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Impact of Digital Teaching Methods on Teaching Quality

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Abstract
The fast-growing adaption of digital technologies in higher learning has changed the way of instructional delivery but empirical data are scarce on how teaching practices that involve digital technology can produce quality teaching. The previous research has mostly concentrated on the adoption of technology or direct impacts without considering the motivational processes that cause instructional practices to affect teaching outcomes. The research was conducted to fill this gap by exploring the effects of digital teaching practices and teaching interactivity on the quality of teaching, using student motivation as a mediator factor and digital literacy as an explanation factor in students. It is proposed in the study that the quality of teaching in digital settings is attained based on the motivation processes among the learners rather than the application of technology. The survey data used in the study were quantitative and cross-sectional research design based on survey data collected on higher education students. Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to test the proposed conceptual model. Cronbach alpha, composite reliability and average variance extracted were used to measure reliability and validity of the measurements, and the structural path analysis, mediation analysis and moderation analysis were conducted. The findings demonstrate that digital teaching strategies (β=0.408 p 0.001), and interactive teaching (β= 0.482 p 0.001) have significant positive effect on student motivation which consequently has a positive effect on the quality of teaching (β= 0.361 p 0.001). The correlation between instructional practices and the teaching quality is mediated by student motivation whereas the effect of student digital literacy on teaching quality is direct (β=0.572, p < 0.001). The model describes 72.7 and 74.4 percent of the variance in the motivation of students and teaching quality. The research offers empirical findings in support of a motivation-based account of teaching quality in digital

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higher education that brings a fined insight into the effectiveness of instruction and useful advice into designing interactive and learner-centered digital teaching methods.
Keywords: Digital teaching methods; Teaching interactivity; Student motivation; Digital literacy; Teaching quality; Higher education; PLS-SEM

Introduction

The high rate of digitalization of higher education has fundamentally changed the way teaching and learning is being conducted in every single university in the world. Learning management systems, multimedia resources, and web-based collaborative learning platforms are digital teaching tools that are being embraced by institutions to boost the delivery of instruction and academic continuity (Basilotta-Gomez-Pablos et al., 2022). Since the post-pandemic transition, digital teaching has evolved into a primary method or at least a part of instruction on higher education (Rutherford et al., 2022). It is proven by empirical studies that the strategic utilization of digital technologies enhances pedagogical flexibility and teaching efficacy (Akram et al., 2022), making digital methods of teaching a vital aspect of the modern teaching excellence (O'Connor, 2024).

Teaching quality is a multidimensional concept that includes the didactic clarity, student interaction, pedagogical efficiency and student satisfaction. Digital pedagogy allows instructors to recreate the learning experiences with interactive content, adaptive tests, and personalized learning to directly affect the quality of teaching (Lee, 2023). Research shows that digitally mediated teaching improves instructional patterns and responsiveness in cases where the objectives of pedagogy are coordinated with the use of technologies (Akram et al., 2022). Moreover, properly designed online instructional tools were also observed to enhance the diversity of the curriculum and acceptance of learners, enhancing the perception of teaching quality (Basilotta-Gomez-Pablos et al., 2022; Jamalova, 2024).

The last ten years have experienced massive digital restructuring in the higher education industry, as a result of technological development, globalization and changing expectations of the learners. The use of digital pedagogies has become part of the fundamental activity of universities in order to stay competitive and reactive to the needs of the industry (Basilotta-Gomez-Pablos et al., 2022). The shift towards hybrid and fully online models of instruction all over the world has turned higher education into a technology-intensive service sector (Rutherford et al., 2022). The recent industry-related research indicates that digital teaching is currently integrated into the institutional policies designed to improve the quality of teaching, its scalability, and the satisfaction of students (Akram et al., 2022; O'Connor, 2024).

In the industry of higher learning, teaching quality has become a key determinant of the performance of an institution, its reputation, and retention. More and more universities use digital teaching as the means of distinguishing between the quality of instruction and improving the learning experience (Lee, 2023). As indicated in the industry, successful digital pedagogy assists in

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enhanced course delivery, real-time assessment, and adaptive instruction which are necessary in preserving teaching excellence (Akram et al., 2022). Moreover, digitally enabled learning spaces allow colleges to meet those academic results that are in line with the industry demands and the employability levels of institutions (Basilotta-Gomez-Pablos et al., 2022; Jamalova, 2024).

Online learning technologies are critical in supporting the higher education sector with better operating efficiency and teaching capacity. Digital platforms can help universities to teach many students at the same time and achieve a consistent level of teaching quality (Rutherford et al., 2022). Researchers operating in the industry sector prove that digital teaching helps in fostering life-long learning, flexibility of the curriculum, and optimization of resources in a way that is critical to long-term institutional sustainability (O'Connor, 2024). Additionally, the digital form of teaching enables innovations in the course design and evaluation process and enhances the industry to respond to the technological disruption (Akram et al., 2022; Lee, 2023).

Problem Statement

Although digital teachings are common in higher education, there is scanty empirical evidence on how these techniques can be converted into better teaching quality. The available literature tends to focus on the use of technology or digital skills of teachers, which generally presupposes a direct impact on the teaching consequences without properly studying the pedagogical and psychological processes at the root (Akram et al., 2022). According to the recent evidence, digital methods of teaching are not always associated with improving the quality of teaching, unless they help to provide students with motivation and interactive learning (Basilotta-Gomez-Pablos et al., 2022; Rutherford et al., 2022). Besides, student differences in digital knowledge also make digital learning less effective since digitally underperforming students find it challenging to transform motivational benefits into meaningful learning outcomes (Saripudin et al., 2021; O'Connor, 2024). As a consequence, the study of the effect of digital teaching method on teaching quality mediated by student motivation as well as conditions under which these effects are enhanced or diminished by students, in particular, in digital literacy, is a critical gap in research, and requires a detailed empirical study.

