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Effectiveness of ICT integration in improving learners' performance in the schools division of the city of Batac

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ABSTRACT

Information and communication technology (ICT) has transformed many areas of modern life, including education. This study investigated how ICT integration affects learner performance, involving 443 public school teachers from the Schools Division of the City of Batac using a descriptive-correlational research design. Data collected via a self-perception survey were analyzed with means and Pearson's r . Findings indicate that while teachers primarily use ICT for presentation, online research, and search engines, schools generally show strong ICT integration, supported by leadership and curriculum alignment. A positive correlation was found between teachers' ICT usage and improved student performance. Recommendations include promoting diverse ICT tools, continuous professional development, fostering innovation, ensuring equitable resource distribution, and building partnerships for enhanced ICT integration.

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Introduction

Information and communication technology (ICT) has revolutionized various aspects of modern society, and education is no exception. The integration of ICT in education holds immense potential to transform teaching and learning practices, enhance student engagement, and

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ultimately improve student performance. Despite the recognized benefits, there remains a need to explore the specific mechanisms and contextual factors that maximize its effectiveness.

Research indicates that ICT integration significantly enhances educational performance through various mechanisms (Hamidi, 2016; Hew & Brush, 2013; Mishra & Koehler, 2013). ICT ensures improved access to quality instruction, fosters better teaching practices, and cultivates essential digital literacy skills among students. Additionally, ICT tools facilitate active learning and critical thinking, encouraging student engagement and the development of analytical skills. These contributions underscore the multifaceted impact of ICT integration on fostering a more inclusive, effective, and skill-oriented educational environment.

The use of ICT tools and applications, diverse ways of using ICT, and effective ICT integration practices can collectively contribute to improved MPS. Students can access a wide range of educational software, online resources, and simulations that provide interactive and engaging learning experiences. ICT tools like online learning platforms, virtual learning environments, and educational games can make learning more interactive and personalized, leading to better retention and understanding (Ali et al., 2014).

Despite these advantages, gaps remain in understanding the specific conditions and strategies that optimize ICT's impact on student performance. Limited research exists on how various ICT tools and applications contribute to improved student outcomes in specific educational contexts. This study aimed to understand how ICT integration affects learners' performance in the Schools Division of the City of Batac. The results may help management enhance ICT integration to maximize learning outcomes and formulate projects, programs, and activities aimed at improving ICT integration in the classroom.

Information and Communication Technology (ICT) has revolutionized various aspects of modern society, and education is no exception. The integration of ICT in education holds immense potential to transform teaching and learning practices, enhance student engagement, and ultimately improve student performance. Despite the recognized benefits, there remains a need to explore the specific mechanisms and contextual factors that maximize its effectiveness.

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The use of ICT tools and applications, diverse ways of using ICT, and effective ICT integration practices can collectively contribute to improved Mean Percentage Scores (MPS). Students can access a wide range of educational software, online resources, and simulations that provide interactive and engaging learning experiences. ICT tools like online learning platforms, virtual learning environments, and educational games can make learning more interactive and personalized, leading to better retention and understanding (Ali et al., 2014).

Literature Review

This section presents related topics significant in understanding variables under study.

ICT Integration

Voogt and Pareja Roblin (2012) compare international frameworks for 21st-century competencies, highlighting ICT-related skills. Their study examines how different countries incorporate technology in educational policies and curricula, providing insights into global ICT integration trends and informing national curriculum development recommendations.

ICT Tools and Applications

Zheng et al. (2016) propose using technology to support personalized learning, improving access to education and addressing high teacher-learner ratios. Hew and Cheung (2014) explore the motivations and challenges in MOOCs, revealing that while MOOCs attract learners seeking knowledge and personal challenge, high dropout rates are due to lack of support and content comprehension issues. Picciano and Seaman (2017) discuss the role of online and blended learning in K-12 education, noting its potential for reforming high schools, particularly in rural areas, despite concerns about the quality and funding of online instruction. These findings highlight the importance of designing supportive online learning environments to maximize the benefits of ICT tools.

ICT Integration in Education

Effective ICT integration requires classroom resources, supportive school culture, teacher training, and pedagogical beliefs aligned with 21st-century practices (Ertmer et al., 2015). Ghavifekr and Rosdy (2015) emphasize the need for proper initial implementation and ongoing support to maximize ICT benefits. Zhang (2013) and Shivam (2022) highlight that teachers' attitudes towards ICT are generally positive, but they need more time and training to integrate it effectively into teaching. Access to ICT resources and teachers' willingness to adopt these tools are crucial for successful integration (Moreno et al., 2017).

