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Fostering Tech Integration: Teachers' Attitudes Mediating Lifelong Learning and Technology Integration Self-Efficacy

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What matters in education now is teaching and learning in a transformational era. It is primarily about what we demand from education and how we acquire information. To manage the dynamism of learning and teaching, it is crucial to research the teachers' integration of technology in the context of lifelong education. This study investigates how teachers' perspectives of lifelong learning and technology attitudes influence technology integration self-efficacy. A structural equation model was constructed to represent the causal relationships between variables. In the 2021-2022 academic year, 386 teachers from various high schools in Eskişehir, Türkiye, were selected using the stratified sampling method. Descriptive analysis and simple linear regression analysis were used to analyze the data, and exploratory and confirmatory factor analysis determined the structural validity of the scales. The validity of the structural equation model was tested by means of path analysis and the model was found to be acceptable. Results show that teacher attitudes mediate between lifelong learning and technology integration self-efficacy, thereby influencing successful technology integration in the classroom. Examining the relationship between teachers' perceptions of lifelong learning and their level of competence in adapting to technological advances is expected to contribute to relevant studies in this area.

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Introduction

All learning, according to Dewey (1938, p. 7), stems from experience, which is not limited to academic settings alone, but encompasses all aspects of life. Dewey (1938, p. 63) argued for education that focused not on the old/new dichotomy, but on the essential qualities that define a worthwhile learning experience and create conditions for continuous learning. He proposed a pragmatic approach that encouraged learners to integrate internal tendencies with external conditions and urged teachers to use the surrounding physical and social context effectively to extract valuable contributions that enrich meaningful learning experiences (Dewey, 1938, p. 22). Although Dewey's pedagogy of inquiry and innovation is an early 20th century product, its spirit still guides teaching and learning in the industry 4.0 era. As the conventional unidirectional, teacher-centered approach to teaching has gradually given way to more innovative, reciprocal methods that use interactive digital multimedia and integrated technology (Brown, 2012). Unlike the era of Dewey, students today demand technology-enhanced learning that seamlessly integrates their personal encounters and educational experience (Davis, 2012). To meet this demand in a rapidly changing technological landscape, teachers need to continuously update their knowledge and skills to work in an educational environment that is heavily reliant on digital tools and resources (European Union, 2002; 2019).

The ‘rapid change’ in today’s educational setting may require discerning the period before and after COVID-19 crisis. As a result of the COVID-19 crisis in 2020, teachers found themselves in an educational environment where technology was becoming critical, regardless of their level of preparation or confidence in technology-based teaching (Svrcek et al., 2022). This change took place first through distance learning and later through a mixture of distance and traditional classroom teaching in a hybrid model (Gomez et al. 2022). The increasing use of technological tools in the teaching-learning process in this context raised a question (Zhang et al., 2023): "How competent are the teachers in the integration of the technological tools into the educational environment?" To answer that question researchers focused various variables, like pedagogical approaches to develop digital literacy (Casey & Bruce, 2011; Røkenes & Krumsvik, 2014), teacher beliefs (Ertmer et al., 2012) and attitudes (Nijku et al., 2019), teacher self-efficacy (Hershkovitz et al., 2023), teacher demographics (Peng et al., 2023), computer and resource availability and access (Lembani et al., 2020), and school support structures (Darling-Hammond & Hyler, 2020; Greenhow et al., 2021). With reference to the Deweyan philosophy of education, understood as growth extended throughout one's life, we want to further this question as ‘How can the concept of a learning society or lifelong learning contribute to the overall improvement of teachers' self-efficacy with regard to technology integration?’

Teachers should be actively engaged in lifelong learning and their professional development should encompass ICT knowledge and expertise within the framework of lifelong learning (Cornu & Wibe, 2005). In addition, self-efficacy for technology integration is a reliable indicator or significant predictor of a teacher's ability to effectively engage students through innovative 21st century teaching (Kent & Giles, 2017). Simultaneously, teachers' attitudes significantly impact the adoption and integration of technology in education (Canals & Al-Rawashdeh, 2019). Therefore, fostering teachers' lifelong learning, attitudes, and self-efficacy is crucial for strengthening technology integration in education.

Lifelong Learning

The historical process of human life involves many changes. It is through these changes that people can acquire new knowledge and skills. Learning and change are interrelated; through learning and change, people can overcome various challenges in life. Those who want to keep up with changing social and professional lives must present themselves as constantly learning (Hager, 2011; London, 2011). It introduces the idea of lifelong learning.

John Dewey, a significant figure in the field of education, offered philosophical insights into lifelong learning (Cross-Durant, 1984). Dewey's view, inspired by pragmatism, underscored the idea that education is a lifelong process (Dewey, 1971), promoting the concept of 'learning by doing' (James, 2017) and the active engagement of individuals in practical application throughout their lives (Dewey, 1997), particularly in their professional pursuits (Snook, 2012). Lifelong learning, particularly for educational institutions, enables individuals to develop their skills, adapt to new technologies and social trends, and promote sustainable development (Vieira, 2020).

Lifelong learning encompasses all learning activities an individual performs throughout their life regarding knowledge, skills, and competencies. In other words, as part of lifelong learning, individuals could develop growth skills, knowledge, and skills in their field of employment (Candy et al., 1994; The Organisation for Economic Cooperation and Development [OECD], 2021). There are eight fundamental competencies for lifelong learning, including 'multilingualism, mathematics, science, technology, and engineering,' 'literacy,' 'digital literacy,' 'personal, social, and learning-to-learn skills,' 'citizenship,' 'entrepreneurship,' and 'cultural awareness and expression' (European Union, 2019). It implies that lifelong learners should possess practical communication skills in their native language, grasp basic mathematical and scientific concepts, be adept at using digital tools, exhibit a sense of social and civic responsibility, and demonstrate an understanding of cultural issues. With these expectations (Sarıgöz, 2020), relevant authorities are designing lifelong learning programs. Lifelong learning constitutes a vital component of non-formal education, encompassing a significant portion of adult education (Knowles et al., 2014).

Given that educators consistently strive to enhance their instructional techniques and update their knowledge base with contemporary teaching methodologies and technologies (Asmin & Chapman, 2012), they inherently embody the role of lifelong learners. For teachers, this perpetual learning journey necessitates acquiring indispensable skills, including effective communication, subject matter expertise, and adeptness in utilising digital tools, all of which follow the principles of adult learning theory (Coolahan, 2002). To effectively navigate the evolving dynamics of the teaching and learning process, it is imperative for teachers to proactively participate in their learning journeys as an integral facet of their professional growth (Hürsen, 2014). It involves continuously refining and adapting their knowledge and competencies to the demands and circumstances, that commitment to self-improvement leads to an increased level of efficiency within the teaching and learning environment (Day, 1999).

Attitudes Towards Technology

Technology is a concept as ancient as human history, and it is integrated into various activities as a process alongside the development of humanity, significantly contributing to the advancement of other fields (Aydın & Karaa, 2013). In the contemporary world, technology has been seamlessly woven into the fabric of human existence, increasing productivity, efficiency, and convenience in all aspects of life, especially in meeting basic needs with digital

technologies such as computers, tablets, smartphones, television, printers and robotics (Aksoy, 2005; Al-Zaidiyeen et al., 2010; Şad & Arıbaş, 2010). In education, technology is seen as a comprehensive system that facilitates and enriches the design of learning settings, helps solve problems, improves the overall quality and efficiency of teaching, and sustains its development and impact through continuous innovation (İşman, 2002). These innovations are redefining how we live and ushering in a technologically driven era of connectivity. Here, the concept of 'attitude' emerges as a central factor that shapes human interactions with technology (Berkant, 2013). While the literature offers different definitions of attitude (Kağıtçıbaşı, 2010), it generally refers to the mental, affective, and behavioural responses that individuals form towards objects, people, events, or ideas that result from their personal experiences, whether these experiences are positive or negative (Ajzen, 2005; Satıcı et al., 2009; Üredi & Üredi, 2005). Attitudes significantly influence various aspects of human behaviour, permeating areas such as tool adoption, online behaviour, privacy practices and digital media engagement. Reflecting this influence, whether positive or negative, on emotions, thoughts, and behaviours related to technology and technological tools is considered as an individual's attitude towards technology (Çelik & Kahyaoğlu, 2007; Satıcı et al., 2009; Yilmaz, 2016).

