Rethinking digitally mediated reading assessment practices: An investigation into the Vietnamese undergraduates' attitudes

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ABSTRACT

This study investigates the Vietnamese undergraduates' attitudes towards digitally mediated reading assessments and understands the underlying reasons. A mixed-method study was utilized to fulfill these objectives. All participants are undergraduates in Vietnam who have undergone English as a foreign language (EFL) courses and experienced digitally mediated reading tests. First, a 5-point Likert scale questionnaire was delivered to students through their emails. In the second stage, the researchers randomly selected volunteer participants to join the interview. Vietnamese students hold positive attitudes toward digitally mediated reading assessments. The three aspects of attitudes, namely cognitive, affective, and behavioral positively influence each other. When discussing the embedded reasons for their responses, thematic coding reveals notable themes, such as technical issues, cheating issues, support availability, grading and feedback, testing platform interface, and further engagement. Undergraduates' attitudes reflect enthusiasm and concerns about the shift to digitally mediated reading practices in Vietnam. The findings highlight areas for teachers and policymakers to further enhance digitally mediated assessment practices.

Contribution/ Originality: This study is among the first non-Western studies to provide a comprehensive examination of Vietnamese EFL undergraduates' attitudes towards digitally mediated reading assessments. The study highlights six critical underlying reasons that influence students' experience, offering workable practices for educators, policymakers and test designers to enhance digital assessment design, delivery and support.

1. INTRODUCTION

1.1. Research background

Vietnam has continuously conceived the reading ability of its citizens as a top nation's educational priority and reading as the key determinant of the country's prosperity (Psacharopoulos, 1994). Reading is a fundamental skill and a powerful instrument that plays a fundamental role in not only personal and intellectual development but also the nation's economic and cultural development (Soto, 2019). The essence of reading is undeniable especially in the English as a foreign language (EFL) context. In other words, it is possibly the most important skill for EFL learners to manifest the potential in academic settings (Huijun & Rafizah, 2024). The essence of reading ability is also asserted in UNESCO's Sustainable Development Goal 4 (SDG4) proclaiming "ensure inclusive and equitable quality education while promoting lifelong learning opportunities for all" including two key goals. The critical conclusion from the key goals shows that the present world requires its citizens to prepare themselves with not only literacy and numeracy abilities (SGD 4.6) but also knowledge and skills for sustainable

development (SDG 4.7). Among various 21st-century skills and competencies, reading beyond the idea of basic literacy abilities is a primarily important skill that equips students with bettering other skills (OECD, 2021). Proficient reading comprehension empowers readers to extract essential information crucial to accomplishing the requirements of their assigned tasks as well as navigating the complexities of real-life situations with confidence and efficacy.

Similarly, it is widely agreed that the ubiquitous advancements of Information and Communication Technology (ICT) have dramatically shifted how we engage and function in various aspects of life in the Digital Transformation (DT) landscape. Such advancement has also significantly permeated Education when the Vietnamese Ministry of Education and Training (MOET) issued Directive No. 9772/2008/CT-BGDDT dated October 20th, 2008. This policy aims strengthening teaching and learning within the educational system (Peeraer & Van, 2015). This has increasingly permeated to the Vietnamese higher education system up to the present (Ngo, 2016). In the setting of the DT landscape, reading takes on a new dimension known as digital reading or electronic reading (e-reading). This refers to the act of engaging with digital content or electronic texts using various digital devices, such as computers, tablets, e-readers, smartphones or other digital platforms with the ability to critically evaluate information, navigate digital tools effectively and adapt to the dynamic technological landscape (Rutherford, Singleton, Derr, & Merga, 2018; Shohel et al., 2022). As education increasingly embraces digital platforms, the assessment of students' abilities is transitioning to online formats. In the realm of reading skills, the shift from paper-based reading to online reading has spurred the development of more innovative methods of assessing reading ability, which is, in other words, online reading assessments. This has presented numerous advantages and challenges in enhancing young people's reading experiences and their passion for reading. Therefore, it is imperative to understand students' experience and attitudes towards reading assessments within the dynamic DT landscape. The present study aims to seek the answers for the following questions to explore how students perceive and engage with the online reading assessment process:

1. What is the overall level of EFL undergraduates' attitudes towards digitally mediated reading assessments?

2. What is the dynamic relationship between cognitive, affective, and behavioral dimensions in shaping students' overall digitally mediated reading experiences?

3. What are the underlying reasons behind EFL undergraduates' attitudes towards digitally mediated reading assessments?

1.2. Significance of the Research

The current study explores the digitally mediated reading experience of EFL undergraduates who are studying at two universities in Southern Vietnam. Such trend has more slowly gained traction in non-Western settings, such as Vietnam until the onset of the COVID-19 pandemic despite the prevalence of digitally mediated practices in Western countries. Therefore, this research attempts to make both theoretical and practical educational contributions and to catalyze further research on digitally mediated assessments in Asian tertiary education. The study will make meaningful contributions to the existing body of knowledge on digitally mediated reading assessment practices specifically focusing on the Vietnamese educational setting. Besides, researchers highlight the main obstacles and promoters of online reading assessments, enabling test designers to create a more supportive environment that not only eases students' pressures on testing but also nurtures the undergraduates' love for reading by investigating EFL undergraduates' voices.

2. LITERATURE REVIEW

2.1. Understanding Reading in the Digital Transformation Landscape

The definitions of reading have evolved shifting from a mere decoding ability to information navigating activity (OECD, 2021). Reading is acknowledged as a contemporary literacy paradigm, promoting cognitive,

affective and sociocultural aspects of literacy in various digital environment within the context of the digital transformation (DT) (Jang & Ryoo, 2019). This also mirrors transformations in the Vietnamese social, economic, cultural, and technological advancements concentrating on the circumstances in Vietnam. Reading should be understood in a much broader and deeper significance, exceeding beyond mere mechanical reading (the ability to read and write) through such transformations. In such a fast-changing digital and knowledge-based world, proficient reading practices help readers meet 21st century entrepreneurs' expectations, such as logical thinking, a critical mindset, and problem-solving and decision-making abilities. Adept readers can apply what they glean to constantly construct new knowledge and craft creative ideas, hence facilitate them to become more competitive than their peers (Usman, Fata, & Pratiwi, 2019). Thus, reading stands as an enduring and indispensable skill, if not more crucial than ever before in navigating the complexities of the modern world (Ningsih, Winarni, & Roemintoyo, 2019; Petscher et al., 2020). In the digital transformation era where information is abundant and diverse, hindered reading behavior may result in limited access to reliable information and decreased academic performance. Therefore, it is necessary for teachers and test developers to appropriately evaluate young people's reading skills to make ongoing improvements for better educational outcomes. It becomes crucial to understand students' attitudes towards digitally mediated reading assessment experiences given the challenges associated with developing proper online assessment tools for appraising reading abilities.

2.2. Online Reading Assessments

The term "assessment" in digitally mediated assessment refers to the measurement of learners' progress and outcomes in alignment with specific learning (von Davier, DiCerbo, & Verhagen, 2021). Educational experts emphasize that assessments play a crucial and powerful role in teaching and learning processes. In other words, assessments go beyond merely presenting questions and evaluating correct answers; they encompass a range of ongoing processes, including planning, observation, rating, analysis, aggregation, reflection, and continuous improvements based on the gathered data and artefacts tied to specific objectives (Rouxelle, Joanna, & Larke, 2016). An assessment is not the endpoint but the starting point of the next process (Goldsack, Dowling, Samuelson, Patrick-Lake, & Clay, 2021).

Online assessment was first introduced in the late 1980s when the Cambridge Assessment explored the possibility of computer-based assessments for vocational qualifications. From that time onwards, digitally mediated assessments also known as online assessments or electronic assessments (e-assessments) have progressively gained prominence in the academic realm. The digitally mediated assessment is described as an evaluation process that integrates any technological tools, applications and devices to design and deliver tests, score students' work, provide feedback, and store all assessment data (Dalby & Swan, 2019). Other scholars, in a similar view, describe a digitally mediated assessment as an "end-to-end electronic evaluation process in which ICT serves assessment activities (Alruwais, Wills, & Wald, 2018).

Online reading assessments could be understood as the evaluation of an individual's reading skills and reading competencies using digital tools or platforms bridging the delineations of reading and online assessments. This mode of reading assessments takes advantage of technologies for the measurement of various aspects of reading, including reading comprehension, critical reading and reading engagement. Online reading assessments can encompass a range of digitally mediated activities, such as interactive exercises, comprehension quizzes, and reflective administration through web-based applications or learning management system (LMS). Similar to traditional assessments, digitally mediated reading assessments are required to ensure features including reliability, validity, practicality, and fairness (Goldsack et al., 2021). In addition, digitally mediated reading assessments as any educational assessment modes maintain three types of assessments according to original purposes, such as formative, diagnostic, and summative (Arrafii & Sumarni, 2018; Kasman & Lubis, 2022). Digitally mediated assessment is not a new type of assessment but strengthens the relationships among assessment types

through the support of digital tools and applications in alignment with the definition of assessments and the testing purposes. Maintaining the integrity and effectiveness of the evaluation process is extremely crucial in any type of assessment, including e-assessments. An online assessment activity is deemed credible and applicable if it is authentic, consistent, transparent, and practical to appropriately and precisely evaluate results (Goldsack et al., 2021).

