



Digital Competence of Primary School Design and Technology Teachers for Online Learning and Facilitation: A Pilot Study

C H Go¹, M Z Rozali^{1*}

¹Faculty of Technical and Vocational Education,
Universiti Tun Hussein Onn Malaysia, Parit Raja Batu Pahat, Johor, 86400, MALAYSIA

*Corresponding Author

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Abstract: Digital competence is a set of skills, abilities, and behaviors needed when using Information and Communication Technology (ICT) and digital media to carry out tasks and build knowledge. This study aims to identify the dominant digital competence elements of primary school Design and Technology (DT) teachers and the relationship between these elements for the implementation of online learning and facilitation. The study was a survey that used a quantitative approach. The researcher adapted and translated the DIGIGLO instrument into Malay language. An online survey (Google Form) is used to collect data effectively. This pilot study aimed to examine the reliability of the DIGIGLO Digital Competency Assessment instrument by using Cronbach's Alpha as a measurement of its reliability. The pilot study involved 30 primary school Design and Technology teachers who held the position of Head of the Panel in the Batu Pahat district. Respondents answered an online questionnaire using Google Forms to provide the necessary data for this pilot study. The Statistical Package for Social Science (SPSS) software was used to analyze the data and obtain Cronbach's Alpha values. The analysis results showed that the Cronbach's Alpha values for the eight elements of digital competency ranged from .919 to .966. Therefore, the adapted DIGIGLO instrument is a valid and reliable tool for assessing teacher digital competencies.

Keywords: Digital competence, DIGIGLO instrument, Cronbach's Alpha value, reliability

1. Introduction

Digital competence refers to a range of skills, behaviors, and attitudes necessary for using Information and Communication Technology (ICT) and digital channels effectively and ethically to accomplish tasks, solve problems, communicate, handle information and content, and develop competencies. According to Al Khateeb (2017), digital competence involves knowledge, skills, and attitudes required to use ICT and digital media confidently, critically, and creatively to achieve work-related goals. Teachers, as role models for future generations, should possess digital competencies to actively participate in the digital society and demonstrate their creative and critical use of digital technology to students. However, teachers also need specific digital competencies for education to effectively use digital technology for teaching. Many teachers, including those teaching Design and Technology subjects, lack digital competencies in conducting online learning and facilitation, as well as technical infrastructure such as laptops, internet, and microphones for teaching.

Teachers with specific competencies will develop students' skills, talents, potential, and knowledge in various forms. Effective teachers can transform students' perceptions of a subject. According to Aboagye et al. (2020), teaching methods have shifted from conventional approaches to embracing technology-enhanced learning and online facilitation. The shift from face-to-face teaching to technology-based online, using platforms such as learning portals, websites, YouTube, mobile applications like WhatsApp, Telegram, and so on, constitutes a drastic change that has impacted the education system in Malaysia (Kuppusamy, Y., & Norman, H., 2021). Teaching and facilitation are considered crucial

*Corresponding author: mzulfadli@uthm.edu.my

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processes to meet the dynamic needs of students and are the current learning trend that presents challenges for all teachers to adapt to these new teaching norms. A significant number of teachers, including those teaching Design and Technology subjects, are not well-trained in conducting online teaching and facilitation. They face challenges such as a lack of digital competencies to conduct online teaching and facilitation, as well as a lack of technical infrastructure, such as laptops, internet access, and microphones for teaching purposes.

The European Commission's DigCompEdu framework, proposed and updated in 2016/17, offers a structure for understanding digital competence and assessing and improving teachers' digital competencies. Redecker (2017) reports that the framework was developed through discussions with experts and practitioners, including a literature review and synthesis of existing instruments at various levels. The framework comprises six elements related to teacher digital competencies: Professional Engagement, Digital Resources, Digital Pedagogy, Assessment, Empowering Learners, and Facilitating Learners' Digital Competence. In this pilot study, the DIGIGLO instrument, containing 29 items in addition to the six areas and 22 competencies in DigCompEdu, was adapted to include two more areas related to educators' working environment, Digital Environment, and Extrinsic Digital Commitment.

A pilot study was conducted to assess the questionnaire's clarity, validity, reliability, and respondents' understanding of its requirements. The study included 30 respondents, and the results indicated that the adapted instrument was clear, valid, reliable, and understandable. Minor adjustments were made to the adapted instrument based on the pilot study's findings.