Integrating technology into educational environments is crucial for fostering positive attitudes towards technology (Çepni, 2005). In this context, the critical role of teachers cannot be underestimated, as they are the architects of learning spaces where technology has its place, and they serve as guides in the navigation of technological integration. Teachers' experiences with technology carry significant weight and influence how students perceive, think, and feel about technology (Çelik & Kahyaoğlu, 2007; Satıcı et al., 2009; Yilmaz, 2016). Therefore, the effective use of technology by teachers in their daily lives and their skillful integration of technology in teaching practices play a crucial role in shaping the technological attitudes of the next generation (Afshari et al., 2009; Aksoy, 2005; Canals & Al-Rawashdeh, 2019; Cullen & Green, 2011).

Literature includes numerous studies examining the factors that may influence teachers' attitudes towards technology (Kaya, 2007). Several studies, including Ardıç (2021) and Al-Zaidiyeen et al. (2010), have established a positive correlation between teachers' use of technology and their attitudes towards it. Khine's (2001) research also found a positive relationship between teachers' attitudes towards computers and their use of technology. Berkant (2013), İpek and Acuner (2011), as well as Lin-Milbrath and Kinzie (2000), revealed positive associations between pre-service teachers' attitudes towards computers or technology and their self-efficacy beliefs in these areas. In addition, Çelik and Bindak (2005) found that teachers who owned computers had more favourable attitudes towards them, with a notable positive correlation between computer self-efficacy, frequency of computer use and attitudes towards computers. These studies highlight various factors that influence teachers' attitudes towards technology.

Studies have shown that teachers' positive attitudes towards technology are key to the successful use of technology in education (Albirini, 2006; Hayytov, 2013; Kadel, 2005; Teo et al., 2018; Wright, 2010). At the same time, teachers' attitudes towards technology directly influence its adoption, use and integration in educational settings (Ajzen, 2005; Cullen & Green, 2011; Canals & Al-Rawashdeh, 2019; Kadel, 2005). Consequently, understanding the complex interplay between teachers' attitudes and technology use in educational settings is crucial to understanding how teachers navigate the digital landscape, make informed decisions, and contribute to the trajectory of educational development and societal change (Berkant, 2013; Çepni, 2005; Kadel, 2005).

Technology Integration Self-Efficacy

Technology integration is essential to practical education, emphasising that learning may occur at any time and from any location (Fu, 2013; Nelson et al., 2019). During the COVID-19 pandemic, the need for technology integration with distance learning experiences for schools and teachers became further evident. The relevance of technology integration, particularly high-quality approaches (applications that encourage self-directed and student-centred learning) as opposed to low-quality practices (such as direct instruction), was highlighted during this process (Chiu, 2022; Gomez et al., 2022). While educational technologies are tools that can only be implemented in the classroom, the integration of technology into learning settings ensures that these technologies are transformed into a practical application process to effectively achieve the targeted learning objectives (Mertala, 2019; Nelson & Havk, 2020; Watson & Rockinson-Szapkiw, 2021).

The ability of teachers to make technological and pedagogical judgments about how, why, and when to employ technological tools to improve teaching and student learning influences the integration of technology into learning environments (Backfisch et al., 2021; Ifinedo et al., 2020; Mishra & Koehler, 2006; Nelson et al., 2019; Wang & Zhao, 2021). In that situation, teachers in schools should be equipped with the skills and knowledge required to incorporate technology into classroom settings (Antonietti et al., 2022; Gomez et al., 2022; Keser et al., 2015; Semiz & İnce, 2012). Knowledge and skills for technology integration are necessary but not sufficient; teachers' and pre-service teachers' beliefs and attitudes about technology integration influence their instructional decisions and classroom practices (Ertmer & Ottenbreit-Leftwich, 2010; Farjon et al., 2019; Taimalu & Luik, 2019). In integrating technology into education, teachers' self-efficacy emerges as a pivotal factor (Backfish et al., 2021; Mei et al., 2018). Exploring Bandura's self-efficacy theory, a core element of the Social Cognitive Theory (SCT), provides deeper insights into the dynamics of self-efficacy concerning technology integration.

Self-efficacy is an individual's confidence in their ability to accomplish specific tasks or attain desired outcomes (Bandura, 1997). Self-efficacy beliefs are not judgments about the skills one possesses but rather evaluations of what can be achieved with those skills (Maddux, 2009). Self-efficacious learners, as indicated by Bandura (1993), are often characterised by their inclination toward setting clear goals, actively managing their efforts, displaying persistence in their learning and task completion, and achieving accomplishments and developing competencies. The theory is domain-specific; for example, an individual might have high self-efficacy for teaching maths but not for technology integration (Bandura, 1997; 2012). According to Kent and Giles (2017), technology integration self-efficacy, which reflects teachers' and pre-service teachers' self-confidence in integrating technology in learning environments (Nathan, 2009), is a reliable indicator of their capability and willingness to engage students through innovative instruction. Although teachers' self-efficacy in integrating technology does not ensure automatic technology adoption, it is considered an essential requirement for successful technology integration (Wang et al., 2004), and it plays a critical role in enabling teachers to effectively employ technology in their classrooms and improve student learning outcomes. Therefore, teachers should have a strong sense of self-efficacy specific to the task in order to be able to successfully use digital platforms such as Web 2.0 technologies and software applications in their classroom practices concerning the achievements in the curriculum and to be able to meet the obstacles in this process with flexibility (Artino, 2012; Holden & Rada, 2011). Examining the dynamics of self-efficacy is essential as it influences teachers' skills to integrate technology effectively (Backfish et al., 2021; Bandura, 2012; Mei et al., 2018).

Bandura (2012) identified four primary sources influencing self-efficacy beliefs: enactive mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states. These sources encompass various ways through which individuals' self-efficacy is shaped. Enactive mastery experiences involve hands-on learning that leads to successful outcomes, while vicarious experiences entail learning from observing others' accomplishments. Verbal persuasion, which includes feedback and encouragement, is crucial. Additionally, an individual's physiological and emotional state can impact their self-efficacy. Collectively, these factors contribute to an individual's self-confidence in different educational contexts (Williams et al., 2023). Engaging in hands-on experiences positively impacts teachers' technology integration self-efficacy, fostering feelings of accomplishment. Firsthand learning is essential to enhancing technology integration self-efficacy and active mastery experiences (Banas & York, 2014; Baroudi & Shaya, 2022; Hershkovitz et al., 2023; Kukul, 2023). In addition, exposure to successful technology integration models (vicarious experience) and feedback from teachers (verbal persuasion) contribute to improved technology integration self-efficacy (Ünal et al., 2017; Wang & Zhao, 2021). Lastly, physiological and emotional states influence attitudes and beliefs, emphasising their role in shaping technology integration self-efficacy (Yıldız Durak, 2021). Lifelong learning and teachers' evolving perspectives on technology are pivotal in boosting their self-efficacy in integrating technology. Moreover, analyzing how these elements interact could provide valuable insights into the essence and framework of technology integration self-efficacy.

The Relationship between Teachers' Technology Attitudes, Lifelong Learning, and Technology Integration Self-Efficacy

Previous research has found that teachers' technological skills can be improved through training and development programs, which in turn increases their confidence (Al-awidi & Alghazo, 2012; Chiu, 2022; Lee & Lee, 2014; Michos et al., 2022; Misra, 2018; Nelson & Hawk, 2020; Ozcakir & Aydin, 2019; Wang et al., 2004). Professional development programs can help prepare and motivate teachers to integrate technology in the classroom (Chiu, 2022) by increasing their self-efficacy, perceived ease of use and effectiveness, and new teaching strategies. All activities aimed at developing the knowledge, skills, and competencies teachers acquire at any time and in different personal, social, or professional settings are lifelong learning (European Union, 2002; Field, 2010). Teachers who embrace lifelong learning are more likely to participate in teacher professional development programs tailored to technology integration (Misra, 2018). These programs enable educators to enrich their techno-pedagogical knowledge and skills through direct and indirect experience (Bandura, 1997). Increased knowledge flexibility equips teachers to effectively integrate technology into their classrooms, strengthening their self-efficacy (Ertmer & Ottenbreit-Leftwich, 2010; Mishra & Koehler, 2006). Supporting this, Şen and Yıldız-Durak (2022) found a positive correlation between teachers' self-efficacy for technology integration, professional competence, and their propensity for lifelong learning. So, teachers' perspectives on lifelong learning profoundly influence their perceptions of self-efficacy in integrating technology.