Extensive research has delved into exploring the evolution, applications and benefits of technological adoption for various tasks in general and digitally mediated assessments in particular. One of the most widely used frameworks is the Technology Acceptance Model (TAM) introduced by Masrom (2007). TAM has been a leading model for predicting and explaining technology user acceptance. This framework argues that there are interrelationships between system design features, perceived usefulness, and perceived ease of use (see Figure 1).
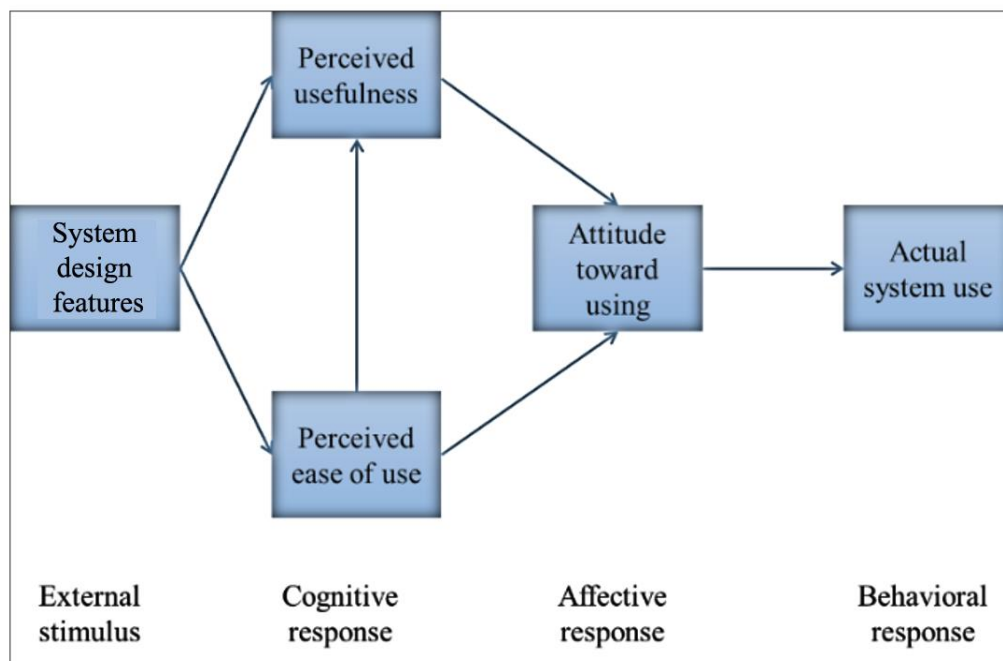

Figure 1. Technology acceptance model (TAM).

It can be implied from TAM that the model effectively shows key variables that drive behavioral responses. However, this model is not context- specific and requires more adaptation to align with particular settings. This limitation highlights the need for a more tailored approach when addressing unique contexts, such as digitally mediated reading assessments.

Efforts have been made on implementing numerous software and programs to satisfy a variety of assessment objectives shaping into educational contexts (Allen, 2003). It was suggested that online assessments are advantageous not only to learners but also to teachers and institutions, encompassing aspects such as cost-effectiveness, user-friendliness, reliability, reproductivity, scoring, result aggregation, and data management. However, Ndibalema (2022) and Shohel et al. (2022) depict that some constraints in the ICT of teachers and learners should be thoroughly considered. Despite numerous research contributions in the broader field of online assessments, there appears to be a scarcity of studies that focus on a particular aspect of digitally mediated assessments, namely the digitally mediated assessments of reading abilities. Besides, when considering the three subjects including administrators, examiners, and examinees collectively, it can be asserted that examinees play the most influential role. In other words, their engagement, experiences and feedback drive other factors and fundamentally shape the effectiveness of the assessment process. Examinees' attitudes and perceptions directly influence their performance in exams and their learning outcomes. Hence, acknowledging and examining

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examinees' attitudes is not just beneficial but critical for the upcoming improvements of digitally mediated reading assessments.

2.3. Attitudes

The theories of attitudes have thrived throughout the 20th century with diverse delineations evolving. McGuire (1989) and Wang, Qin, and Zhou (2020) describe attitude as a mental state of preparedness shaped experiences, exerting a directive and a dynamic impact on an individual's response. Attitude can be conceptually defined as an acquired predisposition to consistently react in either a favorable or an unfavorable manner towards a specific object or event (McKenna, Kear, & Ellsworth, 1995). According to the theory of social psychology by Hogg and Vaughan (1995) and McDougall (2015), an individual's attitudes can be classified into three classes: cognitive, affective, and behavioral. The description of planned behavior theory is described in Figure 2.
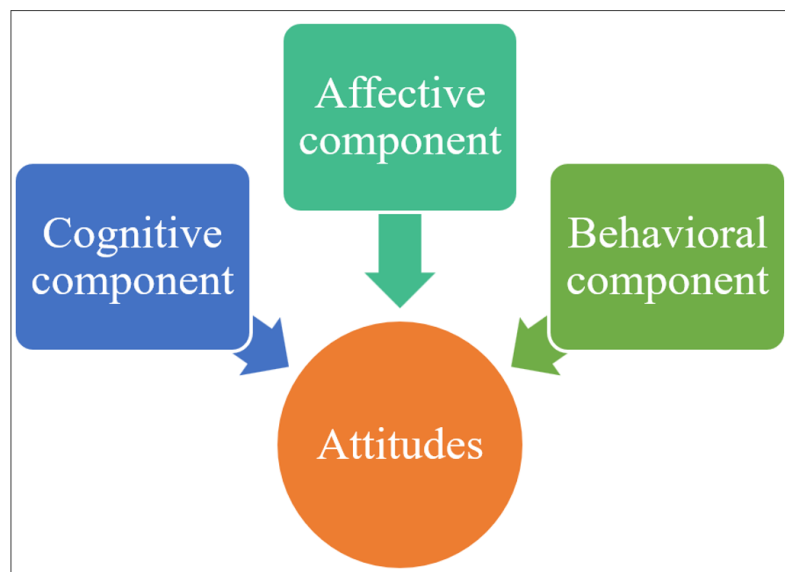

Figure 2. Components of attitudes towards digitally mediated reading assessments

The cognitive elements reflect the knowledge, information, beliefs, thoughts and inferences an individual holds about an issue. One example of the cognitive elements is the utilitarian aspects of the action in relation to the individual's goals. Second, the affective elements involve emotions and feelings that an individual experiences towards an object. It is commonly measured by evaluating the attractiveness of beliefs and thoughts in the cognitive elements. Third, the conative component encompasses individuals' general inclinations towards behavior related to the object, which may not necessarily be expressed in overt actions. These three components stand for the attitude construct. This paper will investigate the level of undergraduates' positive attitudes towards digitally mediated reading assessments, considering cognitive, affective, and coactive components.

The understanding of undergraduates' attitudes towards digitally mediated reading assessments involves examining how students think about, emotionally respond to, and intentionally approach digitally mediated reading assessments. It is believed that collecting such information is vital for improvements in teaching strategies, hence addressing the expectations of students and their parents as well as university administrators and policymakers. Akhmetova, Imambayeva, and Csapó (2022) emphasized the immense importance of attitudes towards students' reading performances.

2.4. The Importance of Understanding Undergraduates' Attitudes towards Digitally Mediated Reading Assessments

Students need to understand the benefits and expectations of digitally mediated assessments as well as factors limiting their performance. This awareness is crucial for them to actively recognize their strengths and

weaknesses and seek support for future learning. Bender (2023) emphasizes that students who genuinely understand their own learning progress and navigate the pros and cons of the learning environment will receive higher learning outcomes. According to Federičová, Pertold, and Smith (2018), supposing students lose their self-confidence when taking an exam, their level of engagement and performance will be influenced in a negative way. As a result, identifying their own needs will help them develop self-learning abilities and become self-regulated learners. *Parents* require information about their children's school performance so that they can timely give their children emotional and financial support when necessary (Pomerantz, Moorman, & Litwack, 2007). Consequently, they can promptly assist their children financially and emotionally. Moreover, digitally mediated assessments are incredibly useful in setting up home-school partnerships by automatically informing parents about their children's progress precisely. Teachers *and administrators* observe how students interact with digitally mediated assessments (Shalatska, Zotova-Sadylo, Makarenko, & Dzevytska, 2020). Understanding students' strengths and weaknesses enables them to subsequently target future teaching and make workable improvements. Regarding *institutions*, data about students' perceptions towards digitally mediated assessment which can be statistically and rapidly analyzed will be used as evidence to justify the appropriateness and legitimacy of assessments. Consequently, policymakers can implement feasible assessment policies and procedures (Shalatska et al., 2020). For these reasons, students' attitudes towards online assessments should be taken more seriously.

