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The Mediating Role of ICT Technology Application in Students' Learning Motivation and Knowledge Expectations

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ABSTRACT

This study explores the mediating role of information and communication technology (ICT) application in the relationship between students' learning motivation and their knowledge expectations. Employing a quantitative, correlational research design, the study involved 309 senior high school students from public schools in Bukidnon, Philippines, selected through stratified random sampling. Data were gathered using validated survey instruments and analyzed through descriptive statistics, Pearson correlation, and regression analysis. Results indicated that students reported high levels of both ICT usage in education and learning motivation, while knowledge expectations were rated at a moderate level. Significant positive correlations were found between learning motivation and knowledge expectations, ICT application and motivation, and ICT application and knowledge expectations. Furthermore, ICT application was found to partially mediate the relationship between students' motivation and their knowledge expectations, underscoring its pivotal role in enhancing learning outcomes within technology-integrated educational environments. These findings highlight the value of strategically integrating ICT to foster motivation and align students' learning expectations in the context of digital education.

Keywords: ICT application, learning motivation, knowledge expectations, educational technology.

1.INTRODUCTION

In today's rapidly evolving educational landscape, fostering student motivation and aligning instructional experiences with learners' knowledge expectations are critical challenges. In the Philippine context, as in many global settings, students frequently encounter low academic engagement and vague understanding of learning objectives (Rogayan & Bautista, 2019). Traditional instructional models, often centered on rote memorization and abstract theoretical content, may fall short of capturing learners' interests or addressing their individual goals. This misalignment between pedagogical delivery and student expectations can reduce intrinsic motivation and weaken overall academic engagement (Fortus & Touitou, 2021; Krishan & Al-rsa'l, 2022).

Motivation is widely acknowledged as a key determinant of academic performance. According to Steinmayr et al. (2019), motivated learners are more likely to persist in tasks and achieve higher levels of academic success. It also acts as a mediating force in how learners interpret the relevance and value of educational content (Sarkis et al., 2020; Winter, 2018). However, understanding motivation in isolation may offer an incomplete picture. As noted by Hong et al. (2020), students' knowledge expectations—what they anticipate gaining from their academic experiences—are interdependent with motivation and must be examined jointly to fully capture the learning dynamic.

In this regard, Information and Communication Technology (ICT) plays an increasingly central role in transforming the educational experience. Beyond its capacity to facilitate access to resources, ICT can enhance

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learner autonomy, increase engagement, and clarify learning goals (Wang et al., 2022). ICT-integrated instruction fosters personalized, interactive learning environments that positively impact students' expectations of academic achievement and their willingness to engage with content (Su et al., 2022; Paul & Roy, 2023).

Empirical studies have consistently demonstrated the benefits of ICT for student learning and motivation. Technologies such as augmented reality, gamified platforms, and adaptive learning tools can promote deeper conceptual understanding and increased engagement (Chang et al., 2019; Wei-Kai et al., 2019). Furthermore, ICT-enabled environments contribute to improved academic outcomes by reinforcing the alignment between curricular delivery and students' perceptions of knowledge relevance (Berami, 2023). These benefits are particularly pronounced in marginalized or geographically isolated areas, where digital tools offer increased inclusivity and access (Soriano-Sánchez & Jiménez-Vázquez, 2023).

Against this backdrop, the present study investigates the mediating role of ICT application in the relationship between students' learning motivation and their knowledge expectations. Specifically, it aims to assess senior high school students' levels of motivation by examining dimensions such as self-efficacy, learning strategies, and goal orientation. It also evaluates students' expectations regarding the knowledge they anticipate acquiring. Simultaneously, the study explores the extent to which ICT is integrated into classroom practice, focusing on how educators implement these tools in their instruction.

By examining the interconnectedness of learning motivation, knowledge expectations, and ICT application, this research seeks to determine whether ICT acts as a meaningful mediating variable. In doing so, it contributes to a more nuanced understanding of how technology can be strategically employed to enhance student engagement and align academic outcomes with learner expectations ultimately supporting more effective digital education systems.