Besides teachers' lifelong learning skills, their attitudes towards technology are key factors impacting their self-efficacy in integrating technology (Hew & Brush, 2007). Teachers' opinions on their efficiency in integrating technology and their general attitudes towards technology affect how they use it (Anderson et al., 2011; Gomez et al., 2022). Teachers' positive attitudes towards information and communication technologies indicate high levels of self-efficacy in technology integration and vice versa (Scherer et al., 2018). Yıldız Durak (2019) found a significant relationship between teachers' attitudes toward technology

integration and their self-efficacy beliefs. Lee and Lee (2014) mentioned that pre-service teachers with favorable attitudes towards computer technology had stronger beliefs in their ability to integrate technology into their teaching. A study by Abbit and Klet (2007) revealed that teachers' self-efficacy for technology integration can vary by as much as 41% depending on their comfort level with ICT. In addition, Backfisch et al. (2021) noted that self-efficacy views of technology integration directly and indirectly affect how technology is used by influencing how people perceive its benefits.

In today's ever-evolving educational landscape, understanding the complex dynamics between teachers' attitudes towards technology, their beliefs in lifelong learning, and their self-efficacy in integrating technology is essential to fostering an environment that embraces digital innovation and pedagogical excellence.

The Purpose of the Study

This research examines the mediating role of teachers' technology attitudes in the relationship between their perceptions of lifelong learning and technology integration self-efficacy.

The research's hypotheses are as follows: Teachers' :

Hypothesis 1 Lifelong learning (L.L.) positively affects their technology attitudes.(T.A.).

Hypothesis 2 Technology attitudes (T.A.) positively impact their technology integration self-efficacy (PSETI).

Hypothesis 3 Lifelong learning (L.L.) positively affects their technology integration self-efficacy (PSETI).

Hypothesis 4 Lifelong learning perceptions (LLP) significantly influence technology integration self-efficacy (PSETI), with technology attitudes (T.A.) acting as a mediating factor.

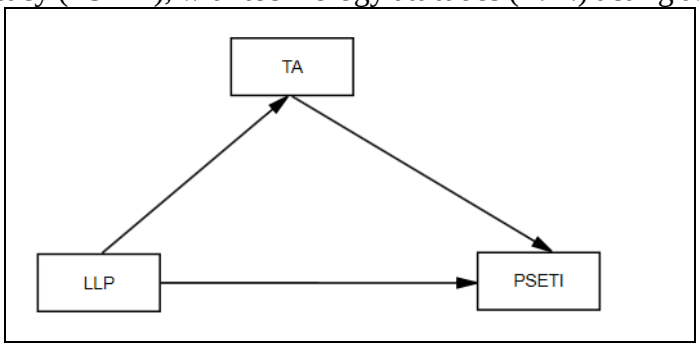

Figure 1. Measurement model

Method

This study tested the theoretical model established as to how teachers' perceptions of lifelong learning and attitudes towards technology influence their technology integration self-efficacy. A causal model was constructed to examine the cause-and-effect relationships that arose or existed between some predictor variables (Bryman, 2012). In this research model, perceptions of lifelong learning and attitudes towards technology were considered as predictors

of technology integration self-efficacy, and the correlation between each variable was examined as a prerequisite for the structural equation model.

Sampling

The study was conducted in Eskişehir, Turkey, during the spring semester of the 2021-2022 school year. The participants in the study were a stratified random sample (Neuman, 2011) of 386 teachers from local schools in the Odunpazarı district of Eskişehir. The teachers were chosen randomly from stratified schools, including science high schools, Anatolian high schools, vocational and technical high schools, and primary and secondary schools. In the Turkish education system, science high schools are dedicated to imparting scientific knowledge, Anatolian high schools serve as institutions for a well-rounded general education, and vocational and technical high schools prioritise education with a strong vocational emphasis. Table 1 presents the demographics of the research sample. According to the data on genders, 68.7% of the study participants' teachers were female, and 31.3% were male. Also, 39.9% of the teachers had more than 21 years of experience in teaching, 8.3% of them had zero to five years. While 48.7% worked in primary education, 7.0% worked at fine arts and physical education branches (See Table 1).

Table 1. Demographics of the sampled participants

	Category	N	%
Gender	Woman	265	68.7
	Man	121	31.3
Length of Service	0-5 Years	32	8.3
	6-10 Years	34	8.8
	11-15 Years	70	18.1
	16-20 Years	96	24.9
	21 Years +	154	39.9
Field of Study	Primary Education Branches	188	48.7
	Math-Science Branches	113	29.3
	Language, History, Geography and Philosophy Branches	58	15.0
	Fine arts and Physical Education Branches	27	7.0

Research Instruments

The research data were collected using the *Lifelong Learning Scale* developed by Boztepe and Demirtaş (2016), *the Pre-Service Teachers' Attitudes toward Technology Scale* by Aydın and Karaa (2013) and the *Technology Integration Self-Efficacy Scale* by Ünal and Teker (2018).

Lifelong Learning Scale

The Lifelong Learning Scale was created by Wielkiewicz and Meuwissen (2014), and Boztepe and Demirtaş (2016) adapted it according to Turkish culture. It consists of 13 items. Each item in the scale is scored on a 5-point Likert scale between "Never" and "Everyday/Always". The scale items were translated into Turkish, and language validation was achieved through a pilot study with 399 ELT students at Sakarya University. The students were first given the scale's English version, after which they were given the scale's Turkish version.

The relationship between the two applications was found at .81. The scale's reliability was determined using Cronbach's alpha of 78. The confirmatory factor analysis (CFA) construct validity was investigated using a maximum likelihood method. The findings were as; $\chi 2/df$ (227.09/64) = 3.54, p = .000, SRMR: .061, NFI = .93; CFI = .94; IFI = .94; RMSEA = 0.091 and the model indices constituted a good fit. For this study, Cronbach Alpha reliability for the entire scale was .85.

Pre-Service Teachers' Attitudes toward Technology Scale

The Pre-Service Teachers Attitudes Toward Technology Scale was developed by Aydın and Karaa (2013). The scale includes 17 items under one dimension because of item analysis using Exploratory Factor Analysis (EFA). Each item in the scale is rated on a 5-point Likert scale ranging from 'I never agree' (1) to 'I always agree' (5). The CFA fit indices for the three-factor structure were: $\chi 2/df$ (542.37 / 119) = 4.5, p = .000, GFI: .86, CFI = .94; AGFI = .81; SRMR = 0.6; RMSEA = .097 and they were in an acceptable range. The reliability analysis revealed that Cronbach's alpha value and the reliability of the two-half test were both 0.87. Additionally, the Cronbach alpha value was determined to be 0.91, and the two-half test reliability was 0.92 because of the reliability analyses conducted in this research.

Technology Integration Self-Efficacy Scale

The Technology Integration Self-Efficacy Scale was adapted into Turkish culture by Ünal and Teker (2018), based on the study of Wang et al. (2004). It consists of 21 items in two dimensions. The scale is a 5-point Likert scale and includes expressions in the range of 'strongly agree' and 'strongly disagree'. It was seen that the Cronbach Alpha values of the scale changed between .87 and .91, and the overall reliability of the scale was .93. Goodness of fit indices were found to be within valid limits when testing scale validity using CFA (Çokluk et al., 2014). DFA values were $\chi 2/df$ (509.47/151) = 3.3, p = .000, CFI = .99; NNFI: 0.98; GFI = .93, AGFI: 0.92; SRMR: 0.034; RMSEA = .056 and it was determined that the model was appropriate for the gathered data. As part of the reliability analyses conducted for this study, Cronbach's alpha values were also determined to be 0.929 for the first dimension, 0.967 for the second dimension, and 0.974 for the overall scale. The evaluation of the correlation between the dimensions was 0.865.

Data Collection

Four hundred copies of the data collection instruments were printed and implemented in selected schools during the spring semester of the 2021 to 2022 academic year. The necessary information was provided to the teachers before the application, and they were informed that the process would be voluntary and take about 20 minutes to complete. Every school had a two-week application period, and after that period, statistical planning for the analysis of the collected data started. The researchers who created and modified the scales provided the necessary approvals before the study's implementation.

Data Analysis

Prior to model testing, the data was subjected to missing value analysis, extreme value analysis, and normality assessment (Tabachnick & Fidell, 2001) to ensure its suitability for the proposed model (Kline, 2005). Kurtosis and skewness values between -1 and +1, according to George and Mallery (2010), showed that the data have a normal distribution. As a result, it was acknowledged that the research data complied with the normality assumptions (See Table 2).

