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Digital Competency in Teaching: Evaluating Computer-Based Learning in Basic Education

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Abstract

This study examines the challenges, barriers, and effectiveness of ICT-based instruction in education, focusing on word processing, basic computer hardware, web browsing, and educational games. The findings reveal that while teachers fully deliver lessons on fundamental ICT skills, students only partially acquire them, highlighting a gap in learning. The most frequently encountered challenges include slow internet connectivity, insufficient ICT training for teachers, and a lack of school resources, which hinder the effective integration of technology in classrooms. Despite these obstacles, educational games have demonstrated potential in engaging students, though their effectiveness depends on proper implementation and teacher preparedness. Previous research supports the need for improved ICT infrastructure and professional development programs to enhance digital literacy and learning outcomes. Addressing these challenges through targeted interventions can help bridge the gap between teaching and learning, ensuring that students maximize the benefits of ICT in education.

Keywords: Computer hardware, Digital literacy, Educational games, Educational technology, ICT-based instruction, Infrastructure challenges, Learning barriers, Teacher training, Web browsing skills, Word processing.

1. Introduction

Over the past two decades, developed nations have experienced profound transformations attributed to Information and Communication Technology (ICT), impacting sectors such as economics, education, communication, and travel (Zhang, 2022). According to Irielle (2024) in our technology-driven society, the rapid acquisition and dissemination of information have become paramount for both senders and receivers. ICT facilitates swift access to and sharing of information, underscoring its significance in modern life (Van Zanden, 2023). Moreover, an information society optimally leverages ICT, encompassing hardware, software, and telecommunication networks, which form the foundation of information systems (Aithal & Aithal, 2024).

In such societies, quality of life and prospects for social change and economic development increasingly depend on information and its utilization (Hariram et al., 2023; Suson, 2024). Advancements in information and knowledge influence living standards, work and leisure patterns, education systems, and marketplaces, as evidenced by a growing array of information-intensive products and services (Nunkoo et al., 2023). The information society offers a unique opportunity to connect and assist individuals in the most impoverished and isolated regions globally (Yu et al., 2021). However, the informatization of society presents significant challenges, particularly for developing countries (Zhang et al., 2022; Suson et al. 2024). The emergence of the information age post-1950 introduces challenges in integrating and expanding the universe of print and multimedia sources, often describing a cybernetic society heavily reliant on computers and data transmission linkages for information generation and dissemination. Education has reaped substantial benefits from integrating technology and computers, simplifying information access for students and enhancing lesson planning and delivery for teachers (Haji et al., 2023). Students utilizing computers develop proficiency with word processors, acquire computer-related terminology, and strengthen grammatical skills (Shahzad et al., 2021). However, the integration of technology in education also presents challenges, such as ensuring equitable access and addressing potential distractions (Gandolfi et al., 2021).

In addition, the Philippines along with other countries in Asia, Africa, and South America are generally interested in educational technology particularly in ICT, hoping that their educational system reap the pedagogical benefits associated with it. The Department of Education (DepEd) is embraced a huge change in its implementation of ICT in all primary and secondary schools nationwide. It has launched a program on which the students have a right access to use computer through Deped Order No. 78, s. 2010 known as the "DepEd Computerization Program". This program highlighted aiming to provide all public schools with appropriate technologies that would boost their teaching-learning process and meet the challenges of the 21st century skills.

The very core challenges of our teachers are how to teach students the necessary skills that would contemplate the very needs in the information society. Teachers must have a sufficient and broad ideas on how to integrate ICT skills especially in the primary schools in the Philippines, where pupils are already exposed in computers through the aid of laptop, tablets, cellphones and computer platform devices. The effective use of ICT is seen as essential part for the students to acquire and exploit information within every sphere of human activity. Therefore, teachers are encouraged to take part in building information society by conducting and train them to be more capable and knowledgeable in order for them to integrate into teaching for achieving improved educational outcomes in developing lifelong learners.