2.5. Previous Research on Students' Attitudes towards Digitally Mediated Reading Assessments

The rapidly evolving nature of digitally mediated assessments has garnered substantial attention in educational research globally, such as Afflerbach (2017), Berger, Moe, and Schweidel (2023) and Yeatman et al. (2021). Early research on digitally mediated assessments was mainly conducted in Western contexts and has laid the groundwork for enhancing learning outcomes. Leu et al. (2005) have been conducting plenty of research related to assessment and technology application (Coiro, 2011). Their work has evaluated the relationship between assessments of traditional and online reading (Leu et al., 2005). The study concluded that online reading comprehension with sufficient intensity not only improves online reading skills but also sustains conceptual content-based learning. Similarly, another study by Gabe and Jiang provided intriguing findings (Grabe & Jiang, 2013). It was suggested that more attention should be paid to issues related to reading assessments tied to reading online texts. Expanding to Australia, Bennett (2006) strongly advocated for the integration of technology in assessment. The scholars emphasized the transformative potential of technology in testing and assessment, particularly its ability to adapt to individual learner needs. Recently, the discussion on academic assessment in the context of digitally mediated teaching and learning has increasingly raised concern in studies, such as Hennessy (2024), Opre, Glava, Opre, and Glava (2024) and Singleton (2021). These researchers demonstrated the effective application of three-dimensional modelling, software apps, programming and interactive tools in both traditional and remote classrooms. In addition, Suárez-Álvarez, Fernández-Alonso, García-Crespo, and Muñiz (2022) underscored the critical importance of designing reliable, valid and fair computerized adaptive tests. Turning to Asian contexts, scholars have concentrated on proposing a wide range of strategies to support struggling readers (Kamaruddin & Kaur, 2023) and enhance the effectiveness of digitally mediated reading tests in terms of computation format (Guarino, Lettieri, Malandrino, & Zaccagnino, 2021) (Napoli, Baig, Maqsood, & Chiasson, 2021) and Putri and Sari (2021). Taking digitally mediated reading assessments in particular, a two-year research project conducted by Rou and Yunus (2020) discovered that students' reading interests increased due to online tasks. Strengthening this view, a quantitative study on 1798 students pointed out that the online environment evokes reading engagement (Berger et al., 2023), critical thinking (Bean & Melzer, 2021) as well as reading motivation and self-efficacy in learning (Forzani et al., 2021).

PISA reported that the relationship between reading achievement and time spent using digital devices for schoolwork was not positive in 36 countries, including Vietnam (OECD, 2021) despite significant efforts. Digitally

mediated assessment has been long rooted in Western educational settings while it was not until the COVID-19 pandemic that traditional educational practices were disrupted. This has driven an urgent need for alternative pedagogical methods, including digitally mediated learning, teaching and assessment. Given the recent and rapid transition towards digitally mediated assessments, corresponding studies in the related fields remain in their nascent stages. While limited in scope, emerging studies, such as Csapó (2023); Bui (2022), Nguyen and Truong (2021) and Tran, Nguyen, and Nguyen (2023) have begun to address critical aspects of this transition. In the domain of reading, valuing the essence of students' attitudes towards online reading practices, Nguyen and Nguyen (2023) employed tri-component analysis (cognitive, affective, and behavioral components) to investigate undergraduates' attitudes towards online extensive reading. Similarly, Nguyen (2022) extended this line of inquiry with a qualitative study on 87 Vietnamese EFL undergraduates to investigate their perceptions towards online extensive reading during emergency remote L2 teaching amidst the COVID-19 pandemic. Her participants reported enjoying extensive online reading due to interesting topics, suitability, and competence enhancement. The aforementioned studies do not thoroughly address the intersection of both reading and e-assessments, which digitally mediated reading assessments have been recorded despite their valuable contribution. There has been one experimental study by Huynh, Agrawal, Chen, and Fan (2021) revealed the application of the Moodle platform for pre-term, mid-term, and final tests. Notably, Vietnamese students demonstrated improved reading scores in their final exam, signaling positive attitudes towards digitally mediated reading assessments. Similarly, Thai et al. (2023) carried out mixed-method research on the assessment practices of Vietnamese teachers only. Although the findings provided implications for an effective online assessment toolkit, its outcomes were unable to directly deepen the understanding of students' perspectives.

In a nutshell, as traditional assessments still gain their popularity at almost all levels, digitally mediated assessment practices in the Vietnamese educational context are still in their infancy. This mode of assessment has just been recognized since the COVID-19 pandemic. In their study in the Southern Vietnamese context, Dang and Chong concluded that the undergraduates had an acceptable digital literacy skills (Dang & Chong, 2023). However, it is important to gain a more in-depth understanding of how they apply these skills in their academic performance. More specifically, research dedicated to digitally mediated assessments, particularly digitally mediated reading assessments has remained limited. Given the nascent nature of this assessment mode, exploring the voices of exam participants is vital for comprehensive insights into the success of the online reading assessments. In addition, while teachers' practices in e-assessment processes play a crucial role, it is equally essential to grasp what examinees think, feel and expect of e-assessments. Therefore, this research paper will contribute to the existing literature a holistic comprehension of students' attitudes in the realm of online reading assessments in Vietnam.

3. METHODOLOGY

Bridging the situational and theoretical gaps, this study aims to examine the overall extent of positive attitudes towards digitally mediated reading assessment practices and to explore the underlying reasons for these attitudes. To meet the research objectives, the researchers employ mixed-method methodology.

3.1. Research Methods and Instruments

A mixed-method approach is opted for in this research to capitalize on the strengths of both quantitative and qualitative methods. Morse (2016) stated that data from both quantitative and qualitative methods can validate and strengthen each other, hence enabling a more holistic and comprehensive understanding, addressing potential weaknesses inherent in using a single method as well as enhancing reliability and validity. Following the mixed-method approach instructions of Creswell (2014), this study is categorized as "sequential exploratory" wherein quantitative data is collected and analyzed first, then qualitative data is subsequently employed to provide further insights. The study combines convenience sampling for the quantitative phase and purposive sampling for the

qualitative phase. The purpose of convenience sampling was to reach a large group of participants within the constraints of time and resources. While this sampling might introduce some bias, its limitations were mitigated because participants were recruited from two universities that attract students from various geographic locations and academic majors. For the qualitative phase, purposive sampling was employed to select participants who provided varied responses in the questionnaire to ensure a mixture of positive, neutral, and less favorable attitudes. This strategy ensured that qualitative data could capture a broad spectrum of experiences and perspectives. Demographic diversity was considered to enhance generalizability to minimize bias in their responses. In addition, the interview questions were carefully worded and piloted to ensure cultural sensitivity and neutrality. During the interview, the researchers created a comfortable and friendly atmosphere where there was no distraction. To build rapport, the interviewers showed empathy, used a calm and friendly tone of voice, and maintained non-judgmental attitudes to show participants that their contributions were entirely valued. Moreover, participants were encouraged to share as much or as little as they felt comfortable. The interviewers informed them that there was no right or wrong answers. Pseudonyms were assigned to interviewees to protect their identities. Their responses were assured of anonymity and confidentiality to reduce the influence of social desirability bias.

The present study simultaneously utilized a questionnaire and a semi-structured interview. According to Olsen (2011), a questionnaire is a friendly means of data collection process in investigating human's attitudes, perceptions, behavior, and activities. Recommended by Frechette, Bitzas, Aubry, Kilpatrick, and Lavoie-Tremblay (2020) and Roulston (2010), appropriate interview question design can effectively delve into lived experiences and capture the unique opinions of the participants. In this research, undergraduates' attitudes towards digitally mediated reading assessments will be measured using the questionnaire adapted from Akhmetova et al. (2022) and Sitepu (2019). The questionnaire is designed on Google Forms and comprises two main parts. In part A, demographic information, such as students' gender, university year, major, and hometown will be resolute. Part B focuses on investigating students' attitudes, consisting of three sections with a total of twenty-seven questions rated on a 5-Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The three sections regarding digitally mediated reading exam process comprise cognitive aspects (9 questions), affective aspects (10 questions) and behavioral aspects (8 questions). The questionnaire was piloted with ten undergraduates to ensure clarity and cultural relevance. All of the questions were carefully crafted to avoid reading the language. Semi-structured interviews were conducted with a purposive sample of participants selected based on the questionnaire responses to explore reasons behind varying attitudes. The researchers conscientiously adhered to the guidelines put forth by Anderson and Jack (2015) regarding interview question design, suggesting that the interview questions should be broad enough to allow the participants to freely raise their own voices while maintaining data collection purposes. Semi-structures questions are constructed as follows to comprehensively elucidate the underlying reasons:

- *Can you describe your general experiences with digitally mediated reading assessments?*
- *What aspects of digitally mediated reading assessments do you find particularly engaging/challenging?*
- *Can you recall any specific situations or instances where you feel motivated or demotivated during the digitally mediated reading assessment process?*

Besides, follow-up prompts, such as "Can you describe that in more detail? Could you give me an example of that? Could you clarify your explanations? Will be asked by researchers to get more nuanced information? In this way, researchers can explore cognitive strategies, emotions and behaviors during digitally mediated reading assessments as well as reasons behind the choices, hence uncovering nuances that quantitative methods might miss. The students' attitude question items and the interview were designed in Vietnamese, the participants' native language to mitigate the risk of unintended misunderstandings. The questions were then scrutinized by two experienced lecturers to assess content validity and piloted by five undergraduates to determine face validity. This review process aims to ensure that the question items were not only linguistically accurate but also resonate well

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with the targeted participants, hence capturing the nuances of students' attitudes towards the subject matter. After a thorough review, some items were refined before distribution to the participants.

