

EdTech Apps and Learner Success: Unraveling the Role of Engagement in Boosting Motivation and Knowledge..

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Abstract

This study employs a survey research method to investigate the effectiveness of Educational Technology (EdTech) applications on learners' motivation, engagement, and knowledge acquisition. Data was collected from EdTech users in various cities of Jharkhand state, India, between October 2022 and January 2023. Out of 166 returned questionnaires, 138 were utilized for analysis. The study employs Partial Least Square Structural Equation Modeling (PLS-SEM) through Smart PLS-4 to test the hypothesized relationships. The findings reveal significant positive relationships between learners' motivation and knowledge acquisition, motivation and engagement, as well as engagement and knowledge acquisition. Additionally, the study identifies a mediating role of learners' engagement in the relationship between motivation and knowledge acquisition...

Keywords: Educational Technology, Learners' Motivation, Learners' Engagement, Knowledge Acquisition, PLS-SEM..

INTRODUCTION

Educational Technology (EdTech) revolutionizes modern education, utilizing technology for enhanced learning. India sees rapid EdTech growth due to increased internet access and smartphone use, reshaping education with online platforms and specialized tools. Key platforms like Byju's, Unacademy, Duolingo, Rosetta Stone, and Vedantu offer diverse courses and transformative live virtual classes. Adaptive tech, augmented reality (AR), and virtual reality (VR) personalize learning. Globally, EdTech brings personalized learning, heightened engagement, and resource accessibility. However, educators need to adeptly navigate this landscape for effective lessons. These interventions enhance self-led learning and instruction, significantly improving outcomes (Mishra et al., 2020; Jaradat, 2023; Lim, 2022; Huang et al., 2019; Rodriguez-Segura et al., 2019; Steele, 1986).

Motivation, a pivotal force in learning, drives human behavior towards specific goals. Riadil (2020) underscores its correlation with improved learning outcomes. In the 21st century, the link between workforce training and success is emphasized by Colquitt et al. (2000) and Tombs (2018), highlighting the value of motivated learners. Learners employing direct strategies for motivation tend to be happier and more successful (Mohseni Takaloo & Ahmadi, 2017). Motivation is crucial for enhancing reading comprehension, a consensus among researchers (Dörnyei and Schmidt, 2001) and educators (Gambrell, 1996). Gopalan et al. (2017) stress motivation's critical role in educational success and lifelong learning, particularly with the shift to digital and virtual learning (Birari et al., 2022). Intrinsic motivation, driven by personal interest, significantly influences reading habits, associated with increased reading time and improved comprehension (Marinak & Gambrell, 2008). Conversely, extrinsic motivation relies on external incentives. Ribeiro Valle (2006) emphasizes that motivation is influenced by a combination of factors.

Educational technology plays a pivotal role in influencing learner motivation, as indicated by studies showing a positive correlation between digital tools and academic drive (Wei, 2022). Well- designed technology captures attention, reinforcing engagement and motivation (Yang & Wu, 2012; (Guri-Rosenblit, 2018). Multimedia

programs enhance enjoyment and motivation (Stepp- Greany, 2002). A connection has been established between optimism, motivation, and success in online language learning (Mantiri, 2015). For language learning, various digital tools, from videos to computers, impact motivation and provide abundant input, fostering engagement (Golonka et al., 2014; Binnur GENC ILTER, 2009). In English language learning, educational technology fundamentally transforms the learning environment, increasing motivation and engagement (Alghasab, 2020). Implementations like gaming, MOOCs, and multimedia learning significantly impact motivation and educational quality (Tsyganova et al., 2021; Deshpande & Chukhlomin, 2017; Yasin et al., 2021). Interactive multimedia fosters independent learning, evoking happiness and motivation (Çelik et al., 2014; Budiarto et al., 2021), cultivating a deep-seated interest and enthusiasm for learning.