2. LITERATURE REVIEW

This study is grounded in three key theoretical frameworks that explain the interplay between learning motivation, knowledge expectations, and the application of ICT in educational settings. First, the Self-Determination Theory (SDT) developed by Ryan and Deci (2000) posits that individuals are naturally inclined toward growth and achievement when their basic psychological needs for autonomy, competence, and relatedness are met. In the context of this study, ICT technologies may foster these needs by promoting learner autonomy, enhancing self-efficacy, and facilitating meaningful engagement with knowledge, thereby supporting internalized motivation and clarifying learning expectations.

Second, the Theory of Planned Behavior (TPB) proposed by Ajzen (1991) emphasizes the role of intention, attitudes, and perceived behavioral control in shaping actual behavior. TPB is particularly relevant to understanding how students' beliefs about their learning capacity and the usefulness of ICT tools influence their motivation and expectations. When students perceive ICT-enhanced instruction as effective and manageable, they are more likely to engage with it actively, reinforcing both their intention to learn and their anticipated knowledge outcomes (Ajzen, 2002; Crawley & Koballa, 1992).

Third, the Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh et al. (2003) integrates insights from multiple models to explain technology acceptance. It identifies performance expectancy, effort expectancy, social influence, and facilitating conditions as predictors of ICT usage. In this framework, students are more likely to adopt and benefit from ICT when they believe it will enhance their academic outcomes, is easy to use, and is supported by their peers and instructors. These perceptions influence their willingness to engage with ICT and, in turn, shape their motivation and expectations about what they can achieve academically.

These theories collectively provide a robust foundation for examining the mediating role of ICT application between students' learning motivation and their knowledge expectations. The application of ICT in education promotes interactive, learner-centered environments where students can explore content more independently and with greater clarity. According to Kelani (2022), two core components define ICT integration: students' perceptions

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of how teachers implement ICT and the perceived benefits derived from its use in the classroom. These elements influence how effectively ICT fosters student engagement and helps clarify what students are expected to learn.

In this study, learning motivation is conceptualized across several dimensions, including self-efficacy, active learning strategies, perceived value of learning, performance goals, achievement goals, and stimulation from the learning environment (Tuan et al., 2005). Students with high self-efficacy are more confident in their academic abilities, while those who use active learning strategies are more inclined to seek knowledge autonomously. Similarly, when students recognize the relevance and value of academic content, their motivation to engage increases. Performance and achievement goals reflect students' desire to excel either through competition or personal growth, while a stimulating learning environment supports sustained academic interest.

Knowledge expectations, as a relatively underexplored construct, refer to students' anticipations regarding what they should learn and what competencies they expect to acquire from instruction. These expectations can shape students' engagement levels and direct their learning strategies. When expectations are clear and aligned with instructional practices, students are more likely to remain motivated and persist in academic tasks.

ICT application is theorized in this study as a **mediating factor** that helps bridge the gap between motivation and knowledge expectations. By offering dynamic content delivery, interactive platforms, and real-time feedback, ICT tools provide students with clearer pathways to achieve learning goals. Studies have shown that technology integration enhances learning clarity, improves student autonomy, and increases motivation through personalized learning environments (Chang et al., 2019; Wang et al., 2022; Su et al., 2022).

While the present study highlights the mediating role of ICT, it also opens up avenues for future research to examine other potential mediators or moderators. These may include students' individual learning styles, socioeconomic backgrounds, and digital competence within instructional practices. Further investigations could explore how these variables interact with ICT to shape students' academic trajectories, offering a more comprehensive understanding of technology's role in educational outcomes.

