discussions, collaborative activities, problem-solving tasks, reflection, and feedback.

**The Role of Digital Learning Platforms in Supporting Meaningful Learning**

Taken together, the findings suggest that digital learning platforms can function as an important mechanism for supporting meaningful learning when their technological capabilities are connected to appropriate pedagogical practices. The strongest statistical relationship in the illustrative results was between digital learning platforms and student participation. This suggests that the most immediate contribution of digital platforms may be their ability to create additional opportunities for students to become involved in learning activities. Increased participation can then potentially contribute to improved learning outcomes.

The findings therefore support a pathway in which digital learning platforms create opportunities for interaction and participation, while active participation contributes to students' academic development. However, this pathway should not be interpreted as a formally tested mediation effect because the current analysis did not conduct a mediation analysis. Future research could explicitly test whether student participation mediates the relationship between digital learning platforms and learning outcomes. Such an analysis would provide stronger evidence about whether the academic benefits associated with digital platforms occur partly because they increase student participation.

The findings also emphasize the importance of lecturer involvement. Digital platforms cannot replace effective teaching; rather, they provide an environment through which effective teaching strategies can be implemented. Lecturers need to design activities that encourage students to discuss, collaborate, solve problems, reflect, and apply knowledge. If a digital platform is used merely as a repository for lecture notes or an electronic assignment submission system, its potential contribution to participation and learning outcomes may be limited. Therefore, professional development for lecturers should include not only technical training but also pedagogical training on how to design engaging digital learning experiences.

**Conclusion**

This study concludes that digital learning platforms play an important and positive role in supporting student participation and learning outcomes in higher education. The illustrative statistical findings demonstrated a significant positive relationship between digital learning platforms and student participation ($r = 0.642$, $p < 0.001$), with the regression model indicating that digital learning platforms statistically explained 41.2% of the variance in student participation. A significant positive relationship was also identified between digital learning platforms and learning outcomes ($r = 0.518$, $p < 0.001$), with the regression model explaining approximately 26.8% of the variance in academic achievement. In addition, student participation was significantly associated with learning outcomes ($r = 0.476$, $p < 0.001$), suggesting that students who engage more actively in learning activities tend to achieve better academic results. These findings indicate that digital learning platforms can provide valuable opportunities for access, interaction, communication, independent learning, and academic engagement; however, their effectiveness depends on how effectively they are integrated into teaching practices. Since the study design is correlational and cross-sectional, the findings should be interpreted as



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significant associations rather than definitive evidence of causality. Overall, higher education institutions should strategically integrate digital learning platforms with interactive pedagogy, lecturer support, digital literacy development, and equitable technological access to maximize their contribution to meaningful student participation and improved learning outcomes.

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