



EXAMINING THE INFLUENCE OF DIGITAL COMPETENCE ON TEACHERS' SELF-EFFICACY IN THE SCHOOL LEVEL EDUCATION

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RESEARCH ARTICLE



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Abstract

Worldwide, school curricula are integrating computing-related content to reflect the increasing importance of technology. These trends have several implications for school teachers. Teachers must develop skills and attitudes towards digital tools to meet the new requirements. Integrating digitalisation in the education system goes beyond algorithmic thinking and coding to address ethical, safety, and problem-solving concerns. Teachers should make themselves more competent with the demands of time. Teachers can meet time demands through in-service and pre-service training initiatives by learning computing content in the curriculum. However, they must also be self-confident and motivated to use technology independently and continuously to make the most of it. They must investigate the innovations and determine the usage of the relevant digital tools in the classrooms. To emphasise professional development initiatives, the paper describes the correlation between digital competence and teachers' self-efficacy. This article provides the conceptual framework for digital competence and teachers' self-efficacy derived from literature reviews. Many articles on digital competence and teachers' self-efficacy focus light on different dimensions of the educational field. Among them, few are related to the subject of teachers. Future educators must enhance their proficiency in meeting contemporary needs.

Keywords: *Digital competence, Teachers' self-efficacy, Teachers' training, Professional development, Use of ICT at school.*

Introduction

The proficient utilisation of digital technology has emerged as an essential competency across various domains, including education and employment. Proficiency in digital devices, applications, and surroundings is categorised as a 21st-century skill, crucial for engagement in education, employment, and daily living in contemporary society. In the past few years, the ongoing advancement of computer hardware and software has consistently enhanced the potential of digital systems and accelerated the pace of innovations. Diverse terminology exists in the literature to denote objective skills for utilising digital systems, and various conceptual frameworks have been proposed (Jin et al., 2020).

The school curriculum covers various computing-related subjects, presenting new teacher obstacles. At the university level, computing subjects related to pedagogy mainly concentrate on formulating research conducted in primary and secondary education. The European Parliament started discussing Digital competence in 2006. The European Council (EC) endorsed the concept as a fundamental competency for 'lifelong learning,' and the European Union (EU) stated, "Information society technology in business includes reliable and critical use of it for entertainment, learning, and communication."

Digital competence denotes the abilities and literacies the ordinary citizen must acquire to function in the digital environment. Individuals with digital proficiency can engage in both creative and critical thinking. Additionally, the learners can continuously enhance their digital skills and possess technical awareness and comprehension (Ferrari, 2021).

The digitalisation of education has resulted in a progressively intricate educational environment, necessitating that teachers adapt to contemporary trends and utilise diverse digital resources in teaching-learning (Hatlevik, 2017).

The most crucial question concerning teacher preparation is how educators prepare to teach new material while incorporating digital competencies and computer literacy into their regular teaching practices. In-service training efforts are insufficient for teachers' professional development; educators must develop the courage to investigate new and relevant material and devise instructional strategies incorporating digital competency (Pears et al., 2017).

Teachers' self-efficacy is integral to teacher training since it is directly associated with an individual's capacity to persist throughout the program. Low self-efficacy leads to a lack of perseverance, eventually leading to task failure. An individual's effort, perseverance, and resilience increase with their sense of self-efficacy (Zulkosky, 2009; Usher & Pajares, 2008). These factors show significance in acquiring problem-solving through digital tools, self-study, and lifelong learning. Research demonstrates that educators with elevated self-efficacy significantly enhance student learning and the development of pristine competencies (Moore & Esselman, 1994; Ross et al., 2001; Thoonen et al., 2011). These studies demonstrate the significant impact of high self-efficacy in technological competency and emphasise the requirement to provide instructors with a comprehensive curriculum incorporating computing and digital skills.

The study focuses on the formulated questions:

- How self-efficacious are teachers when they are digitally competent?
- In what ways can teacher training be improved?

Theoretical Structure of Digital Competence

Digital competence refers to attitudes, knowledge, awareness, and values crucial for effectively using digital technologies and applications inside an organisation. It encompasses proficiency in digital tools for professional, recreational, and communicative purposes. Digital Competence includes essential ICT mastery, such as using computer systems to acquire, access, save, create, display, and share information and collaborate within online networks (Ferrari, 2013).

