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Extending unified theory of acceptance and use of technology to understand the acceptance of digital textbook for elementary School in Indonesia

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The rapid development of technology has led to the change of textbooks from printed to digital forms accessible by students irrespective of their location, thereby improving their overall academic performance. This change is appropriate to the sustainable learning program, where digital textbooks support online learning and students can access material from anywhere and at any time. This research aims to analyze the factors affecting the intention of elementary school teachers to use digital textbooks. Quantitative data were collected and measured from 493 elementary school teachers in Riau, Indonesia, and analyzed using structural equation modeling (SEM). The results showed that performance expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Perceived learning opportunities (PLO), Self-efficacy (SE), and Facilitating Condition (FC) positively affected teachers' intention to use digital textbooks. SI was found to be the factor with the greatest effect on BI. However, attitude, affective need (AN), ICT usage habits, gender, age, and education level did not affect teachers' intention to use digital textbooks. This research provides important information for the government, decision-makers, and schools on using digital textbooks at the elementary level in the future.

KEYWORDS

UTAUT, digital textbook, elementary school, behavior intention, SEM

1. Introduction

Textbooks are media used by subject teachers to deliver the material and meet the needs of educators, educational institutions, and students (Ritter et al., 2019). They act as a liaison between the curriculum and students and help them construct new knowledge, provide logical content, detailed information, and supportive answers to questions (Fan et al., 2008). A good textbook should contain invaluable content, illustrations, motivational elements, support an individual's obsession with knowledge and assess ability value (Figueiredo et al., 2016; Lim et al., 2020). Teachers need to painstakingly select and use textbooks to support learning objectives and achieve curriculum goals. The selection process should be selective at the elementary level, especially in terms of content evaluation, to increase student participation in learning and knowledge based on experience and according to their levels of concrete thinking (Sing et al., 2016).

The examination of the intention of educators to use technological-based learning media yielded different results. Studies, such as Piramanayagam and Seal (2021) show that Performance

Expectancy (PE), Effort Expectancy (EE), and facilitating Conditions (FC) greatly affect teachers' intention to use digital textbooks, respectively. In addition, several studies reported that teachers at elementary and other education levels have different levels of self-efficacy, belief, and perception (Balkaya and Akkucuk, 2021; Jevsikova et al., 2021). Based on this difference, it is necessary to analyze the factors affecting the intention of elementary school teachers to use digital textbooks. Therefore, this research aims to determine the factors that affect the intention of elementary school teachers to use digital textbooks. It also intends to determine whether demographic information such as age, gender, and education level affects the behavior of elementary school teachers' intention to use digital textbooks. It also provides knowledge to teachers, institutional education, and decision-makers to increase the use of digital textbooks at the elementary school level.

This paper is organized as follows. Section 1 explains the background and novelty of the research. Section 2 explains the theoretical background of this research. The methods, models and approaches to answer the research questions were analyzed in Section 3. Meanwhile, Section 4 presents the findings and results of the hypothesis testing. The final parts are conclusions and research implications, limitations, and recommendations for further research.

2. Literature review

2.1. Digital textbook at schools

Revolutionary changes in technology have presented challenges and opportunities to the existing education system from the 21st century. One of such changes is related to reducing the use of paper and pencil in schools by the younger generation by introducing digital textbooks (Hsu et al., 2017; Kolle et al., 2018). Future learning focuses on sustainable development which is not limited to the classroom. It is important to note that since the Covid-19 pandemic, teaching and learning activities have changed drastically, where students have to study online and use digital textbooks.

Numerous competitions have been conducted to develop digital textbooks and analyze their effects on the quality of learning due to their continuous spread in the world (Bagheri et al., 2014; Hwang et al., 2018; Lim et al., 2020). It allows students to have access to learning content to develop their abilities and interests personally without sticking to the new knowledge given by the teacher in the classroom (Hoch et al., 2018). In addition, this media provides the best features available in traditional books, with various interactive functions. Media content such as sound, animation, and Augmented Reality (AR) can be easily entered into digital textbooks (Figueiredo et al., 2016). This feature variation will help students focus on important points in new knowledge, provide notes, combine existing content with their existing knowledge.

Several preliminary studies have been conducted to develop digital textbooks in all educational fields and levels (Yoo and Roh, 2019; Tang, 2021). According to Weng and Weng (2013) and Tang (2021), digital textbooks have been widely used for formal and non-formal education purposes, increasing the number of studies in recent years. There are numerous advantages associated with the development of digital textbooks, such as being more interactive and attractive (Hwang et al., 2018; Radović et al., 2020a), incorporation of advanced features, as well easy to modify and use (Fan et al., 2018). Various preliminary studies stated that digital textbooks helped teachers and students to acquire knowledge independently during the pandemic (Graham-Clare, 2020; Piramanayagam and Seal, 2021).

A meta-analysis study on the effect of digital textbooks on mathematics achievement showed that it has a relatively high effect at the Elementary School level (Wijaya et al., 2022a). The results showed that though the digital textbook was developed in 2013, the use at the Elementary School level have not been maximized compared to the university. Therefore, further study is needed to determine the predictors that have a relationship with the intention of teachers to use digital textbooks at the Elementary School level.

Teachers' use of digital textbooks to teach does not necessarily lead to an increase in quality (Henawy and Mansor, 2013; Santoso et al., 2018; Awaludin and Winarsih, 2020; Kodama et al., 2021; Piramanayagam and Seal, 2021). Teachers only use this media to deliver material in online learning during the pandemic, because it does not have a significant effect on traditional learning (Delgado et al., 2018). The difference between government expectations and the fact in the field stems from a lack of consideration on the willingness and expectations of teachers when using digital textbooks. Owing to this, to understand this difference, the various factors affecting teachers' intention to use digital textbooks, such as attitude (Lin, 2019; Adov et al., 2020), educational belief (Liebenberg et al., 2018; Kim and Lee, 2020), confidence (Lulin et al., 2020), the perceived value of technology (Al-Rahimi et al., 2013), knowledge, social influence (Kim and Lee, 2020), habits (Hu et al., 2020), affective need (Shukla, 2021), and self-efficacy (Liebenberg et al., 2018) were examined.