Finally, the global significance of integrating ICT in education aligns with the goals of **Sustainable Development Goal 4 (SDG 4),** which advocates for inclusive, equitable, and quality education. ICT can democratize access to learning by providing cost-effective educational resources, particularly in underserved or rural areas. It has the potential not only to enhance motivation and clarify expectations but also to reduce educational disparities, empower learners, and foster the development of essential 21st-century skills.

3. METHODOLOGY

This section details the methodological approach employed in the study, including the research design, sampling procedures, participant demographics, instruments used, and statistical analyses conducted to assess the mediating role of ICT application in the relationship between students' learning motivation and knowledge expectations.

3.1. Research design

The study adopted a quantitative, correlational research design to investigate the interplay between ICT integration, learning motivation, and knowledge expectations among high school students. This study employed a **non-experimental, quantitative research design,** specifically utilizing a **descriptive-correlational approach** to explore the relationships among ICT application, learning motivation, and knowledge expectations. Mediation analysis was also applied to assess whether ICT serves as an intermediary variable linking motivation to expectations, following procedures outlined by Bhandari (2021) and Nguyen et al. (2020).

3.2. Respondents

A total of 309 senior high school students from Grades 11 and 12 were selected from public schools across the Kitaotao I, II, and III Districts in the Division of Bukidnon, Philippines. Private school students and other grade levels were excluded to maintain consistency within the target population. To ensure representativeness and reduce sampling bias, a stratified random sampling technique was applied. The appropriate sample size was calculated

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using the Raosoft Sample Size Calculator (1992), meeting the confidence level and margin of error standards for quantitative generalizability.

3.3 Research Instruments

Data were collected using three validated survey instruments, each aligned with one of the study's core variables:

1. ICT Application Questionnaire. Adapted from Kenin's framework on students' perceptions of ICT integration, this instrument comprises 19 items divided into two subscales: ICT Implementation Frequency: measuring how often and effectively teachers introduce ICT tools. Perceived Benefits: assessing student perceptions of ICT's contribution to learning enhancement. Responses were rated on a 5-point Likert scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree). The instrument demonstrated strong content validity, confirmed by a panel of ICT education experts, and showed high internal consistency (Cronbach's $\alpha = 0.855$).

2. Learning Motivation Scale
   Based on Tuan et al. (2005), this 35-item instrument evaluates six motivational dimensions: Self-efficacy; Active learning strategies; Perceived value of learning; Performance goals; Achievement goals and Learning environment stimulation
   Items were measured using a 5-point Likert scale, with subscale reliability ranging from $\alpha = 0.70$ to 0.87, indicating acceptable internal consistency across domains.

3. Knowledge Expectations Questionnaire
   This modified tool was adapted from previously validated instruments and contextualized to fit the local academic setting. It assessed students' expectations across three domains: Clarity of instructional goals; Perceived value of acquired knowledge; Anticipated future academic application. Using the same 5-point Likert scale, the instrument underwent content validation by internal faculty and external reviewers, ensuring both construct reliability and contextual relevance.

3.4 Data collection and analysis

The researchers initiated a three-phase process after securing approval from the University of Mindanao Ethics Review Committee (UMERC Protocol No. UMERC-2024-167). First, all instruments were adapted, translated, and reviewed for linguistic and contextual suitability. Internal and external validators reviewed and revised the tools to enhance their credibility. Second, necessary documentation was submitted for ethical validation, and permission to conduct the study was obtained from school principals. Third, data collection was carried out following ethical guidelines, ensuring informed consent, voluntary participation, data confidentiality, and transparent reporting.

The data were analyzed using several statistical techniques. Descriptive statistics, particularly the **mean**, were used to assess the levels of ICT application, learning motivation, and knowledge expectations. Pearson's r correlation was employed to determine the strength of relationships among the variables. Finally, linear regression and mediation analysis were conducted to evaluate whether ICT technology application significantly mediated the relationship between students' learning motivation and knowledge expectations.