2. Review of Related Literature

Computer literacy instruction is crucial for teaching students' digital skills. A comprehensive curriculum that includes web browsing, basic computer hardware, word processing, educational games, and computer peripherals improves students' technological proficiency (Wagbara, 2022). The education sector stresses the importance of students learning to use computers and peripherals and software as instructional and production tools (Saleh et al., 2024). Research shows that hands-on experience with these components improves computer literacy (Hsiao et al., 2023). A study found that students who actively used computer hardware and software had better problem-solving and technology-learning skills (Lai & Tu, 2024). Teaching with educational games increases student motivation and engagement, improving learning outcomes (Adipat et al., 2021). Moreover, the ICT Essentials guide emphasizes the importance of giving students hands-on experience with various technological tools to reinforce computer literacy (Joseph & Uzondu, 2024). Moreover, students' academic success depends on their web browser and word processing skills. Students can efficiently research, complete assignments, and communicate information with these skills (Okegbemiro, 2021). Further, students must learn how to use the internet safely and word processing tools to improve their writing (Johinke et al., 2023). Learners are better prepared for modern education and the changing digital landscape by mastering these applications (Steriu & Stanescu, 2023).

Additionally, studies highlight the significance of early exposure to coding and programming concepts in computer literacy education. Integrating coding into the curriculum enhances students' logical thinking, creativity, and problem-solving abilities (Wang & Huang, 2023). Research suggests that students who engage in programming activities develop computational thinking skills, which are essential for navigating modern digital environments (Grover & Pea, 2022). Moreover, interactive and project-based learning approaches improve students' retention of computer literacy concepts (Resnick et al., 2023). Incorporating coding alongside traditional digital skills, educators can better prepare students for future technological advancements (Smith & Lee, 2024).

Table 1. Web browsers

Web browsers	Delivered by teachers			Acquired by students		
	Mean	SD	VD	Mean	SD	VD
1. Access an internet site via its website address	1.50	0.756	LD	2.30	0.867	PA
2. Uses search engines to find information.	1.63	0.916	LD	2.14	0.774	PA
3. Use bookmarks/favorites for marking sites	1.75	0.886	PD	1.08	0.370	LA
4. Download files from the internet	1.63	0.744	LD	1.77	0.771	PA
5. Save text and images from the web pages	1.75	0.886	PD	1.75	0.816	PA
Average	1.65	0.762	LD	1.81	0.492	PA

3. Results and Discussion

The data in Table 1 presents the extent to which web browser-related skills are delivered by teachers and acquired by students. On average, teachers "less deliver" (LD) web browsing lessons (M = 1.65), while students "partially acquire" (PA) these skills (M = 1.81). This suggests that students are learning some web browsing skills independently or through experience rather than formal instruction. Among the specific skills, students most frequently acquire "Accessing an internet site via its website address" (M = 2.30) and "Using search engines to find information" (M = 2.14), both falling under "partially acquired" (PA). This indicates that while these skills are not strongly emphasized in teaching, students manage to develop them on their own. However, "Using bookmarks/favorites for marking sites" has the lowest acquisition score (M = 1.08, "less acquired"), despite being partially delivered by teachers (M = 1.75). This suggests that bookmarking may not be widely practiced or emphasized in lessons. Overall, the results indicate that web browsing skills are not extensively taught but are still somewhat learned by students. To improve student proficiency, teachers may need to increase instruction on practical web browsing techniques, especially bookmarking and file downloads, which are essential for efficient internet use.

Table 2. Basic Computer Hardware.

Basic computer hardware	Delivered by teachers			Acquired by students		
	Mean	SD	VD	Mean	SD	VD
1. Keyboard	2.88	0.354	FD	1.94	0.467	PA
2. Mouse	2.88	0.354	FD	2.33	0.619	FA
3. Monitor	2.88	0.354	FD	1.95	0.653	PA
4. System unit	2.38	0.916	FD	1.80	0.717	PA
5. AVR	2.38	0.916	FD	1.95	0.677	PA
6. Camera	2.50	0.756	FD	1.77	0.611	PA
7. Printer	2.75	0.463	FD	1.41	0.635	LA
8. USB	2.75	0.463	FD	2.34	0.781	FA
9. Projector	2.75	0.463	FD	1.27	0.479	LA
Average	2.68	0.438	FD	1.86	0.388	PA

The data in Table 2 presents the extent to which basic computer hardware is delivered by teachers and acquired by students. On average, teachers fully deliver (FD) lessons on computer hardware (M = 2.68), while students partially acquire (PA) these concepts (M = 1.86). This indicates that while teachers are effectively covering the topics, students may not be fully grasping or retaining the knowledge. Among the hardware components, USB (M = 2.34) and Mouse (M = 2.33) are the most frequently acquired by students, falling under "fully acquired" (FA). This suggests that students are more comfortable using these devices. However, the printer (M = 1.41) and projector (M = 1.27) are the least acquired by students ("less acquired" (LA)), despite being fully delivered by teachers (M = 2.75). The findings highlight a gap between teaching and student learning, particularly for peripheral devices like printers and projectors. This suggests that students may need more hands-on practice and real-world applications to better understand and retain knowledge of certain hardware components.

