DIFFERENCES BETWEEN ARABIC AND ENGLISH MEDIUM SCHOOL LEARNERS IN TERMS OF E-LEARNING TECHNOLOGY ACCEPTANCE AND USE FROM THE ASPECT OF THE CONSTRUCTIVIST LEARNING APPROACH

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ABSTRACT

Schools in Iraq use Arabic, and English, as the language of instruction. This study aims to examine the impact of language of instruction on students' attitudes towards technology, teaching practices, and learning outcomes in secondary and upper primary schools in Iraq. This research study employed a quantitative approach to explore the differences in influencing factors such as, constructivist learning approach, student investigation, respect for difference, attitude towards technology use, perceived usefulness, perceived ease to use, learning facility that affect the acceptance of e-learning technology and perceived e-learning outcomes by incorporating a constructivist learning approach between schools that use either Arabic or English as the language of instruction. The data were obtained from 936 secondary and upper primary school students based in Erbil through a self-report questionnaire. A structural equation modeling approach was implemented to analyze the data and test the hypotheses in this study. This study revealed that students studying in English medium schools showed stronger positive effects from the Constructivist learning approach on their perceived e-learning outcomes. Conversely, students studying in Arabic medium schools demonstrated a more potent positive effect from perceived usefulness on their attitudes towards technology. Moreover, the positive impact of an attitude towards technology use on perceived e-learning outcomes was more pronounced among the Arabic medium school students compared to English medium school students. Additionally, the influence of the learning facility on the perceived ease of use, as well as the perceived usefulness of technology, differed between the two groups. The English medium school students experienced a more substantial positive impact. However, there was no significant positive difference observed in the effect of perceived ease of use on attitudes towards technology use between the English medium and Arabic medium school students. Furthermore, no significant positive difference was observed in the effect of perceived usefulness on the Constructivist learning approach for either Arabic medium school students or English medium school students.

Keywords: English-medium instruction, Arabic-medium instruction, constructivist learning approach, e-learning technology acceptance model, perceived e-learning outcomes, Multi-group Analysis, partial least squares structural equation modeling (PLS-SEM).

INTRODUCTION

In the digital age, there has been a surge in the prevalence and visibility of Information and Communication Technologies (ICTs), which have necessitated a reconceptualization of teaching and learning. The utilization of ICTs in the educational sector has become a significant and widely discussed issue in recent years. Despite the growing popularity of educational technologies such as tablets and smartphones, mobile learning has emerged as the preferred choice among education users. Its ability to provide proactive teaching, foster active learning, facilitate quicker knowledge acquisition, and create spaces for sharing information and interaction all contribute to its growing popularity (Huang et al., 2020; Livingstone, 2012). Schools in Iraq use Arabic and English as languages of instruction. This study examines the impact of the language of instruction on students' attitudes towards technology, teaching practices, and learning outcomes in Arabic and English medium school students in Iraq.

Many international organizations, such as UNESCO, as well as Arab governments and policymakers in the field of education, have expressed considerable worry about the impact of language, especially English, on internet use and access (Hasan & Ditsa, 1999; United Nations Development Program & Regional Bureau for Arab States, 2011). Despite there being almost 6,000 other languages in the world, 58.8% of websites in a poll done in (2023) by World Wide Web Technology Surveys (W3Techs) used English as their primary language. As it turns out, only ten languages make for 86.4% of all online material as it is shown in the figure (1). About 1.5 billion people can communicate well in English, yet only 1.2 billion of them utilize the internet, making up only 25.9% of all internet users. Therefore, without the aid of translation software, over 60% of websites may be inaccessible to the world's non-English speaking internet users. These numbers highlight the seriousness of language hurdles in the worldwide web, which may prevent non-English speakers from fully partaking in global conversations and restricting their access to information (Richter, 2022). Therefore, it is essential in countries where English is not first language to develop e-learning resources that make use of local languages.

