

A Systematic Review on In-service Teachers Experiences of using ISTE Standards for Educators in the Classroom

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Integrating technology in k-12 classrooms is still a challenge. However, the International Society for Technology in Education (ISTE) provides standards that can help educators to integrate technology in teaching and learning. The purpose of this study is to share the pillars of the ISTE Standards for Educators that in-service teachers felt comfortable and confident to use in their classrooms. This study used a systematic review to examine the primary research publications on the experience of in-service teachers using ISTE Standards for Educators as a framework or a foundation to create an instrument. The findings showed that the in-service teachers had focused on the pillars of Designer, Analyst, Facilitator, Citizen, and Learner in their teaching and learning activities. These five pillars may serve as a foundation for in-service teachers to fully implement the seven pillars of ISTE Standards for Educators in the classrooms. The authors also recommend the instructors at a postsecondary level to use the ISTE Standards for Educators in their teaching and learning activities.

Keywords: ISTE standards for educators, systematic review, in-service teachers, technology in education

INTRODUCTION

We live in a world dominated by technology and as a society we have noticed and experienced the pros and cons of using technology in our daily lives. It is easier to understand what a technology can provide; however, it may be impossible to predict the worst-case scenario of the technology we choose. While it is simple to make decisions on technological tool for personal use, it is more challenging to select the right tool for k-12 education (Dukuzumuremyi & Siklander, 2018; Mucundanyi & Woodley, 2021). It is no longer unusual to receive a message that the school data was stolen or the technology was unavailable for known or unknown reasons. All uncertainties surrounding the technology makes the process of integrating technology in k-12 education more complex.

Before adapting technology into the classrooms, teachers weigh the advantages over disadvantages to ensure the safety of k-12 students. In addition to the safety of the students, there are other challenges that prevent k-12 teachers to use technology (Hali, 2021). Teachers' belief on using technology influences their decisions of not introducing technology in the classroom (Iskandar, 2021; Wiburg et al., 2017). Teachers who believe that a technology in a classroom is a distraction may not be motivated even to try it with the students. Furthermore, a lack of teacher professional development or teacher training on integrating technology into teaching and learning may prevent teachers not to use technology at all. It is important to note that the professional development should not be just one time opportunity, but an ongoing activity that helps teachers to cope up with the technology changes. The

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ongoing professional developments on technology help the novice teachers to feel comfortable, learn, and collaborate with the experienced teachers, which in turn creates a community.

Even though technology in education is regarded as a new field, it is impacting the ways of teaching and learning (Rajbanshi et al., 2020; Yüksel & Eren, 2016). Almuqayteyb (2021) stated that “there is a growing concern to use new teaching methods in teaching educational technology courses rather than the traditional lecture methods” (p. 679). Therefore, there are benefits of using technology in k-12 classrooms if it is done properly. Different profit and non-profit organizations and government agencies have developed the pedagogical and methodological tools that can assist k-12 teachers in integrating technology in the classroom. The pedagogical and methodological tools include the standards and the strategies that teachers can follow in adapting technology in the classrooms (Kwitonda, 2017; Kwitonda & Singhal, 2018). The authors of this article focused on the standards of the International Society for Technology in Education (ISTE). Therefore, this article used a systematic review to learn from k-12 teachers who had integrated technology in their classrooms. The systematic review was guided by the following research question: What pillars of ISTE Standards for Educators did k-12 teachers use in integrating technology into the classrooms?

ISTE Standards for Educators

The International Society for Technology in Education (ISTE) creates and publishes the standards in five categories: ISTE Standards for Students, ISTE Standards for Educators, ISTE Standards for Administrators, ISTE Standards for Coaches, and ISTE Standards for Computer Science Educators (Ayad & Ajrami, 2017). This article focuses on the ISTE Standards for Educators and it is essential to highlight that these standards are updated to reflect the technological changes and societal needs (Gomez, 2020; Vucaj, 2020). According to Smith (2017)’s article published on the ISTE official site,

The Standards for Educators were last updated in 2008, when the focus was on supporting learning with technology. For this update, ISTE received input and feedback from 2,200 educators and administrators from around the globe. These standards reflect an evolution in education focusing on the promise technology has for empowering learning and the teaching profession. (para. 2).

The ISTE Standards for Educators have seven pillars, Learner, Leader, Collaborator, Facilitator, Designer, Analyst, and Citizen. The brief summary of the pillars is provided below.

Table 1
Explanation of 2017 ISTE standards for educators

Pillars	Explanation
Learner	This pillar states that educators should “continually improve their practice by learning from and with others and exploring proven and promising practices that leverage technology to improve student learning” (ISTE, 2017).
Leader	This pillar emphasizes that educators should “seek out opportunities for leadership to support student empowerment and success and to improve teaching and learning” (ISTE, 2017).
Collaborator	This pillar highlights that the educators should “dedicate time to collaborate with both colleagues and students to improve practice, discover and share resources and ideas, and solve problems” (ISTE, 2017).
Facilitator	This pillar emphasizes that “educators facilitate learning with technology to support student achievement of the ISTE Standards for Students” (ISTE, 2017).
Analyst	This pillar points out that educators should “understand and use data to drive their instruction and support students in achieving their learning goals” (ISTE, 2017).
Citizen	This pillar emphasizes that educators should “inspire students to positively contribute to and responsibly participate in the digital world” (ISTE, 2017).
Designer	This pillar highlights that the educators should “design authentic, learner-driven activities and environments that recognize and accommodate learner variability” (ISTE, 2017).

