Exploring intervention of e-textbook in schools: Teachers' perspectives

Amal Alibrahim (iD) **and Elham Alsadoon** (iD)
Curriculum and Instruction, Faculty of Education, King Saud University, Riyadh, Saudi Arabia
amabdull@ksu.edu.sa

As an innovative educational tool, e-textbooks has gained wide interest – especially with the growth of e-learning. As with any new technology, understanding how users adopt these technologies is still unclear. In the study reported on here we proposed a theoretical model shaping the determinants of teachers' attitude toward e-textbooks. Specifically, we identified three contextualised factors (ease of use, usefulness, and concerns) as the factors of adopting e-textbooks. In addition, we examined teachers' use of e-textbooks. A mixed-methods research design was used in which quantitative and qualitative data were collected and analysed. The results show that teachers held positive attitudes toward using e-textbooks in their teaching and used them as instructional aids. The results might inform education decision-makers who are planning to integrate e-textbooks into their schools in line with digital transformation and the knowledge society.

Keywords: attitudes; e-textbooks, K-12 education; mixed methods; perceptions

Introduction

The growing amount of digital content and increased ownership of digital devices have made e-textbooks common in education (Hao & Jackson, 2014). Such equipment has already been implemented in many classroom activities worldwide (Embong, Noor, Rafek, Othman & Khalid, 2014), creating broad interest in using e-textbooks to supplement or replace printed textbooks (Liaw & Huang, 2016). Moreover, when educational organisations began to incorporate e-textbooks into education (Embong et al., 2014) it helped spread them among learners (Van Schalkwyk, 2017). Recently, they have become an essential part of learners' learning experiences at all levels (Ragan, Kammer, Atkins & Burress, 2019).

Saudi Arabia has joined the move toward e-textbook implementation in education and has taken the initiative to transform the traditional textbook into digital form (Al-Sahil, 2017). As with any technology, bringing e-textbooks into the education field elicited new responsibilities and challenges for teachers and learners. Although teachers have more responsibility to implement e-textbooks and their features into learning experiences (Ragan et al., 2019), some do not take advantage of the features that e-textbooks provide (Hao & Jackson, 2014). Teachers' use of and attitudes towards e-textbooks in education need to be examined to help facilitate their implementation. Studies investigating the use of e-textbooks have focused on learners in the higher education sector (Al Saadi, Lane-Kelso, Al Hafeedh, Al Sheithani & Al Wishahi, 2017; Ebied & Rahman, 2015; Falc, 2013; Fouh, Breakiron, Hamouda, Farghally & Shaffer, 2014; Hao & Jackson, 2014; Jeong, 2012; Khan, Bhatti & Khan, 2016; Liaw & Huang, 2016; Woody, Daniel & Baker, 2010). In this study we examined how K-12 Saudi teachers used e-textbooks, as well as their attitudes toward implementing e-textbooks in learning and what factors drove such attitudes.

With this study we attempted to address the following questions:
1) How do K-12 Saudi teachers use e-textbooks?
2) What are teachers' attitudes toward using e-textbooks in K-12 education?
3) What factors influence teachers' attitudes towards using e-textbooks in education?
4) Is there a significant difference between male and female teachers in their attitudes toward using e-textbooks in education

Literature Review
E-textbooks in teaching and learning

Researchers have found that the features of e-textbooks' can increase learning (Ragan et al., 2019). Such features include peer review, sharing functionality and content creation (Fouh et al., 2014), ease of updating, portability (Ebied & Rahman, 2015), and ease of use, e.g., their user-friendly interface (Liaw & Huang, 2016). Multimedia integration is another important advantage of e-textbooks (Hao & Jackson, 2014) rendering them visually appealing and allowing for the addition of supporting materials (Woody et al., 2010). With the use of e-textbooks, teachers can add supplemental material, provide immediate feedback, and present information in different ways (Ragan et al., 2019). E-books also provide advantages for learners with special needs. For example, reading aloud is a feature that helps learners with reading difficulties (Zinn & Langdown, 2011).

Ebied and Rahman (2015) boost the educational value of e-textbooks, e.g., helping to turn the teacher's role into that of facilitator and the learner's role into that of active participant in acquiring information and constructing learning at his or her own pace. E-textbooks give learners control of their learning, which develops independent-learning skills. Furthermore, e-textbooks support pedagogical practices based on constructivist principles, interactivity, collaboration, and project-based learning (Embong et al., 2014). Falc (2013) asserts that the features

of e-textbooks, such as searching, copying, and pasting, support the discovery of new information. Interactivity and the support for collaboration that e-books provide have been found to facilitate authentic learning (Chiu, 2017) and increase learner involvement, leading to improved outcomes (Hao & Jackson, 2014). Van Schalkwyk (2017) highlights other educational benefits of e-textbooks, such as motivating learners to read – an important element of learning – and enriching learners' knowledge through the use of hyperlinks. Liaw and Huang (2016) assert that e-textbooks improve learners' satisfaction and performance, as well as enhance learning efficacy. However, drawbacks inherent in e-textbooks could hinder learning and teaching. For example, their limited downloading and printing capabilities, as well as limited annotation tools, may hold serious consequences for learners' learning (Falc, 2013). Hao and Jackson (2014) found that the reading performance level from reading printed books was higher than that from reading e-textbooks. In addition, learners found it difficult to concentrate, retain information, and learn while reading from a screen (Li, Chen & Yang, 2013). Finally, using e-textbooks may increase teachers' workloads (Chiu, 2017).

Teachers implemented e-textbooks to support teaching and learning activities, as well as reading and presentation (Lin, Liu & Kinshuk, 2015). E-textbooks have been used in classrooms as scaffolds (De Oliveira, Camacho & Gisbert, 2014) offering various features that allow teachers to assign relevant materials easily and provide different resources, such as texts, photos, animations, audio, and video, as well as easy access to internet resources. They also provide such basic text functions as highlighting, searching, editing, annotating, bookmarking, and referencing (Lin et al., 2015).