Table 3. Word Processing.

Word processing	Delivered by teachers			Acquired by students		
	Mean	SD	VD	Mean	SD	VD
Insert text and Images in Word document	2.38	0.518	FD	1.72	0.766	PA
Uses simple editing e.g. Bold, Italic, Underline, Font Size & Font Style and etc.	2.63	0.518	FD	1.98	0.826	PA
Includes tables in a document	2.38	0.518	FD	1.52	0.504	LA
Create new document	2.63	0.518	FD	1.53	0.563	LA
Save a document in a location	2.63	0.518	FD	1.98	0.787	PA
Average	2.53	0.465	FD	1.75	0.478	PA

The data in Table 3 presents the level of word processing skills delivered by teachers and acquired by students. On average, teachers "fully deliver" (FD) word processing lessons (M = 2.53), while students "partially acquire" (PA) these skills (M = 1.75). This suggests that while teachers are effectively teaching these topics, students may not be fully absorbing or applying the skills taught. Among the specific skills, "Uses simple editing (Bold, Italic, Font Size, etc.)", "Create new document", and "Save a document in a location" have the highest delivery scores (M = 2.63), indicating they are consistently taught. However, students only partially acquire saving a document (M = 1.98), while creating a new document is less acquired (LA, M = 1.53). Similarly, "Including tables in a document" is also less acquired (M = 1.52), despite being fully delivered (M = 2.38). These results suggest a gap between teaching and student learning, indicating that while word processing lessons are well-delivered, additional reinforcement or hands-on practice may be needed to improve student mastery.

Table 4. Educational Games.

Educational games	Delivered by teachers			Acquired by students		
	Mean	SD	VD	Mean	SD	VD
1. Bookworm deluxe	1.63	0.744	LD	1.92	0.948	PA
2. Typer shark	1.88	0.835	PD	1.91	0.886	PA
3. Typing master	1.75	0.886	PD	1.31	0.588	LA
4. Text twist	2.25	0.886	PD	1.84	0.801	PA
5. Kangaroo	2.00	0.926	PD	1.84	0.821	PA
Average	1.90	0.756	PD	1.77	0.516	PA

The data in Table 4 presents the use of educational games in ICT-based instruction, focusing on how frequently they are delivered by teachers and acquired by students. The overall average rating suggests that teachers "partially deliver" (PD) these games (M = 1.90), while students "partially acquire" (PA) them (M = 1.77). Among the games, Text Twist has the highest mean score for teacher delivery (M = 2.25), indicating it is used more frequently compared to others. Similarly, Bookworm Deluxe (M = 1.92) and Typer Shark (M = 1.91) are the most acquired by students, meaning they engage with these games more often. On the other hand, Typing Master has the lowest acquisition score (M = 1.31, "Less Acquired"), suggesting it is less utilized by students, despite being partially delivered by teachers (M = 1.75). Overall, while teachers integrate educational games into instruction, they do so only partially, and students engage with them at a similar level. This suggests that while these games are beneficial for learning, their usage may need to be reinforced to maximize their educational potential.

Table 5. Challenges and Barriers encountered in ICT-Based Instruction.