Suarez et al. (2018) and Knezek and Christensen (2016) underscore the role of ICT in developing higher-order thinking skills and keeping up with modern developments. They point out that ICT enables continuous access to educational resources, facilitating knowledge sharing among teachers, students, and professionals. Moreno, Cavazotte, and Alves (2017) argue that effective

ICT use in education depends on both the availability of technological resources and the willingness of educators to incorporate these tools into their teaching methods.

Additionally, Ertmer et al. (2015) stress that technology integration should be seen as a means to achieve pedagogical goals rather than an isolated objective. This perspective encourages teachers to use ICT to engage students in meaningful work, ultimately enhancing their learning experiences. Shivam (2022) suggests that ICT not only supports the development of digital skills but also fosters social interaction, creative expression, and the ability to navigate multiple programming languages, which are essential for modern education.

Statement of the Problem

This study aimed to determine the effectiveness of ICT Integration in improving learners' performance.

Specifically, it sought to answer the following questions:

1. What is the teachers' extent of use of ICT tools and applications in teaching?
2. How do teachers use the ICT tools and applications in the classroom?
3. What is the status of implementation of ICT integration among the schools?
4. Is there a significant relationship between the mean percentage scores and:
 - 4.1 teachers' extent of use of ICT tools and applications;
 - 4.2 ways of using ICT tools and applications; and
 - 4.3 status of implementation of ICT integration?

Theoretical Framework

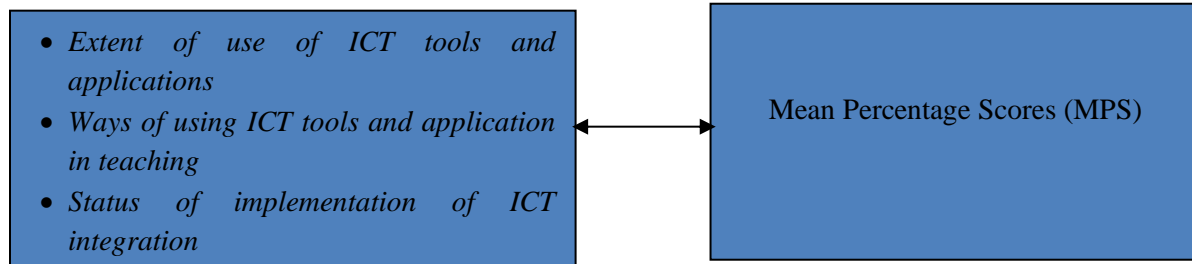
This study adopted the "Technological Pedagogical Content Knowledge" (TPACK) framework. TPACK is an educational framework that underscores the dynamic interaction among three primary knowledge domains: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK).

In the context of ICT integration, TPACK emphasizes the integration of these three knowledge domains to optimize teaching and learning. The framework suggests that effective technology integration requires teachers to possess not only knowledge of the content they are teaching (CK) and effective pedagogical strategies (PK) but also an understanding of how to purposefully integrate technology to enhance both content understanding and pedagogical practices (TK).

The TPACK framework is particularly relevant to explain the interplay of ICT integration on learners' performance because it highlights the importance of teachers' ability to blend technology seamlessly into their teaching practices. It recognizes that successful integration goes beyond technological competence alone; it requires a nuanced understanding of how technology can enhance the delivery of content and the application of effective pedagogical strategies.

In essence, TPACK provides a comprehensive lens through which to explore how teachers' knowledge and skills in integrating technology, content, and pedagogy contribute to improved learners' performance when ICT is thoughtfully incorporated into the educational process.

Conceptual Framework



Information and communication technology (ICT) has become an integral part of modern society, and its integration into schools has been a major focus of educational reform efforts in recent years. ICT integration has the potential to improve teaching and learning, but its effectiveness depends on a number of factors, including the extent of use of ICT tools and applications, the ways in which ICT tools and applications are used in teaching, and the status of implementation of ICT integration among schools.

The conceptual framework for this study is based on the following variables:

Extent of use of ICT tools and applications: This variable refers to the frequency and regularity with which ICT tools and applications are used in schools.

Ways of using ICT tools and application in teaching: This variable refers to the pedagogical approaches and methods that are used to integrate ICT tools and applications into teaching and learning.

Status of implementation of ICT integration among schools: This variable refers to the overall level of ICT integration in schools, considering factors such as infrastructure, teacher training, and curriculum support.