The use of e-textbooks in the classroom, as with any technology, varies depending on several factors. Usually, the teachers decide how to adopt technology in the classroom, and their attitudes toward technology lead the way (Lin et al., 2015). Teachers' perceptions of technology were found to be an important influence on their use of it. In a study by De Oliveira et al. (2014), the researchers found that one teacher's beliefs influenced how he used e-textbooks. He printed the lessons in anticipation of any technical problems and to prevent learners from getting lost in menu navigation. He thought that the printed version would be useful for learners at home. However, teachers will not replace printed learning resources with digital versions because they believe that their learners still prefer printed versions over digitalised ones in school or at home (Elesini & Tomažin, 2018).

E-textbooks further provide learners with a platform for collaborative learning (Sun, Flores & Tanguma, 2012) allowing learners to work in groups, which affords teachers more time to provide support for those who need more help (De Oliveira et al., 2014) while using animation in e-textbooks to help learners memorise content (Elesini & Tomažin, 2018). One example of using e-textbooks as a teaching tool is using them to provide hyperlinks to a bilingual dictionary with synchronised audio to help learners who speak a different language (Chu, 2003). Grading assignments were assigned to learners, and teachers knew which part required more attention and who understood the material correctly (McFall, Dershem & Davis, 2006).

In terms of cost, several studies suggest that e-textbooks could decrease the expense of producing textbooks (De Oliveira et al., 2014). However, to actively engage learners in using e-textbooks, schools will need to provide essential resources (Sun et al., 2012). There are different ways in which schools provide e-textbooks to learners. For example, schools in the United States of America provide several business models, such as "subscription to permanent access, license for a certain period, license with a certain amount of traffic, the simultaneous use with other digital products, the usage fee (i.e., price per download)" (Vorotnykova, 2019:94). Institutions have adopted digital learning platforms, with e-interactive textbooks, as well as quizzes, among the items that are attracting instructors (Van Horne, Russell & Schuh, 2016).

Factors influencing attitudes
Previous studies reveal factors that influence users' attitudes toward e-textbooks. Ease of use and perceived usefulness were significant factors in predicting users' attitudes toward e-textbooks (Jalal, Ayub & Tarmizi, 2014; Li et al., 2013; Liaw & Huang, 2016; Tri-Agif, Noorhidawati & Ghalebandi, 2016). One study of teachers' attitudes toward e-textbooks indicated that their usefulness, rather than their ease of use, appealed to teachers (Jalal et al., 2014). A related factor is self-efficacy, which refers to one's feelings about one's own ability to use technology to accomplish a specific task (Ahmad, 2015). It has been found to be significant in explaining the use of e-textbooks (Chiu, 2017; Liaw & Huang, 2016; Tri-Agif et al., 2016; Waheed, Kaur, Ain & Sanni, 2015). Using new technology may be perceived as easy by teachers who have high self-efficacy (Chiu, 2017).

In addition, organisational factors may be involved. These are the aids that schools provide to teachers through policies or technical support (Chiu, 2017). Research on teachers' use of technology in their classrooms proposes that teachers' attitudes toward such use are correlated with their schools' technology vision (Blackwell, Lauricella & Wartella, 2014). Schools that aim to use technology in learning provide teachers with financial,

technical, and professional development support to help them achieve their goals. Organisational support has been found to affect the use of technology positively; thus, teachers who perceived support from their schools tended to implement technology in their classrooms (Chiu, 2017). Moreover, subjective norms such as peer influence can be "determined by beliefs about what specific important others think one should do and how much one is motivated to comply with those important others" (Trafimow, 2009:506). One study found peer influence to be significant in predicting users' attitudes toward e-textbooks (Chiu, 2017), but another study found it to be insignificant (Ahmad, 2015).

Furthermore, perceiving e-textbooks as being a convenient tool was found to be influential in their adoption (Waheed et al., 2015). Although readers with previous e-textbook experience found them more comfortable to read, this quality did not increase their preference for them (Woody et al., 2010). Professional fields have been found to influence the use of technology. Learners in hard-science disciplines were more likely to adopt e-textbooks than learners in social science disciplines (Khan et al., 2016). However, age and educational status exerted no significant impact (Khan et al., 2016).

Methodology
Research Design
In this study we used a sequential exploratory mixed methods research design in which qualitative data collected from a focus group and interviews were used to develop a survey (Creswell & Clark, 2018), making the study objective and holistic (Onwuegbuzie, Bustamante & Nelson, 2010), and affording us an opportunity to refine the survey items and integrate the collected data into the survey. Because we investigated a new phenomenon, the mixed methods approach was used to gauge breadth and depth of understanding (Creswell & Clark, 2018). The focus group and interviews gave voice to the teachers and provided rich details. The rationale for mixed methods was for significance enhancement by allowing us to maximise data interpretation (Onwuegbuzie et al., 2010).

Qualitative Component
Participants
The target population was teachers in K-12 education. Six such teachers participated in the focus group session, and another seven participated in the semi-structured interviews. The focus group participants were chosen purposively. They were students at university with at least 3 years of teaching experience. Snowball sampling was applied – an initial interviewer was chosen, who then recommended another participant, etc. We asked teachers who had used e-textbooks to participate in the study. Table 1 provides information about the participants.

Table 1 Demographic data on participants in focus group and interviews

Participants	Numbers of participants	Specialty	Teachers' experience		
No.			1–5 years	6–15 years	16+ years
Focus group	6 teachers	Computer education	1	5	
Interview	2 teachers	Religious studies		1	1
3	2 teachers	Arabic studies			2
4	1 teacher	English language			1
5	2 teachers	Science		1	1

Data Collection
Focus group
A focus group, viewed as the best tool to acquire initial information for investigation, was the primary instrument used to collect qualitative data (Wellington, 2000). This method's power is that "the participants', rather than the researcher's agenda, can predominate" (Cohen, Manion & Morrison, 2007:376). "Focus groups can be a valuable tool, efficient for collecting data and sometimes giving insights in addition to one-to-one interviews" (Wellington, 2000:127).

One session was conducted on the university campus with six female high school teachers. Their topic of discussion was e-textbooks and the discussions lasted about 45 minutes. We carefully set up the group's environment to ensure that it was easy for all members to participate. During the focus-group session, participants were asked to reflect on their use of e-textbooks. No other questions were asked. The research team acted as moderators to keep the discussion focussed and give the participants space to question/stimulate each other. With the group's permission, the session was taped and later transcribed. The transcript was sent back to the participants for reviewing. The results from this session led to the development of the interview questions.