The ISTE Standards for Educators provide clear guidance that helps k-12 teachers to integrate technology in the classrooms. Through a systematic review, this article highlights the experience of k-12 teachers who used the ISTE Standards for Educators in their classrooms.

METHOD

Selection of the primary research resources

The authors used the available literature review to conduct a systematic review on the primary research resources, namely peer-reviewed articles and dissertations. The authors focused on the primary research resources that had used ISTE standards to learn from the experiences of in-service teachers in integrating technology in the classrooms. The authors were mainly interested on the primary research resources published after the release of the 2017 ISTE Standards for Educators. However, the selection included the primary research with 2008 ISTE Standards for Educators. All primary research resources conducted on k-12 students, pre-service teachers, k-12 coaches, and k-12 administrators, including principals were excluded. The authors relied on all databases linked to the digital library of a public research university in the Southwestern United States. The option of selecting all databases allowed the search to go beyond three main electronic databases that are used in educational research, such as Academic Search Complete, Education Research Complete, and Education Resources Information Center (ERIC).

The initial search with a keyword, ‘ISTE Standards’, generated 516 resources. The authors selected only the academic journals and dissertations and the search produced 221 academic journal articles and 70 dissertations. The authors limited the search on the academic journal articles and dissertation published between 2018 and 2021 and the search yielded 89 resources, including 64 academic journals and 25 dissertations. Then, the authors used another keyword “classroom” and the search produced 32 resources, namely 18 academic journal articles and 14 dissertations. The authors downloaded the resources available in the digital library and requested the resources that were not available through Interlibrary Loan Internet Accessible Database (ILLiad). After getting all 32 resources, the authors read the peer-reviewed articles and dissertations to check whether they fulfilled the inclusion criteria: a) primary research, b) usage of 2017 or 2008 ISTE Standards for Educators as a framework or

alignment of an instrument with 2017 or 2008 ISTE Standards for Educators, c) participants as in-service teachers. Finally, the authors selected three peer-reviewed articles (Michaeli, Kroparo, & HersHKovitz, 2020; Gomez, Trespalacios, Hsu, & Yang, 2021; Aslam, Khan, & Ahmed, 2020) to include in the analysis.

Description of the primary research resources

One study of a primary research was conducted in the United States (Gomez et al., 2021). Another study of a primary research was done in Israel (Michaeli et al., 2020), and the last research study was conducted in Pakistan (Aslam et al., 2020). In terms of the research methodology, two peer-reviewed articles (Aslam et al., 2020; Gomez et al., 2021) were based on quantitative research methods, and one peer-reviewed article (Michaeli et al., 2020) combined qualitative and quantitative research methods, mixed methods.

FINDINGS

Michaeli et al. (2020) used the ISTE Standards for Educators as a framework and 52 public elementary school teachers participated in quantitative study by responding to a survey. Only 9 teachers participated in the qualitative study which used semi-structured interview technique for a better understanding of the quantitative part. Michaeli et al. (2020) used a Research Questionnaire based on ISTE Standards for Educators with 7 pillars, Learner, Leader, Collaborator, Facilitator, Designer, Analyst, and Citizen. Michaeli et al. (2020) mapped teachers' statements to three dimensions of the ISTE Standards for Educators, Designer, Analyst, and Facilitator, and they were not able to find statements to map to other four dimensions (Collaborator, Citizen, Learner, and Leader). Therefore, Michaeli et al. (2020) found significance on three pillars, Designer, Analyst, and Facilitator.

The usage of mixed methods in Michaeli et al. (2020) contributed to a better understanding of the study. The qualitative part supported the quantitative analysis to provide insights on why k-12 teachers aligned the pillars of ISTE Standards for Educators with the integration of technology in the classrooms. First, a pillar of "Designer" allowed teachers to use differentiated instruction, such as dividing students into groups based on knowledge level, providing individual lessons and extra time, and assisting the students with special needs. Second, the teachers used a Dashboard software and were able to see the strength and weakness of the students. The pillar of "Analyst" provided an opportunity for teachers to give feedback to specific students. The data also helped the teachers to communicate with the parents on how they could improve the student learning. Finally, the pillar of "Facilitator" motivated teachers to suggest different strategies that could facilitate and support meaningful learning.