Schools' mean percentage scores: This metric represents the average percentage scores of learners across Quarters I to III in summative tests, calculated at the school level.

The conceptual framework proposes that there is a positive relationship between the three variables and the mean percentage score. The extent of use of ICT tools and applications, ways in which ICT tools and applications, and status of implementation are more likely to experience positive outcomes, such as improved student achievement, increased teacher engagement, and

enhanced school leadership. This is because schools with greater access to ICT resources are more likely to develop innovative pedagogical approaches that make effective use of ICT.

Research Methodology

This study employed a descriptive-correlational research design to investigate the impact of ICT integration on learners' performance. This design was chosen to comprehensively describe the effectiveness of ICT in educational settings and its influence on academic outcomes, capturing nuanced aspects of ICT integration and its effects on student achievement.

Population and Sampling

The study targeted all public elementary and secondary teachers in the Schools Division of the City of Batac, using a total enumeration approach. With a 90% participation rate, 443 teachers responded. The reduced response rate was due to some teachers declining to participate and facing unstable internet connections.

Instrumentation

A self-perception survey tool was used, consisting of three parts: the extent of use of ICT tools, ways of using ICT tools, and the status of ICT implementation. The survey items were based on relevant literature and contextualized for this study. Responses were collected using 4-point and 5-point Likert scales. The tool was validated by experts, achieving a high validity rating with an overall mean of 4.95.

Data Collection Procedures

After validating the survey instrument, permission was obtained from the School Division Superintendent to administer the survey. The survey was distributed via Google Forms, accompanied by a memo to guide educators. Data collection spanned three months, after which the data were meticulously analyzed to extract meaningful insights into the integration of ICT tools in teaching practices.

Data Analysis

The data gathered were analyzed and interpreted using means with qualitative description following the scale below:

Range of Means	Descriptive Interpretation
4.51 – 5.00	Consistently (C)/Always (A)/Very Highly Implemented (VHI)
3.51 – 4.50	Frequently (F)/Often (O)/Highly Implemented (HI)
2.51 – 3.50	Sometimes (S)/Moderately Implemented (MI)
1.51 – 2.50	Occasionally (O)/Rarely (R)/Slightly Implemented (SI)
1.00 – 1.50	Never (N)/Not Implemented (NI)

Pearson's r was used to determine the relationship between the independent variables (extent of use, ways of using ICT, and status of implementation) and the dependent variable (mean percentage scores). Level of significance was set at .05.

Results and Discussion

This section presents the results and discussion of data gathered.

What is the teachers' extent of use of ICT tools and applications in teaching?

Table 1. Extent of Use of ICT tools and applications

ICT Tools and Applications	Mean	DI
1. Presentation software (e.g., PowerPoint, Google Slides)	4.67	Consistently
2. Online research and search engines	4.05	Frequently
3. Multimedia creation tools (e.g., video editing software, podcasting tools)	3.42	Sometimes
4. Educational apps or software	3.21	Sometimes
5. Online collaboration tools (e.g., Google Docs, Padlet)	3.24	Sometimes
6. Simulations and virtual models	2.79	Sometimes
7. Online assessment platforms	2.97	Sometimes
8. Learning management systems (e.g., Google Classroom, Moodle)	2.93	Sometimes
Overall Mean	3.41	Sometimes

Source: Natividad et al. (2024)

Legend:

Range of Means	Descriptive Interpretation
4.51 – 5.00	Consistently (C)
3.51 – 4.50	Frequently (F)
2.51 – 3.50	Sometimes (S)
1.51 – 2.50	Occasionally (O)
1.00 – 1.50	Never (N)

Table 1 summarizes the extent of teachers' use of ICT tools and applications. The overall mean of 3.41 indicates that teachers use ICT tools intermittently, based on necessity or specific circumstances, rather than consistently. This sporadic use suggests that ICT tools are not yet integrated into routine teaching practices but are employed opportunistically.

Presentation software, such as PowerPoint and Google Slides, stands out with a mean rating of 4.67, indicating consistent and reliable use. This high frequency of use is likely due to the effectiveness of these tools in conveying information and their user-friendly design, making them essential in both professional and educational settings.

In contrast, online research and search engines have a mean rating of 4.05, showing regular use for information needs. This routine dependence highlights their integral role in teachers' information-seeking behaviors. The remaining ICT tools, including multimedia creation tools, educational apps, online collaboration tools, simulations, virtual models, online assessment

platforms, and learning management systems, have mean ratings ranging from 2.79 to 3.42, indicating occasional use based on specific instructional needs. This variability underscores the context-dependent nature of their integration into teaching practices.