Semi-structured one-to-one interviews

Wellington (2000:71) argues that "interviews can reach the parts which other methods cannot reach." The semi-structured interviews applied in this study were used to triangulate other methods. After analysing the data collected from the focus group, guideline questions were developed for the interviews. Table 2 presents some questions which may have been raised based on the interviewee's answers. The interviews lasted 20 to 30 minutes each and were scheduled at times and places convenient for the interviewees. The results from the focus group and interviews subsequently guided the development of the questionnaire. The use of both quantitative and qualitative data provides greater insight into the phenomena studied (Cohen et al., 2007).

Table 2 Guideline questions for the semi-structured interviews

1	Use	Do you use e-textbook?
		How do you use it?
		Where/when do you use it?
2	Difficulty	Have you faced any difficulties while using it?
3	Benefits	Why do you use it? What are the advantages of using it?
		Any added value of using e-textbook in your teaching?
4	Suggestions	Do you have any suggestions?
		Do you want to add anything more?

Trustworthiness/Authenticity

In qualitative research, trustworthiness and authenticity are established as alternatives of the validity and reliability found in quantitative research (Lincoln & Guba, 1985, cited in Wellington, 2000). In this research, we used triangulation (using two or more methods) to increase the accuracy and validity of the research (Cohen et al., 2007; Wellington, 2000).

Adding to the validity of the data, we followed a rigorous procedure for data collection and data analysis. In addition, the data were analysed until a saturation point was reached at which no new themes emerged, which increased the credibility of the results. The participants' confidence was increased as the interviews were anonymous. Additionally, transferability is an important component (Cohen et al., 2007), so detailed descriptions of the data collection and data analysis were provided to ensure transferability of the study.

Data Analysis

The data collected from the focus group and semi-structured interviews were analysed qualitatively.

The focus-group session and interviews were recorded, then transcribed. Firstly, the focus-group transcript was verified, then the data were analysed. The interview data were then analysed separately. We used thematic analysis, in which themes emerged from the data during the process. We were open-minded about the themes that could emerge relating to the research.

We read through the data without analysing it, then gained some distance from the data after which the data were reread, following Wellington's approach of "immersing oneself in the data" (2000:135). We then started coding the data, and themes emerged. When a saturation point was reached and no more themes emerged, we stopped coding and started to sort the resulting themes from the focus group and interviews. Themes that related to each other were grouped and categorised.

Table 3 presents the categories and themes that emerged from the focus group, which resulted in the guideline questions developed for the interviews. Table 4 presents the themes that emerged from the interviews and were used to develop the survey.

Table 3 Summary of focus group results

Categories	Themes
Use	• The teacher's book (e-book) was available to all teachers. It had been difficult to find before. • Used in lesson planning. • Refer to e-book sometimes in classroom (e.g., as a presentation, to answer the assignment, or to refer to homework).
Difficulties	• Limited internet access and download. • Need more storage space. • School's policy for electronic devices and access to the internet. • Technical issues.
Features	• Ease of access. • Alternative solutions when books are lost or delayed.
Recommendations	• Increase interactive features. • Add more information (enrichment).

Table 4 Summary of interview results

Factors	Attitude	Themes
Ease of use	positive	
Usefulness	positive	
Efficiency	positive	• Searching
		• Interactive with learner in class
		• Instructional aid/presentation
Convenience	positive	• Cost
		• Easy to carry/store (small size)
		• Offline use
		• Mobility
		• Availability (anywhere/anytime)
Organisational/institutional	positive	• Support
		• Policy
		• Infrastructure
		• Maintenance
Peer support	positive	
Computer self-efficacy	positive	• Motivation, intuition, computer skills
	negative	• Anxiety, "attitude"
Concerns about their learners	negative	• Learning (study) skills
		• Understanding
		• Addicted to technology
		• Cost of device
Technical factors	negative	• Difficult to find/download
		• Interactive book
		• Reliability
		• Not for all subjects

Quantitative Component
Participants and data collection
A questionnaire was designed in light of this information and administered online to collect quantitative data. Approval was obtained to contact teachers through their advisors. A personal electronic mail (e-mail) was sent to approximately 400 teachers explaining the aim and the benefits of the study. They were asked to participate and were informed that their participation was voluntarily. Two weeks later, the questionnaire was closed, and the data were downloaded and analysed quantitatively. In all, 166 teachers responded. Table 5 provides the distribution of participants among the data collection instruments.

Table 5 Distribution of participants among the instruments

Instruments	Number of participants
Focus group	6
Semi-structured one-on-one interviews	7
Questionnaire	166
Total	179

Based on the literature, as well as analysis of the qualitative data collected from the focus group and semi-structured interviews, we developed a questionnaire. The survey comprised two sections. In the first, demographic data of the participants,

such as gender, age, years of teaching experience, education level, specialty, school level at which they taught, and their computer-skill level were collected. In the second section data on eight constructs related to their attitudes toward the use of e-textbooks were collected. Seven of these constructs had emerged from the qualitative data as influencing the teachers' thoughts about using e-textbooks (ease of use, self-efficacy, usefulness, concerns, institutional support, peer support, and convenience). Table 6 lists these constructs and the number of items within each one; Table 7 provides more details on these items.

Table 6 Reliability statistics for the survey constructs ($N = 166$)

	Construct	Cronbach's alpha coefficient	Number of items	*M*	*SD*
1	Attitude	.931	3	3.886	1.09
2	Ease of use	.788	3	3.956	0.91
3	Self-efficacy	.868	3	4.098	0.87
4	Usefulness	.950	5	3.788	1.04
5	Concerns	.797	5	3.386	0.87
6	Institutional support	.825	4	2.720	0.99
7	Peer support	.872	3	2.867	0.95
8	Conveniences	.937	5	3.984	0.14