2.2. Research of digital textbook on education field

Few studies have examined the implementation of digital textbooks in learning activities. Some of them only examined user screen time, which provides information on preschool and elementary school students' interest in using digital textbooks for reading (Kolle et al., 2018; Zhang et al., 2020). At the initial development stage, several studies used the pretest-posttest method to analyze the effect of digital textbooks and found that they improve student achievement (Huang et al., 2017; Radović et al., 2020b). During the pandemic, some teachers used it to deliver course materials in online learning (Kodama et al., 2021; Piramanayagam and Seal, 2021). Moreover, some findings have shown that it does not affect student outcomes (Hwang et al., 2018; Tsai et al., 2018; Akçapinar et al., 2020). Kolle et al. (2018), Luo et al. (2021), and Sartika and Mauladaniyati (2021) stated that teachers use digital textbooks only as intermediaries for information on learning activities with a focus on screen time and also pre-test posttest. In contrast, this research investigates the factors affecting teachers' intention to use digital textbooks at the elementary school level. This is very important because knowing the factors may be able to improve teaching performance, which will, in turn, improve its effectiveness.

This research provides direction on increasing teacher intention to use digital textbooks in learning activities at the elementary school level, in which students can use on their tablets, computers, or laptops. When they experience difficulties during usage, the app can independently help them navigate through. Hence there is a shift in learning from teacher-centered to student-centered (Figueiredo et al., 2016).

This literature review indicates that digital textbooks increase students' motivation and interest in learning, provide new experiences and improve their outcomes. However, research on factors affecting

teachers' intention to use digital textbooks at the elementary school level is still limited. Based on this analysis, further studies need to be conducted to explore the factors that promote teachers to use digital textbooks in learning activities at the elementary level.

2.3. Acceptance of technologies by teacher

Teachers' acceptance of innovative educational technology is crucial and important to understand, especially when technology-based learning media is increasing and being implemented in the teaching and learning process (Venkatesh et al., 2012). The implementation of technology-based learning media will not have the maximum effect without teacher acceptance. Technology acceptance is defined as an individual's willingness to integrate its usage to complete tasks in daily activities (Venkatesh et al., 2003).

Although numerous studies prove that technology-based learning media is beneficial, its implementation in learning activities is still not maximal, and it has not been effectively used by teachers. Several studies have analyzed the factors affecting the adoption and use of technology-based learning media in teaching and learning activities, namely user characteristics, content characteristics, technological considerations, and the capacity of an organization (Balanskat et al., 2006; Lim and Chai, 2008; Tondeur et al., 2008; Buabeng-Andoh, 2012). Furthermore, many studies have revealed that using technology-based learning media by students in the learning process is very high (Flores et al., 2018; Hermita et al., 2021; Wijaya et al., 2021a,b).

In the development of technology-based learning media in this era, most studies focus on user characteristics with few on the teacher aspect. At the elementary school level, most previous research has focused on student interaction and technology.

2.4. The unified theory of acceptance and use of technology

Several models have been investigated to analyze teacher intentions and user acceptance of new technology. Venkatesh et al. (2003) evaluated and compared 8 prominent models. The first is the theory of reasoned action, an extension of the theory of planned behavior (TPB), which proves that attitude and subjective norms are factors of behavior intention. Technology acceptance model (TAM) is widely used in the business field to explain the acceptance of Information Technology (IT) tools, taking a lot of theory from reasoned action (Ngafeeson and Sun, 2015; Elyazgi, 2018). A total of 2 primary direct determinants are identified and believed to affect individuals to accept and use IT tools, namely easy to use and usefulness. Bagozzi et al. (1992), in their motivational model (MM), applied its associated theory from psychology to understand the use and adoption of new technology. Meanwhile, Taylor and Todd (1995) developed a hybrid model by combining the TPB predictor with the perceived usefulness of the TAM model. Rogers (1995) stated that acceptance or rejection of innovation is based on the user's belief with the theory of Rogers (1995) used to analyze various innovations, such as WWW, spreadsheet, and teaching methods. Compeau and Higgins (1995) applied and extended the social cognitive theory (SCT) of Bandura (1986) in the context of using computers. TAM2, an extension of the TAM model, adds subjective norm and value constructs as predictors of intention to use new technology (Gellerstedt et al., 2018).

Over the years, several theoretical approaches have been used to systematize attitudes that might affect the use of new technologies. Some well-known and frequently used models include the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). Both models are based on the Theory of Planned Behavior (Ajzen, 1985), estimating that attitude affects behavior intention. The TAM model has been shown to explain up to 40% of intentions to use new technologies, predictable through attitudes. Conversely, the UTAUT model can explain up to approximately 74% of the variance as stated in the behavioral intention research by Venkatesh et al. (2003). This is supported by prior research using a sample of teachers with the predicting value showing that it reaches more than 40 percent. TAM and UTAUT models are widely used in educational contexts such as college and high school to predict the intention to use new technology by both students and teachers (Nikolopoulou et al., 2021; Zacharis and Nikolopoulou, 2022; Wijaya et al., 2022c). However, the determinant that most accurately predicts behavior intention varies depending on the context.

In accordance with the evaluation and comparison of the 8 models described above, this research extending the UTAUT model based on its advantages in the field of education. The model was developed from 9 core determinants of intention and 3 moderators of key relationships, namely performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) Perceived learning opportunities (PLO), Self Efficacy, Affective Need, Attitude Towards ICT, ICT Usage habits (IUH). The three moderators examined, namely gender, age, and education levels, affect teachers' intention to use digital textbooks at the elementary school level.

2.4.1. Proposed model and hypotheses

Based on the literature review, there is a critical need to propose a new model capable of analyzing the most important factors affecting elementary school teachers' intention to use digital textbooks, such as the UTAUT model. However, other studies suggest the extension of this model when investigating an individual's intention to use the technology for in-depth analysis.

In this research, 5 new variables were added to the UTAUT model, including Perceived learning opportunities, attitude towards technology, self-efficacy, affective need and ICT usage habits. These factors are also proposed as direct predictors of behavior intention.

2.4.1.1. Perceived learning opportunities

The technology acceptance model was initially set up for research in the business and commercial fields, with its objective different from those in the education sector (López et al., 2021). These items do not fully reflect teacher or student motives. Bourgonjon et al. (2010) reported that the conceptualization of performance is too restrictive in the educational context Therefore, a new construct, namely perceived learning opportunities, was used to explain the learning process results. Perceived learning opportunities are defined as the degree to which individuals believe that using digital textbooks in teaching and learning activities can increase their opportunities to learn new teaching models or methods. Digital textbooks have a better future than the traditional, which led to the following initial hypothesis:

> *H1*: Perceived Learning opportunities (PLO) affects performance expectancy (PE).