Knowledge, encompassing facts, skills, and information from various sources (Goldman, 1999; Nawar, 2013; Selvi, 2012), significantly shapes education, impacting curricula and learning methods (Wahlström, 2010). Learning is intimately tied to motivation, influenced by internal drives and goal-setting (Mas' ud, 2020). In the knowledge era, learning is pivotal for adaptation, competitiveness, and technological progress (Xerri et al., 2018). The community of practice theory emphasizes social learning through active participation (Yakhlef, 2010; Wegner, 1991). Recognizing learners as knowledge workers underscores the dynamic nature of learning and the importance of conducive environments and tools (Broberg, 2001; Eraut 2010). This framework illuminates the intricate interplay between knowledge, learning, and motivation in education. Information technology in education aims for an inclusive learning environment, providing learners access to diverse resources and expert teachers worldwide, prioritizing collaboration over replacing human instructors with technology (Al-Banna, 2016). Effective EdTech interventions emphasize self-led learning and instructional enhancements, aligning with Rodriguez-Segura et al.'s (2019) perspective. Experiential Learning (EL) by Kolb (1984) advocates learning through experiences and assessing learners based on prior experiences (Sternberg & Zhang, 2014). EL promotes a cycle of "Do, Reflect, Think, and Apply," harmonizing with self-led learning and improved instruction through EdTech (Butler, 2019; Kong, 2021). This narrative underscores the overarching goal of educational technology, effective interventions, and a pedagogical approach that complements these efforts.

Student engagement in education has evolved into a multidimensional concept (Phuc, N. H., 2022; Arnold & King, 2014; Christenson et al., 2012). Initially, Astin (1984) defined it as the energy students invest in academic experiences, but subsequent scholars like Newman (1992), Kuh (2003), and Robinson & Hullinger (2008) refined it to include psychological engagement and the time and effort dedicated to educational activities. Modern perspectives encompass motivation, emotions, attention, and goals (Mahdikhani & Rezaei, 2015; Sari & Nayır, 2020; Oraif & Elyas, 2021; Suharti et al., 2021). Fredricks et al. (2016) further categorize it into behavioral, cognitive, and emotional dimensions, providing a comprehensive view.

In online education, student engagement refers to participation, motivation, and interest in synchronous virtual learning environments (Kahu & Nelson, 2018; Maheshwari, 2021; Nurharjanto, 2023). These settings, facilitated by platforms like Zoom and Microsoft Teams, pose unique challenges (Hiltz & Hiltz, 1995; Eraut, 2010). Therefore, effective strategies to enhance engagement in online classes are crucial (F. Martin et al., 2018; Hiver et al., 2021).

Educational technology (EdTech) plays a vital role in promoting student engagement, particularly in the behavioral dimension (Bedenlier et al., 2020; Coates, 2007; Payne, 2019). Tools like blogs, mobile learning, and assessments are effective in this regard. While caution is needed in assessing EdTech's educational effects due to limited research and concerns about research design (Ullah & Anwar, 2020; Hong & Kim, 2021), its integration into education offers tangible benefits, increasing engagement and students' enjoyment of learning materials (Schindler et al., 2017; Kawinkoonlasate, 2020). Technology's incorporation into education has the potential to transform the learning experience and foster deeper student engagement (Fredricks et al., 2004; Appleton et al., 2008; Kahu & Nelson, 2018; Pekrun & Linnenbrink-Garcia, 2012).

Research Objectives

To empirically investigate the extent and nature of the relationship between learners' motivation and their knowledge acquisition.

To examine the association between learners' motivation and their level of engagement in the learning process.

To assess the influence of learners' engagement on their knowledge acquisition in educational settings.

To explore the mediating role of learners' engagement in the relationship between their motivation and knowledge acquisition.

Literature Review and Hypotheses Development

Learners' Motivation and Learners' Knowledge

Motivation is a cornerstone of students' learning experiences and outcomes, driving their active engagement with educational activities (Rodríguez et al., 2000; Baldwin & Karl, 1987). This heightened engagement facilitates better information absorption (Levpušček et al., 2012) and employs higher cognitive processes, leading to a deeper grasp of the material (Riswanto & Aryani, 2017). Research consistently establishes a strong link between

motivation and academic performance, underlining its significance (Mawarsih, 2013). Higher motivation also translates into more substantial learning achievements (Riadil, 2020) and supports meaningful learning, active participation, and enduring knowledge retention (Nurmadiyah, 2016).