Table 7 Item percentages, means, and standard deviations

Scale		Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	*M*	*SD*
Attitude	1	I plan to use (to continue using) e-textbooks in teaching.	32%	32%	20%	10%	6%	3.8	1.2
	2	Using e-textbooks would be fun for me.	37%	36%	14%	6%	7%	3.9	1.2
	3	The use of e-textbooks is essential in this age.	42%	34%	11%	7%	6%	4.0	1.2
Ease of use	4	E-textbooks are easy to use.	36%	42%	10%	7%	5%	4.0	1.1
	5	I do not need training to use e-textbooks.	32%	38%	16%	10%	4%	3.8	1.1
	6	I can download e-textbooks easily from the internet.	43%	34%	14%	6%	3%	4.1	1.0
Self-efficacy	7	I have the skills to use technology effectively.	39%	34%	18%	7%	2%	4.0	1.0
	8	The use of technology does not cause any anxiety or tension for me.	45%	36%	12%	5%	2%	4.2	.98
	9	I have no trouble trying new techniques.	40%	41%	14%	3%	2%	4.1	.91
Usefulness	10	Using e-textbooks will improve my teaching strategies.	30%	30%	25%	9%	6%	3.7	1.2
	11	I think that the e-textbook is an effective teaching tool.	30%	36%	20%	9%	5%	3.8	1.1
	12	Using e-textbooks will increase interaction between me and my learners.	30%	34%	21%	10%	5%	3.7	1.2
	13	Using e-textbooks will facilitate my duties as a teacher.	36%	34%	18%	5%	7%	3.9	1.2
	14	Using e-textbooks will allow me to present lessons in a way that is interesting for learners.	36%	33%	20%	6%	5%	3.9	1.1
Concerns	15	The use of e-textbooks will affect learners' educational skills negatively.	13%	20%	26%	31%	10%	3.0	1.2
	16	Understanding educational content will be better when using printed textbooks than when using e-textbooks.	21%	27%	30%	16%	6%	3.4	1.2
	17	Using e-textbooks will affect learners' health negatively.	17%	24%	28%	21%	10%	3.0	1.2
	18	Learners cannot afford to buy devices to download e-textbooks.	35%	31%	22%	7%	5%	3.8	1.1

Alibrahim, Alsadoon

Scale		Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	*M*	*SD*
	19	Using e-textbooks can cause learners to become addicted to technology.	26%	27%	25%	19%	3%	3.5	1.2
Institutional support	20	My school has the infrastructure to use e-textbooks.	8%	16%	26%	24%	26%	2.5	1.3
	21	My school supports the use of e-textbooks.	7%	14%	34%	30%	15%	2.7	1.2
	22	My school policies support the use of e-textbooks.	13%	29%	26%	19%	13%	3.2	1.2
	23	The school has technical support to help me solve technical problems when using e-textbooks.	9%	17%	21%	28%	25%	2.6	1.3
Peer support	24	My colleagues use e-textbooks.	4%	22%	31%	31%	12%	2.8	1.1
	25	My colleagues encourage me to use e-textbooks.	5%	19%	38%	27%	11%	2.8	1.1
	26	My colleagues who use e-textbooks are satisfied about their use.	8%	26%	40%	15%	11%	3.1	1.1
Convenience	27	The ability to carry e-textbooks anywhere encourages me to use them.	33%	47%	13%	4%	4%	4.0	1.0
	28	The small size of e-textbooks encourages me to use them.	36%	41%	13%	5%	5%	4.0	1.1
	29	The light weight of e-textbooks encourages me to use them.	39%	40%	14%	3%	4%	4.1	1.0
	30	Using e-textbooks offline encourages me to use them.	46%	37%	10%	2%	5%	4.2	1.1
	31	The affordable price of e-textbooks encourages me to use them.	30%	33%	23%	8%	6%	3.7	1.2

Validity and Reliability

After the questionnaire was developed, four faculty members assessed its validity, and it was revised based on their comments. A pilot study involving 20 teachers was conducted to ensure the questionnaire's clarity and reliability. A Confirmatory Factor Analysis (CFA) was conducted to verify the survey's construct validity. This showed that no editing was required.

The Cronbach's alpha coefficient for internal consistency was used to examine the instrument's reliability. The scales' alpha coefficients ranged from .79 to .95. Table 6 provides each scale's alpha coefficient, number of items, mean, and standard deviation.

Data Analysis

The Statistical Package for Social Sciences (SPSS) software was used to analyse the quantitative data. Descriptive statistics on means, standard deviations, frequencies, and percentages were used to interpret the data to answer the first research question and ascertain the teachers' attitudes toward the use of e-textbooks. Multiple regression analysis was used to examine whether the factors identified from Step 1 were significant predictors of teachers' attitudes towards the use of e-textbooks.

Results

Participants' Demographic Data

Of the 166 participants who completed the survey, 114 (69%) were female, and 52 (31%) were male. As shown in Table 8, there were 113 (68%) holders of bachelor's degrees, 49 (30%) holders of master's degrees, and four (2%) holders of doctorates. Broken down by years of experience, most participants (114, 68%) had more than 10 years of experience; 36 (22%) had 5 to 10 years of experience, and 16 (10%) had less than 5 years of experience. Almost half the participants (81 - 49%) were over the age 45, 69 (42%) were 30 to 45 years old, and only 16 (10%) were younger than 30 years. The participants were distributed among the three school levels as follows: 36 (22%) taught elementary school, 24 (15%) taught middle school,

and 64 (38%) taught secondary school.

Table 8 Participants' demographic data

Variable	Levels	N	%
Gender	Male	52	31.3
	Female	114	68.7
Education level	Bachelor's	113	68.1
	Master's	49	29.5
	Doctorate	4	2.4
Years of experience	Less than 5 years	16	9.6
	From 5 to 10 years	36	21.7
	More than 10 years	114	68.7
Age	Less than 30	16	9.6
	From 30 to 45	69	41.6
	More than 45	81	48.8
Specialty	Math	20	12.0
	Arabic	22	13.3
	Art	8	4.8
	Computer	26	15.7
	English	10	6.0
	Islamic	22	13.3
	Others	27	16.3
	Physical Education	3	1.8
	Sciences	18	10.8
	Social Studies	10	6.0
School level	Elementary	36	21.7
	Middle	24	14.5
	Secondary	64	38.6
Computer skills	Beginner	27	16.3
	In-between	63	38.0
	Advanced	76	45.8

In response to the computer-skills item, 27 (16%) teachers described themselves as beginners, 63 (38%) placed themselves in the in-between category, and almost half believed themselves to be advanced in using technology. Table 8 provides this demographic data, including participants' areas of specialty.

Analysis of Research Questions

To answer the first question, How do K-12 Saudi teachers use e-textbooks?, qualitative data were analysed.