2.4.1.2. Attitude

Attitude (ATT) is defined as the degree of an individual's positive experience, such as interest and enjoyment towards the use of new technology (Venkatesh et al., 2003). In the UTAUT model, attitude is predicted to directly affect behavior intentions towards using ICT as a variable. Furthermore, it significantly affects teachers' intention to use technology in teaching and learning activities (Fang and Liu, 2017). According to this research, when teachers' attitude towards digital textbooks is good, it will affect their intention to use it to teach in class.

> *H2*: Teachers' attitudes toward digital textbooks affect teachers' intentions to use digital textbooks.

2.4.1.3. Self-efficacy

Self-efficacy (EFF) is defined as individuals' beliefs likely to affect the intention to use technology (Bandura, 1986; Tan, 2013), such as digital textbooks. It was used as another cognitive variable to be included with UTAUT. Previous research has shown that self-efficacy affects performance expectancy and effort expectancy and does not directly affect the intention to use technology (Horzum et al., 2014; Chao, 2019; Shiferaw et al., 2021). This research defined self-efficacy as teachers' belief that the use of digital textbooks has a good effect on students and teaching performance. Therefore, it is suspected to have an influence on teachers' opinion on the performance and effort expectancies. Based on this explanation, the following hypotheses were formulated:

> *H3*: self-efficacy affects performance expectancy (PE).

> *H4*: self-efficacy affect effort expectancy (EE).

2.4.1.4. Affective need

The affective need (AN) is primarily defined as the experience of an individual's feelings or emotions (Pierce et al., 2007; Shukla, 2021). Affective learning is associated with the attained knowledge and psychomotor skills mindset, views, and values. Meanwhile, Shukla (2021) reported that effective needs affect the intention to use technology Meanwhile, Baydas and Yilmaz (2018) reported that effective needs affect the intention to use technology. This is interpreted in this research as teachers' feeling that digital textbooks are effective learning media needed to increase the effectiveness of teaching and learning activities. Therefore, it led to the following hypothesis:

> *H5*: Affective need (AN) affects teachers' intention to use digital textbooks (BI).

2.4.1.5. ICT usage habits

Habit is defined as a routine of previous behavior, which measures an individual's tendency to perform a behavior automatically because of learning developed by Venkatesh et al. (2012) on UTAUT2. In this research, habit is more about the experience and the existing situation of elementary school teachers using digital textbooks. This led to the formulation of the following hypothesis:

> *H6*: ICT usage habits affect teachers' intention to use digital textbooks (BI).

2.4.1.6. Facilitating conditions

Facilitating conditions is the degree to which individuals believe that the environment supports them to use technology (Venkatesh et al., 2003). In recent research, FC was used to predict both BI and usage behavior (UB). The first version of the TAM model did not consider FC against UB (Venkatesh et al., 2003). However, the extensions in the UTAUT model show FC to be a valuable addition and this led to the following hypothesis:

> *H7*: Facilitating condition (FC) affects teachers' intention to use digital textbooks (BI).

2.4.1.7. Social influence

Social influence is the degree to which an individual is convinced to use technology from important people (Venkatesh et al., 2003). It is an important factor used to predict an individual's intention and acceptance to use technology in both the UTAUT and BI models (Wijaya et al., 2022b). Social influence in previous studies has also been shown to affect EE (Shiferaw et al., 2021; Zhou et al., 2022). Support from the environment to use new technology drives an individual to feel that the technology is not difficult. In several research studies, the social aspect does not significantly affect BI (Lin, 2019; Naveed et al., 2020; Abbad, 2021), while others found SI as an important factor to predict teacher intentions to use technology-based learning media (Li and Zhao, 2021; Mujalli et al., 2022). SI denotes students were influenced by teachers to use digital textbooks to teach in class. This led to the formation of the following hypothesis:

> *H8*: social influence (SI) affects teachers' intention to use digital textbooks (BI).

> *H9*: social influence (SI) affects effort expectancy (EE).

2.4.1.8. Effort expectancy

Effort expectancy analyzes the difficulty level of using new technology, in accordance with (Venkatesh et al., 2003) analysis subjectively. In the UTAUT model, EE is predicted to directly affect behavior intention, which is affected by self-efficacy, where the higher it is, the easier the use of new technology. EE is defined as when teachers feel that digital textbooks are easy to use for teaching and do not require much effort. This led to the following hypothesis:

> *H10*: Effort expectancy (EE) affects teachers' intention to use digital textbooks (BI).

2.4.1.9. Performance expectancy

Performance expectancy focuses on determining an individual's ability to use the new technology to achieve their desired goals. Venkatesh et al. (2003) defined PE as the degree to which people believe that new technology can help them complete their tasks more effectively and efficiently. Numerous preliminary studies have proven that PE plays a central role in predicting an individual ability to use digital textbooks (Yoo and Roh, 2019).

> *H11*: Performance expectancy (PE) affects teachers' intention to use digital textbooks (BI).

2.4.1.10. Digital textbooks behavior intention

Behavior intention (BI) is defined as an individual's potential to intensely execute a specific behavior (Venkatesh et al., 2003), empirically verified as a significant determinant of many behaviors (Shukla, 2021), including the use of new technologies. Behavioral intention represents internal orientation symbolizing belief structure or schema to perform a targeted behavior. Several studies have investigated the BI of digital textbooks from students' points of view (Liebenberg et al., 2018; Lin, 2019; Piramanayagam and Seal, 2021).

The proposed model contains a total of 11 hypotheses, as shown in Figure 1.

2.4.1.11. Gender age and education for moderator effect

This research examines three types of demographic information capable of influencing teachers' intention to use digital textbooks for teaching, namely gender, age, and education level. It is expected that this additional test will provide a deeper understanding based on actual integration. According to numerous preliminary research, there is a relationship between demographic information and technology integration. Gender is significantly different on the use of technology for learning and computer acceptance (Putra et al., 2022), while age is reported to have a relationship with the use of ICT. Therefore, it is necessary to conduct further research to determine whether gender, age and education affect the intention of teachers to use digital textbooks at school.