In workplace learning, motivation is pivotal for program effectiveness, and positive motivational factors are closely associated with improved learning outcomes (Noe et al., 2010; Brom et al., 2018). University students with robust motivation exhibit enhanced utilization of learning strategies (Cenic et al., 2018; Cox et al., 2001.). Favorable motivational beliefs, like high self-efficacy and a focus on mastery goals, correlate with heightened cognitive engagement and superior academic performance (Garcia & Pintrich, 2023; Rodriguez-Segura et al., 2019). The integration of technology and interactive activities significantly impacts learner engagement, revolutionizing the educational landscape (Ullah & Anwar, 2020; Al-Banna, 2016).

This intricate relationship between motivation and learning emphasizes their reciprocal influence and underscores the imperative of sustaining motivation for successful educational outcomes.

Recognizing individual disparities in learning goals and motivations is crucial for establishing effective learning environments (Cheng & Chang, 2015). Moreover, in higher education, motivated learners are more likely to achieve success, underscoring the importance of nurturing motivation (Halif et al., 2020; Derakhshan, 2021). Krashen's monitor model and Bialystok's strategy model highlight motivation's role in language acquisition, demonstrating how learners' motivational levels impact their language learning proficiency (Krashen, 1981; Mahdikhani & Rezaei, 2015). Drawing from the insights presented in these literature reviews, the study proposes that:

H1: There is a positive relationship between learners' motivation and learners' knowledge acquisition.

Learners' Motivation and Learners' Engagement

The interplay between student motivation and academic engagement is a pivotal focus in educational research. Motivation, a multifaceted psychological aspect, significantly influences students' approach to learning. Engagement, on the other hand, encompasses observable behaviors that demonstrate active involvement in the learning process. Scholars emphasize the intertwined nature of motivation and engagement in education (Han et al., 2021), a viewpoint further supported by the ascendancy of positive psychology in education, which prioritizes classroom engagement (Kong, 2021). Studies highlight that learner engagement strongly impacts overall academic achievement in higher education, underscoring its significance (Xerri et al., 2018). Low levels of engagement have been linked to negative experiences, discontent, and even student dropout rates (Derakhshan, 2021). Additionally, research delves into the intricate relationship between teaching

practices and learner motivation. Need-supportive teaching has emerged as a catalyst for enhancing students' motivation and engagement (Stroet et al., 2013), consistently showing a positive correlation in empirical studies (A. J. Martin & Dowson, 2009). The realm of e-learning and blended-learning projects has also been a focal point, investigating engagement and motivation dynamics, particularly in digital and hybrid learning environments (Priego & Peralta, 2013; Unrau & Quirk, 2014). Motivation theories stress aligning educational practices with students' individual needs and expectations to significantly enhance their engagement (McMillan & Forsyth, 1991). Utilizing the foundation laid by these literature reviews, the study proposes that:

H2: There is a positive relationship between learners' motivation and learners' engagement.

Learners' Engagement and Learners' Knowledge

Learner engagement is pivotal for academic success, consistently linked to positive learning outcomes (Zhang, Z., 2022). It establishes an active learning environment, though insufficient motivation can lead to deficits in behavioral, emotional, and cognitive involvement (Stroud, 2019). Heightened engagement correlates with increased learning effectiveness, emphasizing its crucial role (Sharma, D. H., & Chachra, A., 2020). The shift towards hybrid teaching, propelled by technology, underscores the adaptability of student engagement in modern education (Johnson et al., 2018). This adaptability is notably evident in blended learning environments, where a strong connection between engagement and knowledge acquisition in distance education is established (Brown et al., 2018; Alrashidi et al., 2016).