Table 2. Descriptive statistics and coefficients of skewness-kurtosis

Variables	N	Minimum	Maximum		S.D.	Kurtosis	Skewness
LLS	386	2.54	5.00	4.18	0.51	-.374	-.354
TA	386	1.29	5.00	3.66	0.63	.334	-.373
PSETI	386	1.47	5.00	3.78	0.78	-.476	-.333

The data were analysed using the Process Macro in SPSS. The study's measurement model can be seen in Figure 1.

Findings

In the first stage of the analysis, lifelong learning perceptions on technology attitudes, technology attitudes on technology integration self-efficacy perceptions, and lifelong learning perceptions on technology integration self-efficacy perceptions were assessed as hypotheses in the measurement model developed for the research. Regression analysis findings (See Table 3) showed that teachers' attitudes toward technology were positively predicted by their perceptions of lifelong learning (B= 0.464, p<.01). Teachers' attitudes towards technology were positively correlated with their perceptions of their self-efficacy concerning technology integration (B= 0.843, p<.01). Teachers' self-efficacy perceptions of technology integration were positively predicted by their perceptions of lifelong learning (B= 0.731, p<.01). As an outcome, the study's initial three hypotheses were accepted. As a direct consequence, the prerequisite in mediator variable studies was met, according to Baron and Kenny (1986).

Table 3. Regression analysis results between the variables

Dependent variable: Technology Attitudes (T.A.)						
Independent variable	F	p	B	S.E.	t	p
LLS	62.058	0.000	0.464	0.059	7.878	0.000
R= .373	R^2= .139					
Dependent variable: Technology Integration Self-Efficacy Perceptions (PSETI)						
Independent variable	F	p	B	S.E.	t	p
TA	327.632	0.000	0.843	0.047	18.101	0.000
R= .679	R^2= 460					
Dependent variable: Technology Integration Self-Efficacy Perceptions (PSETI)						
Independent variable	F	p	B	S.E.	t	p
LLS	110.449	0.000	0.731	0.070	10.509	0.000
R= .473	R^2= 223					

A mediation effect analysis was conducted during the second stage of the study. The mediation model of the study was evaluated using SPSS PROCESS v3.3 (Hayes, 2013). The predictive effect of teachers' perceptions of lifelong learning and technology attitudes on their self-efficacy perceptions towards technology integration was examined (See Table 4). Teachers' perceptions of lifelong learning and technology attitudes, when combined, significantly predicted their perceptions of technology self-efficacy (F= 204.474, p<.01). It is worth noting

that after including technology attitudes in the regression model, the non-standardised effect value of lifelong learning perceptions on technology integration self-efficacy perceptions decreased from 0.464 to 0.394. This may be evidence that attitudes toward technology may mediate perceptions of lifelong learning and self-efficacy about technology integration. Therefore, examining the combined, direct, and indirect effects is necessary to produce definitive results.

Table 4. The predictive effect of lifelong learning perceptions and technology attitudes on self-efficacy perceptions towards technology integration

Independent variable	F	p	B	S.E.	t	p	LLCI	ULCI
LLS	204.474	0.000	0.394	0.0592	6.658	0.000	0.278	0.5109
TA			0.748	0.0476	15.233	0.000	0.631	0.8184
R= .718	R^2= .516							

The second phase of the research, to examine the indirect effect of technology attitudes on technology integration self-efficacy through lifelong learning perceptions, mediation analysis was employed using the Bootstrap method with a 95% confidence level (see in Table 5). This method involved repeatedly resampling the data 10,000 times to generate a distribution of indirect effects. The lower and upper bounds of the 95% confidence interval (CI) were determined from this distribution. For the results of this test to have any significance, the lower (LLCI: .023) and upper (ULCI: .43) limits of the confidence interval need to be above or below zero together (Preacher & Hayes, 2008). A mediating effect existed after examining the confidence intervals surrounding the effect values. Also, a VAF value between 0.20 and 0.80 indicated partial mediation, according to Hair et al. (2013). The VAF value in this study was discovered to be 0.46. As a result, there was a partial mediating role of technology attitudes in the relationship between teachers' perceptions of lifelong learning and their perceptions of their self-efficacy about technology integration. As a result, the research's fourth hypothesis was also verified.

Table 5. Regression analysis results regarding the mediating effect

	B	S.E.	LLCI	ULCI
Total Effect	0.731	0.069	0.594	0.867
Direct Effect	0.394	0.059	0.278	0.510
Indirect Effect	0.336	0.051	0.237	0.438
VAF= Indirect effect / Total effect= 0.336 / 0.731= 0.46				

Discussion

The study's primary aim was to examine the role of teachers' technology attitudes in mediating the relationship between their lifelong learning perceptions and technology integration self-efficacy. Four hypotheses were evaluated in this study.

The first hypothesis of the study proposed that teachers who view lifelong learning positively also hold favourable attitudes towards technology, consistent with previous research findings (Gökbulut, 2021; Karaoğlan-Yılmaz & Binay-Eyuboğlu, 2018; Kılıç & Kılıç, 2022; Örün et al., 2015).

The study's second hypothesis showed that teachers' technology attitudes positively impact

technology integration self-efficacy. Drawing from Bandura's (1997) self-efficacy theory, it becomes apparent that self-efficacy is intertwined with physiological and affective states, correlating with the current research findings. Attitudes can shape emotional states, with a positive attitude fostering positive emotional responses and a negative attitude potentially leading to adverse emotional reactions (Tavşancıl, 2006). Some other studies confirmed significant connections between teachers' technology attitudes and self-efficacy perceptions (Banas & York, 2014; Lee & Lee, 2014; Wang et al., 2004; Yıldız Durak, 2021). According to Sassenberg et al. (2022), positive attitudes towards technology were linked to enhanced perceived usefulness and self-efficacy in utilising specific technologies. Similarly, Yalçın and Önder (2022) identified a modest positive link between science teachers' perceptions of technology integration self-efficacy and their attitudes towards distance learning, highlighting the significance of positive attitudes and self-efficacy in technology integration. By fostering positive attitudes towards technology, teachers can enhance their self-efficacy and improve their ability to integrate technology into their classrooms (Zhang et al., 2023).

The third hypothesis of the study indicated that teachers' views of lifelong learning positively correlate with their perceptions of self-efficacy for technology integration. Teachers must continuously refine their technological skills through ongoing opportunities for professional development (Chiu, 2022). Providing teachers with authentic learning experiences, practical application opportunities, modelling and practice, mentoring, comprehensive support, authentic coaching experiences, social persuasion, and feedback from instructors through professional development programs contributes to the development of their technology integration self-efficacy (Barton & Dexter, 2020; Kabataş & Karaoğlan-Yılmaz, 2018). All these efforts constitute vital elements of teachers' lifelong learning paths. They notably bolster their technology integration self-efficacy (Gomez et al., 2022), acting as the nourishment for enactive mastery, vicarious experiences, and verbal persuasion (Banas & York, 2014; Liao et al., 2021; Ünal et al., 2017; Wang & Zhao, 2021; Williams et al., 2023). Expanding on this, it can be deduced that fostering the pillars of self-efficacy through ongoing professional development within the lifelong learning framework can markedly bolster teachers' self-efficacy in technology integration.

The study's fourth hypothesis revealed that teachers' attitudes towards technology partially mediate the connection between their perceptions of lifelong learning and technology integration self-efficacy. Teachers who embrace lifelong learning are more likely to continually seek new knowledge and skills, including those related to technology (Fleming, 2011; Gür-Erdoğan & Arsal, 2014). This is in line with Dewey's philosophy of education as a continuous process that emphasizes the need for individuals to adapt to changing circumstances, especially in the rapidly evolving technological landscape (Bourn, 2001; Dewey, 1997). Social Cognitive Theory (SCT) further emphasizes that individuals are not merely passive recipients of external influences but active agents in seeking and interpreting information in their environment (Stajkovic & Luthans, 1998). This perspective highlights individuals as proactive shapers of their motivation, behaviour and overall progress within a complex web of interrelated elements (Bandura, 1997; 2012). The Fatih Project in Education, a major milestone in the integration of technology into Turkish education (Çiftçi et al., 2013; Ekici & Yılmaz, 2013), exemplifies this concept. By providing teachers with in-service training in the use of technology (Çakır & Oktay, 2013), the project effectively reduced their concerns and fostered positive attitudes towards technology (Banoğlu et al., 2014). This positive attitude acted as a catalyst for professional development (Banoğlu et al., 2014) and increased teachers' technology self-efficacy (Bayrak & Hırça, 2016; Berkant, 2013; Kutluca & Ekici, 2010). This highlights the importance of fostering a culture of lifelong learning and promoting positive attitudes towards

technology among teachers in order to effectively harness its potential to enhance teaching and learning in the 21st century.