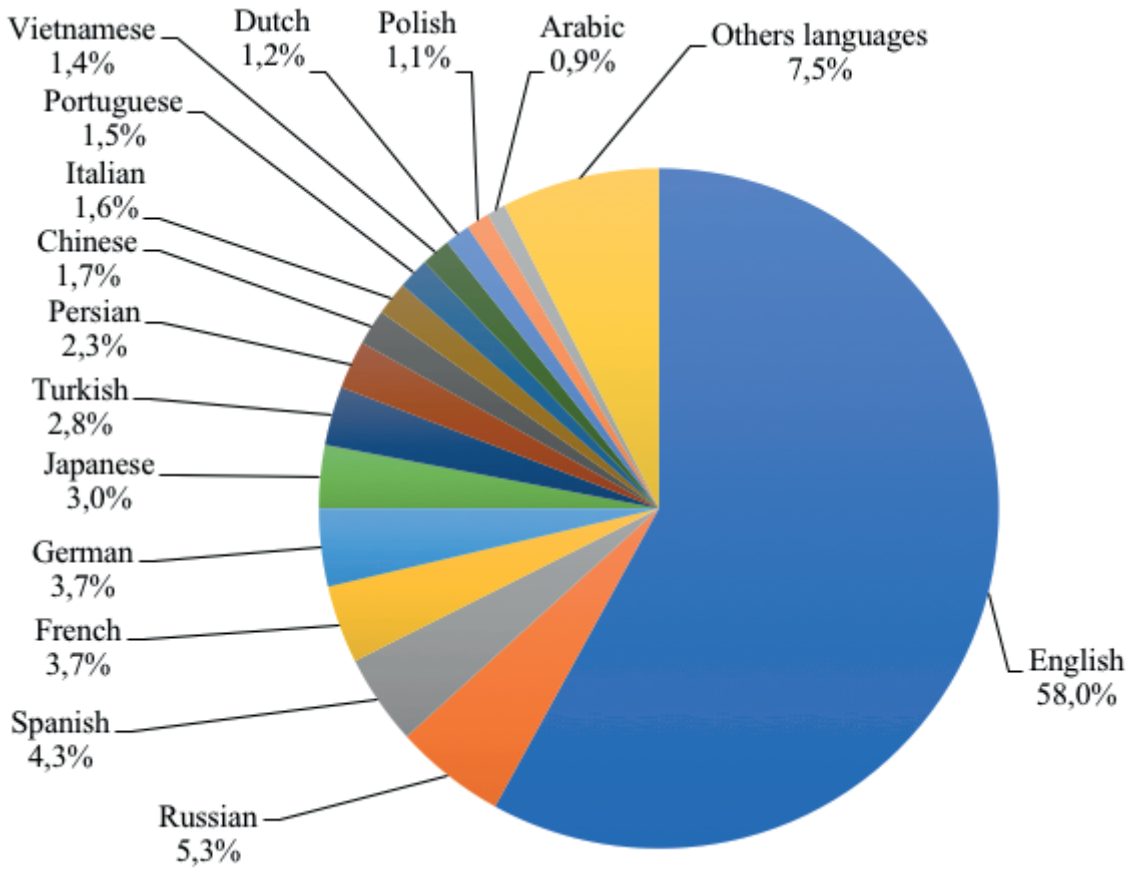

Figure 1. As of January 2023, the languages most commonly utilized for web content

The Arab educational system also confronts similar difficulties. Many students with low English proficiency tend to avoid e-learning due to their struggle with understanding English materials, as observed by Shraim and Khalif (2010) in Palestine. This issue extends to instructors, with some faculty members at Libyan universities reported as being computer illiterate and having struggles with English, compounded by a lack of Arabic-supported e-learning applications (Kenan et al., 2013). Studies in the Arab world, including those by Al Masri and Rimawi (2022) and Alkharang and Ghinea (2013), have highlighted this issue, suggesting the need for local language resources to boost the efficacy of internet utilization and e-learning. The underrepresentation of Arabic online coupled with the absence of comprehensive translation tools heightens the language barrier for Arab people, impeding their full participation in global digital spaces.