Focus group results

After the focus-group session, data were analysed qualitatively. The results from this analysis were categorised into themes (cf. Table 3). Four main themes emerged at this stage: teachers' use of e-textbooks; difficulties; features; and recommendations. The participants believed that e-textbooks were useful in everyday teaching, including in classrooms. Some teachers downloaded e-textbooks onto whiteboards and used them as presentations or guides to answer book questions. In addition, the participants perceived that e-textbooks were solving the shortage of teachers' books because e-textbooks are available online and can be downloaded at any time. However, many difficulties in using the e-textbooks were reported during the focus-group session (e.g., the need for more storage space, schools' policies for electronic use and internet access, technical issues; a few of the participants raised the issue of the difficulty of downloading e-textbooks and accessing the internet, stressing the need for institutional support). All participants agreed that e-textbooks were easy to use and were viewed as good solutions when paper textbooks were lost or delayed. All participants agreed that e-textbooks provided more interactive features and information than paper textbooks could provide.

Interview results

An analysis of the interview data revealed that the participants held a positive attitude toward e-textbooks because of their ease of use, usefulness, efficiency, and convenience, but this depended on peer support, computer self-efficacy, and organisational/institutional support. Concerns about their learners, anxiety, and technical issues limited these teachers' use of e-textbooks. In addition, the data revealed some of the teachers' use of e-textbooks in classrooms. Participants' perspectives are summarised in Table 4.

The participants perceived that e-textbooks were easy to use, useful, and efficient (for searching, interacting with learners in class, and as instructional aids/presentations). One participant commented as follows: "*All the e-textbooks on (the) iEN platform which is a Saudi national education portal, are on the Portable Document Format, which anyone can download. It is easy and clear how to download and explore it, and it can also be used offline.*" Another commented: "*It saves (me) time; it is easy to use.*" Another added: "*It is replacing the textbook, especially when the textbook is late or is not received.*"

The results show that the teachers used e-textbooks in their classes as presentation tools and discussion aids. One participant explained how she interacts with her learners using e-textbooks in the classroom, in which she presented the e-textbook on a smartboard: "*I let the students engage with the book, read the content of the subject, discuss it, present the main ideas, read the questions, and have a discussion on the pictures and diagrams.*" Other teachers use the e-textbook to discuss and correct homework. One of them explained as follows: "*When I want my students to copy the correct answer or* [want to] *check their answers, I plug the e-textbook into the projector.*" Interestingly, using e-textbooks inspires learners/teachers to read other e-books:

> *I encourage my students to search for other e-books on the web*;
> *I refer/search many e-books in my subject.*

Moreover, all the participants perceived that the e-textbook was convenient (cost-effective, easy to carry/store, offline use, mobility, availability). One of the participants said: "*For me, the searching and cost (are) suitable.... The book is in my mobile .... Also, a student has all his/her textbook, notes, homework in one device.*" Another commented as follows: "*I load it on my mobile, refer to it any time.*"

Nevertheless, the participants asserted that their use depended on peer support, computer self-efficacy, and organisational/institutional support. As one participant said: "*If the ministry obligates using e-textbooks, the teacher will use it.*" On the other hand, this teacher spoke about the support from her school: "*My school introduced the digital content and national educational portal for us. It is a wonderful education platform.... I started using the e-textbook and encourage other teachers to use it.*" Another teacher commented: "*School policies banned students from using smart devices at school.*" Peer support is clear in this participant's comment: "*We did not receive the textbook–paper. One of my colleagues does not know about technology, I convinced her to use the e-textbook, and she likes that.*"

However, the teachers were concerned about their learners. Anxiety and technical factors reportedly limited their use of e-textbooks. As one reported: "*I don't prefer e-textbooks for students. Reading a paper book, looking through it, (the) feeling of it, I think it is more understandable.*" Another explained: "*Some skills will disappear with e-textbooks, like holding a pen, writing, and exploring books.*" Another reported: "*(The) e-textbook isn't interactive. Some teachers prefer presenting with PowerPoint. It is more interactive.*" Many participants agreed that e-textbooks were not interactive, and that only highlighting and writing notes can be done. As a result, one teacher said: "*We have a project in the school to use augmented reality with e-textbooks.*"

After having re-read the data, we decided that *usefulness* and *efficiency* were grouped as one factor. *Searching*, *interactive with students in class*, and *instructional aid/presentation* were categorized as *efficiency*, which can also be regarded as *usefulness*. In addition, *concern about their learners*

and *technical factors* or *concern about technical issues* were grouped as one item, *concerns.* These were the factors that influenced the teachers' attitudes toward e-textbooks (cf. Table 4).

To answer the second question: What are teachers' attitudes toward using e-textbooks in K-12 education?
Frequencies, percentages, mean, and standard deviation for the 31 items were calculated. As shown in Table 7, the mean values ranged from 2.5 to 4.2, and standard deviations ranged from 0.91 to 1.2, representing a properly positive response to the items. Responses to each item were measured on a 5-point Likert scale ("strongly agree" = 5 points, "strongly disagree" = 1 point). The constructs' means and standard deviations were also calculated, and their values are presented in Table 6. The highest mean was gained from the self-efficacy construct ($M = 4.1$; $SD = 0.87$), while the lowest mean came from the institutional support construct ($M = 2.7$; $SD = 0.99$).

In addition, the results indicate that 64% of participants planned to use (or continue using) e-textbooks in teaching; 73% believed that using e-textbooks would be fun, and 76% that using e-textbooks was essential in the modern age. The mean for the attitude factor was 3.9 ($SD = 1.1$), indicating positive attitudes toward the use of e-textbooks. Item percentages, means, and standard deviations are presented in Table 7.

To answer the third question – What factors influence teachers' attitudes toward using e-textbooks in education? – and to examine the possible predictors' (ease of use, self-efficacy, usefulness, concerns, institutional support, peer support, and convenience) influence on teachers' attitudes toward the use of e-textbooks, a multiple regression (Method = Enter) was run, and the results are presented in Table 9. The overall regression was statistically significant ($R = .88$, $R^2 = .77$, adjusted $R^2 = .76$, F [7,158] = 73.411). To assess the statistical significance of the contribution of individual predictors, the t ratios for the individual regression slopes were examined. Three of the seven predictors were significantly predictive of teachers' attitudes toward the use of e-textbooks: ease of use, t (158) = 4.413; usefulness, t (158) = 3.204; and concerns, t (-158) = 3.204.