Engagement serves as a powerful tool to combat disaffection, boost motivation, and elevate student participation and achievement levels (Appleton et al., 2008; Carter et al., 2012; Li & Lerner, 2011; Upadyaya & Salmela-Aro, 2013). Studies consistently affirm a positive link between students' academic performance and their level of engagement, assessed through standardized tests, scores, and grades (Finn et al., 1997). The dimensions of engagement - cognitive, emotional, and behavioral - mutually influence academic performance, further highlighting their significance (Chase et al., 2014; Wang & Eccles, 2012). In a correlational framework, vigor, dedication, and absorption emerge as significant predictors of students' performance (Alrashidi et al., 2016; Casuso-Holgado et al., 2013). The impact of learner engagement on achievement is widely recognized, supported by extensive theoretical and empirical research across various educational levels (Ahmed, H. A., & Salih, H. S. M., 2020). Additionally, Sarr, E. I. A. (2021) underscores the notable relationship between adults' engagement in knowledge acquisition, further emphasizing its

significance in the learning process. Anchored in the evidence and perspectives articulated in these literature reviews, the study proposes that:

H3: There is a positive relationship between learners' engagement and learners' knowledge acquisition.

Mediating Role of Learners' Engagement

The mediating role of learner engagement is pivotal in understanding the connection between motivation and knowledge acquisition. Engagement is increasingly recognized as vital for effective learning, particularly in technologically enhanced environments (Reading, C. E., 2008; Brown et al., 2018). Stimulating instructional practices correlate with positive educational outcomes (Shin & Bolkan, 2021; Stolk et al., 2014). In the realm of workforce learning, comprehending learner motivation is essential for understanding knowledge acquisition (Dörnyei & Schmidt, 2001). Additionally, learners' engagement serves as an indicator of their motivation, acceptance, and attachment to learning activities (Garcia & Pintrich, 2023; Bouvier et al., 2013). Affective learning and student engagement further mediate the impact of intellectual stimulation on intrinsic motivation (Shin & Bolkan, 2021). In sum, engagement's mediating role is vital in facilitating the link between learner motivation and knowledge acquisition. On the basis of these insights from the literature reviews, the study proposes that:

H4: Learners' engagement mediates the relationship between learners' motivation and learners' knowledge acquisition.

Research Methodology

The research utilized a survey method to gather data from individuals utilizing edtech for their studies. Data analysis was conducted through Partial Least Square Structural Equation Modeling (PLS-SEM) using Smart PLS-4. Respondents were selected via purposive sampling in various cities of Jharkhand, India, between October 2022 and January 2023. Out of 200 distributed questionnaires, 166 were returned, yielding an 83.00% response rate. After excluding 28 incomplete questionnaires, 138 were used for analysis. The sample size (138) exceeds the recommended size for PLS-SEM (Hair et al., 2014). The questionnaire consists of two sections: one collecting demographic information, and the other assessing LM, LE, and LK on a 5-point Likert scale. The measurement of LM encompasses 5 items and draws from the framework established by Deci and Ryan (1985) as outlined in their Self-Determination Theory. The section on LE comprises 3 items, which were adapted from the research conducted by Schaufeli, Bakker,

and Salanova in 2006. Additionally, the assessment of LK encompasses 3 items, sourced from the work of Anderson and Krathwohl (2001). The scale items included in the final questionnaire are shown in Table 1.

Table 1: Scale Items and Latent Measures

Latent Measures	Variable	Description
Learners' Motivation (LM)	M1	When I engage with virtual topics through ed-tech apps, I anticipate finding them highly motivating.
	M2	I feel motivated to retain information from my classes and readings when I use an edutech app.
	M3	I am motivated to utilize the edutech app to create new, complex interpretations or connections by organizing concepts, knowledge, or experiences.
	M4	I have confidence in my ability to excel in solving problems and completing tasks assigned to me through ed-tech apps.
	M5	When attending classes on educational technology apps, I often come prepared with questions I want to ask.