How do teachers use the ICT tools and applications in the classroom?

Table 2. Ways of Using ICT tools

Ways of Using ICT	Mean	DI
1. Creating and sharing interactive multimedia presentations	4.20	Often
2. Facilitating online discussions and collaborative projects	3.52	Often
3. Using gamification elements to make learning more engaging	3.62	Often
4. Incorporating virtual simulations and virtual reality experiences	3.34	Sometimes
5. Utilizing educational apps and software for interactive learning activities	3.58	Often
6. Encouraging student creativity through multimedia projects (e.g., video creation, digital storytelling)	3.59	Often
7. Integrating online quizzes and interactive assessments for immediate feedback	3.24	Sometimes
8. Promoting student research and information literacy skills through online resources	3.27	Sometimes
9. Implementing flipped classroom approaches with pre-recorded lectures and online materials	3.04	Sometimes
10. Providing access to online educational platforms and resources for self-paced learning	3.26	Sometimes
11. Using digital tools for real-time data visualization and analysis in science or math lessons	3.22	Sometimes
12. Supporting student inquiry and problem-solving through online research and exploration	3.22	Sometimes
13. Leveraging social media or blogging platforms for collaborative learning and sharing ideas	3.16	Sometimes
14. Incorporating online simulations and virtual field trips to enhance understanding of real-world concepts	3.22	Sometimes
15. Engaging students in coding and programming activities through interactive tools or coding platforms	2.84	Sometimes
16. Integrating technology for student presentations, such as video or audio recordings	3.77	Often
17. Empowering students to create and share digital portfolios showcasing their work and achievements	3.33	Sometimes
Overall Mean	3.38	Sometimes

Source: Natividad et al. (2024)

Legend:

Range of Means	Descriptive Interpretation
4.51 – 5.00	Always (A)
3.51 – 4.50	Often (O)
2.51 – 3.50	Sometimes (S)
1.51 – 2.50	Rarely (R)
1.00 – 1.50	Not at all (N)

Table 2 provides the different ways how teachers use ICT in the classroom. The overall mean of 3.38 indicates that teachers use ICT strategies periodically rather than consistently. This suggests that ICT tools are not yet a routine part of teaching practices and are used selectively based on specific instructional needs or contexts. Teachers may choose to utilize ICT tools depending on factors such as the lesson nature, student engagement requirements, or educational goals.

Six indicators show frequent adoption with mean ratings from 3.52 to 4.20, while the other 11 items have mean ratings of 2.84 to 3.34, indicating occasional use. The highest mean ratings are for creating multimedia presentations, facilitating online discussions, and using technology for student presentations. These strategies are often employed to enhance engagement and interaction, aligning well with pedagogical goals and fostering active learning. Teachers recognize the value of incorporating technology to create dynamic and participatory learning experiences.

Conversely, the lowest ratings are for engaging students in coding activities, implementing virtual reality experiences, and utilizing online simulations and virtual field trips. These methods are not consistently integrated into teaching routines, suggesting selective use based on specific needs or contexts. The lower adoption of these strategies highlights the need for additional support, training, or contextual relevance to increase their prevalence in educational practices.

What is the status of implementation of ICT integration among the schools?

Table 3. Status of Implementation of ICT Integration among Schools

Practices	Mean	DI
1. The school has a clear vision and strong leadership that prioritize and support the effective use of technology in education.	4.44	HI
2. The school ensures that they have the necessary ICT infrastructure, including reliable internet connectivity, sufficient devices (computers, tablets), and appropriate software and tools.	4.17	HI
3. The school invests in comprehensive and ongoing professional development for teachers to enhance their ICT skills and pedagogical practices.	4.21	HI
4. The school aligns ICT integration with the curriculum and instructional goals.	4.42	HI
5. The school promotes active learning and collaboration through ICT integration.	4.41	HI
6. The school prioritizes teaching students about responsible and ethical use of technology.	4.36	HI
7. The school establishes policies and guidelines to ensure a safe and secure online learning environment.	4.29	HI
8. The school integrates ICT tools for assessment and feedback purposes.	4.31	HI
9. The school provides access to a wide range of digital resources, educational software, and online platforms that support ICT integration.	4.11	HI
10. The school engages in research and evaluation to measure the impact of ICT integration on teaching and learning outcomes.	3.98	HI
11. The school collaborates with external organizations, universities, and other schools to share best practices, resources, and expertise in ICT integration.	3.96	HI
Overall Mean	4.24	HI