The social and cultural aspects play a significant role in the e-learning process. The cultural elements and factors affecting the implementation of e-learning cannot be overlooked, despite their complexity. The cultural factors are considered the most challenging to identify, conceptualize, and quantify (Hasan & Ditsa, 1999). To craft effective e-learning policies, policymakers need to possess a comprehensive understanding of the social and cultural standards and contextual expertise of a specific region. These cultural standards and customized instructional materials govern the modification of course content to accommodate local language, culture, and religious beliefs. For example, symbols and images used in the course material should be culturally appropriate to avoid offending or confusing the learners.

E-learning providers in Middle Eastern countries with educationally limited development tend to overlook these crucial elements (Khan et al., 2015). The available content is often disorganized and lacking instructional value. In Saudi Arabia, a major challenge in e-learning is the lack of customization, as evidenced by a research investigation conducted at King Khalid University has found that there is interference between educational and non-educational materials on social media platforms (Al-shehri, 2012). To ensure the maximum effectiveness of e-learning, it is crucial to make sure that educational materials are available in the native language of the targeted learners. This is especially important for enabling individuals living in remote areas to take advantage of online learning.

This study is a comparative study between schools that use English-medium instruction and schools that use Arabic-medium instruction, focusing on technology acceptance and use in the constructivist learning approach and its impact on e-learning outcomes. Previous research has highlighted the lack of e-learning resources and software applications in Arabic, particularly in many Arab countries such as Palestine, Libya, Jordan, and Kuwait, which can hinder the adoption and acceptance of new technologies like e-learning platforms by both teachers and students (Al Masri & Rimawi, 2022; Alkharang & Ghinea, 2013; Kenan et al., 2013; Shraim & Khlaif, 2010).

In addition to language barriers, most e-learning resources are primarily available in English and are not adapted to the cultural context of local communities. For instance, symbols and images used in course materials may be culturally inappropriate, leading to confusion or offense, especially in subjects like social studies. This creates significant concerns for educators and impedes the adoption of e-learning among Arab students in many Arab countries. For example, in Palestine, a large percentage of students and teachers reported difficulties in understanding English ICT terminology and expressed a preference for Arabic (Shraim & Khlaif, 2010). Similarly, the lack of software in native languages, as observed in the Vietnamese context, also affects students' ability to use educational applications effectively (Vu et al., 2011).

Based on these findings, the goal of this study is to evaluate the acceptance of e-learning and technology in English and Arabic medium schools. The study aims to identify the factors influencing e-learning adoption in both types of schools and determine how these factors vary in different educational environments.

ARABIC MEDIUM INSTRUCTION

Stretching from the Atlantic Ocean to the Arabian Gulf, the Middle East and North Africa encompass a vast geographical area. Numerous shared historical and cultural elements can be found across the nations in this region. The predominant religion, Islam, coupled with the widespread use of the Arabic language, significantly contributes to the formation of the region's identity (Akkari, 2004). Arabic is official language

in Iraq. English is taught alongside Arabic. Therefore, the students in Arabic medium instruction schools are from Arabic ethnic group but beside mastering their mother tongue language, they take Kurdish and English courses. The Mathematic, natural Science and social science are taught in Arabic language.

ENGLISH MEDIUM INSTRUCTION

English Medium Instruction (EMI) refers to the practice of using English as the language of instruction to teach academic subjects in non-English speaking countries or regions. Instruction in English is widespread in countries throughout the Middle East, Asia, and Europe, primarily because of a growing need for global integration and the dominant role English plays as a global lingua franca (Macaro et al., 2018). Importantly, the focus of EMI is not on teaching English itself, but on teaching academic content with English serving as the medium (Pecorari & Malmstrom, 2018). English language proficiency is thus a byproduct of this approach, rather than its main goal (Muttaqin & Chuang, 2022). The cultural and linguistic landscape of Iraq is diverse and rich. Serving as the official languages, Arabic is understood and spoken by the majority of the citizens. Besides these, the region also accommodates languages such as Assyrian Neo-Aramaic, Chaldean Neo-Aramaic, and Turkmen, each spoken widely within their respective communities. Among this linguistic multitude, English emerges as a second or third language for most students studying in English medium schools within the region.