3.2. Procedure

Before recruitment, the researchers obtained approval from the heads of English language department by sending a consent form clearly stating the study's objectives, procedures and ethical considerations. After getting acceptance from the head, the researchers could send emails to call for volunteer research participation. Those who were ready to join the research also signed in the online consent form to show their willingness to participate in the study. This form clearly stated their rights, their voluntary status of participation, and their ability to withdraw at any stage without negative consequences. Only when receiving the online consent form from the students can the researchers invite them to participate in the study. Even though the study did not involve sensitive issues, efforts were made to ensure the privacy and confidentiality of the participants. Personal identifiers, such as names, email addresses, gender and academic majors were not directly disclosed in the study, except when necessary for communication between the researchers and the participants. During analysis and reporting, all participants' details were replaced with unique codes to anonymize the data. Survey results and interview recordings were stored in encrypted, password-protected files accessible only to the research team. The data collection process followed two stages, combining both convenience and purposive sampling.

Stage 1: Questionnaire distribution (quantitative data collection method).

Convenience sampling was utilized to recruit participants who were available and willing to respond to the questionnaire. Specifically, the researchers sent the link of the questionnaire via the voluntary participants' emails. This way would be easier to connect the participants, hence reducing cost and time constraints. Voluntary participants were informed that their responses would be used solely for academic purposes and would remain confidential. In addition, students were also allowed to spend as much time as they wished to complete the questionnaire. It took the participants approximately 25 to 30 minutes to complete the survey. The questionnaire was just completed and returned to the researchers when all the answers were filled in. From the initial convenience sampling, purposive sampling was launched to ensure the inclusion of individuals who had taken digitally mediated reading assessments, were aged from 18-21, and had active enrolment in their active academic program. Questionnaire responses were encrypted and securely stored to ensure no identifiable information was linked to the data during the analysis.

Stage 2: Participant collection for the interview (qualitative data collection method).

Following was the interview stage when the researcher sent a follow-up invitation email to the participants from the questionnaire group. Voluntary participants who were willing to join in the interview were asked to reply to the email. Eventually, the researchers could connect and schedule the interview with eight participants. To accommodate participants' preferences, comfort and confidentiality, the interview was conducted in a private setting and both online and face-to-face formats. Five of them preferred an online interview whereas the others opted for a face-to-face one. Before each interview, participants were reminded of their rights, and verbal consent was obtained for audio recording. The purpose of the recording - ascertaining accurate transcription and subsequent data analysis was explicitly stated. The data from face-to-face conversations with follow-up prompts would enable the researchers to get a more nuanced understanding of undergraduates' experiences with digitally mediated reading assessments, feelings, recommendations and embedded reasons. Moreover, this data would be compared with the figures in the survey to enhance validity.

3.3. Participants

Participants were EFL undergraduates who were studying at the two universities in Can Tho City from the school years 2021 to 2024. Only those who have experienced taking digitally mediated reading tests in university

are qualified in obtaining significant data. Regarding the quantitative measurement, after one month, 467 responses to the questionnaire were collected through Google Form. For the interview, a subset of eight students from the questionnaire group voluntarily participated in the interview. Although the sampling may not produce a completely representative population, efforts are made to ensure individuals are 18 to 21 and in different majors such as business and marketing, agriculture, engineering, information technology or education.

3.4. Data Analysis

For the data analysis process, the questionnaire data collected underwent descriptive statistics using SPSS software. The reliability of the data was assessed using Cronbach's alpha to ensure consistency among items. Following that, descriptive data statistics (mean scores and frequency distributions) were computed to determine the percentage of positive and less favorable responses for each item in the attitude sections. Correlation analysis was computed to identify relationships between cognitive, affective, and behavioral dimensions.

Regarding the interview responses, thematic analysis was employed to identify and interpret patterns and themes within the responses. Audio recordings were transcribed verbatim and reviewed multiple times for accuracy to enhance the rigor and reproducibility. NVivo was employed to systematically manage, code, and analyze qualitative data, ensuring transparency and reliability. This user-friendly platform allowed the researchers to easily sort, categorize, and visually track themes and sub-themes of the eight participants. The thematic analysis process went through six stages (see Table 1).

Table 1. Thematic analysis is staged and its application to the current research

Thematic analysis stages	Application of thematic analysis to the current research
1. Familiarization	Immerse in the transcripts to thoroughly be familiar with and understand the participants' reading thoughts and attitudes.
2. Condensation to key points	Distill the lengthy answers and remove irrelevant details to extract responses related to reading discipline only.
3. Initial coding	Generate initial codes by systematically labelling meaningful segments of the text that are related to the research questions.
4. Theme identification	Group the codes into broader sub-themes and themes based on similarities and patterns.
5. Reviewing and refining	Re-examine the themes for consistency, coherence and relevance, minimize subjective bias and refine them where necessary.
6. Data interpretation	Analyze the themes to draw meaningful interpretations about the research objectives.

The two researchers conducted an iterative review of the coding process until the codes were consistent. Pseudonyms were assigned to all respondents to protect their identities. The following sections will detail the findings from the mixed-method approach, offering an integrated perspective on the quantitative and qualitative data:

4. FINDINGS AND DISCUSSION

4.1. Findings from the Questionnaire

The present study seeks to examine the overall level of 467 EFL undergraduates' attitudes towards digitally mediated reading assessments administered by two universities in Can Tho city, Vietnam. Those who have not experienced any digitally mediated reading assessments do not need to continue the survey. There were 467 responses from students who have experienced digitally mediated reading assessments during their university years. This qualification served as the threshold for the researchers to examine the undergraduates' attitudes concerning the efficacy of this mode of assessment.

For the Likert scale format questions, Cronbach's alpha was used to analyze reliability. Cronbach's alpha was 0.903, indicating excellent reliability for the twenty-seven question items. Consequently, the researchers were able to proceed with more in-depth analysis of the results, including the overall EFL undergraduates' attitudes towards digitally mediated reading assessments (see Table 2).

Table 2. Overall level of EFL undergraduates' attitudes towards digitally mediated reading assessments.

Aspects of attitudes	Cognitive domain	Affective domain	Behavioral domain	Overall attitude
Mean	3.2	3.3	2.6	**3.0**

Table 2 summarizes the overall level of EFL undergraduates' attitudes towards digitally mediated reading assessments with each aspect contributing to and influencing the overall perspective. According to Holtzman and Donnellan (2017), the midpoint of the scale is designated as 2.5. Therefore, the overall level of EFL undergraduates' attitudes towards digitally mediated reading assessments in this study (m = 3.0) is considered positive. This finding aligns with the prior studies in the Asian settings by Kundu and Bej (2021) and Oyelere, Suhonen, Wajiga, and Sutinen (2018) concluded that Nigerian and Indian students respectively, demonstrated more interests in less traditional modes of assignments. In the Vietnamese context, Tran, Nguyen, Nguyen, and Tran (2021) and Trang and Chi (2022) both pinpoint the highly positive perceptions of tertiary students towards e-assessments. Particularly in the similar setting by Dang and Chong (2023) concluding that the undergraduates have an average overall level of digital literacy skills for academic activities. There is a reciprocal relationship among cognitive, affective and behavioral aspects where the enhancement in one aspect may have a corresponding impact on the other. It is observed in Table 2 that there is no significant distinction among the cognitive and affective domains, with the mean of each ranging from 3.0 to 3.3. The narrow range of mean values underscores a balanced distribution between cognitive and affective attitudes. However, the relatively lower mean of behavioral attitudes (m=2.6) indicates that students are less likely to translate their positive cognitive and affective attitudes into behavioral intentions. This discrepancy highlights challenges hindering actual behaviors that require more exploration. The description of cognitive, affective, and behavioral factors are presented in Tables 3, 4, 5 respectively. Each item in the questionnaire is conceptualized to align with a specific corresponding dimension for further systematic conclusions. Further discussion on these aspects will be provided as follows:

Table 3. Description and mean of each cognitive factor

Statements	Corresponding dimension	Mean
1.1. Digitally mediated reading tests enable me to recognize the text types and paragraph organization easily.	Text organization	3.3
1.2. I can easily extract ideas from the texts, identify main ideas, analyze and evaluate information.	Reading proficiency	3.0
1.3. Digitally mediated reading tests enhance my digital literacy skills.	Digital literacy	3.5
1.4. I can apply various reading skills and strategies in my reading tests.	Reading proficiency	3.1
1.5. Digitally mediated reading tests help me think more effectively and find out the answers more easily.	Cognitive processing	3.3
1.6. Digitally mediated reading tests enable me to retain information better and apply it to answer the questions more accurately.	Information retention	2.2
1.7. It is easier to cheat in digitally mediated reading tests than in paper-based reading tests.	Cheating concern	3.5
1.8. Digitally mediated reading tests can enhance my concentration.	Concentration	3.1
1.9. I feel the reading tests are easier when they are digitally mediated.	Ease of use	3.0
1.10. I feel confident in having my reading test scored automatically because it is more accurate and secure.	Fairness of scoring	3.6