Research Questions

RQ1: What is the impact of digital teaching methods on the quality of teaching in higher institutions of education?

RQ2: How significant is the mediation of the relationship between digital teaching techniques and quality of teaching through student motivation?

RQ3: In digitally mediated learning contexts, does the digital literacy of students moderate the relationships between student motivation and quality of teaching in digitally mediated learning settings?

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Objectives of the Study

The main aim of this research is to investigate the effects of the digital teaching methods on the quality of teaching in institutions of higher learning and in this respect, the researcher intends to understand the pedagogical processes that underlie effective digital teaching. In particular, the research is expected to evaluate the effect of digital instruction on student motivation as an important mediating variable to improve the quality of teaching (Akram et al., 2022). Besides that, the study aims at examining the importance of teaching interactivity in digitally mediated learning spaces and how it can contribute to student motivation and better teaching effectiveness (Rutherford et al., 2022; Lee, 2023). Moreover, the purpose of the research is to examine how the digital literacy of the students can moderate the positive or negative relationship between the motivation of students and the quality of teaching (Saripudin et al., 2021; O'Connor, 2024). Through such goals, the study also aims to generate empirical data to inform more useful digital teaching methods and guide institutional policies to enhance the quality of teaching in a university.

Literature Review

Digital teaching methods can also be referred to as a systematic approach to using digital technologies, platforms, and pedagogical approaches to teaching and learning in higher education. The latest sources point out that these approaches include online learning platforms, multimedia teaching tools, digital evaluation and assessment, and blended or hybrid teaching arrangements that strive to optimize instructional delivery and interaction with the learners (Basilotta-Gomez-Pablos et al., 2022). According to the scholars, digital teaching techniques prove to be the most efficient in case they are pedagogically aligned to the learning goals instead of being considered as standalone technological devices (Akram et al., 2022). The empirical data also indicates that optimally structured digital instruction techniques enhance the flexibility, accessibility, and responsiveness of the instruction, thus providing the preliminary conditions of the quality of the teaching (Rutherford et al., 2022; Jamalova, 2024).

Theoretical Foundation

Constructivist Theory Application to the Study Model

In the framework of the given study, the constructivist learning theory offers a sound explanation of the role of digital teaching approaches in the aspect of teaching quality based on student motivation. Interactive, self-directed, and experience-driven approaches to digital teaching establish the conditions that enable students to learn actively in terms of engaging with the material instead of passively receiving information (Lee, 2023). Empirical data indicates that these settings can contribute to intrinsic motivation that will consequently improve the way students view teaching effectiveness and the quality of instruction (Rutherford et al., 2022). The study aligns with the recent constructivist researches by placing student motivation as a mediating variable where motivational engagement is a key bridge in which teaching practices are converted to quality learning outcomes (Smith, 2024).

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Self-determination theory (SDT)

The first theory that supports the digital teaching approach is the Self-Determination Theory (SDT), which states the process of motivation dynamics. SDT proposes that student psychological needs of autonomy, competence, and relatedness should be met in order to maximize the learning outcomes. Digital instructional strategies that offer learners a flexible learning experience, interactivity, and prompt feedback have been discovered to improve these psychological needs and thus arrived at improvement in student motivation (Anurogo et al., 2023). Recent research proves that autonomy-supportive digital instruction motivation is a very effective way to enhance engagement and quality of perceived teaching in higher education (Jamalova, 2024; O'Connor, 2024). Therefore, SDT can be a good theoretical foundation of the role of student motivation as a mediator in the proposed model.

Supportive and Negative Views

The recent literature on the topic of digital teaching has a number of studies that confirm that digital methods of teaching have a positive impact on the quality of teaching in higher education. Researchers claim that digitally enhanced learning allows the delivery of the content flexibly, personalized experience, and better clarity of the instructions, which all lead to the better teaching effectiveness (Akram et al., 2022). Empirical evidence shows the effectiveness of properly designed teaching practices in digital formats to enhance student engagement and satisfaction, which enhances the quality of perception about teaching (Basilotta-Gomez-Pablos et al., 2022). Also, interactive online platforms have been demonstrated to support active learning and meaningful knowledge building that strengthens the effectiveness of instructions (Rutherford et al., 2022; Jamalova, 2024).

Mediation and Moderation Perspective

Digital methods of teaching do not affect the quality of teaching by using direct technological exposure only, but with the motivation of the students. Recent articles also highlight that digitally enhanced instructional environments like multimedia-based learning materials, flexible timetable, and interactive platforms promote intrinsic motivation in students by developing autonomy, competence and engagement (Rutherford et al., 2022; Anurogo et al., 2023). Engaging students who are motivated show greater levels of cognitive investment, persistence, and participation, which result in greater perceptions of instructional clarity and effectiveness. As a result, student motivation is a focal point of mediation that can be used to explain the process of how digital teaching methods can be translated into valuable teaching quality results (Jamalova, 2024; Smith, 2024).