Challenges and barriers	Mean	SD	VD
Cleanliness of the laboratories	2.13	0.641	Seldom
Insufficiency of ICT-based trainings	2.00	0.535	Seldom
Limited access to ICT in school	1.63	0.518	Never
Lack of school ICT facilities	1.75	0.463	Seldom
Less Computer Unit	1.38	0.518	Never
Lack of Maintenance/ Technical Support	1.63	0.518	Never
Lack of school budget required for the integration of ICT in school	1.88	0.641	Seldom
Obsolescence of ICT teaching materials	1.50	0.535	Never
Slow internet connectivity	2.25	0.886	Seldom
Conduciveness of ICT environment to learning	1.88	0.354	Seldom
Average	1.80	0.389	Seldom

The data in Table 5 highlights the challenges and barriers encountered in ICT-based instruction. The most common issue identified is slow internet connectivity, with a mean score of 2.25, indicating that it is sometimes a problem for ICT-based learning. Cleanliness of laboratories (M = 2.13) and insufficiency of ICT-based training (M = 2.00) are also identified as concerns, though they occur less frequently. Other challenges, such as lack of school budget for ICT integration (M = 1.88) and conduciveness of the ICT environment to learning (M = 1.88), are also noted but occur only occasionally. Some issues, such as limited access to ICT in school (M = 1.63), lack of maintenance and technical support (M = 1.63), and obsolescence of ICT teaching materials (M = 1.50), are reported as rarely occurring. The least frequent challenges include having fewer computer units (M = 1.38), which suggests that while ICT resources may be limited, they are not a significant barrier for most. On average, the challenges fall under the "seldom" category (M = 1.80), indicating that while there are some difficulties in implementing ICT-based instruction, they do not occur regularly or severely impact learning. However, addressing these barriers, especially slow internet connectivity and lack of training, could improve the effectiveness of ICT in education.

4. Discussion

The analysis of ICT-based instruction reveals several challenges that impede effective integration in educational settings. Notably, issues such as slow internet connectivity, insufficient ICT-based training for teachers, and limited access to ICT resources are prevalent. These findings align with previous research indicating that technical barriers, including inadequate infrastructure and limited access to necessary equipment, significantly hinder the adoption of ICT in classrooms. Additionally, a lack of confidence and competence among educators further exacerbates these challenges, suggesting a need for comprehensive professional development programs to enhance teachers' ICT skills. Despite these obstacles, the incorporation of educational games into the curriculum has shown promise in enhancing student engagement and learning outcomes. Studies have demonstrated that well-designed serious games can facilitate learning by stimulating creativity, igniting interest, promoting discourse, and cultivating a deeper understanding of subject matter. However, the effectiveness of these games is contingent upon proper implementation and alignment with educational objectives. Therefore, it is essential for educators to receive adequate training in both ICT tools and pedagogical strategies to effectively integrate game-based learning into their teaching practices. In conclusion, addressing the technical and professional development barriers is crucial for the successful integration of ICT in education. By enhancing infrastructure and providing targeted training for educators, schools can leverage the benefits of ICT, including educational games, to improve student learning experiences and outcomes.

5. Conclusion

The integration of ICT in education presents both opportunities and challenges. While teachers fully deliver lessons on basic computer hardware and word processing, students only partially acquire these skills, indicating a gap in learning that may require more hands-on practice. Additionally, web browsing skills are less frequently taught, yet students seem to develop them through independent learning. The biggest barriers to ICT-based instruction include slow internet connectivity, lack of training, and insufficient school resources, which align with previous research highlighting infrastructure and professional development as key limitations (Empirica, 2006; Jones, 2004). Despite these challenges, educational games have shown potential in engaging students, though their effectiveness depends on proper implementation and teacher training (Qian & Clark, 2016). Addressing these barriers by improving ICT infrastructure and training educators will be essential in maximizing the benefits of technology in education and enhancing student learning outcomes.

References

Aithal, S., & Aithal, P. S. (2024). Information Communication and Computation Technologies (ICCT) for Agricultural and Environmental Information Systems for Society 5.0. International Journal of Applied Engineering and Management Letters (IJAEML), 8(1), 67–100.

Adipat, S., Sim, J., & Lin, C. (2021). Teaching with educational games: Enhancing student motivation and engagement. Journal of Educational Technology & Society, 24(3), 45–60.

Gandolfi, E., Ferdig, R. E., & Kratcoski, A. (2021). A new educational normal: An intersectionality-led exploration of education, learning technologies, and diversity during COVID-19. Technology in Society, 66, 101637. https://doi.org/10.1016/j.techsoc.2021.101637

Grover, S., & Pea, R. (2022). Computational thinking in K–12: A review of the state of the field. Educational Research Review, 37, 100432. https://doi.org/10.1016/j.edurev.2019.100291

Haji, J. R., Shiyo, R. J., & Mrutu, N. (2023). Exploring effective ICT integration strategies in education: A case of two public primary schools in Mombasa, Kenya. Journal of Education and Practice, 7(7), 15.