2. Literature Review

Cabero et al. (2020) argue that digital competence is one of the key competencies that citizens in general, and teachers in particular, must master in the future society. In fact, in Spain, the National Digital Competence Plan (MINECO, 2021) recently identified the acquisition of Digital Competence by Teachers at all levels of education, including universities, as one of its main strategic pillars, aimed at promoting sustainable and inclusive economic growth. Teachers are key in the process of integrating such technology and play a crucial role in the adoption and implementation of ICT in the classroom, as the transformation and improvement of education will depend, among other aspects, on educational action, which presupposes that teachers must have effective digital competencies that enable them to integrate and use technology pedagogically.

Teacher digital competence refers to the skills, abilities, and knowledge that educators need to acquire in order to carry out their educational tasks, stemming from the concept of digital competence. It has been developed in several countries around the framework established by the European Commission, but its implementation is based on various models of development and assessment. This concept of digital competence recognizes that modern education is intertwined with technology, and teachers need to possess not only subject matter expertise but also digital literacy to effectively engage with students in a technology-driven world. Durán (2019) further emphasizes that teacher digital competence is a set of knowledge, skills, and attitudes required for teachers to effectively use ICT from various perspectives (technological, informational, multimedia, communicative, collaborative, and ethical). In other words, teachers who aim to utilize ICT effectively in their educational practices need to possess the necessary knowledge, abilities, and attitudes to leverage technology optimally. Additionally, they must consider pedagogical-didactic criteria when integrating this technology into learning, so that its use can enhance learning outcomes and provide a more meaningful learning experience.

The development of teacher digital competence varies from one country to another, adapting to local contexts and educational systems. While the European Commission's framework provides a foundation, each country may adopt different strategies and approaches in integrating digital skills into teacher training and professional development programs. In this era of rapid technological advancement, fostering teacher digital competence is essential to prepare students for the challenges and opportunities of the digital age. It equips educators with the tools to create innovative and engaging learning experiences, leverage digital resources, and guide students in developing critical digital literacy skills. As the landscape of education continues to evolve, nurturing teacher digital competence remains a key component in ensuring high-quality and relevant education for all.

Based on the European Framework for Digital Competence of Educators (DigCompEdu), a self-assessment instrument has been developed by M. Ghomi and C. Redecker (2019) to measure teacher digital competence. Based on the study's results, the developed self-assessment instrument is reliable and valid. Therefore, this instrument is suitable for assessing teacher digital competence. This instrument provides an opportunity for teachers to learn more about the DigCompEdu framework, which aims to foster digitally competent educators. It allows them to gain an initial understanding of their individual strengths and ideas for enhancing their competence. Furthermore, this self-assessment instrument serves as a valuable tool for teachers to reflect on their own digital skills and identify areas for growth. It enables them to assess their proficiency across different dimensions of digital competence as outlined in the DigCompEdu framework, including technological, pedagogical, and ethical aspects.

By engaging with this instrument, educators can gauge their level of readiness to integrate digital technologies effectively into their teaching practices. It empowers them to take proactive steps towards enhancing their digital skills, exploring innovative teaching methods, and fostering a technology-enhanced learning environment. In essence, the availability of this self-assessment instrument aligns with the broader goal of promoting continuous professional

development among teachers. As the landscape of education continues to evolve in response to digital advancements, equipping educators with tools for self-assessment and improvement is crucial for maintaining high-quality teaching practices and ensuring that students receive the best possible education in the digital age. According to Alarcón, del Pilar Jiménez, & de Vicente-Yagüe (2020), the resources and opportunities available to educators in their work environment are very important. Educational institutions must ensure that teachers have access to all the digital tools and resources they need to enhance student learning both inside and outside the classroom, along with sufficient ICT training and support services. Additionally, and given the speed at which digital technology is evolving, it is important for institutions and educators to be alert to new teaching and learning opportunities. Based on the above, and to contribute to the assessment of teacher digital competencies, the objective of Alarcón, del Pilar Jiménez, & de Vicente-Yagüe's (2020) study is to develop and validate a survey based on the existing DigCompEdu Framework proposed by the European Commission.