Table 3 illustrates the cognitive factors influenced by taking digitally mediated reading exams with each sub-element in its mean score. Generally, participants express positive attitudes with higher mean values for the elements namely text organization, reading proficiency, digital literacy, cognitive processing, concentration and ease of use (m>=3.0). This aligns a recent quasi-experimental study by Caccia et al. (2019) and Schmitterer, Tetzlaff, Hasselhorn, and Brod (2023) stating that young learners improved their literacy skills effectively due to the digitally mediated reading assessment tool namely, LPA. In addition, test takers express a high level of confidence in the fairness of scoring as reflected in the mean score of m=3.6. This finding is similar to previous studies from Bailey (2020) and Hafeez, Ajmal, and Zulfiqar (2022) concluded that there is no discrepancy in student grades and outcomes between a digitally mediated and a traditional test if it is well-designed. Conversely, a sub-element, such as information retention ability (m=2.2) is not rated high. This indicates that the digitally mediated reading tests may hinder students' long-term retention ability. In addition, concerns related to ease of cheating stand out (m=3.5), implying that students perceive digitally mediated testing as more vulnerable to dishonest practices.

Table 4. Description and mean of each affective factor

Statements	Corresponding dimension	Mean
2.1. Digitally mediated reading tests are more interesting.	Excitement	4.0
2.2. Using technological devices in reading tests adds to the stress of the tests.	Test anxiety	2.6
2.3. I prefer doing the reading tests on a technological device or an application than on a paper.	Tech preference	3.2
2.4. I feel less nervous when taking digitally mediated reading tests.	Test anxiety	2.9
2.5. I am more motivated when answering digitally mediated reading questions.	Motivation	3.4
2.6. I feel familiar with digitally mediated reading tests.	Familiarity	3.6

Table 4 describes another aspect that is influenced by digitally mediated reading assessments which is an effective aspect. The level of students' attitudes towards this aspect is highly optimistic. Specifically, excitement is rated the highest (m=4.0), with more than 75% respondents expressing their satisfaction. Moreover, nearly 80% of them also admit that digitally mediated reading assessments are familiar to them, enhance their motivation and confidence (m=3.6). More than half of them also assert that they do not experience high levels of test anxiety when taking digitally mediated reading exams. This completely does not correlate to Isha, Hetanshi, Gohil, and Shinde (2021) and Susanne, Joshua, Philip, and Ulrich's (2022) conclusions suggesting that students suffered a variety of stress or pressure types when doing digitally mediated tests. Whereas, in the study of Gudiño Paredes, Jasso Peña, and de La Fuente Alcazar (2021), students became much more flexible in the digitally mediated mode than the traditional one. Gudiño Paredes et al. (2021) concluded that both students and teachers highly valued the accessibility of digitally mediated assessments, it is intriguing to further explore which elements of the current digitally mediated reading assessment platform can positively facilitate the Vietnamese students' reading testing experience and whether such elements can be adapted in other testing practices.

Table 5. Description and mean of each behavioral factor

Statements	Corresponding dimension	Mean
3.1. I will choose to take reading exams digitally.	Intention of digitally mediated reading assessments	3.5
3.2. I can make better choices in digitally mediated reading tests.	Precise answer	2.8
3.3. I can use my IT skills to interact with different sections of the digitally mediated reading tests.	Digital literacy skill application	2.9
3.4. I can give a more accurate answer in digitally mediated reading tests.	Precise answer	3.0
3.5. Digitally mediated reading tests enable me to revisit specific	Information access	3.3

Statements	Corresponding dimension	Mean
details and find out the answers more easily.		
3.6. I manage sufficient time to answer and finish the digitally mediated reading exams.	Time management	2.7
3.7. I want to practice more digitally mediated reading exercises to improve my skills.	More digitally mediated reading practices	3.5
3.8. I want to improve my IT skills to do the digitally mediated reading tests better.	Digital literacy skill improvement	3.5
3.9. I will choose paper-based materials for reading practices.	Intention to paper-based reading practices	2.3

Table 5 depicts the third aspect of attitudes – the behavioral element, whose overall mean is the highest among the three aspects (m=3.2). When asked about testing mode, 60% of participants expressed their inclinations towards choosing digitally mediated reading exams (m=3.5). This appears to endorse the findings of Magda and Aslanian (2018) with 85% admitting that the digitally mediated mode was either the same or better than the face-to-face mode. Noticeably, they also had the intention to give more precise answers (m=2.8), practice more digitally mediated reading exercise practices (m=3.5), and improve their digital literacy skills to perform better in their upcoming digitally mediated reading assessments (m=3.5). This result was in accordance with the review from Coiro (2021) in which students emphasized the essence of more practice in IT skills for better digitally mediated assessment performances. Besides, the high percentages of neutral responses towards time management (m=2.7) and digital literacy skill application (m=2.9) are noteworthy, signaling the reluctance among participants. Similarly, in a study by Ivanova and Ivanov (2021), their students approved they could actively organize time to complete their own digitally mediated tests. This leaves the need for deeper exploration to understand the factors contributing to these neutral sentiments of the Vietnamese test takers in their digitally mediated reading exams.

Collectively, the overall positive attitude reflects an optimistic outlook of the Vietnamese students on the digitally mediated reading assessment mode. The summary of the three attitudinal aspects is presented in Figure 3.
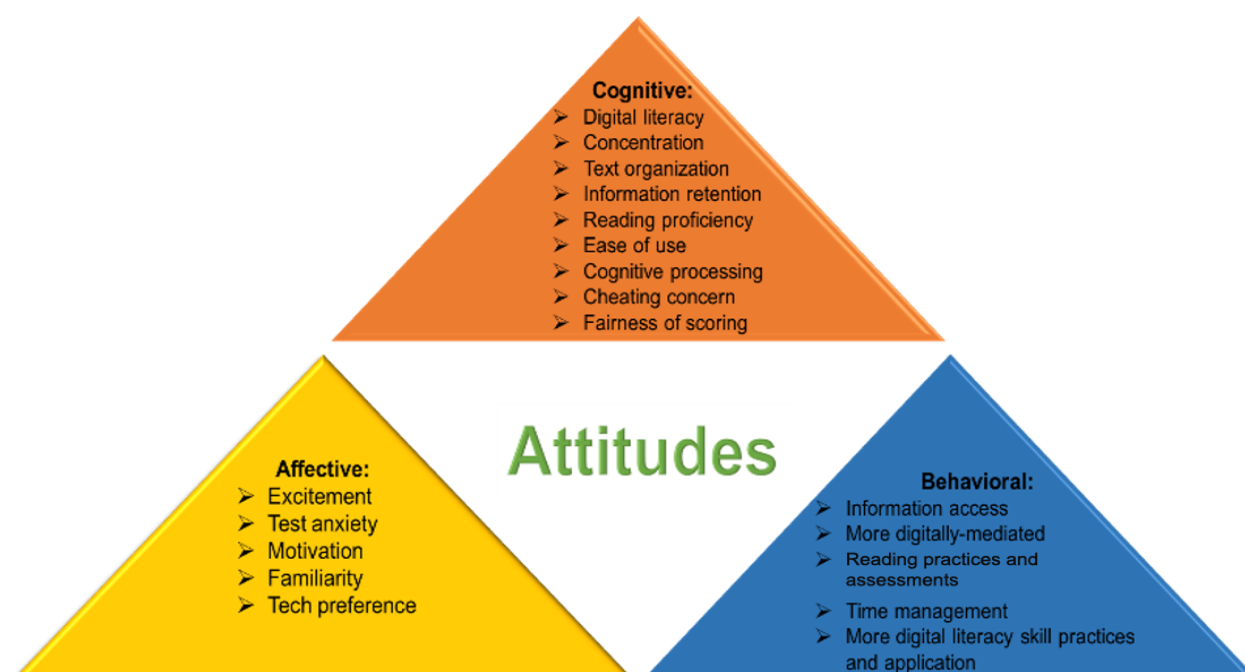

Figure 3. The tri-dimensional model of attitudes towards digitally mediated reading assessments.

The tri-dimensional model (see Figure 3) can bridge the gaps of some prior theories of attitudes and technology adoption. As revised in the previous section, in the traditional social psychology theories, Hogg and Vaughan (1995) highlighted the essence of cognitive aspects while McDougall (2015) put more emphasis on innate and emotional

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factors. While the previous scholars provide foundational constructs of attitudes, single adoption of one framework cannot cover all aspects of attitudes. The present model offers a multi-dimensional approach, and delves into the interplay of cognitive, affective, and behavioral attitudes in a specific context. Furthermore, this model also tailors its analysis to digitally mediated reading assessments – a specific educational setting overlooked by other theoretical frameworks. For instance, the Technology Acceptance Model (TAM) is renowned for technological behavior adoption through constructs such as perceived usefulness and ease of use; however, it does not address the intricate dynamics of attitudes within specific settings. In contrast, this tri-dimensional model of attitudes is more comprehensive and context-specific to educational environments – contexts that are increasingly focusing on digital mediation. This triadic model provides a robust framework for future research aimed at investigating various attitudinal aspects that enhance educational experience and outcomes. However, to identify how these dimensions interact and mutually construct one another to enhance students' overall experiences, correlation analysis was conducted. The following section will analyze the relationships between dimensions in each attitude and the triadic inter-correlations between the three aspects of attitudes.