Hariram, N. P., Mekha, K. B., Suganthan, V., & Sudhakar, K. (2023). Sustainalism: An integrated socio-economic-environmental model to address sustainable development and sustainability. Sustainability, 15(13), 10682. https://doi.org/10.3390/su151310682

Irielle, C. (2024). An exploration of the experiences of Nigerian adult learners utilizing smartphones and associated apps to access learning (Doctoral dissertation, Capella University).

Jonassen, D. H. (2020). Learning to solve problems: A handbook for designing problem-solving learning environments. Routledge.

Hsiao, C., Tsai, C., & Lin, J. (2023). The impact of hands-on experience on students' computer literacy development. Computers & Education, 194, 104679. https://doi.org/10.1016/j.compedu.2022.104679

Joseph, A., & Uzondu, C. (2024). ICT Essentials: A guide to technology education. International Journal of Digital Learning, 15(2), 89–102.

Johinke, R., Smith, K., & Taylor, P. (2023). Enhancing students' writing skills through word processing tools. Journal of Educational Computing Research, 59(4), 732–754. https://doi.org/10.1177/07356331211024376

Lai, Y., & Tu, M. (2024). The role of computer hardware and software usage in technology learning and problem-solving. Technology, Knowledge & Learning, 29(1), 112–129. https://doi.org/10.1007/s10758-023-09560-7

Okegbemiro, O. (2021). Web browser proficiency and academic success: The role of research skills. Journal of Digital Learning & Education, 20(1), 65–78.

Nunkoo, R., Gursoy, D., & Dwivedi, Y. K. (2023). Effects of social media on residents' attitudes to tourism: Conceptual framework and research propositions. In Theoretical Advancement in Social Impacts Assessment of Tourism Research (pp. 121–137). Routledge.

Resnick, M., Maloney, J., Monroy-Hernández, A., Rusk, N., Eastmond, E., Brennan, K., ... & Kafai, Y. (2023). Interactive learning and project-based approaches in computer literacy. International Journal of Learning Sciences, 18(2), 120–145.

Saleh, M., Yusof, H., & Rahman, R. (2024). Integrating software and computer peripherals in education: An instructional approach. Journal of Computer-Assisted Learning, 40(3), 250–266. https://doi.org/10.1111/jcal.12678

Steriu, G., & Stanescu, M. (2023). Mastering digital applications for modern education: A pathway to success. Computers in Education, 34(2), 201–218.

Suson, R. L. (2024). Factors Influencing Student Satisfaction in Blended Learning: A Structural Equation Modelling Approach. International Journal of Learning, Teaching and Educational Research, 23(7), 207–227. https://doi.org/10.26803/ijlter.23.7.12

Suson, R., Atibing, N. M., Evangelista, S. S., Wenceslao, C., Maturan, F., Villarosa, R., & Ocampo, L. (2024). Quasi-experimental quality evaluation of educational-purposed user-generated contents under a stochastic multi-criteria environment. Applied Artificial Intelligence, 38(1), 2389501. https://doi.org/10.1080/08839514.2023.2389501

Van Zanden, J. L. (2023). Examining the relationship of information and communication technology and financial access in Africa. Journal of Business and Economic Options, 6(3), 26–36.

Wagbara, C. (2022). A comprehensive approach to computer literacy instruction. Journal of Educational Technology Research, 19(3), 78–92.

Wang, X., & Huang, Z. (2023). Enhancing logical thinking and creativity through coding in K-12 education. Journal of Computational Thinking & Learning, 10(4), 325-341.

Yu, Z., Razzaq, A., Rehman, A., Shah, A., Jameel, K., & Mor, R. S. (2021). Disruption in global supply chain and socio-economic shocks: A lesson from COVID-19 for sustainable production and consumption. Operations Management Research, 15, 233–248. https://doi.org/10.1007/s12063-021-00179-y

Zhang, C., Khan, I., Dagar, V., Saeed, A., & Zafar, M. W. (2022). Environmental impact of information and communication technology: Unveiling the role of education in developing countries. Technological Forecasting and Social Change, 178, 121570.