ENGLISH LANGUAGE PROFICIENCY AND E-LEARNING OUTCOMES

English language proficiency refers to an individual's capability to effectively use the English language, encompassing writing, listening, reading, and speaking skills (Jimoh & Kenneth, 2016). This competency is critical for academic success, particularly for students in English Medium Instruction (EMI) programs, and is often measured through tests like TOEFL, IELTS, or TOEIC (Dev & Qiqieh, 2016; Rose et al., 2019).

Several studies have underscored the relationship between English language proficiency and learning achievement. These studies were conducted across multiple countries, including Iran (Maleki & Zangani, 2007; Sadeghi et al., 2013; Sahragard & Baharloo, 2009), Oman (Roche & Harrington, 2013; Sivaraman et al., 2014), Australia (Feast, 2002; L. C. Wilkinson & Silliman, 2008), Nigeria (Ajibade, 1993; Fakeye & Ogunsiji, 2009; Jimoh & Kenneth, 2016), and the United Arab Emirates (Suleiman, 1983). The studies discovered that students with a higher command of English often achieved higher academic success. This significant relationship was observed using various metrics, such as Grade Point Average (GPA) and performance in specific courses like cataloguing and classification (Jimoh & Kenneth, 2016; Muttaqin & Chuang, 2022).

Meanwhile, inadequate mastery of language skills has been found to stifle academic progress. For instance, in the Arab world, Suleiman (1983) found that deficient language skills impeded the advancement of Arab students at the university. Likewise, an investigation by Sivaramana and colleagues in (2014) also discovered that poor English Language proficiency in the English language hindered the success of engineering students in Oman. Further supporting these findings, research conducted at two higher education institutions in Oman showed a significant and positive correlation between performance in English and overall academic success (Jimoh & Kenneth, 2016; Roche & Harrington, 2013).

Language proficiency also influences how efficiently, and quickly non-native speakers assimilate and comprehend information. For example, in a global e-learning program, non-native English speakers read at a slower speed than native speakers and thus preferred instructors to summarize the content before reading assignments (Edmundson, 2007). The use of English as a medium of instruction presents language challenges to students, affecting their capacity to accurately express their ideas, logic, and understanding of scientific concepts (Pun et al., 2022). This issue is especially pronounced for students with limited English proficiency. Moreover, poor vocabulary knowledge in English has been associated with reduced communication skills, lack of comprehension and potential negative impacts on student achievement (Pun et al., 2022; Soruc et al., 2018; Wang et al., 2018).

ENGLISH LANGUAGE PROFICIENCY AND E-LEARNING TECHNOLOGY ACCEPTANCE

Language plays a crucial role in cultural identification and mediates cognition, embodying unique ways of thinking and speaking (Gudykunst & Mody, 2002; Mason, 2003; Pincas, 2001). It's an essential component of cross-cultural communication that's often overlooked in theoretical frameworks, despite its profound influence on thought and communication patterns (Gunawardena et al., 2001). Underlying this is the Sapir-Whorf hypothesis, suggesting that language not only reflects but also shapes our thoughts, beliefs, and attitudes. In this context, language's grammatical structure isn't just a conduit for expressing ideas, but it actively influences and shapes those ideas (Mason, 2003).

From an educational perspective, a student's ability to effectively use a language can influence their willingness to embrace technology. For example, a more recent study conducted by Al Masri & Rimawi (2022) titled "Challenges of applying e-learning facing faculty members in public universities during COVID-19" echoes these sentiments. In their study involving 226 randomly chosen faculty members from four Jordanian public universities, they found that second only to the challenge of scientific research on the Internet was the issue of English language proficiency. Their findings align with another study conducted in Palestine by Shraim & Khlaif (2010), where a significant percentage of both students and teachers reported being perplexed by English ICT terminology, expressing a preference for Arabic.

The role of social and cultural issues affecting e-learning effectiveness has been the focus of multiple studies, particularly those conducted in non-English speaking countries such as Arab nations. Research has shown that factors such as computer illiteracy, language barriers, and a lack of e-learning resources can significantly influence instructors' utilization of e-learning (Aldowah et al., 2019; Alkharang & Ghinea, 2013; Kenan et al., 2013). For instance, despite being provided with personal computers, a significant number of faculty members at Libyan universities were found to be computer illiterate, with additional struggles with English. This language issue was compounded by the lack of Arabic-supported E-learning applications, making teaching e-learning courses nearly impossible (Kenan et al., 2013).