4.1.1. Correlation Insights of Cognitive, Affective, and Behavioral Dimensions

The inter-connectedness between cognitive, affective, and behavioral attitudes is fundamental to understanding students' experiences with digitally mediated assessments. In addition, such correlations provide empirical evidence that validates prior assumptions and relevant theories. This section will thoroughly discuss the intricate relationship between dimensions in each attitudinal aspect, including cognitive, affective, and behavioral.

Table 6. Correlation between dimensions of attitudes

Dimension		Cognitive aspects								
		1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
Cognitive aspects	1.1. Text organization	1	0.81	0.56	0.81	0.77	-0.37	0.73	0.45	0.66
	1.2. Reading proficiency		1	0.67	0.72	0.44	-0.47	0.34	0.61	0.56
	1.3. Digital literacy			1	0.21	0.14	-0.73	0.63	0.89	0.79
	1.4. Cognitive processing				1	0.62	0.71	0.56	0.84	0.37
	1.5. Information retention					1	-0.11	0.79	0.45	0.44
	1. 6. Cheating concern						1	-0.54	0.11	0.45
	1.7. Concentration							1	0.54	0.77
	1.8. Ease of use								1	0.41
	1.9. Fairness of scoring									1
Dimension		Affective aspects								
		2.1	2.2	2.3	2.4	2.5				
Affective aspects	2.1. Excitement	1	-0.91	0.89	0.56	0.45				
	2.2. Test anxiety		1	0.41	0.32	0.54				
	2.3. Tech preference			1	0.68	0.65				
	2.4. Motivation				1	0.44				
	2.5. Familiarity					1				
Dimension		Behavioral aspects								
		3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	
Behavioral aspects	3.1. Intention to do digitally-mediated reading assessments	1	0.81	0.86	0.79	0.75	0.55	0.76	-0.27	
	3.2. Precise answer		1	0.32	0.53	0.37	0.45	0.64	0.81	
	3.3. Intention to apply digital literacy skills			1	0.77	0.73	0.41	0.45	0.44	
	3.4. Information access				1	0.54	0.56	0.62	0.77	
	3.5. Time management					1	0.54	0.45	0.31	
	3.6. Intention to practice digitally-mediated reading						1	0.64	-0.36	
	3.7. Intention to improve digital literacy skills							1	0.2	
	3.8. Intention to do paper-based reading assessments								1	

Table 6 describes the intricate relationship and interdependencies between cognitive, affective, and behavioral attributes of attitudes towards digitally mediated assessments. Generally, the relationships among cognitive dimensions reveal both positive and negative correlations.

Moderate correlations are indicated between "text organization" and "concentration", "reading proficiency" and "cognitive processing" and "ease of use" and "fairness of scoring". "Text organization" shows a strong correlation with "reading proficiency", "cognitive processing", and "information retention" with approximately r=0.8. These optimistic correlations emphasize the critical role of "text organization" in supporting efficient reading, processing, and retention. A similar trend is found in the strong associations between digital literacy with "ease of use" and fairness of scoring with r=0.89 and r=0.79, respectively. The associations underscore the importance of digital literacy skills in enhancing user experience and perceived fairness in assessments. Additionally, "cognitive processing" strongly correlates with "information retention" and "ease of use", implying that user-friendly assessment platforms are able to promote cognitive engagement. On the other hand, negative correlations are shown in "cheating concerns" with "text organization" (r=-0.37), "ease of use" (r=-0.54), "reading proficiency" (r=-0.47), and "information retention" (r=-0.11). The opposite trends suggest that well-organized testing platforms and clearly-structured reading texts can reduce students' worries about fairness. Moreover, improved reading skills can reduce the concern about cheating possibilities. "Cheating concerns" exhibits a strong negative relationship with "digital literacy" (r=-0.73) inform that higher digital literacy skills may help reduce cheating-related concerns, hence improving test takers' positive attitudes towards digitally mediated assessments. This is closely in line with Aydogan and Özel (2023) depicting that consciousness has a positive relationship with English proficiency performance.

In terms of affective attitudes, the relationships among dimensions are generally positive. The strongest positive relationship is highlighted between "excitement" and "technological preference" (r=0.89). The finding suggests that interest in technologies and digital tools will reinforce the excitement in taking digitally mediated reading tests. This concurs with Svenningsson, Höst, Hultén, and Hallström (2022) who implied that "interest" is the key affective factor in technology education. In contrast, the only distinction is observed between excitement and test anxiety (r=0.91), indicating that efforts in creating a comfortable and stimulating testing environment can effectively alleviate pressures and anxiety on taking tests.

Similarly, the correlation among behavioral dimensions offers valuable insights. Students who are inclined to take digitally mediated reading assessments tend to apply digital literacy skills well into the tests (r=0.86) give more precise answers (r=0.81), access information (r=0.79) and manage their time well (r=0.75). Whereas there is a notable negative relationship between digital literacy application and intention to paper-based practices (r=-0.66). This implies that students with stronger digital literacy are less likely to choose paper-based assessments. In addition, although students with higher digital literacy often excel in digital-mediated assessments, they still highly value traditional formats as indicated by a strong positive correlation with precision (r=0.81). The familiarity and perceived usefulness of paper-based testing formats cannot be overlooked but require more exploration for deeper understanding despite advancements in digital technologies. Interestingly, students who are inclined to traditional testing formats are less likely to improve their digital literacy (r=0.2) and engage in online reading practices (r=-0.66). This suggests that reliance on paper-based methods may hinder students' ability to adapt to digital platforms, which are increasingly integral to modern education and professional environments.

4.1.2. Triadic Inter-Correlations of Cognitive, Affective, and Behavioral Attitudes

Table 7 further demonstrates intricate inter-relationships between cognitive, affective, and behavioral dimensions of undergraduates' attitudes toward digitally mediated reading assessments. This dynamic interplay underscores the complexity of learners' digital assessment experiences and highlights the need to interpret attitudinal responses holistically rather than in separate silos.

Table 7. Correlation between cognitive, affective, and behavioral aspects of attitudes

Dimensions		Affective aspects					Behavioral aspects							
		2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8
Cognitive aspects	1.1. Text organization	0.72	0.54	0.36	0.32	0.37	0.78	0.76	0.63	0.43	0.32	0.66	0.31	0.43
	1.2. Reading proficiency	0.67	-0.34	0.12	0.45	0.41	0.32	0.54	0.36	0.58	0.46	0.52	0.39	0.72
	1.3. Digital literacy	0.32	0.45	0.53	0.73	0.46	0.64	0.61	0.54	0.62	0.77	0.72	0.65	0.53
	1.4. Cognitive processing	0.63	-0.46	0.66	0.64	0.56	0.73	0.83	0.45	0.21	0.86	0.52	0.27	0.65
	1.5. Information retention	0.63	-0.34	0.74	0.32	0.55	0.53	0.37	0.45	0.81	0.54	0.56	0.62	0.77
	1.6. Cheating concern	-0.47	0.81	-0.66	-0.34	-0.12	0.71	0.56	0.84	0.63	0.79	0.79	0.17	0.56
	1.7. Concentration	0.63	-0.33	0.71	0.63	0.34	0.44	0.81	0.74	0.45	0.44	0.21	0.54	0.36
	1.8. Ease of use	0.72	-0.72	0.81	0.78	0.83	0.83	0.52	0.88	0.45	0.53	0.76	0.35	-0.56
	1.9. Fairness of scoring	0.54	-0.44	0.76	0.71	0.12	0.74	0.79	0.17	0.85	0.79	0.17	0.56	-0.66
Affective aspects	2.1. Excitement			–			0.85	0.32	0.54	0.62	0.77	0.72	0.89	0.14
	2.2. Test anxiety			–			0.36	0.41	0.28	0.32	0.27	0.65	0.62	0.78
	2.3. Tech preference			–			0.53	0.78	0.56	0.64	0.81	0.54	0.65	-0.7
	2.4. Motivation			–			0.76	0.54	0.76	0.63	0.5	0.54	0.66	-0.3
	2.5. Familiarity			–			0.81	0.56	0.77	0.66	0.45	0.64	0.54	0.54