Learners' Engagement (LE)	E1	The educational technology app effectively maintains my interest by providing periodic assessments.
	E2	I often dedicate my free time to explore compelling subjects that have been covered in different educational technology app courses.
	E3	I find the content shared on educational technology apps to be intriguing and captivating.
Learners' Knowledge (LK)	K1	The use of ed-tech apps significantly contributes to the acquisition of job or career-related knowledge and skills.
	K2	Ed-tech apps effectively support clear, accurate, and effective writing.
	K3	Ed-tech apps play a valuable role in the development of critical and analytical thinking.

Data Analysis and Modelling

Sample Description

Table 2: Sample Description					
Gender		Age		Qualification	
	Percent		Percent		Percent
Male	63.8	Up to 25 years	98.6	Post Graduate	63.8
Female	36.2	26-45 years	1.4	Under Graduate	27.5
				Intermediate	8.7

Table 1 presents demographic characteristics of the sample population, offering foundational insights for the research. It shows a notable male predominance, comprising 63.8% of the total, while females account for 36.2%. The majority, 98.6%, fall within the "Upto 25 years" age category, indicating a youthful sample. In terms of educational qualification, "Post Graduate" holders represent a significant portion at 63.8%, followed by "Under Graduate" qualifications at 27.5%, suggesting a substantial engagement in higher education.

Measurement Model Assessment

Figure 1 depicts the PLS-SEM measurement model with influencing factors, namely motivation as exogenous and learners' knowledge acquisition as the endogenous variables. The factor related to learners' engagement was considered as the mediating variable between learners' motivation and learners' knowledge acquisition.

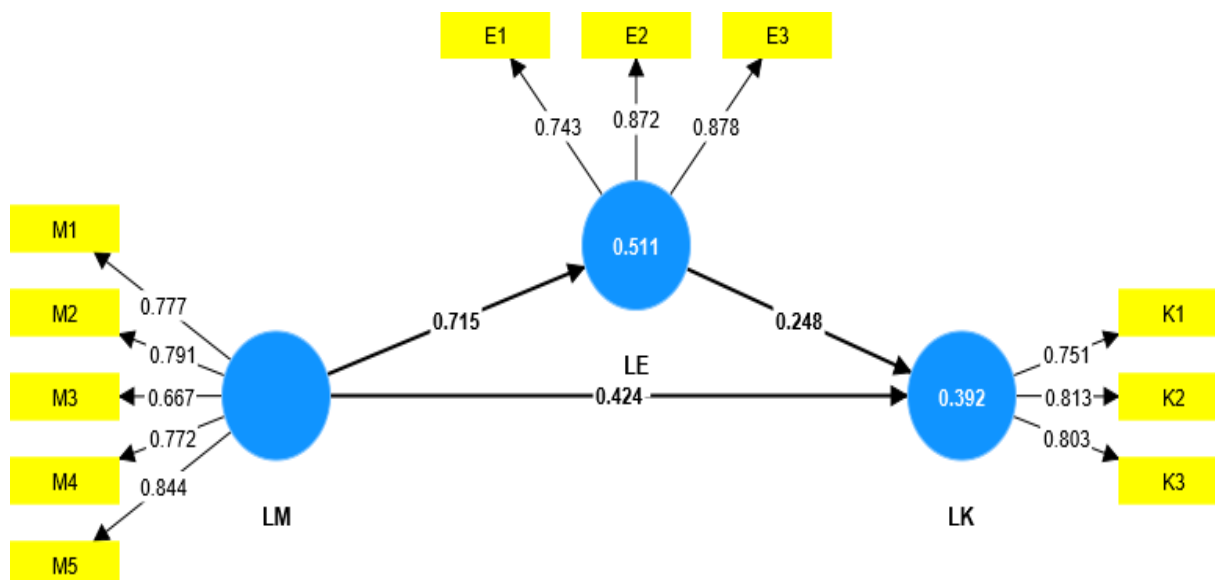


Figure 1: Measurement Model

As depicted in Table 2, all latent variables exhibited composite reliability (CR) values exceeding 0.70, aligning with the criteria established by Hair et al. (2006). This outcome affirms the internal consistency of the constructs. Moreover, the average variance extracted (AVE) values surpassed the recommended threshold of 0.50, as stipulated by Hair et al. (2006), substantiating the presence of convergent validity.