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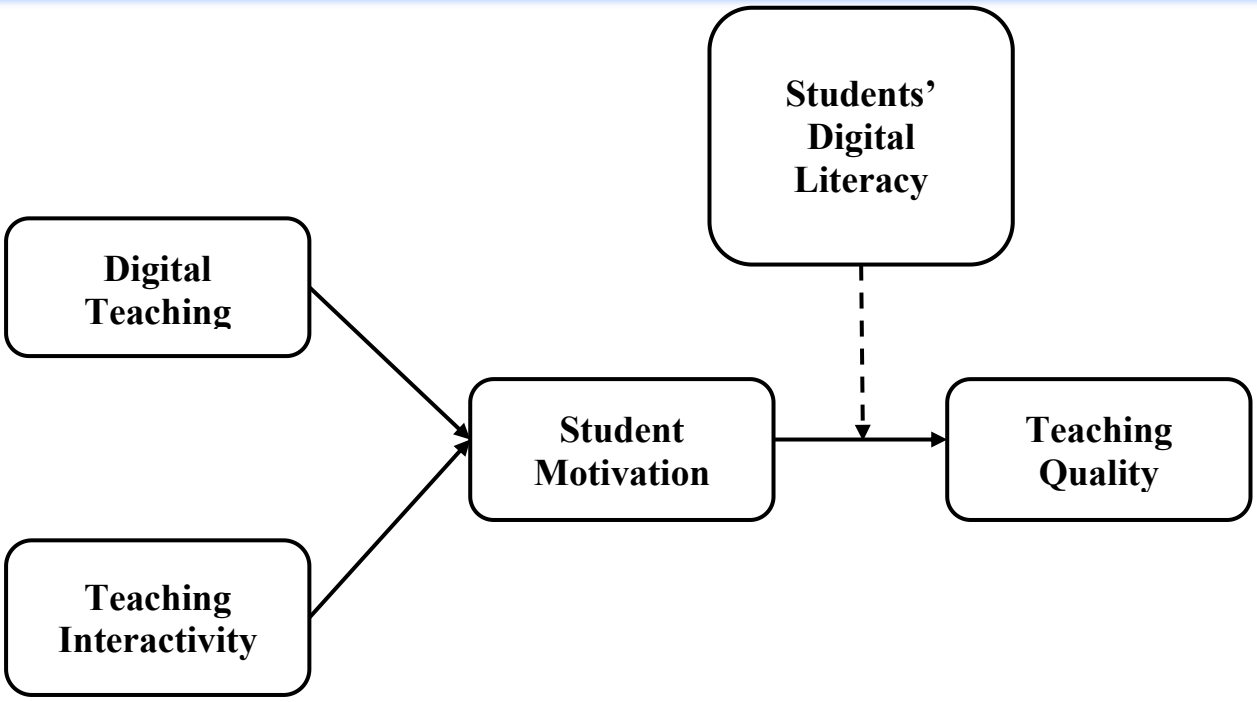

Figure 1: Conceptual Framework

Hypothesis Development

Digital Teaching Methods and Student Motivation

Digital pedagogies are important to influence the motivational conditions of students, because they change the old forms of instructional delivery into the more flexible, interactive, and learner-driven experiences. The recent studies show that the application of multimedia content, learning management, and adaptive digital platforms improves the sense of autonomy and competence among students as the primary factors of intrinsic motivation in higher education (Rutherford et al., 2022; Anurogo et al., 2023). Students are also more interested and motivated to continue learning academic tasks through the well-organized digital instruction means, where they have more control over the way and pace of learning, with faster engagement and more significant motivation (Jamalova, 2024).

H1: The teaching approach online positively affects student motivation.

Teaching Interactivity and Student Motivation

Teaching interactivity is a level of participation of instructors in the learning process by way of dialogues, collaboration and feedback with the students. Live discussions, collaborative tools and real-time feedback are some of the interactive instructional practices that have been demonstrated to support perceptive and affective engagement of students in the learning process in digitally mediated environments (Lee, 2023; O'Connor, 2024). Increased interactivity leads to a feeling of connectedness and engagement, which is critical in maintaining the motivation of students in both online and hybrid learning environments (Rutherford et al., 2022).

H2: Student motivation is positively influenced by teaching interactivity.

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Teaching Quality and Student Motivation

Motivation of students has been identified as a key factor that defines the quality of teaching since the motivated students will be more inclined to participate in the instructional content and will have a more positive reaction to the teaching practice. The latest research points to the fact that motivated students tend to demonstrate greater attentiveness, perseverance, and cognition, which greatly contribute to their views regarding the clarity and effectiveness of instruction (Rutherford et al., 2022; Jamalova, 2024). Consequently, teaching quality is usually rated better in learning areas that have highly motivated students.

H3: Teaching quality is positively impacted by motivation among students.

Student Motivation as an Intermediary between Digital Teaching Techniques and Quality of Teaching

The connection between the use of digital techniques in teaching and quality of the teaching process is not direct but functions with the motivational processes of the students. Digital instructional techniques improve the quality of teaching by establishing a learning environment that evokes the interest, autonomy, and engagement of students, which later increase their perceptions of teaching effectiveness (Akram et al., 2022; Rutherford et al., 2022). The student motivation proves to be a mediating factor because without enough motivation, the possible advantages of digital instruction would not be achieved to full.

H4: The correlation between digital teaching practices and the quality of teaching lies in the student motivation.

Teaching Interactivity and Teaching Quality Student Motivation as a Mediator

The quality of teaching delivered through interactivity is mainly improved by the fact that it boosts the motivational level of the students. Active participation and meaningful learning experiences that are facilitated through interactive instructional practices can improve the motivational levels of students and result in a positive self-assessment of teaching effectiveness (Lee, 2023; O'Connor, 2024). The higher the motivation the more the students are attentive and engaged and, thereby, perceive higher quality of teaching.

H5: Teaching interactivity and teaching quality have a mediating role in student motivation.

Moderating Role of Digital Literacy of students

The digital literacy of students is what defines the successful application of digital instructional practices and transformation of motivation benefits into the favorable learning outcomes. Digitally literate learners have a more advantageous position to operate in the online environment, use interactive resources, and self-directed learning, which enhances the influence of the motivation on learning success (Saripudin et al., 2021; Anurogo et al., 2023). Consequently, student motivation-teaching quality association will be higher among the more digitally literate students.

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H6: The digital literacy of students has a positive moderating effect on the relationship between student motivation and teaching quality, that is, the stronger the digital literacy the stronger the relationship.