Conclusion

The accelerated evolution of technology has transformed the educational landscape, particularly during the pandemic, where teachers who are skilled in technology integration have demonstrated greater proficiency in navigating remote teaching and learning environments (Şen & Yıldız Durak, 2022). These findings are in line with the theoretical underpinnings of the field and are consistent with previous research by Özçiftçi and Çakır (2015) and Çetin and Güngör (2014). Collectively, these studies demonstrate a strong correlation between teachers' perceived self-efficacy in technology use and their endorsement of lifelong learning, further emphasizing the interconnectedness of these two crucial aspects in shaping teachers' professional development.

Over the past two decades, Turkey's education system has undergone a significant transformation, embracing student-centered education and contemporary teacher training. In-service training programs have instilled a lifelong learning mindset among teachers and emphasized the importance of technology integration through targeted training initiatives. These efforts have fostered positive changes in teachers' attitudes and skills towards technology. Our research sheds light on the mediating role of teachers' attitudes towards technology in shaping the relationship between their perceptions of lifelong learning and their self-efficacy for technology integration. This opens new avenues for future research to explore this relationship further, considering a broader spectrum of variables.

Limitations and Directions for the Future Research

The present relational study has highlighted the role of technology attitudes as a partial mediating factor, suggesting the need to consider additional variables that may influence teachers' perceptions of lifelong learning and effective technology integration. Including additional variables alongside technology attitudes in the measurement model of this research could allow for the exploration of novel measurement models. Using a structural model based on quantitative data could complement this research with future longitudinal studies and comprehensive qualitative assessments that allow for in-depth examination of technology use. In addition, the integration of mixed methods research could provide multiple insights. In addition, extending the application of a comparable operational model to specific educational sectors may facilitate tailored approaches in different teaching areas.

One of the study's limitations is the limited sample structure, which only included teachers from public schools in one Turkish city. Expanding the sample size could lead to more generalisable conclusions while including different geographical and cultural contexts to comprehensively represent the findings. Consequently, conducting this research across multiple cities and nations would provide a nuanced map of the findings, highlighting the influence of different cultural and regional characteristics. In addition, comparative analyses across different countries or cultures could enrich our understanding of these educational strategies' universal applicability and cultural adaptability.

Based on the study's findings, it is evident that teachers' technology attitudes significantly influence their self-efficacy perceptions concerning technology integration. Consequently, policymakers can foster a culture of lifelong learning among educators by facilitating accessible in-service training programs.

References

Abbitt, J. T., & Klett, M. D. (2007). Identifying influences on attitudes and self-efficacy beliefs towards technology integration among pre-service educators. *Electronic Journal for the Integration of Technology in Education, 6*(1), 28-42.

Afshari, M., Bakar, K. A., Luan, W. S., Samah, B. A., & Fooi, F. S. (2009). Technology and school leadership. *Technology, Pedagogy and Education, 18*(2), 235-248. https://doi.org/10.1080/14759390902992527

Agyei, D. D., & Voogt, J. M. (2011). Exploring the potential of the will, skill, tool model in Ghana: Predicting prospective and practising teachers' use of technology. *Computers and Education, 56*(1), 91-100. https://doi.org/10.1016/j.compedu.2010.08.017

Ajzen, I. (2005). *Attitudes, personality, and behaviour*. Open University Press.

Aksoy, H. H. (2005). Medya ve bilgisayar teknolojisinin eğitimde kullanımının etkileri üzerine eleştirel görüşler: Orwell ve Huxley'in gelecek tasarimlari çerçevesinde bir değerlendirme [Critical views on the effects of the use of media and computer technology in education: An evaluation within the framework of Orwell and Huxley's future designs]. *Education Science Society*, 54-67.

Al-Awidi, H. M., & Alghazo, I. M. (2012). The effect of student teaching experience on pre-service elementary teachers' self-efficacy beliefs for technology integration in the UAE. *Educational Technology Research and Development, 60*(5), 923-941. http://dx.doi.org/10.1007/s11423-012-9239-4

Albirini, A. A. (2004). An exploration of the factors associated with the attitudes of high school EFL teachers in Syria toward information and communication technology [Unpublished doctoral dissertation]. The Ohio State University.

Al-Zaidiyeen, N. J., Mei, L. L., & Fook, F. S. (2010). Teachers' attitudes and levels of technology use in classrooms: The case of Jordan schools. *International Education Studies, 3*(2), 211-218. http://dx.doi.org/10.5539/ies.v3n2p211

Anderson, S. E., Groulx, J. G., & Maninger, R. M. (2011). Relationships among pre-service teachers' technology-related abilities, beliefs, and intentions to use technology in their future classrooms. *Journal of Educational Computing Research, 45*(3), 321-338. https://doi.org/10.2190/EC.45.3.d

Antonietti, C., Cattaneo, A., & Amenduni, F. (2022). Can teachers' digital competence influence technology acceptance in vocational education? *Computers in Human Behaviour, 132*, 107266. https://doi.org/10.1016/j.chb.2022.107266

Ardiç, M. A. (2021). Opinions and attitudes of secondary school mathematics teachers towards technology. *Participatory Educational Research*, 8(3), 136-155. https://doi.org10.17275/per.21.58.8.3

Artino, A. R. (2012). Academic self-efficacy: from educational theory to instructional practice. *Perspectives on Medical Education, 1*(2), 76-85. https://doi.org/10.1007/s40037-012-0012-5

Asmin, D. H., & Chapman, J. D. (2012). Towards a philosophy of lifelong learning. In the book *Second International Handbook of lifelong learning* (p. 3-35). Springer.

Aydın, F., & Karaa, F. N. (2013). Pre-service teachers' attitudes toward technology: scale development study. *Journal of Turkish Science Education, 10*(4), 103–118.

Backfisch, I., Scherer, R., Siddiq, F., Lachner, A., & Scheiter, K. (2021). Teachers' technology use for teaching: Comparing two explanatory mechanisms. *Teaching and Teacher Education, 104*, 103390. https://doi.org/10.1016/j.tate.2021.103390

Banas, J. R., & York, C. S. (2014). Authentic learning exercises as a means to influence pre-service teachers' technology integration self-efficacy and intentions to integrate

technology. *Australasian Journal of Educational Technology*, *30*(6), 728-246. https://doi.org/10.14742/ajet.362

Banoğlu, K., Madenoğlu, C., Uysal, Ş., & Dede, A. (2014). An investigation of teachers' perceptions of the implementation of the FATIH Project (Eskisehir Province Case). *Journal of Educational Sciences Research*, *4*(1), 39-58. http://dx.doi.org/10.12973/jesr.2014.4os3a

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*, *28*(2), 117-148. https://doi.org/10.1207/s15326985ep2802_3

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Macmillan.

Bandura, A. (2012). On the functional properties of perceived self-efficacy revisited. *Journal of Management*, *38*(1), 9-44. https://10.1177/0149206311410606

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182.

Baroudi, S., & Shaya, N. (2022). Exploring predictors of teachers' self-efficacy for online teaching in the Arab world amid COVID-19. *Education and Information Technologies*, *27*(6), 8093-8110. https://doi.org/10.1007/s10639-022-10946-4

Barton, E. A., & Dexter, S. (2020). Sources of teachers' self-efficacy for technology integration from formal, informal, and independent professional learning. *Educational Technology Research and Development*, *68*, 89-108.

Bayrak, N. & Hırça, N. (2016). The investigation of techno-pedagogical self-efficacy of teachers participated in the FATIH project in-Service Training. *Gazi University Gazi Faculty of Education Journal*, *36*(1), 95-111.

Berkant, H. G. (2013). Investigation of pre-service teachers' attitudes and perceived self-efficacies toward computer and their attitudes toward computer-supported education in terms of some variables. *The Journal of Instructional Technologies and Teacher Education*, *1*(3), 11-22.