4. RESULTS AND DISCUSSION

4.1 Overview of Research Questions and Structure

This section presents the results and discussion of the study, which examines the role of Information and Communication Technology (ICT) in students' learning motivation and knowledge expectations. The results are structured around two main research questions:

1. What is the relationship between ICT application, learning motivation, and knowledge expectations?
2. Does ICT mediate the relationship between learning motivation and knowledge expectations?

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The findings are organized to address these questions, focusing on the relationship between ICT, student motivation, expectations, and ICT's potential mediating role.

4.2 Research Question 1: Relationship Between ICT Application, Learning Motivation, and Knowledge Expectations

4.2.1 Learning Motivation

The study found that students reported relatively high levels of learning motivation, with certain dimensions of motivation standing out more than others. In particular, the highest mean score (M = 3.88) was the learning value, meaning that students perceive the value in intrinsic meaning and personal relevance in academic tasks (Table 1). This means that students are getting engaged by the inherent value they find in their study subjects, which supports the idea that intrinsic motivation is a strong engagement driver.

Indicator	SD	Mean	Description
Self-efficacy	0.60	3.38	Moderate
Active Learning Strategies	0.63	3.68	High
Learning Value	0.64	3.88	High
Performance Goal	0.75	3.12	Moderate
Achievement Goal	0.66	3.38	Moderate
Learning Environment Stimulation	0.69	3.58	High
Overall	0.49	3.50	High

Table 1: Levels of Learning Motivation

On the other hand, the performance goal (M = 3.12) was given the lowest score, indicating that the students are not as motivated by external competition or outperforming other students (Figure 1). This finding adds to the validation of the need to stimulate intrinsic motivation in the classroom, which is likely to generate more profound and sustained engagement with academic materials. This is in line with Steinmayr et al. (2019) findings focusing on the idea that students who enjoy learning for the sake of learning do better academically.

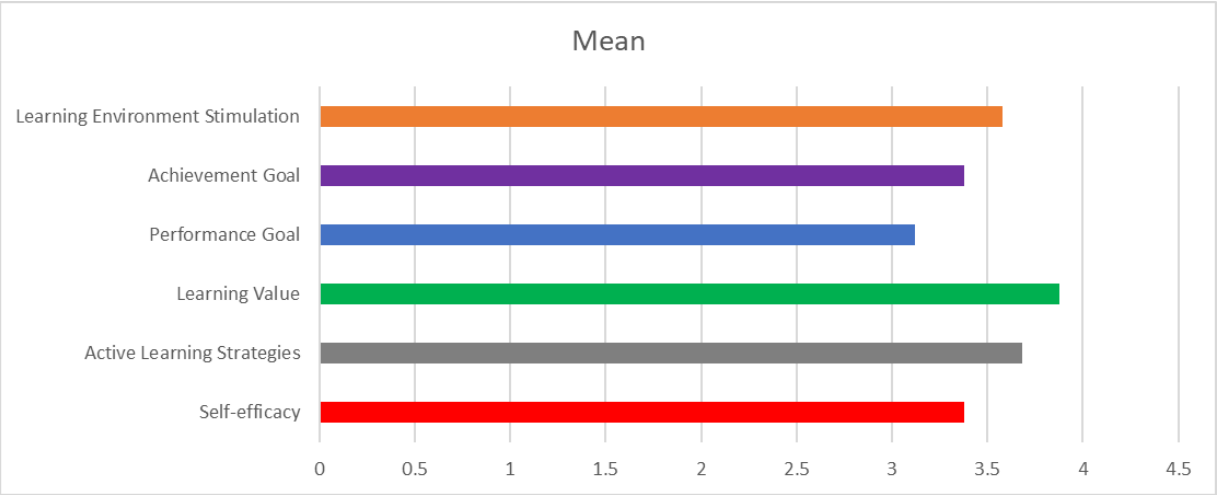

Figure 1: Learning Motivation Mean Scores

In general, the results relating to learning motivation align with earlier studies that find high levels of intrinsic motivation in the student are correlated with a positive educational outcome. For instance, Kamberi (2025) found that intrinsic motivation to know was positively and directly linked to academic achievement, whereas intrinsic motivation to experience stimulation was indirectly but significantly linked to academic achievement only

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through deep learning strategy. While there were some knowledgeable students with high levels of self-efficacy (M = 3.38) and achievement goals (M = 3.38), it seems like they may yet require more support and encouragement to increase their personal confidence and goal-setting skills.