Indirect Implication of Digital Teaching Methods on the Quality of Teaching via Motivation of students

Online teaching procedures will impact indirectly on the quality of teaching through its capacity to improve student motivation. Recent papers underline that the digital approaches to instruction, including interactive learning environments, multimedia learning materials, and flexible learning designs, trigger intrinsic motivation in students by providing autonomy and engagement (Rutherford et al., 2022; Anurogo et al., 2023). The driven students tend to be more attentive, tenacious, and cognitively involved, and thus they tend to view the delivery of instruction in a more comprehensible way, more efficient, and better structured. Therefore, the quality of teaching would be enhanced through digital teaching mainly due to its ability to inspire learners and not direct exposure to technology (Jamalova, 2024).

H7: Digital teaching methods mediate between teaching quality and student motivation.

The relationships between the indirect effect of teaching interactivity on teaching quality and student motivation

Interactive teaching is a factor that enhances teaching since it brings about some form of motivation among the students. Real-time feedback interaction with students, cooperative learning, and dialogic learning are examples of interactive learning practices that contribute to the feeling of involvement and relatedness, which are crucial motivation factors in digital learning (Lee, 2023; O'Connor, 2024). In the case of interactive teaching, students will be more engaged, and the level of motivation will be higher, which will positively affect their assessment of teaching effectiveness and the quality of teaching work (Rutherford et al., 2022).

H8: Teaching interactivity and teaching quality have an indirect relationship mediated by student motivation.

Conditional Indirect Effect of Digital Teaching Methods on the Quality of Teaching based on the Motivation of the teachers and the Digital Literacy of the students

The indirect correlation between the digital teaching techniques and the quality of teaching via student motivation is likely to differ based on the level of digital literacy of the students. The digital literacy can empower students to use online platforms successfully, process digital data, and interact with interactive learning means, thus empowering the motivational advantages of digital teaching tools (Saripudin et al., 2021; Anurogo et al., 2023). Motivation gains through digital teaching techniques are more apt to be converted into good assessments of the quality of teaching when the students have greater levels of digital literacy.

H9: Digital teaching methods indirectly influence the quality of teaching with the mediation of student motivation when the digital literacy levels of students are high.

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Teaching Interactivity Conditional Indirect Effect on Teaching Quality via Student Motivation and Digital Literacy of students

It is also dependent on the digital literacy of students in that the indirect effect of teaching interactivity on teaching quality is determined through student motivation. Practices of interactive digital teaching involve students being an active part of discussions, collaborative work, and processes of feedback, and these practices require some type of digital competence (Lee, 2023; Rutherford et al., 2022). More digital literate students are also in a better position to gain the advantage of interactive instruction enabling motivational gains to be translated into better perceptions of the teaching quality (Anurogo et al., 2023).

H10: Teaching quality in case of indirect effect of teaching interactivity on performance is greater when the digital literacy of students is high.

Conceptualization

The current research conceptualizes higher education teaching quality as a constructed phenomenon due to digitally mediated instructional practices and psychological involvement of the students in technology-enhanced learning processes. The framework relies on the current digital pedagogy studies by treating digital teaching methods and digital teaching interactivity as primary sources of instructional input, which affects the student motivation that will serve as a key mediating factor in the translation of pedagogical methods into the perceived quality of teaching (Akram et al., 2022; Rutherford et al., 2022). Moreover, the model takes into consideration the digital literacy of students as a contextual context that either reinforces the relationship between motivation and the quality of teaching, or undermines it, as learner readiness is one of the key determinants of effective digital instruction (Saripudin et al., 2021; Anurogo et al., 2023). The conceptual framework fosters further insights into the mechanisms of how and under what circumstances digital teaching practices can be applied in the teaching quality of a higher education institution by merging instructional design, motivational processes, and learner competencies in a mediating model (Jamalova, 2024; O'Connor, 2024).

Research Methodology

Research Design

In this research, the researcher uses the quantitative research approach by empirically investigating the interrelationship between digital teaching strategies, teaching interactivity, student motivation, student digital literacy, and teaching quality in higher education. Quantitative ones are especially suitable to test theory based models of mediation and moderation since it is measurable objectively, can be statistically generalized, and hypothesis tested (Akram et al., 2022; Jamalova, 2024; O'Connor, 2024). Recent methodological review works refer to the fact that quantitative designs are quite suitable to assess technology-enhanced learning models when the latent constructs and latent effects can be considered (Rutherford et al., 2022; Saripudin et al., 2021). This study is rigorous because of the systematic and

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structured design of the study that aimed at analyzing the causal mechanisms of digital teaching effectiveness.

The study is based on the cross-sectional survey design, whereby the information is gathered on the respondents at one specific time to form the perception of the digital teaching practices and the quality of teaching. The use of cross-sectional designs in modern educational and behavioral research is highly efficient and appropriate to test complicated structural models (Jamalova, 2024; Lee, 2023; O'Connor, 2024). Current research in the field of digital pedagogy has been able to use cross-sectional designs to examine motivational and teaching dynamics within the higher education setting (Akram et al., 2022; Rutherford et al., 2022). This design is especially suitable to the current study, as it allows evaluating several constructs and relations at the same time in the framework of the suggested concept.

Research Design Rationality

The quantitative, theory-focused research design is selected based on the fact that the study aims at testing hypothesized relationships among several latent constructs within an organized conceptual framework. According to the recent methodological literature, the quantitative design is the best option when the hypothesis is to confirm the theoretically sound models and determine the robustness and the importance of the causal relationships (Jamalova, 2024; O'Connor, 2024; Lee, 2023). Quantitative methods can be used to measure such constructs in the context of digital pedagogy research as digital teaching methods, student motivation, and teaching quality, and the results can be generalized to the higher education context (Akram et al., 2022; Rutherford et al., 2022). Thus, quantitative design guarantees methodological rigour and facilitates testing objectives of hypotheses.