Alkharang and Ghinea (2013) suggest that language barriers, specifically when e-learning content is primarily available in English, can inhibit the adoption and acceptance of new technology, such as e-learning platforms, particularly in non-English speaking regions or where English is a second language. In these contexts, learners who are not proficient in English may find it challenging to understand and interact with the technology, leading to reluctance to use it (Alkharang & Ghinea, 2013). In an examination of this issue in the Arab world, Alkharang and Ghinea (2013) also found out that these language barriers are a priority concern in Kuwait, unlike in developed countries where they are considered less significant. This indicates that the correlation between the language of instruction and technology acceptance may vary from region to region, and it is not a universal phenomenon.

METHODOLOGY

The Constructivist Learning Survey

The Constructivist Learning Survey is a tool grounded in social and cognitive constructivist theories. It measures the value students place on creating engaging learning environments that foster critical thinking, inquiry, investigation, negotiation of ideas and collaboration (Huang et al., 2020; Sultan et al., 2011). There are five scales within the pioneering CLA survey which are adopted from Constructivist Learning Environment Survey (CLES) (P. C. Taylor et al., 1994, 1997), and each scale includes between four and six sub-scales. Standard elements of the constructivist learning approach (CLA) survey, widely used within the CLES, include Shared Control, Student Negotiation, Uncertainty, Personal Relevance, and Critical Voice. The combination of these constructs has created a high-order construct known as a constructivist learning approach and administrated in the Arabic and English school students at Iraq. The range of potential responses a student can provide in the survey includes Almost Never, Seldom, Sometimes, Often, and Almost Always. These options constitute what is referred to as the five-point Likert scale. Johnson and McClure (2004) in their research, defined elements of constructivist learning approach, regarded as the primary constructs in the current research investigation:

1. *Personal Relevancy* of students refers to the growth of their knowledge derived from their daily activities and the interconnectedness of experiences both inside and outside the school environment. (Johnson & McClure, 2004).
2. *Critical Voice* is the practice of questioning teaching methods and structures through the identification of hindrances to learning, along with the extent to which an environment fosters such questions and innovations positively, to find room for alternative ways of developing knowledge (Johnson & McClure, 2004).
3. *Student Uncertainty* refers to the degree to which students view scientific knowledge as being derived from theoretical investigations. This concept also includes the exposure of students to human values and experiences that are consistently evolving and are established within social and cultural contexts (Johnson & McClure, 2004).
4. *Student Negotiation* is the method where students assess the significance of their concepts or opposite ideas by carefully listening, appraising other students' viewpoints, and elaborating on their developing ideas (Johnson & McClure, 2004).
5. *Shared Control* refers to the practice of students actively participating in defining evaluation criteria, setting learning goals, designing instructional methods, and shaping the classroom environment by offering their input and ideas (Johnson & McClure, 2004).

The influence of psychological aspects in the formal and informal learning environment on student learning outcomes has been confirmed by recent studies, building upon early academic research in the field. This validation is seen in works from various countries, such as Singapore (Chionh & Fraser, 2009), Malaysia (Sultan et al., 2011), Indonesia (Margianti et al., 2004) , and Canada (Parker & Becker, 2003). T. Wangpipatwong and Papasratorn (2007) found out that students using constructivist e-learning technologies within a traditional classroom achieved superior test scores and learning outcomes compared to their counterparts. Tynjala (1999) carried out an experiment as part of an educational psychology course. The experiment indicated that students who learned in a constructivist setting displayed better learning results and a more extensive range of knowledge than those who learned through conventional teaching approaches. Thus, the current research has proposed the following hypothesis regarding constructivist learning approach:

Hypothesis 1: There is a significant positive difference for effect of a constructivist learning approach on perceived e-learning outcomes between Arabic and English medium school students.

