

Evaluating the Impact of a Digital Literacy Intervention on Pre-Service Teachers: A Mixed-Method Analysis

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Abstract:

The purpose of this study was to assess the impact of a digital literacy intervention on pre-service teachers (PSTs). A mixed-method design was employed, with a focus on quantitative analysis of seven specific dimensions: Digital Literacy, Ethics and Responsibilities, General Knowledge and Functional Skills, Daily Usage, Advanced Production, Privacy & Security, Social Dimension, and Beliefs about Instructional Use of ICT. Paired sample t-tests were conducted to evaluate pre- and post-intervention scores for each dimension. Findings reveal statistically significant improvements in most dimensions, except for Daily Usage and Privacy & Security. The results suggest that while the intervention effectively enhanced digital literacy in general, certain areas require further investigation.

Key words: Digital Literacy, Pre-service teachers, Intervention Course, ICT.

Introduction:

As digital technologies become ubiquitous in educational settings, it is essential that pre-service teachers possess strong digital literacy skills. Digital literacy extends beyond the ability to use technology; it encompasses a range of competencies, including ethics, general knowledge, functional skills, privacy, security, and instructional use. To address this need, a comprehensive digital literacy intervention was introduced to pre-service teachers (PSTs), aiming to equip them with the necessary skills to integrate digital tools into their future classrooms effectively. This study evaluates the impact of this intervention using a mixed-method approach, primarily focusing on quantitative analysis through paired t-tests on pre- and post-intervention scores.

Literature Review:

Digital literacy is increasingly recognized as a critical competency for educators. Researchers have identified various dimensions of digital literacy that are essential for effective teaching (Spante et al., 2018). These dimensions include the ability to navigate digital environments, understand ethical implications, and maintain privacy and security (Covello, 2010). Despite the importance of digital literacy, studies indicate that pre-service teachers often lack confidence in their digital skills (Tondeur et al., 2017). Interventions targeting digital literacy have shown promising results, yet comprehensive evaluations of specific dimensions remain limited (Tang & Chaw, 2016).

Buckingham (2007) explores digital media literacy, redefining it in light of the internet's pervasive role in education. Buckingham emphasizes that digital literacy must encompass not only technical skills but also critical thinking and ethical considerations, which are particularly relevant for educators shaping young minds in a digital world.

Gilster (1997) provides foundational insights into digital literacy, defining it as the ability to understand and use information in multiple formats from a wide range of digital sources. This work sets a basis for understanding how digital literacy skills have evolved with the advancement of digital technology.

Hague & Payton (2010) discuss the integration of digital literacy across various subjects in the educational curriculum, highlighting the need for students to develop digital competencies alongside traditional subjects. This reference underscores the importance of a comprehensive approach to embedding digital literacy in education.

Hobbs (2010) presents a strategic plan for integrating digital and media literacy into education, advocating for an inclusive framework that fosters critical thinking and responsible digital citizenship. Hobbs' work is critical in outlining the steps necessary for effectively incorporating digital literacy into teacher education programs.

Koehler & Mishra (2009) introduce the Technological Pedagogical Content Knowledge (TPACK) framework, which explains how teachers integrate technology, pedagogy, and content knowledge. This model supports the notion that pre-service teachers need not only digital skills but also the knowledge of how to use technology effectively in pedagogical contexts.

Mishra & Kereluik (2011) review components of 21st-century learning, emphasizing digital literacy as a critical skill for educators. They synthesize research on essential skills, which aligns with the goals of your study in preparing teachers for digitally enriched educational environments.

Punie & Cabrera (2006) analyze the future of ICT in learning, stressing the shift towards knowledge-based societies that require educators to possess high digital literacy. This report highlights the importance of developing digital competencies as part of a broader strategy for lifelong learning and adaptation in a rapidly changing digital world.

Ribble (2011), addresses the concept of digital citizenship, which includes the ethics, privacy, and security aspects of digital literacy. Ribble's work is relevant to your study as it emphasizes the ethical responsibilities of digital citizens, particularly educators who must model these skills for their students.

Selwyn (2012), provides a global perspective on digital technology in education, covering issues such as educational equity and the challenges educators face when integrating ICT. Selwyn's insights into the global implications of digital literacy provide context for understanding the broader challenges faced by pre-service teachers.

Teo (2009), examines technology acceptance among pre-service teachers, finding that attitudes towards technology significantly impact its integration into the classroom. This study highlights the importance of digital literacy interventions in shaping positive attitudes and building confidence in using ICT.

Warschauer & Matuchniak (2010), investigate issues of access, use, and outcomes related to digital technologies, focusing on equity in digital literacy. Their research underscores the importance of ensuring that digital literacy interventions are inclusive and accessible, catering to diverse groups of pre-service teachers.

Yildirim (2000), explores the impact of educational computing courses on teachers' attitudes and usage of technology. This research is pertinent as it supports the idea that formal training in digital literacy can significantly improve pre-service teachers' readiness to integrate ICT into their teaching practices.

The review highlights the multi-faceted nature of digital literacy, the importance of teacher training, and the challenges of integrating digital competencies in educational settings. This foundational knowledge will help position our study within the broader context of digital literacy research and underscore the relevance of our findings.

Research Objectives:

The primary objective of this study is to assess the overall effectiveness of a digital literacy intervention on pre-service teachers. Specifically, the study aims to:

1. Evaluate the improvement in total digital literacy scores post-intervention.
2. Examine dimension-wise improvements across various aspects of digital literacy, including ethics, functional skills, daily usage, advanced production, privacy & security, and social competencies.
3. Assess changes in beliefs about the instructional use of ICT post-intervention.