In Gomez et al. (2021)'s research study, the first author developed the Technology Integration Confidence Scale (TICS) version 3 on a scale from 0 to 5, where 0 means not confident at all and 5 means completely confident. The first author aligned the instrument with the 2017 ISTE Standards for Educators. This was a quantitative study with a population around 2,500 k-12 teachers and only 327 teachers participated in the study. The majority of participants were elementary and middle school teachers. The results of the first research question showed that teachers had confidence on using technology "with 3.2 ($SD = .78$) for Technology Usage, 3.2 ($SD = .78$) for Technology-infused Learning, and 3.2 ($SD = .73$) for overall Technology Usage" (Gomez et al., 2021, p. 4). The second research question showed,

teachers' level of confidence to integrate technology in the teaching process using the ISTE (2017) Standards for Educators was 3.0 ($SD = .89$) for Technology Application, 3.5 ($SD = .68$) for Technology Literacy and Digital Citizenship, 3.1 ($SD = .88$) for Technology-supported Assessment, and 3.2 ($SD = .73$) for overall Technology Application. (p. 5).

Aslam et al. (2020) conducted a quantitative study with the overall sample of 120 private secondary school teachers. The authors created a survey to examine the teachers' professional knowledge based on two pillars of 2008 ISTE Standards for Educators. They found a strong correlation between Information Communication Technology (ICT) and teachers' professional knowledge (enhancing creativity in students and designing digital-age assessment). They also highly recommended teachers to integrate ICT in the classrooms using ISTE standards.

The authors of the three primary research in this systematic review (Aslam et al., 2020; Gomez et al., 2021; Michaeli et al., 2020) designed their studies in different ways. Michaeli et al. (2020) used a questionnaire based on 2017 ISTE Standards for Educators and data analysis provided the pillars that k-12 teachers were using in integrating technology in the classrooms. Gomez et al. (2021) created their instrument and aligned it with the 2017 ISTE Standards for Educators, which might complicate the interpretation of results in line with ISTE standards. Aslam et al. (2020) also created an instrument targeting two pillars of 2008 ISTE Standards. It is essential to highlight that 2017 ISTE Standards for Educators improved 2008 standards, which makes easier to see where the two pillars of 2008 standards fit in 2017 ISTE Standards for Educators. For Aslam et al. (2020)'s research, there was a strong correlation between ICT and two pillars of ISTE standards, Learner and Citizen.

DISCUSSION

The three primary research highlighted that k-12 teachers focused on the following pillars, Designer (Michaeli et al., 2020; Gomez et al., 2021), Analyst (Michaeli et al., 2020), Facilitator (Michaeli et al., 2020), Citizen (Gomez et al., 2021; Aslam et al., 2020), and Learner (Aslam et al., 2020). In responding to the research question of identifying the pillars of ISTE Standards for Educators that k-12 teachers used in integrating technology in the classroom, this article revealed five pillars that teachers felt comfortable to adapt in their classrooms, such as Designer, Analyst, Facilitator, Citizen, and Learner. These five pillars were explained in the ISTE standards section of this article.

As integrating technology into the classrooms is becoming a necessity, it is important for k-12 teachers to share what works in the classroom settings for integrating technology in a classroom. Knowing what other k-12 teachers experience by using ISTE Standards for Educators creates an opportunity for the teachers who are hesitant to try technology in the classrooms. Therefore, this study contributes to the process of identifying the pillars that in-service teachers can start with and progress towards the full implementation of all seven pillars, Learner, Leader, Collaborator, Facilitator, Designer, Analyst, and Citizen.

It is vital to note that all seven pillars of 2017 ISTE Standards for Educators provide the best practice for k-12 teachers to adapt technology in the classrooms in the ways that benefit the students (Konak, 2018, McCoy, 2021; Shemshack, 2021). It is in this regard that the ultimate goal for k-12 teachers should be to integrate all seven pillars in the classrooms.

RECOMMENDATIONS

First, some of the peer-reviewed articles and dissertations excluded from this article used the ISTE Standards for Educators as a methodology or a foundation of an instrument; for those researchers had not adequately established the connection of their results to the pillars of the ISTE Standards for

Educators. Thus, the authors of this article recommend to the researchers interested in using the ISTE Standards for Educators as methodology or a foundation of an instrument to interpret their findings based on the pillars of ISTE Standards for Educators.

Second, ISTE standards provide the best practice for integration technology in teaching. There are five categories of ISTE standards, namely ISTE Standards for Students, ISTE Standards for Educators, ISTE Standards for Coaches, ISTE Standards for Administrators, and ISTE Standards for Computer Science Educators. This study focused on the ISTE standards for Educators. Therefore, the authors of this article recommend conducting systematic reviews for other ISTE standards. In addition, the authors of this article recommend using ISTE standards as methods in primary and secondary research, not only focusing on k-12 education but also including postsecondary education.

Finally, teacher education programs are incorporating the ISTE standards in their courses, which means that the pre-service teachers are having hands-on experiences on ISTE standards before starting their teaching career. The authors of this article recommend a systematic review to learn from the experience of pre-service teachers, using ISTE Standards for Educators and ISTE Standards for Students. The authors also recommend research on how the in-service teachers who used ISTE Standards as pre-service teachers apply them in their classrooms.

LIMITATIONS

This study used the primary research resources available in the digital library of a public research university in the Southwestern United States. There might be other academic journal articles or dissertations that fit the inclusion criteria that were not accessible through the digital library of a public research university in the Southwestern United States. Finally, the authors of this article might have missed potential resources based on ways the authors of the primary research resources had defined the keywords.

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