E-Learning Technology Acceptance Model

The E-Learning Technology Acceptance Model (ETAM), renowned for its simplicity, adaptability, and predictive prowess, is a dominant model in the realm of technology acceptance. ETAM probes both individual and social-psychological factors affecting attitudes and utilisation of e-learning technology. As such, it proves to be a dependable research instrument for predicting technology adoption (Casey et al., 2021). Davis (1993) posits that the usage of technology is positively influenced by its perceived usefulness and perceived ease to use technology interface, both of which are mediated through attitudes towards technology utilization. The E-Learning Technology Acceptance Model (ETAM) was operationalized via a structured survey, consisting of multiple constructs such as perceived usefulness, attitudes towards technology usage, perceived ease of use, perceived e-learning outcomes, learning facility condition, and demographic information. Each construct was evaluated using a 5-point Likert scale, where a rating of 5 indicated strong agreement, while a rating of 1 indicated strong disagreement. The specific items employed in the survey were borrowed from the study conducted by Li and colleagues in (2019). The subsequent scales constitute the aspects related to attitudes toward the use of technology:

Attitude toward Technology Use (ATU)

In the realm of technology application, Venkatesh et al. (2003) define the attitude towards technology usage as the emotional response of students, signifying their level of positivity towards the employment of a specific technology. The students' attitude on the utilization of technology significantly influences their educational

outcomes and academic success. A positive attitude towards technology enhances individuals' willingness and likelihood to use technology effectively and leading to positive educational outcomes, while a negative attitude can result in under-utilization and potential adverse effects on perceived learning outcomes (Dick & Yagmur Akbulut, 2020; Teo et al., 2009; Wongwatkit et al., 2020).

Additionally, the attitude towards educational technology strongly correlates with the extent of satisfaction, amusement, fulfilment, and delight experienced during its use (El Bachari et al., 2011; S. Y. Park, 2009). According to Liang and Tsai (2008), advanced proficiency in internet usage can improve students' attitudes, search methodologies, and overall learning outcomes when engaging with online instruction. Hence, the present study proposes the subsequent hypothesis related to attitude:

Hypothesis 2: There is a significant positive difference for effect of Attitude toward technology use on perceived e-learning outcomes between Arabic and English medium school students.

Perceived Usefulness (PUF)

Arshad and Akram (2018), Davis (1989), and Li et al. (2019) have expounded on the concept of technology's perceived usefulness within e-learning. According to these researchers, this refers to the degree to which individuals' belief that their task or job performance will be enhanced by employing a specific system or technology. Additionally, they suggest that this adoption also contributes to alleviating cognitive stress. Research by Cheung and Vogel (2013), along with Nagy (2018), has demonstrated a notable positive correlation between the perceived usefulness and perceived ease of technological tools use and the attitudes towards these tools. These attitudes were found to have a considerable influence on students' behavioral intent to utilize the tools, as also supported by Gurer and Akkaya (2022), and Ibili et al. (2019). Despite this, students' attitude to use online forums as collaborative educational tools was influenced more by their perceived usefulness of the forums than by their ease of use (Camarero et al., 2012).

Concerning the correlations between the perceived usefulness and the constructivist learning approach, F. Huang et al. (2020) and Ertmer and Ottenbreit-Leftwich (2010) have suggested that learners who adhere to constructivist philosophies tend to use technology more proficiently in learning environments, as their beliefs about learning encourage active participation and readiness to integrate technology into education, compared to those with conventional learning beliefs. The key difference in the effectiveness of technology utilization appears to stem from the perception of traditional learners viewing technology merely as an alternative to standard knowledge dissemination channels such as instructors and textbooks. In contrast, Learners adopting constructivist beliefs tend to be more active in learning environments that encourage hands-on participation, interaction, and reflection. They effectively employ e-learning tools for information discovery and collaboration with peers and educators, fostering a richer, experiential learning process that facilitates knowledge investigation and sharing (Ertmer, 2005; Howard et al., 2000).