Excitement strongly correlates with text organization (r=0.72), ease of use (r=0.72), and reading proficiency (r=0.67). These relationships indicate that students who effectively engage with text structures will be more likely to feel excited about digital tests and exhibit better reading comprehension skills. In addition, their "excitement" about digitally mediated reading tests also facilitates higher-order thinking, as shown in the correlation with "cognitive processing" (r=0.63). However, the role of the unfavorable affective dimension – "test anxiety" highlights an opposing dynamic. "Anxiety" affects cognitive dimensions such as "ease of use" (r=-0.72) and "cognitive processing" (r=-0.46). "Anxiety" has a strong correlation with "cheating concern" (r=0.81), suggesting that heightened stress can shift focus toward fairness and integrity issues. In contrast, "technological preference" emphasizes the positive influence of comfort with digital tools. Its strong correlations with "ease of use" (r=0.81) and "information retention" (r=0.74) suggest that familiarity with technologies fosters better usability and memory. However, its weak link to "reading proficiency" (r=0.12) indicates that technological affinity alone does not necessarily enhance reading comprehension skills. This highlights the need for balanced approaches that integrate cognitive and technical developments. Besides, "motivation" emerges as a key driver of cognitive attitudes, particularly in promoting "digital literacy" (r=0.73), "fairness of scoring" (r=0.71), and "cognitive processing" (r=0.64). These correlations denote the role of motivation in fostering necessary skills and high-order thinking. Hence, it is crucial to create a fair and supportive online testing environment to sustain test takers' motivation. Lastly, "familiarity" with digital testing formats is essential to boost usability and comprehension. Its strong correlation with "ease of use" (r=0.83) underscores the importance of user-friendly online platform design. Moreover, moderate links with "information retention" (r=0.55) and "cognitive processing" (r=0.56) implies that familiarity with the digital mode of testing optimize the thinking process and cognitive engagement, therefore improve the overall assessment experience. The correlation between cognitive and behavioral attitudes towards digitally mediated reading assessments is generally positive. In particular, "intention to do digitally mediated assessments" strongly correlates with "text organization" (r= (r=0.78), "cognitive processing" (r=0.73), and "time management" (r=0.86). This reveals how a solid grasp of text structures enhances students' cognitive abilities and efficient test performance. Similarly, "digital literacy" links to time management (r=0.77) and "intention to do digitally mediated assessments" (r=0.72), suggesting that technical proficiency facilitates structured engagement with digital platforms. Another cognitive dimension - "ease of use" has strong correlations with "intention to practice digitally mediated reading" (r=0.76) and "intention to do digitally mediated reading assessments" (r=0.83)

whereas negatively correlating with "intention to do paper-based reading assessments". This finding closely aligns with that of Svenningsson et al. (2022) concluding that behavioral intention to technology integration have strong relationship with cognitive components. These points out that well-designed testing platform can encourage more exposure to digital mode while reducing the need for reverting to traditional methods. Noticeably, "cheating concern" and "fairness of scoring" significantly influence behavioral attitudes. These two cognitive dimensions strongly correlate with "intention to do digitally mediated reading assessments" with r=0.74 each. It can be implied that students' awareness of potential misconduct shapes their willingness to approach online assessments.

Table 7 also provides insights into how affective attitudes influence behavioral attitudes. As can be seen, "excitement" shows strong positive correlations across all behavioral dimensions, particularly with "intention to do digitally mediated reading assessments" (r=0.85) and "intention to improve digital literacy skills" (r=0.89). These results indicate that excitement acts as a powerful motivator for digital activities. Likewise, similar positive correlations are evident between "motivation", "tech preference", and "familiarity" with almost behavioral dimensions, whose correlations range from r=0.50 to r=0.80. This finding is similar to Ben-Eliyahu, Moore, Dorph, and Schunn (2018) who emphasized that students' motivation positively influenced their engagement in learning activities. However, these affective dimensions have weak or negative relationship with "intention to do paper-based reading assessments. It can be implied that test takers with positive affective attitudes tend to be more engaged in digital-related activities. Conversely, "test anxiety", with moderate correlations with behavioral dimensions is considered a challenge that hinders tasks in digital environments.

The correlation analysis highlights the interconnectedness of cognitive, affective, and behavioral attitudes in general and of dimensions in particular. This finding confirmed the prior studies related to the essence of cognitive, affective, and behavioral attitudes in digitally mediated education, such as Hudson et al. (2019); Jung, Kim, Yoon, Park, and Oakley (2019) and Post, Guo, Saab, and Admiraal (2019). However, the present study contributes to the existing body of literature by specializing in assessment discipline. It provides valuable guidance for designing effective assessment approaches that foster students' performance in digital environments. Besides these, to explore the embedded reasons for varying degrees of positive attitudes and neutral responses, qualitative data from the eight respondents were rigorously analyzed utilizing the thematic analysis approach. The detailed findings will be discussed in the following section.

4.2. Findings from the Interview

Thematic analysis enabled the researchers to identify the embedded reasons which were conceptualized into six main themes, namely technical issues, cheating issues, support availability, grading and feedback, testing platform interface and future engagement.

Category 1: Technical issues

Overall, most of the students' responses (n=12) underscore the vulnerability of the digitally mediated reading assessment system to unforeseen problems, such as application malfunctions and system logouts. This firstly may pose a risk to the smooth execution of the digitally mediated reading assessments, which induces stress and anxiety:

Student 3: *"I am a bit worried about some unexpected problems with my laptop before the exam dates. Sometimes the application required by the university does not work accidentally."*

In addition, students also described unexpected disruption which caused the loss of data and compelled them to redo the tests:

Student 6: *"I was extremely stressed when I was doing the reading tests, and the system was suddenly logged out. I lost all the data and needed to do the test again. I felt demotivated then and it affected my abilities to answer reading questions."*

The technical challenges contribute to demotivation and potential hindrances to effective performance in digitally mediated reading assessments. This finding restated the finding of a quantitative study in the South

Vietnamese context by Trang and Chi (2022) acknowledging that technical issues are the most problematic issue. Bender (2023) emphasizes the importance of informing students that unexpected technical issues would not diminish their test accomplishments.

Category 2: Cheating issues

The theme "Cheating issues" is highlighted from complex opinions towards dishonesty in digitally mediated reading tests. Although some students (n=4) did not mention any problems related to cheating, the rest of them (n=8) raised doubts about the integrity of the assessment process.

> Student 4: *"I feel it is easier for students to cheat in digitally mediated reading tests because I find some of my friends' results higher than usual."*

Besides, they also suggest a lack of confidence in unfairness due to the repetition of the reading content.

> Student 7: *"Sometimes the reading texts are repetitive, so it is quite unfair. I heard my friends doing the same reading the text and questions twice."*

Similarly, in their interview responses, two other students present contrasting views, asserting that cheating can be minimized due to the randomization of the questions and less chance for discussion.

> Student 8: *"I think it is harder to cheat in digitally mediated reading exams because the questions are random, and we cannot ask our peers. The invigilators are strict. We can be fined."*

> Student 3: *"I can trust that the tests are of high quality and are reliable. The invigilators are very strict, even my teacher in her invigilation, so we cannot cheat whether it is a digitally mediated test or a traditional test. I have no problem whether the exam is digitally mediated or on paper."*

Similarly, students also feel secure in taking digitally mediated reading tests due to the strict and supportive invigilation. This suggests that the issues of cheating should be less about the digitally mediated system and more about the perceived efficacy of invigilation methods for some students. This opinion strengthens the findings of Coniam (2022) who reported that their participants feel grateful in the exams with strict invigilation.

Category 3: Support availability

Students express their satisfaction that teachers and invigilators are responsive during the instances of technical difficulties (n=5) as follows:

> Student 2: *"I am happy that whenever some technical problems happened, my teacher or the invigilators always listened and supported me as much as they could."*

This reflects the importance of implementing a robust support system in place by the testing policies, which positively reassures healthy testing environment for test takers. This viewpoint endorses Coniam's (2022) findings, asserting that the test-takers feel confident that they get sufficient support when taking digitally mediated exams.

Category 4: Grading and feedback

Regarding the notion of grading and feedback, students appreciate the turnaround time and automated grading processes (n=9) as follows:

> Student 1: *"Since I take the digitally mediated reading tests, I can get the results much faster. I also trust that my scores are precise because I know all are automatic."*

They additionally note the efficiency of the electronic reading test compared to the paper-and-pencil exams.

> Student 2: *"I think digitally mediated reading tests save more time because typing is faster than handwriting, and you know, my handwriting is not good as well, so it can influence my score because the graders cannot see my answers clearly."*

The "grading and feedback" theme highlights the advantages of the digitally mediated reading assessments in terms of speed, precision, and objectivity in grading as well as the potential time-efficient benefits for students. This shared the same vein with Irons and Elkington (2021) and Martin and Bolliger (2018) also asserting that both

students and teachers assumed timely and frequent feedback are highly appreciated. Sharing a similar view, Hyland and Hyland (2019) emphasized that while technology integration serves as a pivotal tool in modern education, teachers' constructing feedback – an inherently human process is highly recommended in developing students' academic performance.