4.2.2 ICT Application in the Classroom

The study also found that students perceived ICT integration into their classrooms as effective. Individual teacher introduction to ICT (3.75) and ICT integration in classroom instruction (3.75) indicated that ICT tools have been greatly received in the learning environment. This indicates the belief through students that ICT is being used in a consistent and meaningful manner in the classroom and that the tools are helpful in their learning process.

ICT tools are seen as enhancing educational delivery, especially in raising engagement and supporting autonomous learning. This agrees with previous research stating that ICT can enhance the classroom into a more interactive, student-focused environment and increase student motivation (Wang et al., 2022). These findings corroborate the benefits that technology integration has on student engagement in education, as the mean scores on ICT applications are all high.

4.2.3 Knowledge Expectations

The key indicators of knowledge expectations were measured in terms of clarity of instructional goals, perceived value of acquired knowledge, and anticipated future academic application. The results are presented in Table 2. The perceived value of knowledge to society was the highest mean score (M = 3.97), indicating that students acknowledged the societal importance of their education. However, learning anxiety scored lowest (2.85), suggesting students do not feel learning anxiety though they are aware of the importance of their studies. This emotional struggle could be a barrier that inhibits an alignment of expectations with an academic goal, pointing to the importance of supportive environments for alleviating anxiety and building up confidence.

Indicator	SD	Mean	Description
Perceived Teacher Support	0.77	3.80	High
Learning Anxiety	0.83	2.85	Moderate
Knowledge Value to Society	0.74	3.97	High
Confidence in Knowledge Use	0.65	3.20	Moderate
Desire for Learning Outcome	0.80	3.47	Moderate
Overall	0.45	3.46	Moderate

Table 2: Levels of Knowledge Expectations

Additionally, the moderate mean for confidence in knowledge use (M = 3.20) and desire for learning outcome (M = 3.47) imply that students are somewhat unclear on knowing how their knowledge will be used in future contexts and that there was an area of future development of the educational environment. This fits in with Ryan and Deci's (2022) study findings, emphasizing the alignment between students' learning expectations and their actual experiences to promote motivation and engagement.

4.2.4 Relationships Between Variables

Significant correlation analyses were found between the study variables. There was a strong positive correlation ($r = 0.698$, $p < 0.001$) between learning motivation and knowledge expectations, where more motivated students were expected to have more clear academic goals and clear knowledge expectations. This finding aligns with the theoretical framework of Self-Determination Theory (Ryan & Deci, 2022), which bears the idea that motivation has a central role in determining students' academic goals and expectations.

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Moreover, in learning motivation ($r = 0.663$, $p < 0.001$) and knowledge expectations ($r = 0.514$, $p < 0.001$), ICT application was also highly correlated. These findings suggest that using ICT in the classroom is associated with higher student motivation and clearer knowledge expectations. Hence, ICT seems to be an essential part of the shaping of the learning environment, stimulating both intrinsic motivation and stressing the academic expectations of the students with real-world application.

Furthermore, the analysis correlating ICT dimensions (Teacher ICT Use and ICT Integration) and key motivational and learning factors revealed a significant positive correlation. The results of the study are shown in Figure 2. The strength of correlations between Teacher ICT Use and self-efficacy (0.400), learning strategies (0.502), learning value (0.422), achievement goals (0.406), learning environment (0.479), and overall motivation (0.539) were moderate to strong while its link to performance goals (0.223) was lower. ICT Integration demonstrated stronger statistical relationships with all study variables, which included learning strategies (0.578), learning value (0.571), and overall motivation (0.661). Students experience greater motivation and better learning approaches and value learning more when both teachers use ICT, and there is extensive ICT integration across education because ICT Integration proves more impactful than teacher ICT use.