According to prior analysis, scholars posit that constructivist learning contexts might influence how students perceive the usefulness and ease to use of technology, shaping their attitudes towards it. Evidence from studies by Liu et al. (2017) and Limone et al. (2019) corroborates a positive relationship among constructivist beliefs held by individuals and their perception of technology's usefulness and ease of use:

Hypothesis 3 There is a significant positive difference for effect of Perceived Usefulness on Constructivist Learning Approach between Arabic and English medium school students.

Hypothesis 4: There is a significant positive difference for effect of Perceived Usefulness on Attitude towards Technology use between Arabic and English medium school students.

Perceived Ease to Use (PEU)

The term " Perceived ease of use" is an individual's assumption regarding the minimal physical or cognitive effort required to operate a specific system or technology, leading to lessened cognitive strain and simpler task execution (Davis, 1989; Sarwar et al., 2019). Most scholars agree that users' attitudes towards technology are significantly shaped by their perceived usefulness and ease of use, a sentiment echoed in the works of Davis (1989) and Gurer and Akkayas (2022).

The role of perceived ease of use in determining users' attitude towards mobile technology has been extensively studied by Teo et al. (2012) and E. Park et al. (2014). Their research highlights the importance of this factor in shaping individuals' attitudes towards mobile technology. Furthermore, studies such as Al-Rahmi and colleagues (2019) have shown that the perceived level of simplicity in using e-learning technology has noteworthy consequences for its acceptance and uptake. Building upon these findings, the present study proposes the following hypotheses to examine the role of perceived ease of technology use in the context of our research:

Hypothesis 5: There is a significant positive difference for effect of Perceived Ease to Use on Attitude towards Technology Use between Arabic and English medium school students.

Learning Facility (LFC)

Learning Facility is the concept of how an individual perceives environmental support in terms of encouraging and enabling technology adoption (S. Taylor & Todd, 1995). Li et al. (2019) along with Teo (2011) and Teo et al. (2018) posited that facilitating conditions conceptually involves not only the accessibility to technological resources but also the provision of technical and administrative support. It could be essential to offer skill training, facilitate the availability of pertinent information or resources, and extend administrative assistance to educators and students, with the aim of incorporating educational technologies into their pedagogical methodologies (Groves & Zemel, 2000).

Multiple scholarly works underscore the indispensable role of technical support in promoting technology adoption in educational settings (Y. Li et al., 2019; Williams, 2002) and enhancing user satisfaction (Mirani & King, 1994; Vanitha & Alathur, 2020). Furthermore, there is a considerable body of literature that highlights the direct influence of good facility conditions on elements like perceived ease of use (Abbad, 2012; Teo, Ursavas, & Bahcekapili, 2012), perceived usefulness (Y. Li et al., 2019; Sanchez-Prieto et al., 2016), as well as attitudes pertaining to computer utilization (Ngai et al., 2007; Teo, 2008; Teo, Ursavas, & Bahcekapili, 2012). Thus, the current research has proposed the following hypotheses related to the learning facility condition:

Hypothesis 6: There is a significant positive difference for effect of Learning Facility on Perceived usefulness between Arabic and English medium school students.

Hypothesis 7: There is a significant positive difference for effect of Learning Facility on Perceived Ease to Use between Arabic and English medium school students.

Perceived E-Learning Outcome (PLO)

Perceived E-learning outcomes encapsulate their discernments about the efficacy of the technology in fostering critical thinking and enhancing comprehension. Succinctly, it represents the potential benefits learners may derive from utilizing e-learning resources and tools to bolster their academic performance (Sultan et al., 2011; Wighting, 2011).

Data Collection (Sampling)

The study was quantitative in nature, employing specific methodologies to address distinct research inquiries through numerical descriptions of various phenomena. Data collection involved the use of a questionnaire. The accumulated data was then processed using Partial Least Squares Structural Equation Modelling (PLS-SEM) on the SmartPLS software. Meanwhile, the SPSS software was utilized for initial data screening and coding. The research was conducted within the Erbil Province, located in the Northren region of Iraq. The study involved the recruitment of participants using a technique known as stratified random sampling. Specifically, it aimed to include students in grades 8 through 12. A total of 936 students from both upper primary and secondary school levels were invited to participate in the research survey. This research sample included 780 students from English Medium schools and 156 students from Arabic Medium schools. A method of random selection was employed to choose the schools, and the data was gathered through a questionnaire that individuals completed on their own using paper forms. There was a fairly even gender

split across the sample, with 48.3% girls and 51.7% boys. A majority, about 78.53%, of students utilized a computer or laptop at home for internet access. Additionally, 16.02% can access to only internet by using their phone or tablet.