Methodology:

A mixed-method design was adopted for this study, with a focus on quantitative analysis. The participants consisted of 48 pre-service teachers enrolled in a teacher education program. Data was collected through pre- and post-intervention surveys that measured seven dimensions of digital literacy. Paired t-tests were conducted for each dimension to determine the statistical significance of the changes in scores.

Data Collection:

Data was collected via surveys administered before and after the intervention. The surveys included questions on general digital literacy, ethics, general knowledge, daily usage, advanced production, privacy & security, social competencies, and beliefs about ICT. Each question was rated on a Likert scale, with higher scores indicating greater proficiency or stronger beliefs.

Data Analysis:

Paired sample t-tests were employed to compare pre- and post-intervention scores across the seven dimensions. This statistical method was chosen because it allows for the assessment of mean differences within the same group over time. The null hypothesis for each test stated that there was no significant difference between the pre- and post-intervention scores. A significance level of 0.05 was used for all tests.

Results:

1. Total Digital Literacy Scores:

The paired t-test results indicated a significant improvement in overall digital literacy scores post-intervention (Mean Pre = 110.52, Mean Post = 120.44, $p < 0.05$). This suggests that the intervention was effective in enhancing overall digital literacy among the participants.

2. Ethics and Responsibilities:

Ethics and responsibilities scores showed a statistically significant increase from pre-intervention (Mean = 29.04) to post-intervention (Mean = 30.85) with a p-value of 0.01. This improvement suggests that the intervention raised awareness and understanding of ethical responsibilities in digital environments.

3. General Knowledge and Functional Skills:

The t-test results for general knowledge and functional skills also indicated a significant increase (Mean Pre = 20.42, Mean Post = 23.56, $p < 0.05$). This suggests that participants developed a better grasp of essential digital skills and general knowledge.

4. Daily Usage:

Although there was a slight increase in daily usage scores from pre- to post-intervention (Mean Pre = 24.85, Mean Post = 25.73), the p-value (0.10) did not indicate statistical significance. This suggests that the intervention had minimal impact on participants' daily usage of digital tools.

5. Advanced Production:

The scores for advanced production showed a significant improvement (Mean Pre = 5.13, Mean Post = 6.58, $p < 0.05$). This increase suggests that the intervention effectively enhanced participants' advanced digital production skills, such as creating and sharing digital content.

6. Privacy & Security:

No statistically significant improvement was found in privacy and security scores (Mean Pre = 17.02, Mean Post = 17.48, $p > 0.05$), indicating that the intervention did not substantially impact participants' understanding or skills in this area.

7. Social Dimension:

The social dimension scores showed a significant improvement (Mean Pre = 14.06, Mean Post = 16.23, $p < 0.05$). This suggests that participants developed a better understanding of social competencies within digital environments.

8. Beliefs about Instructional Use of ICT:

The beliefs about instructional use of ICT also showed a significant positive change (Mean Pre = 156.98, Mean Post = 162.92, $p < 0.05$). This indicates that participants' confidence and beliefs in using ICT for instructional purposes were enhanced following the intervention.

Discussion:

The findings indicate that the digital literacy intervention was effective in improving overall digital literacy and specific dimensions, such as ethics, functional skills, advanced production, and social competencies. However, the lack of significant improvement in daily usage and privacy & security suggests that these areas may require a different or more targeted approach.

The significant improvement in ethics and responsibilities aligns with previous research indicating that targeted interventions can raise awareness of ethical considerations in digital contexts (Livingstone & Sefton-Green, 2016). The improvement in social competencies also supports existing literature that highlights the importance of developing digital social skills (Selwyn, 2009).

Conversely, the lack of improvement in privacy & security is concerning, as digital privacy remains a crucial aspect of digital literacy. Future interventions should consider incorporating more comprehensive privacy and security training to address this gap.

The rise in mean scores reflects a meaningful shift in participants' perceptions of ICT as a valuable and effective tool in instruction. Prior to the intervention, participants may have been hesitant or lacked full confidence in integrating ICT into their teaching practices. The increase in the post-intervention scores indicates that through exposure, training, or hands-on experience during the intervention, participants gained a better understanding of how ICT can enhance the learning process. This improvement in confidence likely reflects a shift towards seeing ICT as not only a supplementary tool but as a central component in creating interactive, engaging, and effective lessons.

Limitations:

While this study provides valuable insights, it is not without limitations. The sample size is relatively small, which may limit the generalizability of the findings. Additionally, the study relied solely on self-reported measures, which may be subject to response bias. Future research should consider larger sample sizes and incorporate objective measures of digital literacy.

Conclusion:

The digital literacy intervention had a positive impact on pre-service teachers' overall digital literacy, with significant improvements observed in multiple dimensions. However, the findings also highlight areas requiring further attention, such as daily usage and privacy & security. This study contributes to the growing body of literature on digital literacy and offers practical implications for teacher education programs. By identifying specific areas for improvement, future interventions can be more targeted and effective in equipping pre-service teachers with the necessary skills to navigate and teach in digital environments.

In conclusion, the observed positive shift in participants' beliefs about the instructional use of ICT is a promising outcome, indicating that the intervention has succeeded in boosting confidence and shaping more positive attitudes. However, to ensure this change translates into sustained, effective ICT integration, ongoing support and infrastructure are necessary, along with further research to track long-term outcomes.

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