3. Methodology

This research aims to use the results of the extended UTAUT model to measure teachers' intention to use digital textbooks as learning media

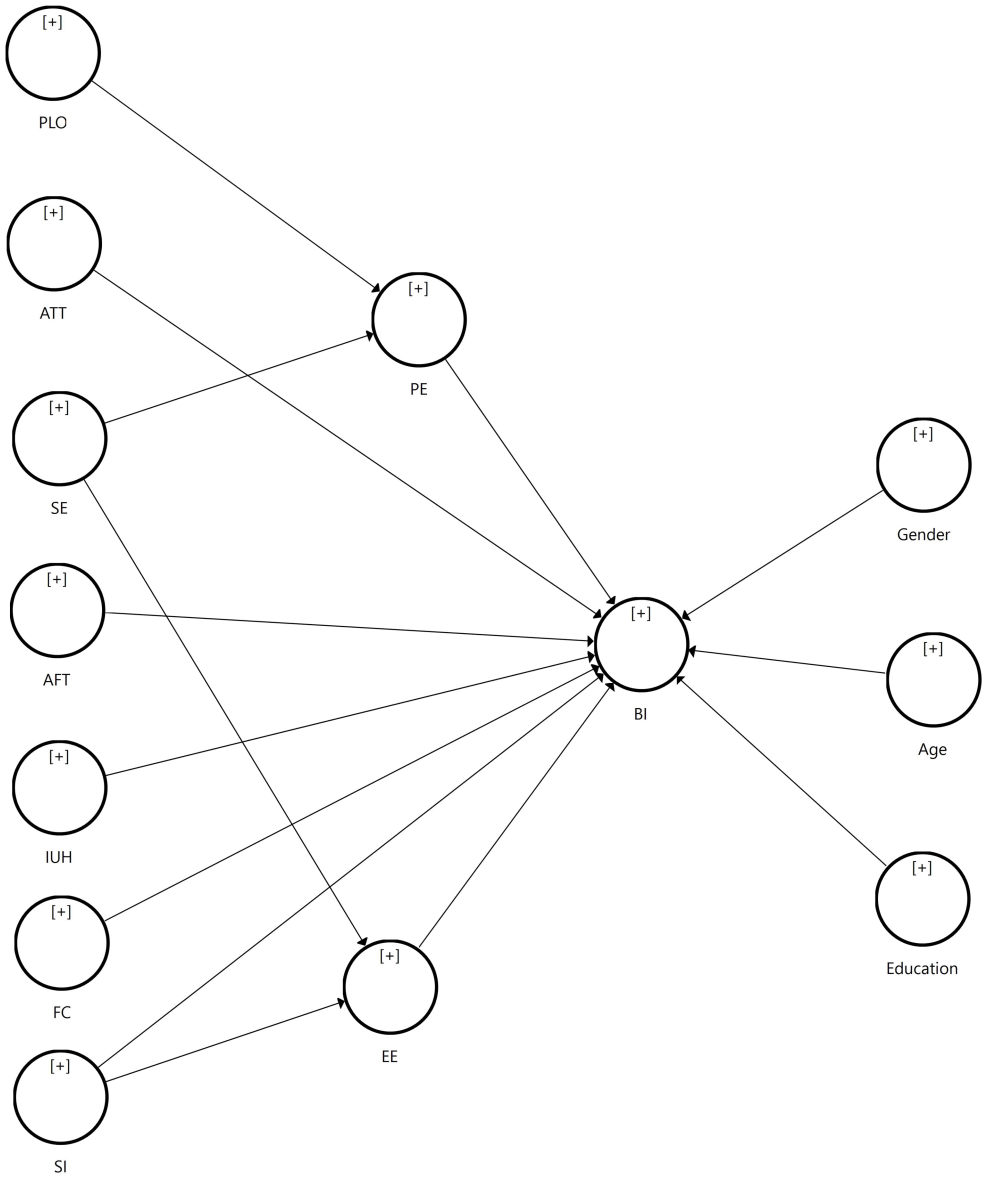

FIGURE 1
The proposed modified UTAUT model.

at the elementary school level. This model incorporates technical factors capable of affecting the intention of elementary school teachers to use technology-based learning media.

3.1. Research approach

The questionnaire was designed by adopting several sources to measure the proposed model and test the 11 hypotheses (see Appendix A). The review shows that the questionnaire survey is the most widely used instrument to analyze the intention and acceptance of the model in technology. The questionnaire in this research was divided into 2 parts; the first contains demographic participants, and the second consists of 35 questionnaire based on the UTAUT model. The 5-point Likert scale was selected based on popularity and is considered one of the best scales to measure questionnaire responses and ranged from 1 = strongly disagree to 5 = strongly agree. A language specialist translated the original English-language questionnaire into Indonesian to ensure accuracy. The translation was re-checked by an expert with sufficient English and Indonesian language skills.

3.2. Sampling and data collection

The survey was carried out in the even semester of the 2021–2022 academic year. The primary sample were elementary school teachers in Riau, Indonesia, who had studied the creation and use of digital textbooks. All the students consented to participate in this study. Online questionnaires were distributed *via* WhatsApp groups and through Email to fill out the questionnaire voluntarily and without repetition. Of the 501 respondents from different age groups, gender, education levels, 8 failed to fill the data, which resulted in a lack of information. In the end, only 493 responses were valid and used for further analysis. The complete summary of demographic information is shown in Table 1.

Of the total 493 responses used for the analysis, 74.04% were male and 25.96% female. Based on the age, 44.22% of respondents were aged 21–30, while the remaining 41.18 and 14.6% are within 31–40 and over 40 years. As many as 95.85% of teachers had Bachelor's degree education, while the remaining 3.94 and 1% had Master's and Doctor degrees, respectively. It is concluded that most respondents were females, with Bachelor's degrees and an age range of 20–30 years (see Table 2).

3.3. Instrument

The questionnaire as a research instrument was divided into two, with the first section containing questions to collect demographic data of respondents. Meanwhile, the second section contained questions to determine the factors affecting the intention of elementary school teachers in Riau to use digital textbooks adapted from previous studies by Ma et al. (2019) and Morchid (2019). A total of 35 items are carefully modified according to the context of this research using a 5-point Likert scale ranging from 1 to 5.

TABLE 1 Demographic information.

Item	Demographic	Total	Percentage
Gender	Male	365	74.04%
	Female	128	25.96%
Age	40 above	72	14.6%
	31–40	203	41.18%
	20–30	218	44.22%
Education	Master	19	3.94%
	Doctor	1	0.21%
	Bachelor	462	95.85%

3.4. Data analysis

Smart PLS is used to perform a structural equation model (SEM) approach to path analysis and test the hypothesized relationships of the full structural model. According to Kline (2005), the sample size required for SEM is at least 200. This research was conducted using a sample of 493 respondents, hence it can be said that it has a surplus size. The analysis evaluated the correlation between PE, EE, SI, FC, ATT, BI, UB, and the previously predicted variables.