Academic scholars and policymakers frequently examine and discuss the significance of digital competence, which has also become an increasingly important area of concentration in higher education. Due to the shift in educational settings, Information and Communication Technology (ICT) has become an essential part of the learning system and is included in the educational achievements of learners (Gomez-Fernandez & Mediavilla, 2021). Digital competence encompasses the requisite knowledge, abilities, and attitudes for proficiently utilising digital technologies in daily activities (Ferrari, 2012). According to the European Commission, digital competence is considered an essential life skill in their recommendations on critical competencies for lifelong learning. Digital competence is the capacity to effectively utilise and interact with digital technologies to learn, work, and engage confidently, critically, and responsibly with society (European Commission, 2019). Digital competence is a multifaceted talent encompassing cognitive, attitudinal, and technological abilities, and it is crucial for addressing the difficulties and challenges of our modern knowledge-based society (Janssen et al., 2013). Furthermore, it is a dynamic and cross-cutting skill. Digital competence includes technical abilities related to digital capabilities and the social and emotional dimensions involved in utilising and comprehending digital devices and technology. Within educational settings, digital competence refers to the capacity to possess the necessary knowledge, attitudes, and abilities to effectively design, execute, assess, and consistently improve information and communication technology (ICT)-enhanced instructional and learning methods while having a solid theoretical background. Recently, there have been multiple assessments and certifications of digital competence in higher education (Zhao et al., 2021).

The European Commission Framework of Digital Competence (DigComp) is commonly utilised to strategise, execute actions, create educational and training programs, and evaluate individuals' digital competence (Vuorikari et al., 2016). Digital competence is the capacity to utilise information and communication technology with confidence, criticality, and creativity to accomplish objectives associated with employment, education, and societal engagement (European Commission, 2006). The DigComp 2.2 framework categorises digital competence into six domains: (i) foundation and access, (ii) information and data literacy, (iii) communication and collaboration, (iv) digital content creation, (v) safety, and (vi) problem-solving and continual learning (Federal Ministry for Digital and Economic Affairs, 2021).

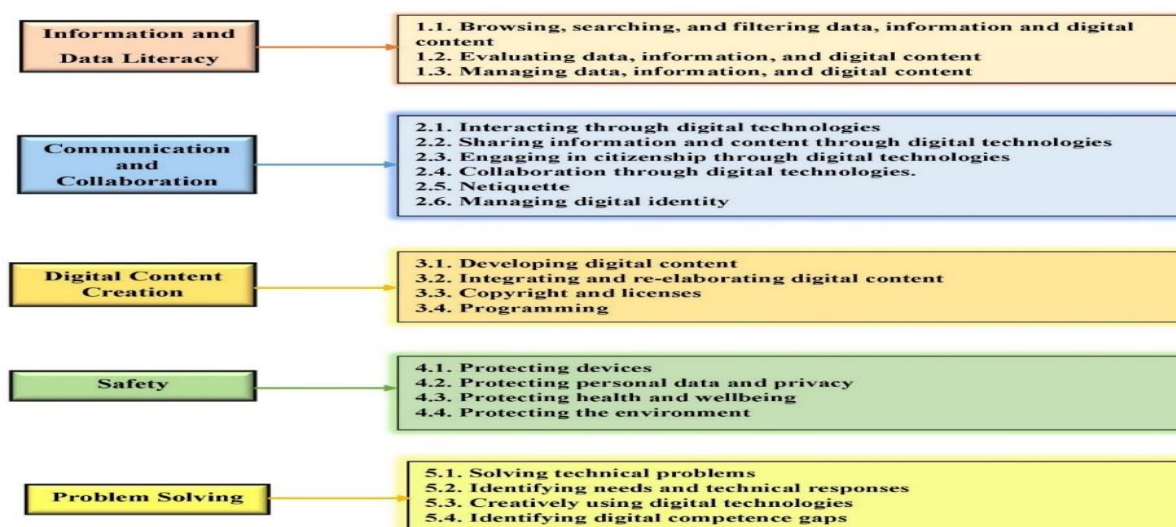


Figure: Dimensions of digital competence (Federal Ministry for Digital and Economic Affairs, 2021).

Theoretical Structure of Teachers' Self-Efficacy

Self-efficacy includes specific ideology in their talents, such as their capacity to complete a task or engage in a particular habit (Cassidy & Eachus, 2002). Bandura defines self-efficacy as an individual's conviction to competently devise and execute the requisite steps to attain a specific goal (Bandura et al., 1999). Beliefs about self-efficacy immediately influence behaviour, especially how long individuals persist in challenging tasks or their fortitude in the presence of adversity. Stunted self-efficacy increases the likelihood of giving up quickly on a task, which can fail. Acquiring a solid belief in one's ability to achieve goals is equally crucial, if not more so, than possessing the required talents. Multiple studies demonstrate that individuals with poor self-efficacy in a particular ability can still effectively accomplish a task that demands competence if they possess a high level of self-efficacy. Self-efficacy beliefs are flexible and impact an individual's cognitive performance. Self-efficacy denotes sole confidence in one's capacity to formulate and implement a specific plan of action to attain a goal. Self-efficacy levels differ depending on the specific function and task at hand, and they encompass multiple dimensions. Bandura states that self-efficacy can be evaluated based on difficulty level, task specialisation, and degree of certainty. Individuals may possess greater self-efficacy in certain domains compared to others, as self-efficacy levels can differ.