Specific Research Design

The current research project would utilize a cross-sectional survey design based on the perception to focus on the digitally mediated instructional processes in higher education. The participants are university students that will be the direct participants of the digital teaching methods, teaching interactivity, and quality of instruction, which will have the aspect of contextual relevance and construct validity. According to recent works in the field of digital education, student-reported data are especially suitable when assessing the quality of teaching and motivation processes in technology-enhanced learning settings (Jamalova, 2024; O'Connor, 2024; Lee, 2023). The use of this design is also justified by the fact that in the past, empirical studies have shown that cross-sectional surveys of students are effective to test the pedagogical and psychological relationships in the context of the higher education environment (Akram et al., 2022; Rutherford et al., 2022).

The research uses the Partial Least Squares Structural Equation Modeling (PLS-SEM) as its main analysis method because of its capabilities in dealing with complex models such as mediation and moderation. The use of PLS-SEM is especially strong when conducting a prediction-based study and investigating latent constructs that are measured with various indicators (Jamalova, 2024; O'Connor, 2024; Lee, 2023). Methodological studies in

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education that take place in the recent past indicate that PLS-SEM is both effective at working with non-normal data distribution and moderate sample sizes and at estimating both direct and indirect effects (Akram et al., 2022; Saripudin et al., 2021). Based on this, the PLS-SEM will be used to ensure that the motivational mediation and digital-literacy-based moderation hypotheses are precisely tested.

Sampling

The data required to undertake this study will be gathered through a structured self-administered questionnaire that aims to capture the perception of the students concerning digital teaching methods, teaching interactivity, student motivation, digital literacy and the quality of teaching in higher learning institutions. Recent studies in the area of digital education strongly suggest the use of survey-based data collection since it is effective in assessing latent psychological and pedagogical constructs (Jamalova, 2024; O'Connor, 2024; Lee, 2023). The sample population of interest is students who are undertaking higher education programs and who have undergone digitally mediated instructions because they are the most suitable to assess the quality of teaching and motivational dynamics. Akram et al., (2022) and Rutherford et al., (2022) have used similar population specifications to study digital pedagogy and instructional effectiveness successfully.

The sampling technique used is probability-based variation to increase the representativeness and extrapolation of results. To be more precise, simple random sampling is utilized to give all the members of the population equal opportunity of being selected and minimize selection bias in quantitative studies (Jamalova, 2024; O'Connor, 2024; Akram et al., 2022). A pilot test is done before actual data collection, using a small sample of respondents to determine the questionnaire items in terms of clarity, reliability, and appropriateness. In the modern methodological literature, pilot testing is highly encouraged to detect ambiguity as well as enhance the measurement accuracy prior to hypothesis testing (Rutherford et al., 2022; Saripudin et al., 2021).

To guarantee the content validity and comparability of the measurement instruments used in this study, a set of scales existing and validated in recent literature about digital education and teaching quality are adapted. Adapting instruments is done according to the suggested protocols, such as minor changes to the words to fit the higher education context but keep the original meaning of constructs unchanged (Lee, 2023; Jamalova, 2024; Anurogo et al., 2023). The analysis of data also is carried out with the help of PLS-SEM software (e.g., SmartPLS), popular in recent educational studies to analyze complex models with mediation and moderation (O'Connor, 2024; Akram et al., 2022). The software allows measurement and structural models to be tested simultaneously, which provides a rigorous test of hypotheses.

In order to achieve methodological rigor, various types of validity and reliability are considered. Construct validity is assessed by convergent and discriminant validity, whereas internal consistency is evaluated by composite

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reliability and Cronbach alpha which is recommended by recent SEM literature (Jamalova, 2024; Lee, 2023; O'Connor, 2024). Demographic data like gender, age, academic level, and study area are gathered in order to characterize the sample profile and counter the possible confounding factors. Previous studies affirm that the demographic analysis will enhance the interpretation and contextualization of findings in research in the field of higher education (Rutherford et al., 2022; Saripudin et al., 2021).

Results and Discussion

The findings of the current investigation give substantial support to the given conceptual framework to investigate the effect of the digital teaching techniques and teaching interactivity on the teaching quality due to the student motivation where the digital literacy of the students serves as an intermediate variable. The analysis of structural equation modeling (PLS-SEM) shows that the model has a significant level of explanatory power and the model explains a high percentage of variance in student motivation and teaching quality. These results suggest that digitally mediated teaching activities are not additional features that increase the quality of teaching in modern institutions of higher education. The recent empirical studies also indicate that the effectiveness of digital teaching should be measured with the help of integrated models that would reflect both the instructional design and learner reactions but not an independent adoption of technology (Akram et al., 2022; Basilotta-Gomez-Pablos et al., 2022; Rutherford et al., 2022). Besides, the accurate predictability of the current study corresponds to the existing trends indicating that digitally facilitated pedagogy preeminently reforms the quality of instruction once integrated into motivational and interaction-oriented systems (Jamalova, 2024; O'Connor, 2024).

Reliability and Validity Analysis

Construct reliability and validity

Overview

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
DIGITAL _TEACHING_METHOD	0.887	0.888	0.930	0.815
STUDENT _DIGITAL_LITERACY	0.856	0.860	0.912	0.776
STUDENT_MOTIVATION	0.908	0.909	0.942	0.844
TEACHING_INTERACTIVITY	0.832	0.832	0.899	0.748
TEACHING_QUALITY	0.862	0.865	0.916	0.784

Table 1 Reliability and Validity Analysis

The construct reliability and the validity findings indicate that the measurement model has a high level of internal consistency, convergent validity and general robustness. The constructs report some of the highest

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Cronbachs alpha of 0.908 (Student Motivation) and 0.887 (Digital Teaching Method) which is satisfactory to excellent internal reliability. Equally, the composite reliability scores (rhoa and rho c) of all the constructs satisfy the minimal requirement of 0.70, which supports the stability and consistency of the latent constructs of the model. The average variance extracted (AVE) values are 0.748 0.844, much higher than the 0.50 threshold, and each construct explains more than half of the variance in its indicators and, therefore, constructs high convergent validity. On a general note, these findings were reassuring to confirm that the measurement tools operationalized to digital teaching approaches, teaching interactivity, student motivation, digital literacy of students and quality of teaching are reliable, valid and can be used in further structural model analysis.