Source: Natividad et al. (2024)

Legend:

Range of Means	Descriptive Interpretation
4.51 – 5.00	Very Highly Implemented (VHI)
3.51 – 4.50	Highly Implemented (HI)

2.51 – 3.50	Moderately Implemented (MI)
1.51 – 2.50	Slightly Implemented (SI)
1.00 – 1.50	Not Implemented (NI)

Schools demonstrate high levels of ICT integration, with an overall mean of 4.24. Particularly high ratings are noted for leadership support (4.44), alignment with curriculum goals (4.42), and promotion of active learning through ICT (4.41). These figures reflect robust and effective ICT practices within these schools.

The results highlight a strong commitment to fostering a safe online learning environment, promoting active learning, and emphasizing responsible technology use. Additionally, the integration of ICT tools for assessment, access to digital resources, and collaboration with external organizations underscores a comprehensive approach to technology integration.

The high implementation status signifies a positive and progressive stance on technology-enhanced education in the surveyed schools, establishing a solid foundation for ongoing advancements in this area.

However, the lowest indicators—engaging in research to measure the impact of ICT integration (3.98) and collaborating with external organizations for ICT expertise (3.96)—suggest areas needing improvement. Enhancing research initiatives and expanding external collaborations will provide a more comprehensive and informed approach to ICT integration in education.

Is there a significant relationship between the schools' mean percentage scores and:

1. *teachers' extent of use of ICT tools and applications;*
2. *ways of using ICT tools and applications; and*
3. *status of implementation of ICT integration?*

Table 4. Correlation analysis between independent variables and dependent variable

Independent Variable	Schools' Mean Percentage Score
Extent of Use	0.68 (p=.002)
Ways of Using ICT	0.81 (p=.000)
Status of Implementation	0.93 (p=.000)

There is a positive correlation between the extent of ICT use and schools' MPS ($r=0.68$, $p=.002$), indicating that increased use of ICT tools by teachers is associated with higher MPS. Similarly, Zhao et al. (2019) found a moderate positive correlation ($r = 0.57$) between ICT use and student achievement, suggesting that greater engagement with ICT can improve student outcomes. This

underscores the importance of consistent and effective use of ICT tools in enhancing educational performance.

A positive correlation also exists between the ways ICT is used and schools' MPS ($r=0.81$, $p=.000$), showing that more strategic use of ICT correlates with higher MPS. Hew and Brush (2013) found that ICT use for problem-solving and collaborative learning boosts student scores, while Prensky (2015) highlighted that engaging and interactive ICT use fosters better understanding and critical thinking, enhancing student outcomes. This indicates that not just the frequency, but the manner of ICT use is crucial for maximizing its benefits in educational settings. Lastly, there is a strong positive correlation between the status of ICT implementation and schools' MPS ($r=0.93$, $p=.000$). This aligns with Almasi (2015), who reported a positive correlation ($r = 0.74$) between ICT implementation levels and student performance, and Hubber et al. (2017), who concluded that comprehensive ICT integration with strong leadership and effective training leads to significant student achievement gains. Additionally, the findings resonate with Ghavifekr and Rosdy (2015), who emphasized that proper implementation and continuous support in ICT integration can significantly enhance both teaching and learning processes, contributing to improved academic performance.

Conclusion

ICT serves as a crucial catalyst in transforming the landscape of teaching and learning, imparting a multifaceted impact on educational processes. By facilitating dynamic and interactive learning environments, ICT plays a pivotal role in elevating the quality of education. The extent to which educators harness ICT tools, the diverse strategies employed for integration, and the overarching status of ICT incorporation within educational institutions collectively contribute to a positive shift in Mean Percentage Scores (MPS). Through these dimensions, ICT not only enhances the dissemination of knowledge but also promotes heightened student engagement. The dynamic nature of ICT tools enables teachers to adopt innovative approaches, fostering an enriched educational experience that resonates positively in students' academic achievements, as reflected in the improved MPS. In essence, the effective utilization and integration of ICT tools become integral components in shaping a modern and effective educational landscape, where technology and pedagogy synergize for optimal learning outcomes. By effectively leveraging ICT tools, implementing diverse integration strategies, and strengthening ICT integration practices, schools can harness the power of technology to enhance student engagement, improve learning outcomes, and achieve educational excellence.

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