Research on teachers' self-efficacy has identified a direct correlation between learner's inspiration, academic achievement, and skill development (Moore & Esselman, 1994; Ross et al., 2001; Thoonen et al., 2011; Zee & Koomen, 2016). Teacher self-efficacy indirectly impacts pupils due to the implementation of effective instructional tactics, meticulous planning, and a willingness to experiment with innovative teaching methods. Regarding education and skill-focused activities, it is crucial to consider how teachers can adapt their teaching methods to boost students' motivation to learn (Tschannen-Moran & Hoy, 2001; Ramalingam & Wiedenbeck, 1998).

A teacher's self-efficacy pertains to their ability to effectively and proficiently teach their students. Effective teaching usually refers to knowledge and skills about a subject area, technology, etc. Teacher efficacy, teacher effectiveness, and teacher competency are distinct concepts that should not be confused with one another. Teachers' self-efficacy might be seen as a sign of their professional expertise and ability to improve their students' performance. Studies indicate that increased self-efficacy impedes successful professional knowledge and skills utilisation. Teachers' efficacy denotes the effect of his or her beliefs on a student's academic progress. Therefore, it is crucial to thoroughly examine approaches for enhancing teacher efficacy in the educational context.

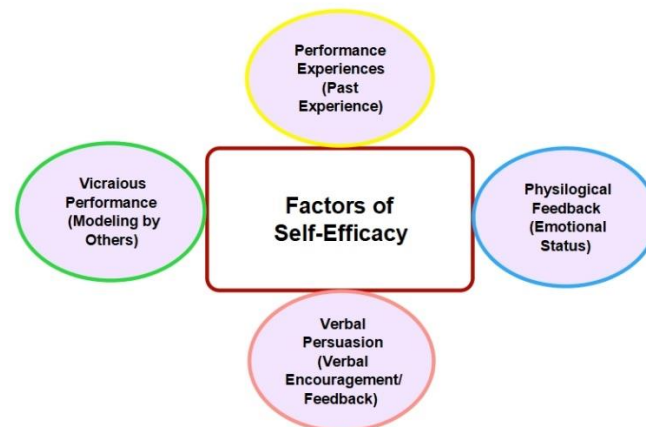


Figure: Factors Influencing the Teachers' Self-efficacy (Bansal & Jena, 2023).

Performance experiences are outlined as the most efficient way to promote constant self-efficacy expectations (Bandura, 1977). It is crucial to remember that a person's sense of self-efficacy is influenced by several factors, such as their beliefs about their abilities, the acknowledged crisis in their job, the amount of effort they exert, the number of outside companions they have, the order in which they succeeded and failed, and their cognitive structure (Bandura, 1977).

Vicarious experiences are considered by observing the action of a social model that sets off social comparison. Nevertheless, watching oneself accomplish a task can also strengthen an individual's self-efficacy beliefs (Bandura, 1977). Consequently, mastery experiences are an individual's direct and active experiences in a classroom setting rather than observing their behaviour. Vicarious experiences, on the other hand, refer to observations of (one's) behaviour (for example, watching one's teaching behaviour on video in the class).

Verbal persuasion significantly enhances teachers' self-efficacy. It encourages people to apply extreme effort when facing challenges, reducing the adverse effects of conscience (Bandura, 1977). Research shows that verbal persuasion motivates teachers to complete who lack confidence in themselves to complete their tasks effectively g high potential and capabilities.

Physiological feedback (Emotional Status) is a feeble source of information regarding self-efficacy. Extreme physical or emotional manifestations of anxiety or exhilaration may indicate incompetence. Emotional arousal can weaken one's ability to succeed before or during task engagement (Woolfolk, 1990).