Table 3: Construct Reliability and Validity

Constructs	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
LE	0.777	0.788	0.872	0.695
LK	0.698	0.701	0.832	0.623
LM	0.829	0.836	0.88	0.596

Discriminate Validity

Table 2 displays the results of the discriminant validity assessment using the Heterotrait-Monotrait Ratio of Correlations (HTMT) method. The findings confirm discriminant validity between the constructs, with HTMT values falling below the recommended threshold of 0.90, aligning with the criteria established by Henseler et al. (2015). This indicates that the constructs are distinct from each other.

Table 4: Hetrotrait Monotrait Ratio (HTMT)

	LE	LK
LM	0.883	0.79
LK	0.749	

Indicator Reliability

Indicator reliability assesses how well a variable explains the variation within an item (Hair et al., 2014). In this study, all items have loadings exceeding the recommended threshold of 0.7, in line with the authors' guidelines, and are thus kept. However, item M3 falls slightly below this threshold with an outer loading of 0.667. Nevertheless, it is retained due to its significant contribution to the overall Average Variance Extracted (AVE). For a visual representation, please see Figure 1.

Structural Model Assessment

Within the context of PLS-SEM, the assessment of the structural model encompasses the examination of path coefficients. These coefficients serve as critical indicators for gauging both the significance and importance of the

relationships within the structural model, a methodology commonly endorsed in previous studies (Hair et al., 2014).

Assessing f^2 Values

The f^2 effect size is a metric used to assess how the exclusion of a specific independent variable from the model affects the coefficient of determination (R^2) value. As shown in table 5, the f^2 effect size of LM on LE is large. However, the effects of LM on LK and LE on LK are both small (Cohen, 1988).

Table 5: f-square-matrix		
	LE	LK
LM	1.044	0.145
LE		0.05

Assessing R^2 Values

The R^2 value is used to evaluate the structural model (Hair et al., 2014). The adjusted R-squared values indicate the proportion of variance in each construct that is accounted for by the model while adjusting for the number of predictors. For "Engagement," the adjusted R-squared is 0.507, implying that 50.7% of the variance is explained. Similarly, for "Knowledge Acquisition," the adjusted R-squared is 0.383, indicating that 38.3% of the variance is accounted for by the model. This suggests a good level of explanatory power in both cases, with Engagement being slightly better explained.

Assessing Q^2 Values

To assess the model's predictive relevance for each of the individual endogenous variables, a blindfold cross-validation approach was employed, as represented by the Stone-Geisser Q^2 value (Geisser, 1975; Stone, 1974). The model demonstrates strong predictive power for both constructs, explaining approximately 49.9% of the variability in learners' engagement and 34.9% in knowledge acquisition. While engagement exhibits slightly higher predictability, the model proves effective in forecasting changes in both aspects of learning.

Hypotheses Testing

The hypothesized relationships were tested, and their results are presented in Table 4. The results showed a significant positive relationship between LM and LK ($\beta = 0.424$, $t = 3.719$, $p = 0.00$), LM and LE ($\beta = 0.715$, $t = 16.663$, $p = 0.00$), and LE and LK ($\beta = 0.248$, $t = 2.143$, $p = 0.03$). Therefore, H1, H2, and H3 are accepted.

Table 5: Direct Relationships				
Hypotheses	β - Coefficient	T statistics	P values	Decision
H1: LM -> LK	0.424	3.719	0	Accepted
H2: LM -> LE	0.715	16.663	0	Accepted
H3: LE -> LK	0.248	2.143	0.03	Accepted

Mediation Analysis

Mediation analysis was performed to assess the mediating role of LE on the linkage between LM and LK. The results (see Table 5) revealed that the total effect of LM on LK was significant (H1: $\beta = 0.60$, $t = 11.129$, $p = 0.00$). With the inclusion of the mediating variable (LE), the impact of LM on LK remains significant ($\beta = 0.42$, $t = 3.719$, $p = 0.00$). The indirect effect of LM on LK through LE was found significant ($\beta = 0.18$, $t = 2.06$, $p = 0.04$). This shows that the relationship between LM and LK is mediated (complementary partially) by LE. Therefore, H4 is accepted.