Bourn, D. (2001) Global perspectives in lifelong learning. *Research in Post-Compulsory Education*, *6*(3), 325-338. https://doi.org/10.1080/13596740100200112

Boztepe, Ö., & Demirtaş, Z. (2016). The adaptation of lifelong learning scale into Turkish culture. *Journal of Family Counseling and Education*, *1*(1), 10-17. https://doi.org/10.32568/jfce.238294

Brown, S. A. (2012). Seeing Web 2.0 in context: A study of academic perceptions. *The Internet and Higher Education*, *15*(1), 50-57. https://doi.org/10.1016/j.iheduc.2011.04.003

Bryman, A. (2012). *Social research methods*. Oxford University Press.

Canals, L., & Al-Rawashdeh, A. (2019). Teacher training and teachers' attitudes towards educational technology in the deployment of online English language courses in Jordan. *Computer Assisted Language Learning*, *32*(7), 639-664. https://doi.org/10.1080/09588221.2018.1531033

Candy, P. C., Crebert, G., & O'Leary, J. (1994). *Developing lifelong learners through undergraduate education*. National Board of Employment, Education and Training. Australian Government Publishing Service.

Casey, L., & Bruce, B. C. (2011). The practice profile of inquiry: Connecting digital literacy and pedagogy. *E-learning and Digital Media*, *8*(1), 76-85.

Chin, J. M. C., Ching, G. S., del Castillo, F., Wen, T. H., Huang, Y. C., del Castillo, C. D., ... & Trajera, S. M. (2022). Perspectives on the barriers to and needs of teachers' professional development in the Philippines during COVID-19. *Sustainability*, *14*(1), 470. https://doi.org/10.3390/su14010470

Chiu, T. K. (2022). School learning support for teacher technology integration from a self-determination theory perspective. *Educational Technology Research and Development*, 1-19. https://doi.org/10.1007/s11423-022-10096-x

Coolahan, J. (2002). Teacher education and the teaching career in an era of lifelong learning. *OECD Education Working Papers*, No. 2, OECD Publishing. https://doi.org/10.1787/226408628504.

Cornu, B., & Wibe, J. (2005). The Stellenbosch Declaration. ICT in Education: Make it Work. Stellenbosch, South Africa: International Federation for Information Processing (IFIP).

Cross-Durrant, A. (1984) Lifelong education in the writings of John Dewey, *International Journal of Lifelong Education, 3*(2), 115-125. http://dx.doi.org/10.1080/0260137840030205

Cullen, T. A., & Green, B. A. (2011). Pre-service teachers' beliefs, attitudes, and motivation about technology integration. *Journal of Educational Computing Research, 45*, 29–47. https://doi.org/10.2190/EC.45.1

Çakır, R., & Oktay, S. (2013). Teachers' use of technology as becoming information society. *Journal of Industrial Arts Education Faculty, 30*, 35-54.

Çelik, H. C., & Bindak, R. (2005). Examining the computer attitudes of primary school teachers according to various variables. *Inonu University Journal of the Faculty of Education, 6*(10), 27-38.

Çepni, S. (2005). *Fen ve teknoloji öğretimi* [Science and technology teaching]. Ankara: PegemA Publishing.

Çetin, O., & Güngör, B. (2014). Computer self-efficacy beliefs of primary school teachers and their attitudes towards computer-aided instruction. *Ondokuz Mayıs University Faculty of Education Journal, 33*(1), 55-11.

Çiftçi, S., Taşkaya, S. M., & Alemdar, M. (2013). The opinions of classroom teachers about FATIH project. *Elementary Education Online, 12*(1), 227-240.

Darling-Hammond, L., & Hyler, M. E. (2020). Preparing educators for the time of COVID… and beyond. *European Journal of Teacher Education*, *43*(4), 457-465. https://doi.org/10.1080/02619768.2020.1816961

Davis, H. E. (2012). Technology in the classroom: A deweyan perspective. *Kentucky Journal of Higher Education Policy and Practice*, *1*(2), 1-19.

Day, C. (1999). *Developing teachers: The challenges of lifelong learning*. Routledge Falmer.

Dewey, J. (1938). Experience and education. New York: Simon and Schuster.

Dewey, J. (1997). *Experience and education*. Free Press; Reprint edition.

Ekici, S., & Yilmaz, B. (2013). An Evaluation on FATIH Project. *Turkish Librarianship, 27*(2), 317-339.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, *42*(3), 255– 284.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers and Education, 59*(2), 423-435. http://dx.doi.org/10.1016/j.compedu.2012.02.001

European Union (2002). *Council resolution on lifelong learning, Official Journal of the European Communities* (Report No. C 163/1-3). Official Journal of the European Union.

European Union (2019). *Council recommendation of 22 May 2018 on key competencies for lifelong learning* (Report No. 2018/C 189/01). Official Journal of the European Union.

Farjon, D., Smits, A., & Voogt, J. (2019). Technology integration of pre-service teachers explained by attitudes and beliefs, competency, access, and experience. *Computers and Education, 130*, 81-93. https://doi.org/10.1016/j.compedu.2018.11.010

Field, J. (2010). Lifelong learning. Retrieved May 13, 2023, from http://booksite.elsevier.com/broch ures/educ/PDF/Lifelong_Learning.pdf

Fleming, T. (2011). Models of lifelong learning: An overview. In M. London (Ed.), *The Oxford Handbook of Lifelong Learning, 2nd edition* (pp. 1-26). Oxford University Press. https://doi.org 10.1093/oxfordhb/9780195390483.013.0018

Frydenberg, M., & Andone, D. (2011). *Learning for 21st century skills*. Presented in Learning for 21st Century Skills (27-29 June 2011). http://dx.doi.org/10.1109/i-Society18435.2011.5978460

Fu, J. (2013). Complexity of ICT in education: A critical literature review and its implications. *International Journal of Education and Development using ICT, 9*(1), 112-125.

George, D., & Mallery, P. (2010). *SPSS for Windows step by step: A simple guide and reference 17.0 Update*. Pearson.

Gomez, F. C., Trespalacios, J., Hsu, Y. C., & Yang, D. (2022). Exploring teachers' technology integration self-efficacy through the 2017 ISTE Standards. *TechTrends, 66*(2), 159-171. https://doi.org/10.1007/s11528-021-00639-z

Gökbulut, B. (2021). Examination of teachers' digital literacy levels and lifelong learning tendencies. *Journal of Higher Education and Science, 11*(3), 469-479. https://doi.org/10.5961/jhes.2021.466

Greenhow, C., Lewin, C., & Staudt Willet, K. B. (2021). The educational response to Covid-19 across two countries: a critical examination of initial digital pedagogy adoption. *Technology, Pedagogy and Education, 30*(1), 7-25. https://doi.org/10.1080/1475939X.2020.1866654

Gür-Erdoğan, D., & Arsal, Z. (2016). The development of lifelong learning trends scale (LLLTS). *Sakarya University Journal of Education, 6*(1), 114-122.

Hager, P. J. (2011). Concepts and definitions of lifelong learning. Models of lifelong learning: An overview. In M. London (Ed.), *The Oxford Handbook of Lifelong Learning, 2nd edition* (pp. 13-26). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780195390483.013.0015

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modelling: Rigorous applications, better results, and higher acceptance. *Long Range Planning, 46*(1-2), 1-12.

Hamutoğlu, N. B., & Başarmak, U. (2020). External and internal barriers in technology integration: A structural regression analysis. *Journal of Information Technology Education: Research, 19*, 17-40. https://doi.org/10.28945/4497

Hayes, A. F. (2013). *Introduction to Mediation, moderation, and conditional process analysis*. New York: Guilford Publications.

Hayytov, D. (2013). The relationship between the adequacy of school administrations? Technological leadership perceptions and teachers' attitudes towards technology [Unpublished master's thesis]. Gazi University.

Hershkovitz, A., Daniel, E., Klein, Y., & Shacham, M. (2023). Technology integration in emergency remote teaching: teachers' self-efficacy and sense of success. *Education and Information Technologies, 28*, 12433–12464. https://doi.org/10.1007/s10639-023-11688-7

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational technology Research and Development, 55*(3), 223-252. https://doi.org/10.1007/s11423-006-9022-5

Holden, H., & Rada, R. (2011). Understanding the influence of perceived usability and technology self-efficacy on teachers' technology acceptance. *Journal of Research on*

Technology in Education, 43(4), 343-367. https://doi.org/10.1080/15391523.2011.10782576

Hongu, N., Kataura, M. P., & Block, L. M. (2011). Behaviour change strategies for successful long-term weight loss: Focusing on dietary and physical activity adherence, not weight loss. *Journal of Extension, 49*(1), 1-4.