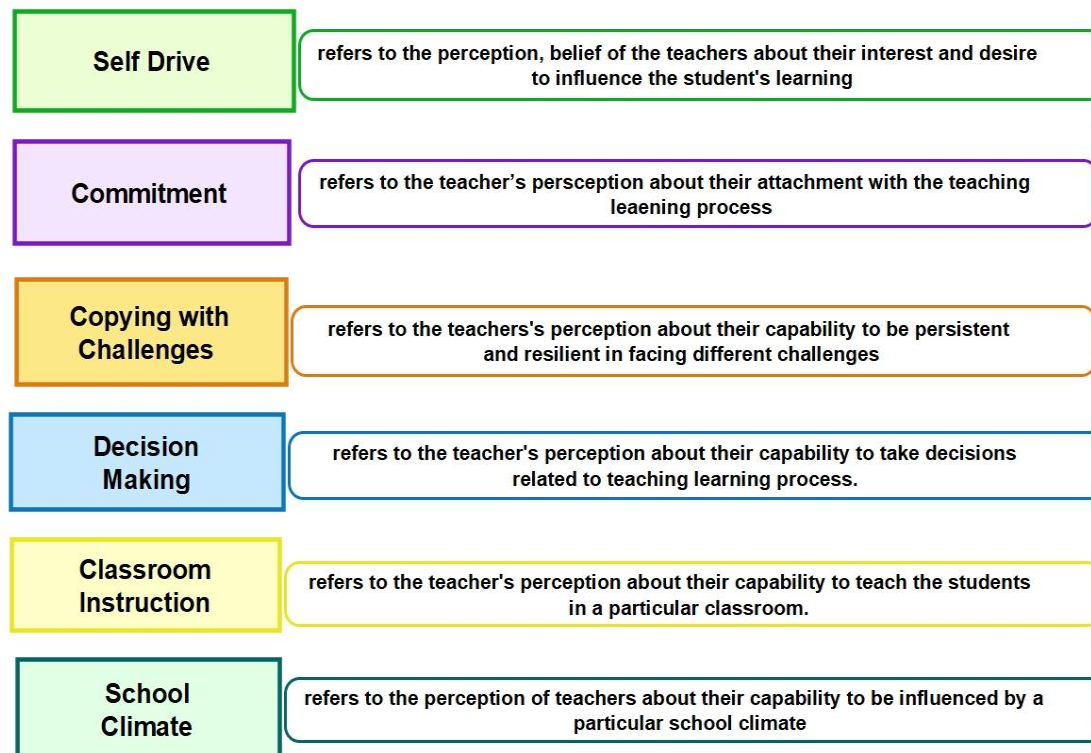


Figure: Dimensions of Teacher's Self-Efficacy (Bansal & Jena, 2023)

The teachers realised self-efficacy refers to their confidence that they can perform a specific task. The study participants usually assess their self-efficacy using a self-report scale (Kear, 2000; Zimmerman, 1995). Preparing a self-efficacy scale requires a mindful design that properly measures an individual's self-efficacy behaviour.

A self-efficacy measure has multiple assertions (items) that articulate an individual's stance on various talents and competencies about the subject under consideration. Participants are requested to indicate the degree to which they believe they can perform the task, considering the present status of their expertise.

Importance of Teacher's Self-Efficacy in Digital Competence

Observations from the preceding section indicate a substantial corpus of literature concerning self-efficacy (Bandura, 1977; Margolis & McCabe, 2003; Zimmerman, 2000). Notwithstanding its extensive academic foundation, these materials lack sufficient clarity for practical use in evaluating self-efficacy in teaching digital competence. Multiple self-efficacy scales have been created to assess computing skills within digital competence. (Compeau & Higgins, 1995; Murphy et al., 1989; Ramalingam et al., 2004; Turel, 2014; Zhang & Espinoza, 1998). The self-efficacy scale primarily emphasises fundamental computing skills, contrasting with the more extensive array of competencies outlined by DigComp. Digital competence has been incorporated into national school educational curricula across Europe. European national authorities are implementing a strategy that impacts programming, computing, and educators of several other disciplines, including mathematics, natural sciences, technology, and crafts.

Since 2006, digital competencies have been integrated into the elementary and secondary education school curriculum. The goal of digital competence describes the usability of digital tools and media in the learning process, such as drawing a graph, evaluating online information, application of important software, and personal safety awareness. Additionally, individual subjects delineate digital competencies, attaining these skills, and the methods by which students might employ digital systems to augment their knowledge and comprehension. Digital skills and competence have become a primary agenda for teachers at every level of school education, but the teacher educational institutions have not taken proper initiatives to train the prospective teachers for the revised curriculum (Engen et al., 2014; Gudmundsdottir et al., 2014).