Category 5: Testing platform interface

Englund, Moosvi, and Roll (2023) and Wang (2023) advocated that digitally mediated interface design has significant influences on how students perceive a digitally mediated tool. In this study, the aspect of the interface possesses two opposite opinions. On the one hand, students enjoyed the interactive features of the platforms (n=5), contributing to the feeling of less tedious testing experiences as follows:

> Student 1: *"I enjoy the feeling of scrolling up and down, uhm…clicking to the answers or from page to page. I do not know why but it just makes me feel the test is shorter and less boring."*

On the other hand, some other students (n=5) cited unfamiliarity with the type and size. This observation underscores the importance of considering readability and user-friendly design in digitally mediated testing platforms to ensure that visual elements do not hinder students' comprehension and performance.

> Student 5: *"I think the font is hard for me to read, like, I am not familiar with that font type and size."*

Category 6: Further engagement

Students reveal the positive impacts of the digitally mediated reading tests on motivation and practice behaviors (n=8). They become more engaged and willing to practice for skill development.

> Student 2: *"I think the digitally mediated reading tests motivate me to practice more online reading exercises. I become more familiar with this mode of reading tests."*

> Student 5: *"Well, the digitally mediated test platform is not very difficult to interact with, so I do not think it can help me improve digital literacy skills, maybe a bit, like I can be more confident in other online tests. But conversely, if you have good literacy skills, it is beneficial."*

This theme highlights a bright side in digitally mediated reading assessment practices, which is promoting the internal motivation of students for further practices. It supports the finding by Pasaribu's (2020) concluding that digitally mediated reading tasks can foster learners' autonomy.
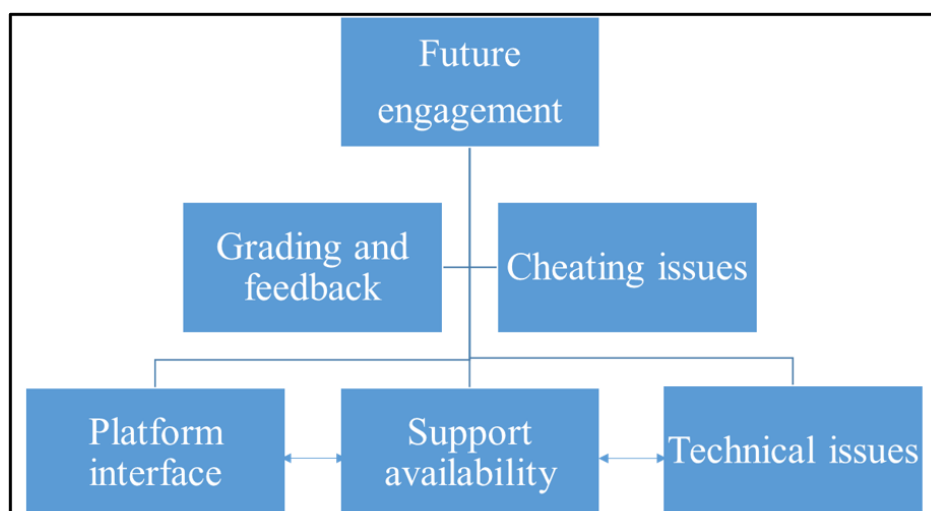

Figure 4. The interconnection of challenges faced by students in digitally mediated assessments.

However, Vietnamese students appear more flexible and eager to adjust to a new learning environment than Hong Kong students compared with a very recent study by Chak (2024). In a nutshell, employing the thematic analysis approach has yielded significant insights into the underlying reasons shaping the EFL undergraduates'

attitudes towards digitally mediated reading assessments. In addition, the identified themes, including technical issues, cheating issues, support availability, grading and feedback, testing platform interface and future engagement, thoroughly enriched and validated quantitative results. A comprehensive visualization (see Figure 4) elucidates the synergistic interrelations among six pivotal themes.

Future engagement is built upon the foundational interplay of the other five elements. Among these, platform interface, support availability, and technical issues are the three primary constituents that can improve grading and feedback mechanisms as well as address cheating issues. It is demonstrated that improvements in one area can have a cascading positive effect on others, which ultimately enhances the overall experience of digitally mediated test-takers. The two concerns related to grading and feedback and cheating issues can directly influence the likelihood of future engagement among digitally mediated test takers. Negative experiences in one area, such as unclear grading criteria or prevalent cheating can deter students from engaging in future digitally mediated assessments. In return, these two elements are shaped by three factors including platform interface, support availability, and technical issues. For instance, poor technical support might lead to cheating concern, which influences students' confidence in the grading system. In other words, addressing technical issues can reduce the test takers' frustration and undermine the integrity of the testing experience. Similarly, an ineffective interface may worsen the digitally mediated testing experience as well as exacerbate frustrations related to cheating or grading feedback. Moreover, knowing that support is available can reduce the test takers' anxiety and discourage cheating, as well as strengthen their confidence in the fairness and reliability of grading and feedback. Comparing the exploration with a recent study in the Asian context by Chak (2024) suggests a distinctive observation regarding adaptability and eagerness. Vietnamese students demonstrated more flexibility and enthusiasm in adjusting to a new learning environment in contrast to their Hong Kong counterparts. A noteworthy contrast is revealed when compared with the conclusions of Tian, Lê, and Nguyễn (2023) suggesting that the digitally mediated mode of assessments is less prevalent than the traditional one. Although the two studies were conducted in the Vietnamese context, when delving deeper into a specific domain of digitally mediated reading assessments, findings in this study reveal a more optimistic outlook among students. However, a harmonious agreement with Tian et al. (2023) is evident in the shared perception that alternative assessments were challenging to students to some extent and highly required further development.

5. CONCLUSION

The integration of technology has become increasingly pervasive across various facets of education in the digital transformation landscape in Vietnam. In a bid to contribute to this educational innovation, the present study has undertaken a thorough examination of Vietnamese EFL undergraduates' attitudes towards digitally mediated reading assessments and gathered surprising information on this issue. Students' attitudes toward digitally mediated reading assessments are categorized into three primary aspects: cognitive, affective, and behavioral, each of which highlights specific attributes. There are positive relationships among the three aspects, indicating that targeted intervention in all three domains can holistically improve students' experience and outcomes in digitally mediated environments. Within the cognitive domain, nine key considerations include digital literacy, concentration, text organization, information retention, reading proficiency, ease of use, cognitive processing, cheating concerns, and fairness of scoring. In the affective domain, students placed significant value on five aspects such as excitement, test anxiety, motivation, familiarity, and tech preference. Regarding behavioral domain, test-takers demonstrated their intentions in further digitally mediated reading practices and assessments, further digital literacy skill practices and application, information access, and time management. The tri-dimensional model of attitudes towards digitally mediated reading assessments (see Figure 3) can serve as a practical tool for future research on diagnosing perception and engagement. Qualitative findings highlight six key themes including future engagement, cheating issues, grading and feedback, platform interface, support availability, and technical issues. The graph of the interconnection of challenges faced by students in digitally mediated assessments (see Figure 4)

can serve as a critical framework in broader educational contexts to consider and examine factors that students may encounter during their learning experience. By leveraging this framework, teachers and researchers can gain nuanced insights into the complex interplay of elements that may be potentially challenging. This comprehensive understanding can mitigate potential barriers and optimize learning outcomes, hence creating a more conductive and supportive educational environment.

6. CONTRIBUTIONS AND RECOMMENDATIONS

The results of this study are poised to make meaningful contributions to the ongoing dialogues surrounding the intersection of technology and education. This study bridges the gap between reading proficiency and digitally mediated assessments in the context of Vietnam where research on digitally mediated reading assessments remains scarce. In accordance with the educational landscape continues to embrace the digitally mediated paradigm, understanding and addressing students' attitudes and experiences in their learning activities becomes paramount. More thoroughly, this study provides a nuanced analysis by categorizing students' attitudes into three interconnected domains - cognitive, affective, and behavioral, and highlights specific factors influencing each domain. The key novelty lies in its comprehensive visualization of findings through graphical representation. It not only enhances clarity but also provides practical frameworks for advancing the design and implementation of digitally mediated assessment systems in particular, and relevant educational practices in general.

The study suggests several recommendations for teachers and policymakers as well as acknowledging further improvements for further research. Regarding teachers and policymakers, five recommendations are pinpointed. First, institutions should offer digital literacy training for students to improve their skills to confidently navigate digitally mediated assessments. Second, it is important to address technical issues, upgrade interface design, and prioritize features that reduce cognitive load, enhance positive emotions and motivate ongoing engagement. Third, teachers should show their readiness to familiarize students with the assessment process, communicate clear testing and grading policies and secure their testing experience from cheating and unfairness. For further research, first, it is imperative for future studies in this domain to empirically examine the elements in cognitive, affective and behavioral domains identified in this study to validate their influences on students' attitudes. Additionally, comparative studies can be conducted to evaluate the generalizability of the present findings across different settings, cultural environments, or subject areas. Third, extending studies also can enlarge the sample size including more diverse age groups, academic disciplines, and demographic backgrounds. Fourth, another enhancement could be the involvement of not only test takers but also instructors and test designers who equally play a pivotal role in integrating digitally mediated reading assessments into the academic environment. Besides, conducting further investigations that additionally consider students' academic performances would provide more valuable insights. Lastly, as students may exhibit varying attitudes and outcomes across different academic subjects, conducting studies that explore these variations could yield more robust and reliable results.

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