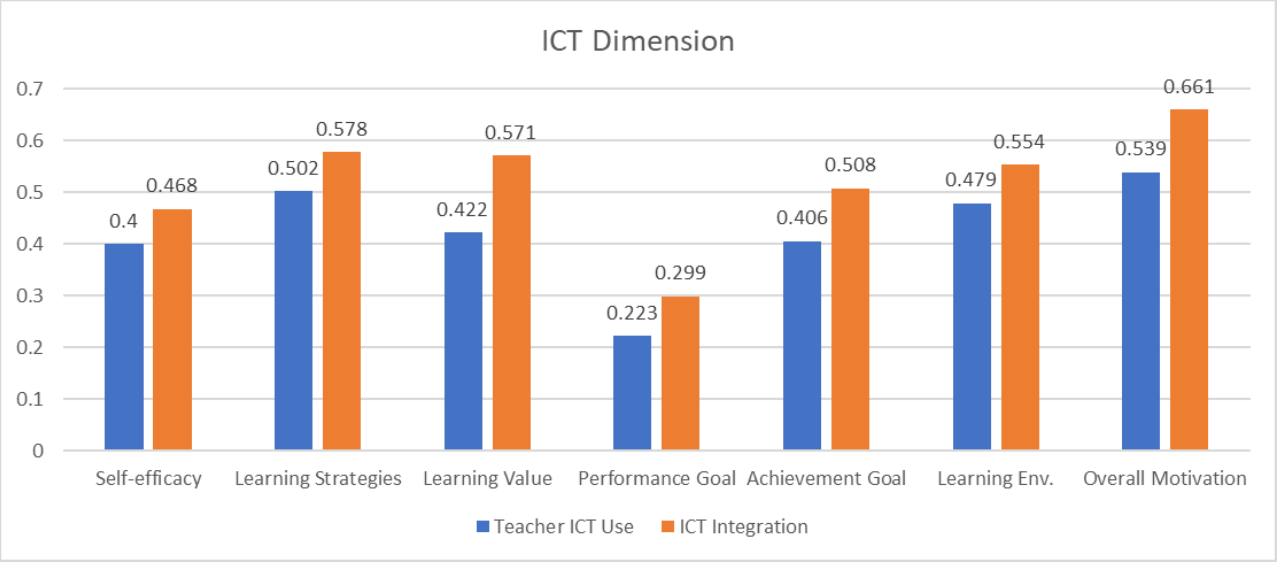

Figure 2: Correlation Between ICT Application and Learning Motivation

4.3 Research Question 2: The Mediating Role of ICT Application

4.3.1 Mediation Analysis

The relationship between knowledge expectation and learning motivation was tested through a mediation analysis using an ICT application as the mediating variable. The results of the regression analysis showed a significant direct impact of learning motivation on knowledge expectations ($\beta = 0.698$), thus substantiating the strong relationship between the two. However, ICT application was included as a mediator in which the direct effect was reduced to $\beta = 0.485$, which indicates that ICT partially mediates this relationship.

In support of the hypothesized link between ICT and motivation-generated employee expectations, the indirect effect of ICT application was significant ($\beta = 0.414$). This partial mediation effect implies that ICT would no longer fully account for the relationship between motivation and expectations but is an intermediary way to help enhance this linkage. These findings coincide with the idea that ICT can assist in identifying learning goals, encourage academic engagement, and cohere expectations with the actual academic experience.