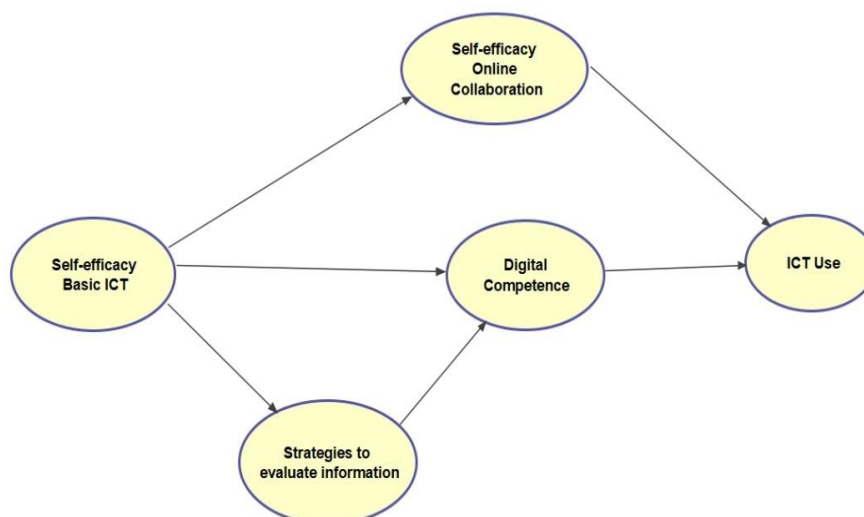


Figure: Theoretical framework illustrating the correlation among educators' self-efficacy, information organisation strategies, digital proficiency, and ICT utilisation (Hatlevik, 2017).

Computer and information literacy included in several school curriculum to emphasize the digital environment (Hargittai & Shafer, 2006). The inclusion of digital competence in school curricula increases the national and international expectations of students' capability in a digital environment (Celik & Yesilyurt, 2013). Firstly, teachers need to use digital technologies to impart knowledge and establish the curriculum for the students (Cassidy & Eachus, 2002). Secondly, educators can include technology in their instructional methods to assist students in achieving their digital competency objectives outlined in the curriculum (Krumsvik, 2011).

Results and Discussion

Results displayed by the above-reviewed literature show an extensive dispersion in the level of teachers' self-efficacy. In the realm of competencies, skill is highly associated with information and data literacy, as respondents with high self-efficacy show high confidence in digital competence. The result is expected as the teachers handle data and information regularly in their daily teaching. Other reviewed literature focuses on the instance survey result that shows the engagement of school teachers with computational thinking in their teaching content (Mannila et al., 2014). Comparable outcomes have been observed in England, where computational thinking was introduced in the national curriculum in 2014. The school teachers compute the learning content using digital technologies that show their competence in the digital environment. Specific research indicates that educators exhibit the lowest confidence in programming and copyright/licensing. The findings indicate that self-efficacy in fundamental ICT foretells methods for assessing information and online collaboration. A research review suggests a positive link between digital skills and confidence in basic ICT, with some overlap (Fanni et al., 2013). The partial overlapping is self-reported efficacy, which measures the difference in assessing digital competence (Hatlevik et al., 2015). The appropriate strategies evaluate information and suggest better achievement (Schunk et al., 2008). The research emphasises the significance of learning styles in articulating teachers' digital competence (Krumsvik, 2014). Concluding the results of the reviewed literature, teachers with high self-efficacy feel more confident in all the areas of digital competence, and educators with diminished self-efficacy need assistance and direction in all domains of digital competence, excluding data and information literacy.

Conclusion

Teachers must possess a substantial degree of self-efficacy concerning digital proficiency and computational concepts in our increasingly technological society so that young people can receive the education they need. Schools and governments must take continuing education seriously to address the difficulties mentioned in the research. The presented result implies strong evidence that helps develop teachers' self-efficacy in digital competence. Teachers' self-efficacy in computational ideas and digital competence is essential to preparing the next generation of learners for the technological culture. Schools and governments must take continuing education seriously to address the issues mentioned in this study. The presented result implies strong evidence that helps develop teachers' self-efficacy in technological proficiency. The studies exhibit that educators with elevated self-confidence in their subject matter remain engaged with the information for extended periods, create a superior educational setting for students, and exhibit resilience to stress (Zee & Koomen, 2016).

The study significantly contributes by offering fundamental frameworks for upcoming education and teacher preparation difficulties. The findings establish a baseline for tracking teachers' self-efficacy throughout time following specific training and indicate alterations to their self-efficacy. Ultimately, fostering digital confidence and disseminating the findings of this study would facilitate the continuous enhancement of digital competencies and self-assurance among prospective teachers. These

findings are relevant in the contemporary academic and digital landscape, aligning with global trends and research on digital competence and self-efficacy.

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