Hürsen, Ç. (2014). Are the teachers' lifelong learners? *Procedia - Social and Behavioural Sciences, 116*, 5036-5040. https://doi.org/10.1016/j.sbspro.2014.01.106

Ifinedo, E., Rikala, J., & Hämäläinen, T. (2020). Factors affecting Nigerian teacher educators' technology integration: Considering characteristics, knowledge constructs, ICT practices and beliefs. *Computers and Education, 146*, 103760. https://doi.org/10.1016/j.compedu.2019.103760

İpek, C., & Acuner, H. Y. (2011). Primary Pre-service teachers' computer self-efficacy beliefs and attitudes toward educational technologies. *Journal of Ahi Evran University Kırşehir Faculty of Education, 12*(2), 23-40.

İşman, A. (2002). Sakarya ili öğretmenlerinin eğitim teknolojileri yönündeki yeterlilikleri [Educational technology competences of teachers in Sakarya province]. *The Turkish Online Journal of Educational Technology, 0*(3), 9-40.

James, W. (2017). *Pragmatism, a new name for some old ways of thinking; popular lectures on philosophy (1907)*. CreateSpace Independent Publishing Platform.

Kabataş, S., & Karaoğlan-Yılmaz, F. G. (2018). Evaluation of teachers' lifelong learning attitudes in terms of self-efficacy towards the standards of educational technology. *Bartin University Journal of Faculty of Education, 7*(2), 588-606.

Kadel, R. (2005). How teacher attitudes affect technology integration. *Learning and Leading with Technology, 32*(5), 34-47.

Kağıtçıbaşı, Ç. (2010). *Günümüzde insan ve insanlar sosyal psikolojiye giriş* [Introduction to social psychology of man and people today]. İstanbul: Evrim Publishing.

Karaoğlan-Yılmaz, & Binay-Eyuboğlu (2018). Investigation of the relationships between lifelong learning attitudes, digital native status, and technology acceptance of teachers in terms of each other and various variables. *International Journal of Education Science and Technology, 4*(1), 1-17.

Kaya, B. (2017). *Sınıf öğretmenlerinin eğitimde teknoloji kullanımına ilişkin tutum düzeyi ile mesleğe yönelik tutumları arasındaki ilişkinin incelenmesi* [The relationship between attitude levels and vocational relationship on the use of technology in education in classroom teacher] [Unpublished master's thesis]. Kırşehir Ahi Evran University.

Kent, A. M, & Giles, R. M (2017). Pre-service teachers' technology self-efficacy. *Southeastern Regional Association for Teacher Educators, 26*(1). 9-20.

Keser, H., Karaoğlan-Yılmaz, F., & Yılmaz, R. (2015). TPACK competencies and technology integration self-efficacy perceptions of pre-service teachers. *Elementary Education Online, 14*(4), 1193-1207. https://doi.org/10.17051/io.2015.65067

Khine, M. S. (2001). Attitudes toward computers among teacher education students in Brunei Darussalam. *International Journal of Instructional Media, 28*(2), 147-153.

Kılıç, M. Y., & Kılıç, M. E. (2022). A study on determining the relationship between teachers' lifelong learning tendencies and their attitudes towards using technology in education. *Malaysian Online Journal of Educational Technology, 10*(2), 125-140. http://dx.doi.org/10.52380/mojet.2022.10.2.278

Kline, T. J. (2005). *Psychological testing: A practical approach to design and evaluation*. Thousand Oaks, CA: Sage Publications.

Knowles, M. S., Holton, E. F., & Swanson, R. A. (2014). *The adult learner: The definitive classic in adult education and human resource development.* London:Routledge.

Kukul, V. (2023). Modelling the Spectrum of Technology Integration from Teacher Training to Usage Intention: Findings from a Two-Phase Study. *Technology, Knowledge and Learning*, *28*, 1615–1633. https://doi.org/10.1007/s10758-023-09658-6

Kutluca, T., & Ekici, G. (2010). Examining teacher candidates' attitudes and self-efficacy perceptions towards the computer assisted education. *Hacettepe University Journal of Education*, *38*(38), 177-188.

Laal, M., & Salamati, P. (2012). Lifelong learning: why do we need it? *Procedia-Social and Behavioural Sciences, 31*, 399-403. https://doi.org/10.1016/j.sbspro.2011.12.073

Lee, Y., & Lee, J. (2014). Enhancing pre-service teachers' self-efficacy beliefs for technology integration through lesson planning practice. *Computers and Education*, *73*, 121-128. https://doi.org/10.1016/j.compedu.2014.01.001

Lembani, R., Gunter, A., Breines, M., & Dalu, M. T. B. (2020). The same course, different access: the digital divide between urban and rural distance education students in South Africa. *Journal of Geography in Higher Education*, *44*(1), 70-84. https://doi.org/10.1080/03098265.2019.1694876

Liao, Y. C., Ottenbreit-Leftwich, A., Glazewski, K., & Karlin, M. (2021). Coaching to support teacher technology integration in elementary classrooms: A multiple case study. *Teaching and Teacher Education*, *104*, 103384. https://doi.org/10.1016/j.tate.2021.103384

Lin-Milbrath, Y. C., & Kinzie, M. B. (2000). Computer technologies: Pre-service teachers' attitudes and self-efficacy over time. *Journal of Technology and Teacher Education*, *8*(4), 373-385.

London, M. (2011). Lifelong learning: Introduction. In M. London (Ed.), *The Oxford Handbook of Lifelong Learning, 2nd edition* (pp. 4-11). London: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780195390483.013.0013

Maddux, J. E. (2009). Self-efficacy: The power of believing you can. In S. J. Lopez and C. R. Snyder (Eds.), Oxford Handbook of Positive Psychology (pp. 335-343). London: Oxford University Press.

Mei, B., Brown, G. T., & Teo, T. (2018). Toward an understanding of pre-service English as a Foreign Language teachers' acceptance of computer-assisted language learning 2.0 in the People's Republic of China. *Journal of Educational Computing Research*, *56*(1), 74-104. https://doi.org/10.1177/0735633117700144

Mertala, P. (2019). Teachers' beliefs about technology integration in early childhood education: A meta-ethnographical synthesis of qualitative research. *Computers in Human Behaviour*, *101*, 334-349. https://doi.org/10.1016/j.chb.2019.08.003

Michos, K., Cantieni, A., Schmid, R., Müller, L., & Petko, D. (2022). Examining the relationship between internship experiences, teaching enthusiasm, and teacher self-efficacy when using a mobile portfolio app. *Teaching and Teacher Education*, *109*, 103570. https://doi.org/10.1016/j.tate.2021.103570

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, *108*(6), 1017-1054. https://doi.org/10.1111/j.1467-9620.2006.00684.

Misra, P. (2018). MOOCs for teacher professional development: Reflections and suggested actions. *Open Praxis*, *10*(1), 67-77.

Nathan, E. J. (2009). *An examination of the relationship between pre-service teachers' level of technology integration self-efficacy (TISE) and level of technological pedagogical content knowledge (TPACK)* [Unpublished doctoral thesis]. University of Houston.

Nelson, M. J., & Hawk, N. A. (2020). The impact of field experiences on prospective pre-service teachers' technology integration beliefs and intentions. *Teaching and Teacher Education, 89*, 103006. https://doi.org/10.1016/j.tate.2019.103006

Nelson, M. J., Voithofer, R., & Cheng, S. L. (2019). Mediating factors that influence the technology integration practices of teacher educators. *Computers and Education, 128*, 330-344. https://doi.org/10.1016/j.compedu.2018.09.023

Neuman, L. W. (2011). *Social research methods qualitative and quantitative approaches* (S. Özge, Trans.). Ankara: Yayın Odası.

Njiku, J., Maniraho, J. F., & Mutarutinya, V. (2019). Understanding teachers' attitude towards computer technology integration in education: A review of literature. *Education and Information Technologies, 24*, 3041-3052. https://doi.org/10.1007/s10639-019-09917-z

OECD (2021). *OECD skills outlook 2021: Learning for life*. OECD Publishing. https://doi.org/10.1787/0ae365b4-en

Ozcakir, B., & Aydin, B. (2019). Effects of augmented reality experiences on technology integration self-efficacy of prospective mathematics teachers. *Turkish Journal of Computer and Mathematics Education (TURCOMAT), 10*(2), 314-335. https://doi.org/10.17762/turcomat.v10i2.205

Örün, Ö., Orhan, D., Dönmez, P., & Kurt, A. A. (2015). Exploring the relationship between individual innovativeness and technology attitude of teacher candidates. *Trakya University Journal of Education, 5*(1), 65-76.