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Step	Path	B	S.E.	β
1	Motivation → Knowledge Expectations	0.757	0.044	0.698***
2	Motivation → ICT Application	0.663	0.063	0.514***
3	ICT Application → Knowledge Expectations	0.348	0.035	0.414***
4	Direct Effect (with ICT controlled)	0.526	0.045	0.485***

Table 3: Mediation Model Summary

4.3.2 Sobel Test of Mediation

A Sobel test was run to determine whether the mediation pathway was statistically significant. Results generated a z-value of 7.24, with a p-value< 0.05, which indicates that ICT application significantly mediated learning motivation in knowledge expectations. This is an important finding in terms of bringing ICT into the educational strategies to achieve student engagement and to provide full clarification of learning outcomes.

Combination of Variables	Sobel z	p-value	Mediation
Motivation → ICT Application → Knowledge Expectations	7.24	< 0.05	Partial Mediation

Table 4: Sobel Test for Mediation Effect

4.4 Discussion of Results

4.4.1 Key Findings Summary

This research demonstrates that Information and Communication Technology drive student motivation and helps students match their expectations for their acquired knowledge. Results between learning motivation and knowledge expectations, together with ICT application's influence, demonstrate why ICT tools need direct implementation in educational settings. The mediation analysis demonstrates ICT serves as a motivational platform which connects student academic motivation to their expectations.

4.4.2 Implications for ICT Integration in Education

The obtained research data creates significant implications regarding the use of ICT technologies in educational environments. Educational institutions need to dedicate funds to ICT tools alongside professional training for their teachers so that technology delivers maximum benefits for student motivation and improves expectations. Educational institutions that train their teaching staff in information and communication technologies enable teachers to generate dynamic interactive learning platforms which support student independence while defining learning objectives.

4.4.3 Comparisons with Previous Research

Research literature has confirmed that Information and Communication Technology effectively raises student engagement and motivation (Wang et al., 2022; Su et al., 2022). The research expands current knowledge by showing that ICT functions as a bridge to match students' motivational aspects with their expectation levels, thus demonstrating technology's crucial role in contemporary educational settings.

4.5 Limitations and Future Research Directions

This investigation produces significant results, but its findings are restricted by its single-time study approach and application within Philippine public-school systems. Future investigations should study both the time-dependent aspects of ICT use on student motivation and educational expectations and the effects of economic background and instructional techniques on this relationship. Research should evaluate diverse ICT devices to understand their distinct effects on educational achievements across diverse educational settings.

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5. CONCLUSION

This study examined the mediating role of Information and Communication Technology (ICT) application in the relationship between students' learning motivation and their knowledge expectations. Findings revealed that students demonstrated strong intrinsic motivation, particularly in valuing the meaningful aspects of learning activities, while external performance goals received comparatively less emphasis. Despite this high motivation, students reported only moderate levels of knowledge expectations, suggesting an understanding of academic goals but some uncertainty regarding their ability to achieve them.

ICT integration was found to significantly influence both motivation and students' perceived academic outcomes. Students consistently regarded ICT as a valuable tool that enhanced classroom engagement and provided greater clarity regarding instructional goals. Mediation analysis confirmed that ICT application partially bridges the gap between motivation and knowledge expectations, indicating that technology can support students in aligning their learning efforts with achievable academic objectives.

These results align with Self-Determination Theory (Ryan & Deci, 2000), affirming that intrinsic motivation is strengthened when autonomy and competence are supported. ICT creates interactive, student-centered environments that nurture these psychological needs by clarifying learning expectations and fostering independent engagement with content.

In light of these findings, educational institutions are encouraged to invest in ongoing professional development to equip teachers with the necessary ICT competencies. Well-trained educators are more capable of designing dynamic and inclusive learning environments that stimulate motivation and promote meaningful learning. Additionally, ensuring equitable access to ICT tools—particularly in marginalized communities—can help bridge educational gaps and foster more inclusive, motivation-driven academic outcomes. By empowering students to align their motivations with clearly defined and attainable goals, ICT integration can significantly enhance both engagement and achievement in digital learning contexts.

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