4. Results

Smart PLS is used to perform a structural equation model (SEM) approach to path analysis and test the hypothesized relationships of the full structural model. This research was conducted using a sample of 493 respondents, hence it can be said that it has a surplus size. The analysis evaluated the correlation between PE, EE, SI, FC, ATT, BI, UB, and the previously predicted variables.

4.1. Evaluating the measurement model

This research used convergent validity to measure the (a) item reliability, (b) composite reliability, and (c) average variance extracted (AVE). The values of item reliability in Table 3 show that all constructs of Cronbach's alpha value are greater than the threshold limit of 0.70 with the smallest FC of 0.808 (Hair et al., 2016). The loading factor used in this research was more than 0.8, thereby indicating that all items can be used for further analysis (Hair et al., 2016). For composite reliability, Table 3 show that all construct value was more than 0.7, indicating high internal consistency reliability among the latent variables (Fornell and Larcker, 1981). Ultimately, the analyzed variances of the AVE have a value more than 0.5. Therefore, it can be concluded that this research meets the criteria of convergent validity (Fornell and Larcker, 1981).

Discriminant validity was checked in 2 ways. First, using the Fornell–Larcker criterion, which recommends the use of the square root of AVE on each latent variable to check whether it is more than the correlation coefficients (Fornell and Larcker, 1981). Table 4 shows that the diagonal elements are greater than the other correlation values between the latent variables, thereby fulfilling the discriminant validity condition. However, some criticisms indicate that the Fornell–Larcker is ineffective for evaluating validity (Henseler et al., 2015). Therefore, it was necessary to have a second check using the Heterotrait–Monotrait

TABLE 2 Descriptive statistic.

No	Item	Mean	Standard deviation	Excess Kurtosis	Skewness
1	ATD1	4.028	0.761	1.395	−0.74
2	ATD2	4.059	0.747	1.787	−0.827
3	ATD3	3.842	0.803	0.856	−0.603
4	ATD4	4.012	0.775	1.651	−0.835
5	AFT1	3.878	0.752	1.072	−0.543
6	AFT2	3.746	0.805	0.858	−0.586
7	AFT3	3.959	0.714	1.289	−0.545
8	AFT4	3.872	0.766	0.94	−0.54
9	IUH2	3.639	0.891	0.095	−0.45
10	IUH3	3.653	0.859	0.06	−0.462
11	IUH4	3.631	0.926	0.059	−0.525
12	PLO1	4.11	0.721	0.631	−0.559
13	PLO2	3.97	0.707	1.161	−0.544
14	PLO3	4.081	0.678	0.852	−0.453
15	PLO4	4.039	0.707	1.187	−0.573
16	SE1	3.83	0.723	0.544	−0.408
17	SE2	3.815	0.767	0.306	−0.348
18	SE3	3.897	0.712	0.654	−0.423
19	SE4	3.842	0.756	−0.031	−0.294
20	PE1	3.986	0.678	−0.034	−0.256
21	PE2	3.978	0.684	−0.217	−0.2
22	PE3	3.953	0.718	0.575	−0.426
23	EE1	3.769	0.731	0.347	−0.328
24	EE2	3.779	0.708	−0.151	−0.172
25	EE3	3.771	0.747	−0.108	−0.185
26	SI1	3.574	0.831	0.074	−0.364
27	SI2	3.574	0.848	−0.036	−0.323
28	SI3	3.531	0.881	0.172	−0.471
29	SI4	3.797	0.769	0.849	−0.52
30	BI1	3.696	0.778	0.34	−0.319
31	BI2	3.734	0.712	0.365	−0.272
32	BI4	3.71	0.737	0.368	−0.245
33	FC1	3.499	0.822	0.011	−0.271
34	FC2	3.511	0.81	0.33	−0.312
35	FC3	3.69	0.832	0.583	−0.488

(HTMT) ratio, to ensure the discriminant data validity can be trusted. HTMT value close to 1 indicates a lack of discriminant validity. Henseler et al. (2015) stated that the HTMT value needs to be less than 0.9 to support data discriminant validity, shown in Table 5.

4.2. Evaluating the structural model

The structural evaluation part of the model started by examining collinearity. This was followed by analyzing the structural relationship model reported through the path coefficients in the forms of t and value of ps. It also shows the determination (R2) and the size of the direct, indirect, and total effects.

4.3. Collinearity

Collinearity is usually assessed by analyzing the variance inflation factor (VIF; Morchid, 2019; Chang et al., 2022). The greater the VIF value, the higher the impact of collinearity level, with the reference limit value less than 5 indicating its emergence between variables (Law and Fong, 2020). Table 6 shows all VIF values are less than 5, which indicates collinearity has not been an issue within this research.

4.4. Fit model

The fit model in PLS-SEM is assessed seen from the SRMR and NFI values provided by the SMART-PLS software. According to Yew et al. (2022), SRMR value should be less than or equal to 0.10, or at 0.08, to obtain a good fit. Furthermore, the NFI value, which has a relationship with the chi-square of the benchmark model, should be more than 0.8. Based on the values displayed on SMART-PLS, this research model has a value of 0.047 with an NFI of 0.838. Therefore, it can be interpreted as a good fit.

4.5. Structural model

Assessing the structural model offers researchers the ability to test the capability of a proposed model and predict the associated factors. Hair et al. (2006) suggestion was used to determine the significance of the path coefficients, determinant coefficients (R2), and predictive relevance (Q2). Bootstrapping method which regenerated 5,000 samples was used to obtain path coefficients on factors and validate the model. It measured the indicator's ability to effectively participate in the associated factor when the distribution is normal. The program used to evaluate the structural model was SMART PLS, and the path coefficient measured the hypothesis to determine the factors affecting the intention of elementary school teachers to use digital textbooks by analyzing the value of p error rate. The factor can be significant for the 0.05 significant level, assuming the error ratio is less than 0.05 and the t-test value above 1.96.