Özçiftçi M., & Çakır, R. (2015). Teachers' lıfelong learnıng trends and self-effıcıencıes about the educatıonal technology standards. *Educational Technology Theory and Practice, 5*(1), 1-19. https://doi.org/10.17943/etku.57410

Peng, R., Razak, R. A., & Halili, S. H. (2023). Investigating the factors affecting ICT integration of in-service teachers in Henan Province, China: structural equation modeling. *Humanities and Social Sciences Communications, 10*(1), 1-11. https://doi.org/10.1057/s41599-023-01871-z

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behaviour Research Methods, 40*(3), 879–891. https:// doi. org/ 10. 3758/ BRM. 40.3. 879

Røkenes, F. M., & Krumsvik, R. J. (2014). Development of student teachers' digital competence in teacher education-A literature review. *Nordic Journal of Digital Literacy*, *9*(4), 250-280. https://doi.org/10.18261/ISSN1891-943X-2014-04-03

Sarıgöz, O. (2020). *Lifelong learning*. Anı Publishing.

Sassenberg, K., Roesel, I., Sudeck, G., Bernecker, K., Durst, J., & Krauss, I. (2022). The relation of attitude toward technology and mastery experience after an app-guided physical exercise intervention: a randomised crossover trial. *JMIR Formative Research, 6*(2), e28913. https://doi.org/10.2196/28913

Satıcı, Ö., Akkuş, Z., & Alp, A. (2009). Investigation of attitudes regarding technology in teaching staff members of medical faculty by CHAID analysis. *Dicle Med J, 36*(4), 267-274.

Scherer, R., Tondeur, J., Siddiq, F., & Baran, E. (2018). The importance of attitudes toward technology for pre-service teachers' technological, pedagogical, and content knowledge: Comparing structural equation modelling approaches. *Computers in Human Behaviour, 80*, 67-80. https://doi.org/10.1016/j.chb.2017.11.003

Semiz, K., & Ince, M. L. (2012). Pre-service physical education teachers´ technological pedagogical content knowledge, technology integration self-efficacy and instructional technology outcome expectations. *Australasian Journal of Educational Technology, 28*(7), 1248-1265. https://doi.org/10.14742/ajet.800

Snook, I. A. (2012). Lifelong education: Some Deweyan themes. D. N. Aspin, J. Chapman, K. Evans and R. Bagnall (Ed.). In the book second *International Handbook of lifelong learning* (p. 139-149). Springer International Handbooks of Education.

Stajkovic, A. D., & Luthans, F. (1998). Self-efficacy and work-related performance: A meta-analysis. *Psychological Bulletin, 124*(2), 240–261. https://doi.org/10.1037/0033-2909.124.2.240

Svrcek, N. S., Rath, L., Olmstead, K., & Colantonio-Yurko, K. (2022). "We are still putting out fires": Considering educator intentionality in remote instruction during the COVID-19 pandemic. *Education and Information Technologies, 27*(1), 407-428. https://doi.org/10.1007/s10639-021-10679-w

Şad, S. N., & Arıbaş, S. (2010). Technology education in some developed countries and implications for Turkey. *Journal of Minister of National Education, 185,* 280-281.

Şen, N., & Yıldız Durak, H. (2022). Examining the relationships between English teachers' lifelong learning tendencies with professional competencies and technology integrating self-efficacy. *Education and Information Technologies, 27,* 5953–5988. https://doi.org/10.1007/s10639-021-10867-8

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Pearson Education.

Taimalu, M., & Luik, P. (2019). The impact of beliefs and knowledge on the integration of technology among teacher educators: A path analysis. *Teaching and Teacher Education, 79,* 101-110. https://doi.org/10.1016/j.tate.2018.12.012

Tavşancıl, E. (2006). *Measuring attitudes and data analysis with SPSS*. Nobel Publication.

Teo, T., Doleck, T., & Bazelais, P. (2018). The role of attachment in Facebook usage: A study of Canadian college students. *Interactive Learning Environments, 26*(2), 1–17. http://dx.doi.org/10.1080/10494820.2017.1315602

Tondeur, J., Van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2016). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: a systematic review of qualitative evidence. *Educational technology research and development, 65*(3), 555-575. https://doi.org/10.1007/s11423-016-9481-2

Ünal, E., & Teker, N. (2018). The adaption of technology integration self-efficacy scale in Turkish. *Journal of Social Sciences of Mus Alparslan University, 6*(6), 973-978.

Ünal, E., Yamaç, A., & Uzun, A. M. (2017). The effect of the teaching practice course on pre-service elementary teachers' technology integration self-efficacy. *Malaysian Online Journal of Educational Technology, 5*(3), 39-53.

Üredi, I., & Üredi, L. (2005). A program evaluation study to examine the attitudes of teacher candidates towards the classroom teaching department. *Journal of Yeditepe University Faculty of Education, 1*(2), 1-8.

Vieira, D. (2020). Lifelong Learning and Its Importance in Achieving the Sustainable Development Goals. In: Leal Filho, W., Azul, A.M., Brandli, L., Özuyar, P. G., Wall, T. (eds) *Quality Education*. Encyclopedia of the UN Sustainable Development Goals. Springer, Cham. https://doi.org/10.1007/978-3-319-95870-5_7

Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing pre-service teachers' self-efficacy beliefs for technology integration. *Journal of Research on Technology in Education, 36*(3), 231-250. https://doi.org/10.1080/15391523.2004.10782414

Wang, Q., & Zhao, G. (2021). ICT self-efficacy mediates most effects of university ICT support on pre-service teachers' TPACK: Evidence from three normal universities in China. *British Journal of Educational Technology, 52*(6), 2319-2339. https://doi.org/10.1111/bjet.13141

Watson, J. H., & Rockinson-Szapkiw, A. (2021). Predicting pre-service teachers' intention to use technology-enabled learning. *Computers and Education, 168,* 104207. https://doi.org/10.1016/j.compedu.2021.104207

Wielkiewicz, R. M., & Meuwissen, A. S. (2014). A lifelong learning scale for research and evaluation of teaching and curricular effectiveness. *Teaching of Psychology, 41*(3), 220-227. https://doi.org/10.1177/0098628314537

Williams, M. K., Christensen, R., McElroy, D., & Rutledge, D. (2023). Teacher self-efficacy in technology integration as a critical component in designing technology-infused teacher preparation programs. *Contemporary Issues in Technology and Teacher Education, 23*(1), 228-259.

Wright, W. E. (2010). *Foundations for teaching English language learners. Research, theory, policy, and practice*. Essex: Caslon.

Yalçın, V., & Önder, A. N. (2022). Investigation of the relationship among science teachers' perceptions of technology integration self-efficacy, attitudes towards distance learning and web pedagogical content knowledge during the pandemic. *Scholars Journal of Research in Social Science (SJRSS), 2*(4), 40-53. https://doi.org/10.31219/osf.io/t72f3

Yıldız Durak, H. (2019). Examining the acceptance and use of online social networks by pre-service teachers within the context of unified theory of acceptance and use of technology model. *Journal of Computing in Higher Education*, *31*(1), 173-209. https://doi.org/10.1007/s12528-018-9200-6

Yıldız Durak, H. (2021). Modelling of relations between K-12 teachers' TPACK levels and their technology integration self-efficacy, technology literacy levels, attitudes toward technology and usage objectives of social networks. *Interactive Learning Environments*, *29*(7), 1136-1162. https://doi.org/10.1080/10494820.2019.1619591

Yilmaz, M. (2016). *The evaluation of primary school teachers' computer competency and attitudes toward technology concerning the use of technology in education* [Unpublished master's thesis]. Mersin University.

Zhang, Z., Maeda, Y., Newby, T., Cheng, Z., & Xu, Q. (2023). The effect of pre-service teachers' ICT integration self-efficacy beliefs on their ICT competencies: The mediating role of online self-regulated learning strategies. *Computers and Education, 193*, 104673. https://doi.org/10.1016/j.compedu.2022.104673