DIGIGLO is a simple and easy-to-use instrument for assessing educators' digital competencies (Alarcón, del Pilar Jiménez, & de Vicente-Yagüe, 2020). It expands the scope of the DigCompEdu Framework by incorporating two additional areas of digital competence (digital environment and extrinsic digital engagement). The use of the instrument can provide useful feedback to educators and their institutions on both strengths and areas in need of improvement regarding the use of digital technology in teaching. DIGIGLO is an instrument that contains 29 items in addition to the six domains and 22 competencies included in DigCompEdu, considering two additional areas related to the environment in which educators work: "Digital Environment" and "Extrinsic Digital Engagement." The two additional digital competencies of teachers in the DIGIGLO instrument are Digital Environment and Extrinsic Digital Commitment, which are related to the environment in which educators work. The Digital Environment includes competencies related to digital software and hardware tools, unlimited access to digital resources, continuous opportunities for Continuing Professional Development (CPD), availability of research tools, and availability of digital complementary tools (other than those specifically for teaching). Extrinsic Digital Commitment includes competencies related to the overall digital implementation (all levels and users), continuous updating of tools available to users, and immediate ICT support to users at all levels.

3. Research Methodology

According to Wiersma (2000), research design is a guideline on how methods or procedures are used to obtain data, as well as a plan within the process of achieving research objectives. The conducted study is a survey that employs a quantitative approach, and the research instrument used is an online questionnaire, an adapted Google Form based on the DIGIGLO instrument, aimed at identifying the dominant digital competency elements for Design and Technology teachers when conducting online learning and facilitation. In the context of this pilot study, the researcher used Cronbach's Alpha method to assess the interrelationship between the items in the questionnaire and ensure the reliability of the information gathered. Reliability refers to the degree to which a research instrument, such as a questionnaire, can accurately measure the variables being studied. For this pilot study, an online questionnaire instrument was used, specifically Google Forms, which was adapted from the DIGIGLO instrument to identify the dominant digital competencies of primary school Design and Technology teachers when conducting online teaching and facilitation. The sample for this pilot study consisted of Design and Technology teachers who are heads of the panel in primary schools located in the Batu Pahat district. The researcher needs to consider several aspects in the selection of study respondents such as (i) teaching experience in the subject of Design and Technology (ii) determining the quantity of data that needs to be collected and analyzed, and (iii) interpretation and inference of the examined information.

3.1 Research Instrument

A set of online questionnaires, a Google Form, consisting of two sections identifying elements of teachers' digital competencies. The first section of the questionnaire pertains to respondent demographics. DIGIGLO is the questionnaire's second section designed to assess teachers' digital competencies (Alarcón et al., 2020). The DIGIGLO Digital Competencies of Teachers instrument adapted for this pilot study includes 43 items referring to eight digital competency areas. The first six areas are: 1) Professional Engagement (6 items), 2) Digital Resources (6 items), 3) Digital Pedagogy (6 items), 4) Assessment (6 items), 5) Empowering Students (6 items), and 6) Facilitating Students' Digital Competencies (4 items). The other two areas concern digital resources and opportunities (logistics and ICT support services) available to educators in their work context: 7) Digital Environment (5 items) and 8) Extrinsic Digital Commitment (4 items).

Part B of this questionnaire requires respondents to assess their level of agreement and disagreement with statements using a 5-point Likert scale ranging from 1 (Strongly Disagree), 2 (Disagree), 3 (Slightly Disagree), 4 (Agree), to 5 (Strongly Agree) as shown in Table 1. The research instrument used to gather feedback and collect the intended data is an online questionnaire method (Google Form). The selection of this instrument is appropriate as online questionnaires are a research tool that allows respondents the opportunity to think and take time to make informed decisions. According to Marican (2005), the questionnaire form is a suitable instrument for this study because

the conducted research takes the form of a survey, which will facilitate respondents in providing feedback on the study to be conducted.

Table 1 - 5-point Likert Scale

Likert Scale Description	Likert Scale
Strongly Agree	5
Agree	4
Slightly Disagree	3
Disagree	2
Strongly Disagree	1

The DIGIGLO Digital Competencies of Teachers instrument adapted for this study has been validated by three experts. An associate professor from the Faculty of Technical and Vocational Education (FPTV), UTHM was chosen to review the instrument in terms of structure, wording, language, and format. The validity of the questionnaire was evaluated in terms of the suitability of the content and the content of the questionnaire. Two heads of panels from SJKC Kong Nan, the head of the Malay Language Panel and the head of the Design and Technology Panel, were selected to validate the questionnaire set from the perspective of using appropriate language that accurately conveys the intended meaning in the Malay language. The validity of the questionnaire set needs to be done to enable the questionnaire to achieve the research objectives.