The bootstrapping results in Table 7 show that 8 of 11 hypotheses are significant. The effect of PLO, EFF, SI, and EE is very significant (value of p <0.001). FC and PE also have a significant effect on the intention of elementary school teachers to use digital textbooks (value of p <0.05). Meanwhile, attitude, affective need, and ICT usage habits did not show significant results on BI (value of p >0.05). A detailed analysis of the path coefficient results is shown in Figure 2 and Table 7.

Table 8 shows the direct and indirect information and the total effect of each relationship between variables. Besides attitude with a moderate effect on BI, all determinants have a high effect above 0.5 (Cohen, 1988). Table 8 shows that SI and EE are the first and second significant factors with a direct effect score of 11.003 and 2.620, respectively. Attitude has the smallest factor affecting Behavior intention.

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TABLE 3 Results of loading factor, validity, and reliability.

Construct	Item	Loading	Cronbach's alpha	Composite reliability	Average variance extracted
Attitude	ATD1	0.879	0.906	0.934	0.78
	ATD2	0.888			
	ATD3	0.882			
	ATD4	0.882			
Affective	AFT1	0.894	0.91	0.937	0.788
	AFT2	0.861			
	AFT3	0.87			
	AFT4	0.924			
ICT usage habits	IUH2	0.906	0.911	0.944	0.849
	IUH3	0.92			
	IUH4	0.937			
Perceived learning opportunities	PLO1	0.863	0.912	0.938	0.792
	PLO2	0.892			
	PLO3	0.909			
	PLO4	0.895			
Self-efficacy	SE1	0.904	0.895	0.927	0.761
	SE2	0.898			
	SE3	0.849			
	SE4	0.836			
Performance expectancy	PE1	0.921	0.906	0.941	0.842
	PE2	0.928			
	PE3	0.904			
Effort expectancy	EE1	0.916	0.92	0.949	0.862
	EE2	0.942			
	EE3	0.927			
Social influences	SI1	0.839	0.895	0.927	0.76
	SI2	0.896			
	SI3	0.9			
	SI4	0.851			
Behavior intention	BI1	0.933	0.893	0.933	0.823
	BI2	0.895			
	BI4	0.894			
Facilitating condition	FC1	0.871	0.808	0.887	0.723
	FC2	0.861			
	FC3	0.819			

4.6. Coefficient of determinant (R^2)

The R^2 coefficient of determination is often used to measure the structural model and determine the predictive model's strength through the factors described. R^2 value ranges from 0 to 1, the high value indicates a greater level of predictive accuracy, whereby 0.75, 0.5, and 0.25 indicate substantial, moderate, and weak values (Isaias et al., 2017). The proposed model in this research successfully described the variance of factors affecting teachers' intention to use digital textbooks at the elementary level by obtaining 75.8%. Table 9 shows the results of the R^2 analysis.

4.7. Differences the use of digital textbooks for elementary school teachers based on demographic information

Subsequent research needs to investigate the effect of demographic information, using age, gender, and education level, on the intention of elementary school teachers to use digital textbooks. Table 10 shows that all p values are more than 0.05, indicating no significant difference between the demographic variables. Details on t-test results are shown in Table 10; Figure 2.

TABLE 4 Fornel–Larcker criteria.

	Affective	Attitude	Behavior intention	Effort expectancy	Facilitating condition	ICT usage habits	Perceived learning opportunities	Performance expectancy	Self-efficacy	Social influences
Affective	**0.888**									
Attitude	0.853	**0.883**								
Behavior intention	0.683	0.614	**0.907**							
Effort expectance	0.721	0.625	0.79	**0.928**						
Facilitating condition	0.592	0.552	0.711	0.717	**0.850**					
ICT usage habits	0.461	0.411	0.463	0.554	0.536	**0.921**				
Perceived learning opportunities	0.752	0.728	0.641	0.654	0.515	0.439	**0.890**			
Performance expectancy	0.727	0.68	0.715	0.747	0.614	0.496	0.78	**0.918**		
Self efficacy	0.776	0.7	0.72	0.802	0.637	0.519	0.764	0.826	**0.872**	
Social influences	0.648	0.581	0.805	0.717	0.725	0.482	0.588	0.673	0.672	**0.872**

The square root of AVE in bold.

5. Discussion

Technological advances affect all sectors, including education, by providing opportunities for teachers and students to use technology-based learning media and support for sustainable learning. Digital textbooks are alternative learning media that can be used both in face-to-face and online learning (Park et al., 2012; Bouck and Weng, 2014; Joo et al., 2017; Lee et al., 2020). Since this media have been developed in many countries, there are several factors capable of affecting elementary school teachers to use digital textbooks in the future. Therefore, this research is essential in order to obtain future information needed for sustainable education programs.

The findings indicate that PE, EE, SI, and FC significantly affect teachers' intention to use digital textbooks (see Table 7). Therefore, the average value of the respondents is needed to analyze the extent to which the variables affect the behavioral intention of elementary school teachers. The performance expectancy with an average effort expectancy, social influence, facilitating conditions, learning opportunities, and self-efficacy of 3.99, 3.77, 3.61, and 3.56 have a relationship with the teacher's intention to use a digital textbook. The relationship was moderate based on respondents' answers because the difference between the averages was not obvious. In terms of performance expectancy, the processed data shows that most elementary school teachers in Riau benefit from using digital textbooks during learning activities. Most teachers believe that using digital textbooks can improve their teaching performance because they are easy to use, in line with previous findings (Wijaya et al., 2022a). This is in line with the expectation that learning media should be easy to use and not require much effort to attract the users' attention. The respondents were males aged between 20 and 40 years who were born in the technology era, therefore they should have no difficulty adapting to its usage. In terms of elementary school teachers on social influence, the majority agreed that learning activities will become inseparable from technology-based media in the future.

Most of the respondents had Bachelor's education level, indicating their enthusiasm for learning new teaching methods is still quite high. Therefore, they perceive digital textbooks as new learning media to improve their performance in learning activities. This is similar to user responses to learning opportunities found by other inventors.

The finding also proved that the facilitating condition has an effect on the behavior intention of teachers to use digital textbooks. Facilitation condition here is defined as respondents expect schools and the government to continue improving facilities that help them implement various kinds of technology-based learning media (digital textbooks) in elementary schools. This means that most respondents live in suburban areas far from the capital city with poor computer equipment and internet facilities. Subsequently, the government needs to improve facilities and the internet in other provinces and villages to increase technology-based learning media and their education quality.