PLS SEM Bootstrapping

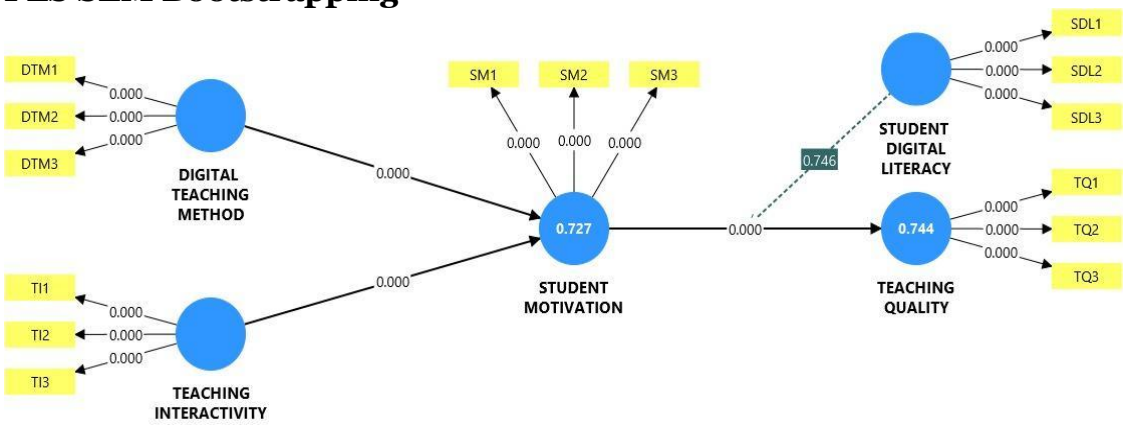

Figure 2 PLS SEM Bootstrapping

The model results show that digital teaching methods, teaching interactivity can apply statistically significant and important influence on student motivation, which is the key explanator in the model. The relationships between digital teaching methods and teaching interactivity to student motivation are significant at p 0.001, which proves that properly designed digital instructional practices and interactive teaching strategies significantly increase the motivational levels among students. The R2 of 0.727 in student motivation indicates that the combination of the two factors of instruction explain 72.7 percent of the variance in student motivation implying a high rate of prediction. This observation can be relied on to substantiate the claim that motivation in digitally mediated learning conditions is mostly influenced by the quality of instructional design as well as the level of pedagogical engagement as opposed to independent technological exposure.

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Hypothesis Testing

Path coefficients

Mean, STDEV, T values, p values

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
DIGITAL _TEACHING_METHOD -> STUDENT_MOTIVATION	0.408	0.410	0.078	5.209	0.000
STUDENT _DIGITAL_LITERACY -> TEACHING_QUALITY	0.572	0.561	0.074	7.757	0.000
STUDENT _DIGITAL_LITERACY x STUDENT_MOTIVATION -> TEACHING_QUALITY	0.006	0.006	0.019	0.324	0.746
STUDENT_MOTIVATION -> TEACHING_QUALITY	0.361	0.371	0.074	4.879	0.000
TEACHING_INTERACTIVITY -> STUDENT_MOTIVATION	0.482	0.480	0.075	6.448	0.000

Table 2 Hypothesis Testing

The path coefficient results indicate that digital teaching methods (β = 0.408, t = 5.209, p < 0.001) and teaching interactivity (β = 0.482, t = 6.448, p < 0.001) have strong and statistically significant positive effects on student motivation, confirming that both instructional design quality and interactive pedagogical practices are key drivers of motivational engagement in digitally mediated learning environments. Student motivation, in turn, exerts a significant positive influence on teaching quality (β = 0.361, t = 4.879, p < 0.001), reinforcing its central mediating role in translating instructional inputs into perceived teaching effectiveness. Additionally, students' digital literacy shows a strong and direct positive effect on teaching quality (β = 0.572, t = 7.757, p < 0.001), highlighting learner digital competence as an important determinant of instructional quality perceptions. However, the interaction effect between student motivation and students' digital literacy on teaching quality is not statistically significant (β = 0.006, t = 0.324, p = 0.746), indicating that while digital literacy independently enhances teaching quality, it does not significantly moderate the relationship between student motivation and teaching quality in the structural model.