4. Research Findings

In this pilot study, a total of 30 respondents, consisting of Primary School Heads of Design and Technology Panel in the Batu Pahat district, answered an online questionnaire. Part B, which consists of 43 items, refers to 8 elements of digital competency. Table 2 shows the Cronbach's Alpha values obtained using SPSS (Statistical Package for Social Sciences)

Table 2 - Cronbach's Alpha Values for 8 Elements of Digital Competency

	Cronbach's Alpha
Element 1 : Professional Engagement S6 – S11	.921
Element 2 : Digital Resources S12 – S17	.966
Element 3 : Digital Pedagogy S18 – S23	.964
Element 4 : Assessment S24 – S29	.937
Element 5 : Empowering Students S30 – S35	.946
Element 6 : Facilitating Students' Digital Competencies S36 – S39	.938
Element 7 : Digital Environment S40 – S44	.919
Element 8 : Extrinsic Digital Commitment S45 – S48	.948

Element 1, Professional Involvement, consists of six items and obtained a Cronbach's Alpha value of 0.921. Element 2, Digital Resources, which consists of six items, obtained the highest Cronbach's Alpha value of 0.966. Cronbach's Alpha value for Element 3, Digital Pedagogy, is 0.964. Element 4, Assessment, obtained a Cronbach's Alpha value of 0.937. Element 5, Empowering Students, which consists of six items, obtained a Cronbach's Alpha value of 0.946. Element 6, Facilitating Digital Competency of Students, obtained a Cronbach's Alpha value of 0.938. Element 7, Digital Environment, obtained the lowest Cronbach's Alpha value of 0.919. Cronbach's Alpha value for Element 8, Extrinsic Digital Commitment, is 0.948.

Based on the Rasch measurement model approach, the acceptable range for Cronbach's Alpha (α) reliability is between 0.71 and 0.99, which indicates the best possible level (71% - 99%), as explained in Table 3 (Bond & Fox 2007). Therefore, the items in the questionnaire in this pilot study that have Cronbach's Alpha (α) values in the range of .919 to .966 possess good and acceptable reliability. Therefore, this adapted DIGIGLO instrument is a valid and reliable tool for assessing teachers' digital competencies. The pilot study has been conducted to ensure the reliability of the constructed instrument. Instruments with high reliability can provide accurate results.

Table 3 - Cronbach's Alpha Interpretation (Bon & Fox, 2007)

Cronbach's Alpha Score	Reliability
0.9 – 1.0	Very good and effective with high level of consistency
0.7 – 0.8	Good and acceptable
0.6 – 0.7	Acceptable

5. Conclusion

The DIGIGLO Digital Competency for Teachers instrument has undergone item analysis and the internal consistency has been measured using Cronbach's Alpha values, with values above .70 considered acceptable (Shultz & Whitney, 2005). The results of this pilot study indicate that Cronbach's Alpha values for the 8 elements of digital competency range from .919 to .966. Therefore, the adapted DIGIGLO instrument is a valid and reliable tool for assessing the digital competency of teachers (Sang, Valcke, Van Braak, & Tondeur, 2020).

Expectation after the study is conducted are the implications for primary school Design and Technology teachers in identifying their needs for further training and professional development in their digital competencies. Emphasizing digital competencies for teachers also promotes ongoing professional growth. Educators need to constantly keep up with the latest technological developments and pedagogical strategies, fostering a culture of innovation and improvement in schools. This emphasis on digital competence not only equips teachers with the necessary skills to navigate the evolving landscape of education but also empowers them to create engaging and effective learning experiences for their students. As technology continues to play a significant role in education, educators must adapt and integrate digital tools seamlessly into their teaching methodologies.

Furthermore, fostering a culture of innovation and improvement within schools is crucial. Teachers should be encouraged to experiment with new teaching approaches, explore innovative uses of technology, and collaborate with colleagues to share best practices. This collaborative environment can lead to the development of more effective teaching methods and ultimately enhance student outcomes.

In conclusion, by embracing digital skills and staying current with technological advancements, educators can not only enhance their own teaching practices but also contribute to the overall advancement of education by preparing students for the digital challenges of the modern world.

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