Social influence is the most important factor despite the significant effect of PE, EE, FC, perceived learning opportunities, and self-efficacy on the intentions of elementary school teachers to use digital textbooks (see Table 8). In this situation, the government and schools play an important role in providing training, support, and motivation to convince teachers to use digital textbooks due to their numerous beneficial effects. It is very important to emphasize that digital textbooks, teachers, students, and co-workers' opinions are

TABLE 5 Heterotrait–Monotrait ratio.

	Affective	Attitude	Behavior intention	Effort expectancy	Facilitating condition	ICT usage habits	Perceived learning opportunities	Performance expectancy	Self-efficacy	Social influences
Affective										
Attitude	0.834									
Behavior intention	0.755	0.679								
Effort expectance	0.788	0.682	0.871							
Facilitating condition	0.69	0.644	0.835	0.829						
ICT usage habits	0.503	0.448	0.508	0.602	0.618					
Perceived learning opportunities	0.824	0.801	0.709	0.713	0.6	0.478				
Performance expectancy	0.8	0.751	0.793	0.817	0.717	0.543	0.856			
Self efficacy	0.858	0.775	0.803	0.882	0.746	0.571	0.843	0.816		
Social influences	0.716	0.641	0.897	0.787	0.852	0.53	0.647	0.744	0.748	

TABLE 6 Variance inflation factor (VIF) value.

	Behavior intention	Effort expectancy	Performance expectancy
Affective	4.879		
Age	1.113		
Attitude	3.868		
Behavior intention			
Education	1.055		
Effort expectance	3.586		
Facilitating condition	2.683		
Gender	1.046		
ICT usage habits	1.695		
Perceived learning opportunities			2.403
Performance expectancy	2.951		
Self-efficacy		1.824	2.403
Social influences	2.822	1.824	

technology-based learning media capable of improving their teaching performance. When other people believe that they should use digital textbooks, they will perform better and be more professional in learning activities. Therefore, subsequent studies need to determine the level of PE, EE SI, FC, learning opportunities, and self-efficacy related to the use of digital textbooks.

In addition to the structural model, this research also examines whether the demographic information influences the behavior of teachers' intention to use digital textbooks. The t-test results showed that that it has no significant effect on demographic information, as illustrated in Table 10 and Figure 2.

6. Implication

This research significantly contributes to the literature on digital textbook adoption at the elementary school level by applying the UTAUT model. The process was conducted by applying the integration of technology-based learning media to improve students' understanding. The UTAUT model was further extended by integrating attitudes, learning opportunities, ICT usage habits, affective needs, and self-efficacy towards the use of digital textbooks. It provides sufficient information that learning opportunities and self-efficacy have a significant effect on the intention of elementary school teachers to use digital textbooks, with the exhaustion of attitudes and affective need is not a significant factor. Further research can examine the effect of learning opportunities and self-efficacy on the use of this tool for teaching and learning activities in elementary school.

The results have valuable insight into the crucial factors affecting BI of elementary teachers to adopt digital textbooks. This study also acts as a practical guideline to successfully increase its future use by

TABLE 7 Bootstrapping results.

	β	Sample Mean (M)	Standard Deviation (STDEV)	T-Statistics	p-value	Interpretation
PLO–PE	0.357	0.359	0.041	8.685	0.000	Significant
ATT–BI	0.021	0.023	0.051	0.417	0.677	Not significant
EFF–PE	0.553	0.551	0.041	13.574	0.000	Significant
EFF–EE	0.584	0.586	0.045	13.102	0.000	Significant
AN -BI	0.051	0.051	0.052	0.969	0.333	Not significant
IUH–BI	−0.058	−0.057	0.031	1.868	0.062	Not significant
FC–BI	0.109	0.110	0.047	2.290	0.022	Significant
SI–EE	0.324	0.324	0.040	8.089	0.000	Significant
SI–BI	0.404	0.403	0.045	8.933	0.000	Significant
EE–BI	0.316	0.312	0.056	5.665	0.000	Significant
PE–BI	0.117	0.118	0.043	2.745	0.006	Significant

TABLE 8 Bootstrapping results on the effect.

Factor	Determinant	Direct	Indirect	Total effect
Behavior intention $R^2 = 0.785$	Perceived learning opportunities	0	**2.368***	**2.368***
	Attitude	0.436	0	0.436
	Self-efficacy	0	**6.417***	**6.417***
	Affective	**1.014**	0	**1.014**
	ICT usage habits	**1.922**	0	**1.922**
	Facilitating condition	**2.336**	0	**2.336***
	Social influences	**6.304**	**4.699***	**11.003***
	Performance expectancy	**2.62**	0	**2.620***
	Effort expectancy	**5.783**	0	**5.783***
Performance expectancy	Perceived learning opportunities	**8.469**	0	**8.469***
$R^2 = 0.735$	Self-efficacy	**13.366**	0	**13.366***
Effort expectancy	Self-efficacy	**13.107**	0	**13.107***
$R^2 = 0.701$	Social influences	**8.085**	0	**8.085***

*$p < 0.05$.

TABLE 9 R-squared results.

	R^2	Results
Behavior intention	0.758	Substantial
Effort expectancy	0.701	Moderate
Performance expectancy	0.735	Moderate

TABLE 10 Moderator result.

Moderator	Mean	Standard deviation	t	p-value
Age	−0.002	0.023	0.084	0.933
Gender	−0.014	0.023	0.588	0.556
Education	0.019	0.026	0.711	0.477

teachers. Factors that greatly affect the use of digital textbooks make policymakers and principals increase its adoption at the elementary school level.

However, active daily use can help the teachers understand and master this media, making it important to utilize software and hardware equipment. Policymakers can support the acquisition, for instance, by dedicated budgets to support integration of digital textbooks in school.

Principals should realize that their schools have the ability to gain many benefits by adapting to the use of digital textbooks early. For example, it allows to create new learning environments, and teachers can adapt quickly when using digital textbooks compared to other schools. Furthermore, schools that previously used digital textbooks were seen as innovative, sophisticated, and advanced, with a positive image that caused them to attract more students.

This research provides valuable information for school principals aimed at increasing the use of technology-based learning media in schools, especially digital textbooks. The findings indicate that teachers need to be more convinced that the use of digital textbooks will make learning more effective than printed textbooks. A team or support system is needed to direct or assist teachers with difficulty using digital textbooks to teach students. Third, additional training on the effective use of these books is needed at the elementary school level. Therefore, this media can be used to the fullest and does not end up like those underutilized by teachers. Additionally, this research also provides valuable information for developers to improve and modify the quality of teacher learning.