Table 6: Mediation Analysis									
Total effect (LM=>LK)			Direct effect (LM=>LK)			Indirect effect (LM=>LE=>LK)			Decision
β - Coefficient	T statistics	p-value	β - Coefficient	T statistics	p-value	β - Coefficient	T statistics	p-value	
0.6	11.129	0	0.42	3.719	0	0.18	2.06	0.04	Accepted

Model Fit

Goodness of Fit (GoF) is considered as an overall measure of model fit in PLS-SEM. Henseler et al. (2015) introduced a measure called standardized root mean square residual (SRMR) to evaluate GoF of a path model. In this study, the SRMR and normed fit index (NFI) values of the model are 0.076 and 0.864, respectively. Since the SRMR value is less than 0.08, it confirms that the model is a good fit, and the NFI value, being closer to 1, indicates a better fit. By considering the Q² value, the model has large predictive relevance. This indicates that the cause-effect relationship established in the model is valid. Also, the influence of factor LM on LK through the mediating effect of LE can be predicted through the given model.

Discussion and Practical Implications

The study explores the intricate dynamics between learners' motivation, engagement, and knowledge acquisition within educational technology settings. It reaffirms the well-established link between motivation and knowledge acquisition, highlighting that motivated students tend to engage more deeply with learning materials, resulting in a comprehensive understanding (Levpušček et al., 2012; Riswanto & Aryani, 2017). These findings align with prior research emphasizing motivation's pivotal role in fostering meaningful learning experiences and language acquisition (Nurmadiyah, 2016; Krashen, 1981; Mahdikhani & Rezaei, 2015). Therefore, educators and policymakers are advised to implement strategies that sustain and enhance learner motivation for more effective knowledge acquisition.

Furthermore, the study emphasizes the intertwined nature of learners' motivation and engagement in the learning process, underlining motivation's significant impact on active participation in learning activities (Han et al., 2021). This supports the importance of need-supportive teaching practices in enhancing both motivation and engagement levels (Stroet et al., 2013). Educators should consider strategies promoting learner motivation alongside these teaching practices to optimize student engagement.

Moreover, the study underscores the critical role of active participation in learning through the positive relationship between learners' engagement and knowledge acquisition. This aligns with prior research highlighting engagement's positive impact on various dimensions of academic performance (Chase et al., 2014; Wang & Eccles, 2012). It also underscores the adaptability of engagement in contemporary education, particularly in hybrid and blended learning environments (Brown et al., 2018; Alrashidi et al., 2016). Hence, educators should aim to create learning environments that facilitate and encourage high levels of student engagement to optimize knowledge acquisition. Finally, the study uncovers the mediating role of learners' engagement in the relationship between motivation and knowledge acquisition, underlining engagement's importance in complementing and enhancing this connection (Garcia & Pintrich, 2023; Shin & Bolkan, 2021). Thus, educators and instructional designers should focus on strategies that not only promote motivation but also actively facilitate and sustain learner engagement.

Limitations and Future Research Suggestions

The study's findings are context-specific and may not universally apply due to potential variations in educational settings, including institutional practices, teaching methods, and student demographics. Self-reported data on motivation and engagement may introduce bias. Future research should account for factors like prior academic performance, socio-economic status, and technological proficiency. Experimental designs could assess interventions for enhancing motivation, engagement, and knowledge acquisition through educational technology. Longitudinal studies tracking learners' progress could provide comprehensive insights into the lasting impact of technology-enhanced education on learning outcomes.

8. Conclusions

This study contributes valuable insights into the complex interplay between motivation, engagement, and knowledge acquisition in the context of educational technology. The findings highlight the mediating role of engagement and underscore the importance of creating environments that not only motivate learners but also actively engage them in the learning process. By understanding these dynamics, educators can develop more effective instructional practices to support meaningful and enduring learning outcomes.

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