Table 9 Results from multiple regression to predict teachers' attitudes from suggested factors

	Ease of use	Self-efficacy	Usefulness	Concerns	Institution support	Peer support	Convenience	*b*	B	*t*
Ease of use								0.309	0.256	4.41*
Self-efficacy	0.66**							-0.040	-0.032	-0.59
Usefulness	0.61**	0.51**						0.599	0.570	9.19*
Concerns	0.09	0.94	-0.25**					-0.164	-0.130	3.20*
Institutional support	0.21**	0.15	0.30**	-0.86				-0.007	-0.001	-0.135
Peer support	0.35**	0.19*	0.49**	0.17	0.59**			0.063	0.054	1.00
Convenience	0.53**	0.45**	0.70**	-0.22**	0.24**	0.43**		0.837	0.10	1.85

Note. *p = > 0.05; **p = > 0.10.

The final model is shown in Figure 1:

$$TP = -.5 + .3\,E + .6\,U - .2\,C,$$ in which:

TP = teachers' attitudes toward using e-textbooks in education
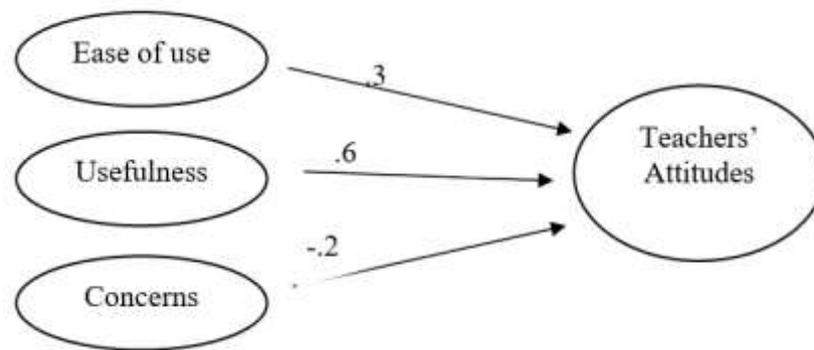
E = ease of use

U = usefulness

C = concerns

An independent samples *t*-test was conducted to answer the fourth question: Is there a significant difference between male and female teachers in their attitudes toward using e-textbooks in education? The results show that no statistically significant difference existed between male and female teachers regarding their attitudes towards the use of e-textbooks (t [86] = .088, $p > 0.05$).

Figure 1 Model predicting teachers' attitudes toward use of e-textbooks

Discussion

This research was motivated by the popularity of e-textbooks and the drive to implement e-textbooks in K-12 classes as part of digital transformation in educational institutions. With this study we investigated K-12 teachers' use of and attitudes towards e-textbooks and the factors influencing these attitudes. From the previous sections, key findings emerging from qualitative analysis concerned Saudi teachers' use and perceptions of e-textbooks. Our results demonstrate that the teachers held a positive attitude towards e-textbooks because of their ease of use, usefulness, efficiency, and convenience. However, this attitude depended on peer support, computer self-efficacy, and organisational/institutional support. In line with previous studies (De Oliveira et al., 2014), many teachers asserted that with institutional support their use of e-textbooks would increase and become embedded smoothly. Nevertheless, concerns about learners, anxiety, and technical factors reportedly limited teachers' use of e-textbooks. The teachers were concerned about the learning skills that their learners might lose while using e-textbooks. Just as the learners did, teachers found it difficult to read and learn from a screen (Li et al., 2013), in contrast to Van Schalkwyk's (2017) findings that e-books motivate and enrich learners' learning.

We found that teachers were using e-textbooks as a presentation and discussion aid. They discussed content or homework and corrected it, as did other teachers (De Oliveira et al., 2014; Lin et al., 2015). One reason for the teachers' limited use may be that no differences existed between current e-textbook versions and paper books; both afforded highlighting and memo-writing functions only. However, an interactive e-textbook may spur teachers to use it in more diverse ways. In line with previous studies (Hao & Jackson, 2014; Van Schalkwyk, 2017; Woody et al., 2010), all teachers indicated the importance of improving e-textbooks to be more interactive: e.g., integrate multimedia and hyperlinks, noting that interactive e-textbooks would improve and enrich learners' learning.

The results from the qualitative and quantitative analyses confirm that, despite their concerns about a negative impact on learners ($M = 3.4$, $SD = 0.9$), K-12 teachers held positive attitudes towards e-textbooks. The mean on attitude was 3.9 ($SD = 1.1$), representing an overall positive attitude. This corresponds with the findings of Jalal et al. (2014) that teachers hold positive attitudes towards e-textbooks.

In addition, in the quantitative part of this study, we examined the seven factors that emerged from the qualitative data and tested their influence on teachers' attitudes towards e-textbooks (ease of use, usefulness, efficiency, convenience, peer support, computer self-efficacy, and institutional support) from a larger sample. The means on ease of use, usefulness, self-efficacy, and convenience were high, indicating that the participants found e-textbooks easy to use ($M = 4.0$, $SD = 1.0$), useful for their teaching ($M = 3.8$, $SD = 1.0$), and convenient ($M = 4.0$, $SD = 1.0$). The self-efficacy scale registered the highest mean ($M = 4.1$, $SD = 1.0$), indicating that the participants perceived their computer skills to be high. With the widespread use

of digital devices, this result is not surprising. What is surprising is that almost 50% of the sample fell into the "more than 45 years old" category, a good sign that even the older teachers felt comfortable using technology. This phenomenon needs further investigation to examine whether or not this was related to job requirements.

Furthermore, the findings in this study reveal that the two scales with low means were institutional support and peer support. The low mean for institutional support (M = 2.7, SD = 1.0) indicates that the teachers perceived that schools were not providing the expected level of support for the use of technology, which is supported by the data collected from the interviews. Institutional support has been found to be a significant factor in influencing teachers' use of technology in the classroom (Chiu, 2017). Thus, this result should encourage further investigation into what support teachers expected from their schools and how they could provide such support. Moreover, the mean for peer support (M = 2.9, SD = 1.0) indicates that teachers were not influenced by their peers to use technology, which is in line with Ahmad's (2015) finding, but contradicts the focus group and interview finding that peers did influence teacher attitudes. One explanation for this inconsistency is that all the focus-group participants were from the same discipline (computer science), and previous research had shown that the adoption of the use of e-textbooks was more likely in the scientific disciplines (Khan et al., 2016). Another explanation is that all the participants in the interviews and focus group were female, while some questionnaire respondents were male. Females have been found to be more likely to be influenced by social factors (Smeda, Shiratuddin & Wong, 2017).