7. Conclusion

This research examined the factors affecting the intention of elementary school teachers to use digital textbooks, using the Unified Theory of Acceptance and Use of Technology (UTAUT) in

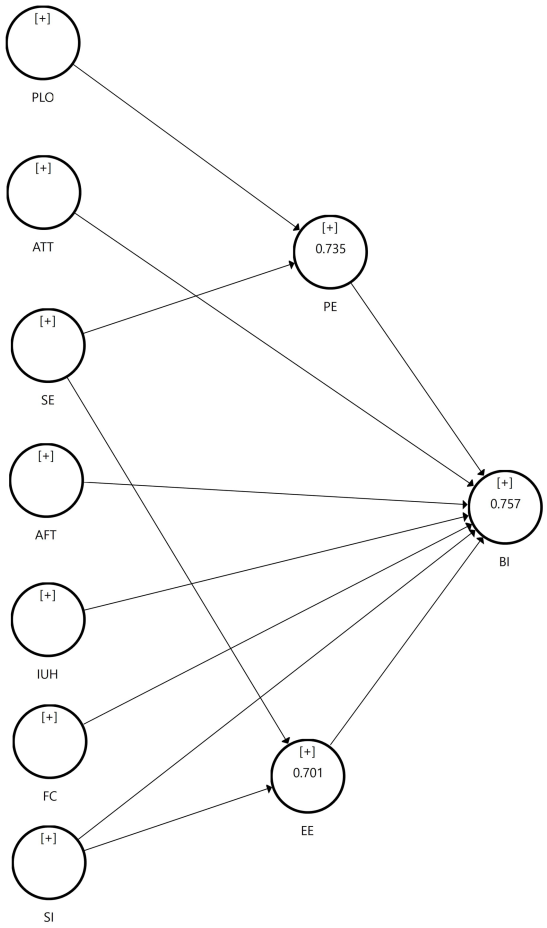

FIGURE 2
Final model with R^2 Values.

accordance with the differences between gender, age, and education level teachers. Therefore, this research provides educational institutions, especially at the elementary school level, to make fiscal and educational decisions regarding digital textbooks in a global technological environment. Although it offers a new pedagogical approach, elementary school teachers' preferences are not sophisticated. This shows that social influence, teacher self-efficacy, providing an easy-to-use and effective digital textbook to improve learning effectiveness is the first step capable of affecting teachers' intention. More instructional models need to be explored for using digital textbooks in learning activities. The teachers also need to be educated on the benefits of digital textbooks in teaching by conducting training. There should be an understanding of the teacher's needs and the factors affecting their intention to continue using digital textbooks in learning activities. Overall, the proposed model was only a significant predictor to determine the factors affecting digital textbooks in learning activities in elementary schools.

8. Limitation

This research is limited to several factors, making it possible for future studies to be conducted. First, the respondents were less than 500 teachers from Riau, Indonesia. The more respondents, the smaller the standard error and bias, hence geography and cultural factors may affect teachers' intention to use digital textbooks. Therefore, future research needs to investigate the use of different geographical and cultural contexts.

Second, this research used the UTAUT model as a theoretical framework to determine the extent of self-efficacy, ICT usage habits, learning opportunities, affective needs, and attitudes toward using digital textbooks, Holzmann et al. (2020).

Finally, due to the novelty of digital textbooks and low adoption at the elementary school level, this research was unable to test whether behavior intention in this context leads to actual use. Digital textbooks in Indonesia are still in the development stage therefore, future research needs to investigate whether teachers' intention facilitates its actual use at the elementary school level.

In Indonesia are still in the development stage therefore, future research needs to investigate whether teachers' intention facilitates its actual use at the elementary school level.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

NH: conceived, wrote the paper, and designed the analysis. TW and EY: contributed data or analysis tools, and wrote the paper. YA: performed the analysis. ZP and JA: collected the data.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Appendix A

Attitude (Liebenberg et al., 2018)

1. Using digital textbooks to teach in elementary schools is a good idea.
2. Digital textbooks make lessons more interesting.
3. I like to teach using a digital textbook.
4. Using digital textbooks makes teaching and learning activities fun (Briz-Ponce et al., 2017).

Affective need (Shukla, 2021)

1. I like to teach using a digital textbook.
2. I like to show other elementary school teachers how to use digital textbooks to teach.
3. The display, animation, illustrations in the digital textbook look very satisfying.
4. I really enjoy teaching using a digital textbook.

ICT usage habits (IUH) (Kim and Lee, 2020)

1. I have used a lot of technology-based learning media.
2. I studied a lot of technology-based learning media when I was in college (Bachelor/Master/Doctor).
3. I learned to use technology-based learning media in college (Bachelor/Master/Doctor).

Perceived learning opportunities (Balkaya and Akkucuk, 2021)

1. Digital textbooks provide opportunities to teach in new ways.
2. Digital textbooks provide opportunities to interact with students.
3. Digital textbooks provide opportunities for creative thinking.
4. Digital textbooks provide an opportunity to motivate students.

Self-efficacy (Balkaya and Akkucuk, 2021)

1. I feel more confident when I teach using a digital textbook.
2. I feel more confident preparing lessons using a digital textbook.
3. I strongly believe I can use a digital textbook after I see other people using it.
4. I believe I can use a digital textbook even though I have never used one before.

Performance expectancy (Shukla, 2021)

1. Digital textbooks improve my teaching quality.
2. Teaching using digital textbooks increases my productivity.
3. Digital textbooks help me when teaching elementary materials.

Effort expectancy

1. It is easy for me to teach using a digital textbook.
2. I find the digital textbook easy to use.
3. Using a digital textbook for teaching does not require much preparation.

Social influences (Balkaya and Akkucuk, 2021)

1. My close friends and relatives think I should use a digital textbook to teach.
2. Other elementary school teachers use digital textbooks when teaching.
3. Another elementary school teacher advised me to use a digital textbook when teaching.
4. In general, the school supports me using digital textbooks.

Behavior intention

1. I will continue to use digital textbooks to teach.
2. I will use the digital textbook whenever the situation allows.
3. I think most of my teaching will be conducted using digital textbooks.

Facilitating condition

1. I have the equipment to use digital textbooks to teach.
2. Some teachers and teams will help me whenever I have difficulty using digital textbooks.
3. There is training on the use of digital textbooks for elementary school teachers.