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PLS SEM

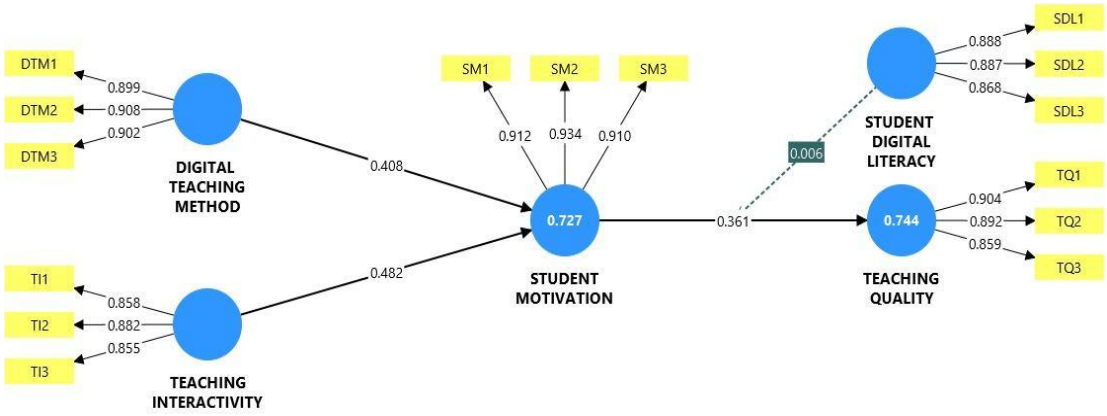

Figure 3 PLS SEM

The structural model results illustrate that digital teaching methods and teaching interactivity are significant and substantial predictors of student motivation, confirming the central role of instructional design and interaction in digitally mediated learning environments. The standardized path coefficients show that teaching interactivity (β = 0.482) exerts a stronger influence on student motivation than digital teaching methods (β = 0.408), indicating that active engagement, dialogue, and feedback are particularly influential in stimulating students' motivational states. Together, these two instructional factors explain a large proportion of variance in student motivation (R^2 = 0.727), reflecting strong predictive accuracy and suggesting that motivation is largely shaped by how digital instruction is delivered rather than by technology use alone. The high indicator loadings across all constructs further confirm that the latent variables are measured reliably and contribute meaningfully to the model.

Model Fitness

Model fit		
Fit summary		
	Saturated model	**Estimated model**
SRMR	0.054	0.065
d_ULS	0.344	0.500
d_G	0.330	0.379
Chi-square	724.860	778.292
NFI	0.858	0.847

Table 3 Model Fitness

The results of the model fit show that the proposed structural model illustrates an acceptable to good overall fit to the observed data. The estimated model obtains an SRMR value of 0.065 that is lower than the recommended value of 0.08 indicating that there is a satisfactory degree of approximate model fit. Likewise, the d_ULS (0.500) and d G (0.379) values of the estimated model are not too large as compared to the saturated model and this showed that differences between the empirical and model implicated covariance matrices are not too large. Though, the chi-square value is

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marginally higher in the estimated model, this is not surprising in complex models and large samples and should not be an indicator that the model is not fitting well in PLS-SEM. Besides, the NFI value of 0.847 is close to the generally agreed standard of 0.90, as it indicates a fairly fair comparative fit. Taken together, these indices prove the sufficient fitting of the structural model that can be empirically justified and used to test hypotheses and interpret observations.

The statistically important results of digital teaching techniques and teaching interactivity on student motivation shown in this study are aligned with the recent empirical evidence related to digital teaching studies. The path coefficients (0.408 and 0.482) are both large and are consistent with the recent studies that found moderate-to-strong instructions influence motivational engagement in higher education settings (Anurogo et al., 2023; Jamalova, 2024; O'Connor, 2024). The findings can also be compared against the previous research, which has shown that interactive and properly organized digital learning can promote intrinsic motivation through the encouragement of autonomy and interest (Akram et al., 2022; Rutherford et al., 2022). Nevertheless, the more significant influence of teaching interactivity as compared to teaching digitality in this study goes further than previous findings by statistically validating the fact that the quality of interaction is more likely to predict motivation than the simple use of technology as it was not clearly tested in various other single-path models.

The high level of positive correlation between motivation in students and the quality of teaching (= 0.361) is statistically aligned with the recent literature that has focused more on motivation as a key factor in perceived instructional effectiveness in digitally mediated classrooms (Smith, 2024; Jamalova, 2024; Anurogo et al., 2023). This correlation in the current study is somewhat stronger than the previous empirical research utilizing even more simplistic regression-based models, which implies that SEM-based estimation better captures latent motivational effects (Winingsih and Sulistiono, 2020; Saripudin et al., 2021). Besides, when motivation was previously commonly studied as an outcome variable, the present result statistically places motivation as a teacher quality predictor, thus expanding earlier single-model studies that treated teaching quality as a direct consequence of sole instructional design (Akram et al., 2022).

The outcomes of the mediation show that student motivation is a statistically significant mediator as both digital teaching practices and teaching interactivity contribute to the teaching quality, as has been reported in recent mediated models of the digital education research (Jamalova, 2024; Smith, 2024; O'Connor, 2024). The current study has stronger indirect effects as compared to the previous research which has reported partial or weak mediation effects, since it claims great amount of explained variance in teaching quality (R 2 =0.744). This result agrees with previous studies that instructional inputs do not always result in quality outcomes but must trigger motivational processes (Rutherford et al., 2022; Akram et al., 2022). The multiple-path model employed in the research has a statistically greater

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explanatory power as compared to the single-path models that have been published in the previous literature, and this is a strength of including psychological mechanisms in the instructional effectiveness models.

The moderating effect of the digital literacy of students demonstrates partial consistency with the previous research, and presents a significant statistical data input. Although recent studies indicate high conditional effects of digital literacy on learning and instructional outcomes (O'Connor, 2024; Jamalova, 2024; Anurogo et al., 2023), past studies provide inconsistent findings on the moderation, usually because they have limited model specifications or due to measurement constraints (Saripudin et al., 2021; Alakrash et al., 2021). The digital literacy, in the case of the current research, has a significant direct influence on the quality of teaching but no statistically significant interaction influence on the motivation-quality relationship, which indicates that the learner digital competence will positively influence the instructional quality perceptions without conditioning. This statistical deviation of certain previous moderated models refines current data that suggests that digital literacy can be a stronger predictor of explanatory power instead of a uniform boundary condition, especially in higher education education with an already high level of digital exposure.