In addition, teachers' attitudes towards the use of e-textbooks were predicted quite well from the set of seven variables (ease of use, self-efficacy, usefulness, concerns, institutional support, peer support, and convenience), with approximately 76% of the variance in attitudes accounted for by the regression. This finding corresponds with those of previous studies that ease of use, usefulness (Jalal et al., 2014; Li et al., 2013; Liaw & Huang, 2016; Tri-Agif et al., 2016), and self-efficacy (Ahmad, 2015; Chiu, 2017; Tri-Agif et al., 2016) influence users' attitudes towards e-textbooks (Liaw & Huang, 2016; Waheed et al., 2015).

Only the predictors, ease of use, usefulness, and concerns, were significant factors in teachers' attitudes toward using e-textbooks in the regression analysis. The final fit model is $TP = -.5 + .3\,E + .6\,U - .2\,C$. The results demonstrate that perceived usefulness was the strongest predictor of teachers' attitudes toward e-textbooks. This result is supported by the findings of another study in which it was found that perceived usefulness was a stronger predictor than ease of use

(Jalal et al., 2014). This could be explained by the participants' familiarity with technology, as shown by the high mean on self-efficacy.

Moreover, ease of use and perceived usefulness were expected to be significant factors, as these were indicated in the aforementioned studies. The concerns that teachers held about their learners' use of e-textbooks was a new factor that emerged in our study. The results reveal concerns to be a negative factor, indicating that teachers who believed e-textbooks would impact learners negatively were less likely to have positive attitudes toward the devices. These results encourage further investigation of the negative impact of e-textbooks on learners and ways to overcome them. Educating teachers on ways to make learners safe when using digital devices, in general, and e-textbooks, in particular, is another issue that may be studied.

Conclusion

In this article we argue that teachers who participated in this study perceived e-textbooks to be useful, easy to use, and convenient as tools, and they also held positive attitudes toward using them in education. Overall, the results from our study demonstrate that teachers' attitudes could be predicted through the factors, ease of use, usefulness, and concerns. Usefulness was the strongest factor, suggesting that developers of training programmes that focus on technological skills should consider raising awareness of the advantages of e-textbooks. These findings provide additional information on teachers' concerns about their learners' use of e-textbooks, an issue that should be addressed.

Future research should address the limitations of this study in which we only analysed individual, organisational, and social influences. As teachers' attitudes on the use of e-textbooks were influenced significantly by their perceptions of usefulness, other factors, such as e-textbooks' design and functionality, should be added. Moreover, a study that examines Saudi K-12 learners' attitudes toward the use of e-textbooks should be conducted, as such attitudes may facilitate or hinder the adoption of e-textbooks. Parents' attitudes should also be considered.

With this study we added to the knowledge in the field, as it was the first study to examine teachers' concerns about the negative impact of e-textbooks on their learners. This factor could be impacted by the school level at which the teachers worked. Thus, it is recommended that a comparative study among teachers in elementary, middle, and secondary schools be conducted.

Authors' Contributions

Amal Alibrahim: conceptualisation, design of the qualitative approach. Elham Alsadoon: conceptualisation, design of the quantitative approach. Both authors wrote the first draft of the manuscript and commented on other previous versions of the manuscript. All authors read and approved the final manuscript.

Notes

References

Ahmad P 2015. E-book adoption in academic and research libraries. PhD thesis. Joondalup, Australia: Edith Cowan University. Available at https://ro.ecu.edu.au/cgi/viewcontent.cgi?article=2602&context=theses. Accessed 30 November 2022.

Al Saadi K, Lane-Kelso M, Al Hafeedh A, Al Sheithani Z & Al Wishahi M 2017. Are we ready for e-books? Omani university students' uses and perceptions of e-books. *Turkish Online Journal of Educational Technology*, 16(2):11–25. Available at https://files.eric.ed.gov/fulltext/EJ1137777.pdf. Accessed 30 November 2022.

Al-Sahil N 2017. بالمدارسوزير التعليم: إيقاف طباعة الكتب في 2020.. واستبدالها بالمناهج الرقمية [Minister of Education: Stop printing books in 2020...and replace them with digital curricula]. Available at http://www.al-jazirah.com/2017/20170330/lp3.htm. Accessed 30 March 2021.

Blackwell CK, Lauricella AR & Wartella E 2014. Factors influencing digital technology use in early childhood education. *Computers & Education*, 77:82–90. https://doi.org/10.1016/j.compedu.2014.04.013

Chiu TKF 2017. Introducing electronic textbooks as daily-use technology in schools: A top-down adoption process. *British Journal of Educational Technology*, 48(2):524–537. https://doi.org/10.1111/bjet.12432

Chu H 2003. Electronic books: Viewpoints from users and potential users. *Library Hi Tech*, 21(3):340–346. https://doi.org/10.1108/07378830310494526

Cohen L, Manion L & Morrison K 2007. *Research methods in education* (6th ed). London, England: Routledge.

Creswell JW & Clark VL 2018. *Designing and conducting mixed methods research* (3rd ed). Los Angeles, CA: Sage.

De Oliveira J, Camacho M & Gisbert M 2014. Explorando la percepción de estudiantes y profesor sobre el libro de texto electrónico en Educación Primaria [Exploring student and teacher's perception of e-textbooks in a primary school]. *Comunicar*, 42:87–95. https://doi.org/10.3916/C42-2014-08

Ebied MMA & Rahman SAA 2015. The effect of interactive e-books on students' achievement at Najran University in computer in education course. *Journal of Education and Practice*, 6(19):71–82. Available at https://files.eric.ed.gov/fulltext/EJ1079544.pdf. Accessed 30 November 2022.

Elesini US & Tomažin G 2018. Analysis of e-textbooks: Development, use and availability on the Slovenian Market. *Journal of Graphic Engineering and Design*, 9(1):11–21. https://doi.org/10.24867/JGED-2018-1-011

Embong AM, Noor AM, Rafek M, Othman H & Khalid PZM 2014. What do teachers and pupils say about using e-books in the classroom? *International Journal of Social Science and Humanity*, 4(6):451–457. https://doi.org/10.7763/IJSSH.2014.V4.397

Falc EO 2013. An assessment of college students' attitudes towards using an online e-textbook. *Interdisciplinary Journal of E-Learning and Learning Objects*, 9:1–12. Available at https://www.researchgate.net/profile/Emilie-Falc/publication/284507728_An_Assessment_of_College_Students'_Attitudes_towards_Using_an_Online_E-textbook/links/5c64a054299bf1d14cc4bf2d/An-Assessment-of-College-Students-Attitudes-towards-Using-an-Online-E-textbook.pdf?_sg%5B0%5D=started_experiment_milestone&origin=journalDetail. Accessed 30 November 2022.

Fouh E, Breakiron DA, Hamouda S, Farghally MF & Shaffer CA 2014. Exploring students learning behavior with an interactive etextbook in computer science courses. *Computers in Human Behavior*, 41:478–485. https://doi.org/10.1016/j.chb.2014.09.061

Hao Y & Jackson K 2014. Student satisfaction toward e-textbooks in higher education. *Journal of Science and Technology Policy Management*, 5(3):231–246. https://doi.org/10.1108/JSTPM-04-2014-0016

Jalal AA, Ayub AFM & Tarmizi RA 2014. Modeling e-Book acceptance: A study on mathematics teachers. In H Ibrahim, J Zulkepli, N Aziz, N Ahmad & SA Rahman (eds). *AIP conference proceedings* (Vol. 1635). AIP Publishing. https://doi.org/10.1063/1.4903605

Jeong H 2012. A comparison of the influence of electronic books and paper books on reading comprehension, eye fatigue, and perception. *The Electronic Library*, 30(3):390–408. https://doi.org/10.1108/02640471211241663

Khan A, Bhatti R & Khan A 2016. E-books usage by agricultural, engineering and social science students in selected universities of Pakistan: An empirical assessment. *The Electronic Library*, 34(6):958–973. https://doi.org/10.1108/EL-08-2015-0163

Li LY, Chen GD & Yang SJ 2013. Construction of cognitive maps to improve e-book reading and navigation. *Computers & Education*, 60(1):32–39. https://doi.org/10.1016/j.compedu.2012.07.010

Liaw SS & Huang HM 2016. Investigating learner attitudes toward e-books as learning tools: Based on the activity theory approach. *Interactive Learning Environments*, 24(3):625–643. https://doi.org/10.1080/10494820.2014.915416

Lin YC, Liu TC & Kinshuk 2015. Research on teachers' needs when using e-textbooks in teaching. *Smart Learning Environments*, 2:1. https://doi.org/10.1186/s40561-014-0008-1

McFall R, Dershem H & Davis D 2006. Experiences using a collaborative electronic textbook: Bringing the "guide on the side" home with you. In *Proceedings of the 37th SIGCSE technical symposium on computer science education*. New York, NY: Association for Computing Machinery. https://doi.org/10.1145/1121341.1121448

Onwuegbuzie AJ, Bustamante RM & Nelson JA 2010. Mixed research as a tool for developing quantitative instruments. *Journal of Mixed Methods Research*, 4(1):56–78. https://doi.org/10.1177/1558689809355805

Ragan A, Kammer J, Atkins C & Burress 2019. Learning to read online: The effect of instruction on e-textbook use. *Library Hi Tech*, 37(2):289–307. https://doi.org/10.1108/LHT-01-2018-0011

Smeda AM, Shiratuddin MF & Wong KW 2017. Measuring the moderating influence of gender on the acceptance of e-books amongst mathematics and statistics students at universities in Libya. *Knowledge Management & E-Learning*, 9(2):177–199. Available at https://researchrepository.murdoch.edu.au/id/eprint/37589/1/gender%20influence%20on%20ebook%20acceptance.pdf. Accessed 30 November 2022.

Sun J, Flores J & Tanguma J 2012. E-textbooks and students' learning experiences. *Decision Sciences Journal of Innovative Education*, 10(1):63–77. https://doi.org/10.1111/j.1540-4609.2011.00329.x

Trafimow D 2009. The theory of reasoned action: A case study of falsification in psychology. *Theory & Psychology*, 19(4):501–518. https://doi.org/10.1177/0959354309336319

Tri-Agif I, Noorhidawati A & Ghalebandi SG 2016. Continuance intention of using e-books among higher education students. *Malaysian Journal of Library & Information Science*, 21(1):19–33. https://doi.org/10.22452/mjlis.vol21no1.2

Van Horne S, Russell JE & Schuh KL 2016. The adoption of mark-up tools in an interactive e-textbook reader. *Educational Technology Research and Development*, 64(3):407–433. https://doi.org/10.1007/s11423-016-9425-x

Van Schalkwyk JH 2017. Generation Y students' attitudes towards e-Books and e-Book adoption. MCom dissertation. Vanderbijlpark, South Africa: North-West University. Available at https://repository.nwu.ac.za/bitstream/handle/10394/24933/VanSchalkwyk_J-H.pdf?sequence. Accessed 30 November 2022.

Vorotnykova I 2019. Organizational, psychological and pedagogical conditions for the use of e-books and e-textbooks at school. *Turkish Online Journal of Distance Education*, 20(3):89–102. https://doi.org/10.17718/tojde.598227

Waheed M, Kaur K, Ain N & Sanni SA 2015. Emotional attachment and multidimensional self-efficacy: Extension of innovation diffusion theory in the context of e-Book readers. *Behaviour & Information Technology*, 34(12):1147–1159. https://doi.org/10.1080/0144929X.2015.1004648

Wellington J 2000. *Educational research: Contemporary issues and practical approaches*. London, England: Continuum.

Woody WD, Daniel DB & Baker CA 2010. E-books or textbooks: Students prefer textbooks. *Computers & Education*, 55(3):945–948. https://doi.org/10.1016/j.compedu.2010.04.005

Zinn S & Langdown N 2011. E-book usage amongst academic librarians in South Africa. *South African Journal of Libraries and Information Science*, 77(2):104–115. Available at https://journals.co.za/doi/epdf/10.10520/EJC61367. Accessed 30 November 2022.