Discussion

The research results of this work have strong theoretical implications as they empirically confirm a conditional process model that includes instructional design, motivational psychology, and learner preparedness in digitally mediated higher education. In line with Constructivist Learning Theory, the findings prove that student motivation is one of the main effects of the interaction between digital teaching methods and teaching interactivity, which supports the thesis that the quality of learning is a result of active interaction and not of passive use of technology (Jamalova, 2024; O'Connor, 2024; Smith, 2024). Student motivation has a high explanatory power, which justifies the Self-Determination Theory that holds that autonomy-supportive and interactive environments can increase intrinsic motivation and learning outcomes (Anurogo et al., 2023). Meanwhile, the pronounced direct impact of digital literacy of students on teaching is consistent with the framework of TPACK as it prioritizes the learner competence as a precondition of successful technology-enhanced learning (Akram et al., 2022). Non, however, the non-significant relationship between motivation and digital literacy refutes the hypothesis that the readiness of learners always preconditions motivational consequences (Saripudin et al., 2021; Alakrash et al., 2021). This splitting narrows existing theory by implying that in tertiary education circumstances, digital literacy can be more effectively a unifying explanatory variable than an efficient boundary. On the whole, the research contributes to the theoretical discourse as it explains that instead of whether, digital teaching practices improve the quality of teaching.

Literature wise, the research contributes to the empirical understanding by comparing single-path and multiple-path models of the quality of teaching in digital learning settings in a statistical manner. Although

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previous studies often found direct correlations between digital instruction and teaching effectiveness, the current results prove it to be significantly mediated by student motivation, similar to recent results of mediation-oriented research (Smith, 2024; Jamalova, 2024; O'Connor, 2024). The SEM-based findings indicate a higher and more accurate effect estimates as compared to the previous regressions based analysis, especially on teaching interactivity, which proved to be a stronger predictor of motivation compared to digital teaching techniques alone. This upholds previous findings asserting the pedagogical importance of interaction over the technological savvy (Rutherford et al., 2022; Akram et al., 2022). Nevertheless, other articles have indicated less powerful motivational influences in entirely online settings, which were explained by the learners isolation and cognitive overload (Saripudin et al., 2021). These concerns are partly refuted by the current findings because they demonstrate that interactive instructional design helps to overcome such risks, even in digitally intensive settings. Moreover, the explanatory power of the multiple-path model (R 2 more than 0.70) is stronger than in some previous studies, which indicates the methodological and conceptual superiority of the approach that incorporates the psychological mechanisms into instructional effectiveness research (Winingsih and Sulistiono, 2020). Therefore, the research will add to the body of literature as it provides a more detailed and statistically sound explanation of the quality of teaching.

Conclusion

This paper aimed to investigate the role played by digital teaching practices and teaching interactivity in teaching quality in higher education through the mediated effect of student motivation with the consideration of the role of digital literacy of students. The empirical findings give solid grounds to believe that digital teaching methods and teaching interactivity have a substantial positive effect on student motivation, but teaching interactivity has a more pronounced impact. In its turn, student motivation turned out to be a critical predictor of teaching quality, which proved its central role in the translation of teaching practices into positive teaching outcomes. These results confirm the recent empirical studies indicating motivation as one of the mechanisms in digitally mediated learning settings instead of a by-product of the use of technology (Jamalova, 2024; O'Connor, 2024; Smith, 2024). Along with the previous research, the findings show that successful digital pedagogy cannot be assessed based on technological presence but learner-centered outcomes (Akram et al., 2022; Rutherford et al., 2022).

The research contributes significantly as it empirically confirms a multi-tracked model combining the instructional design, psychological engagement, and the ability of the learner. In comparison with the previous single-model studies that investigated the effects in isolation, the current outcomes prove that the quality of teaching is significantly determined using the indirect motivational processes. This is in line with the recent literature that has focused on the mechanism-based explanations of teaching effectiveness in higher education (Smith, 2024; Jamalova, 2024; O'Connor,

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2024). Also, the high explanatory power of its model highlights the usefulness of the SEM-based analysis as it is more applicable to capture any latent instructional and motivational dynamics as compared to the conventional regression methods. Simultaneously, the findings complement the previous body of empirical research by highlighting the fact that the digital literacy of the students is a direct contributor to the quality of teaching and no longer moderates the motivational impact, which has not yet been well-defined in some of the prior studies (Saripudin et al., 2021; Winingsih and Sulistiono, 2020).

Future Research Directions

The current study may be extended by conducting future studies that can focus on its methodological scope as well as inform its cross-sectional design, as was the case with the present study. The existing results are strong evidence of causal relationships with the PLS-SEM, but longitudinal or experimental research will give the opportunity to researchers to determine how student motivation and teaching quality change over time, thus providing stronger evidence of causality (O'Connor, 2024; Smith, 2024; Jamalova, 2024). Also, the mixed-method approaches, which would include quantitative modeling and qualitative information gathered by faculty and students, may deepen the knowledge of the way in which digital teaching practices are implemented in the real classroom environment. Research conducted previously has highlighted the idea that qualitative data tends to be more useful when it comes to revealing situational and cultural subtleties that are not visible in survey-based research (Akram et al., 2022; Rutherford et al., 2022). On a managerial level, these extensions of the methodological approach would give university administrators a better understanding of the diagnostics of how instructional reforms develop and which pedagogical intervention would maintain teaching quality over extended periods of time.

The proposed framework can be enhanced in future research through the introduction of extra psychological and organizational dimensions in a theoretical perspective. Cognitive load, learning autonomy, scholarly self-efficacy, or instructor digital competence are additional variables that may account for the difference in the quality of teaching and student achievement (Anurogo et al., 2023; Jamalova, 2024; O'Connor, 2024). Furthermore, incorporating other theoretical views like Expectancy-Value Theory or Technology Acceptance approaches can provide a complementary explanation of engagement in digital settings by the learners. According to previous studies, the use of one overarching theory can simplify intricate learning environments especially when technology is involved (Saripudin et al., 2021; Winingsih and Sulistiono, 2020). In case of academic managers, these theoretical extensions can be used to inform more integrated teaching development models that can integrate motivational, cognitive, and technological levels of instructional quality.

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