Table 1. Sociodemographic characteristics of participants

Characteristic	Total Sample	
	Number	Percentage
Gender		
Girls	452	48.3%
Boys	484	51.7%
Student Grade		
Grade Eight	212	22.64%
Grade Nine	234	25%
Grade Ten	274	29.27%
Grade Eleven	165	17.62%
Grade Twelve	51	5.49%

Adaptation of the Instrument

In this research, the elements were extracted from the E-Learning Technology Acceptance Model (ETAM) and the CLE, having secured the requisite permission from Dr. Peter Taylor. These elements were subsequently rendered in Arabic. To maintain the integrity of the meaning in the English, and Arabic renditions, a method of double back translation was utilized. The process incorporated three multilingual educators: the initial educator converted the English rendition to Arabic, the next educator, not familiar with the initial English text, translated it back to English from Arabic, while the final educator compared this English translation with the original to ensure consistency.

Procedure

Erbil-General Directorate of Education sanctioned data collection for the involved schools and universities prior to its commencement. Ethical approval was given to this research project by the Institutional Review Board of University of Szeged, post evaluation of the research questionnaires, authorizing the researchers to conduct data collection. Students at their corresponding schools received the surveys, and they were inquired to give insights on in person lessons and virtual learning, encompassing both academic and interpersonal exchanges with instructors and peers. Prior to obtaining parental approval, participants were briefed on the data collection procedures, questionnaire completion methods, and guaranteed anonymity. It was emphasized that they had the option to submit incomplete or blank responses without facing any coercion. At last, they received confirmation that their course-related personal data would not be utilized.

Data Analysis

In this study, data analysis was conducted using SmartPLS Version 3, following a two-step analytic approach. This manuscript is organized to initially validate the lower-order measurement framework, subsequently scrutinize the high-order measurement structure, and ultimately, to analysis research hypotheses, examining the differences in variable relationships in a conceptual model between Arabic and English medium school students. The approach of Partial Least Squares-Structural Equation Modeling (PLS-SEM) was employed to evaluate both the measurement and structural models. Additionally, to draw the comparison between these two groups, the researchers utilized Partial Least Squares Multigroup Analysis (PLS-MGA). The consistency of the variables was evaluated through the implementation of a Measurement Invariance of Composite

Models (MICOM) test, a method proposed by Henseler et al. (2016). The choice of PLS-SEM was based on the inclusion of a combination of reflective and reflective constructs in the model. The application of PLS-SEM is supported by various researchers who advocate for its use when dealing with models that encompass both reflective and reflective constructs (Sarstedt et al., 2019). Furthermore, PLS provides a more advantageous method than regression, as it evaluates the model in its entirety, incorporating its moderating impacts as a unified whole instead of breaking it down into separate pieces (Goodhue et al., 2012). This characteristic renders it aptly suited for the scrutiny of complex models (Hair et al., 2011).

Validating the First-Order Measurement Model

The reliability of the item in both Arabic and English school samples was assessed, along with analyses of convergent and discriminant validity, in order to closely examine the validity of the preliminary lower-order measurement model in the initial stage. Each first order construct exhibited a reflective characteristic. Ali et al. (2018) propose that convergent validity and reliability are ascertainable when loading, AVE, and CR values exceed 0.7 and 0.5 respectively. Contrastingly, Hair Jr et al. (2021) argue that surpassing the stated values for AVE and CR allows for a loading range of 0.5 to 0.7, which is considered acceptable. Each first-order construct in this study exhibited reflective characteristics, consistent with theoretical and empirical precedents in construct measurement. As highlighted by Ali et al. (2018), these indicators provide reliable benchmarks for assessing convergent validity and reliability. Specifically, Factor loadings greater than 0.7 indicate a strong relationship between the observed variables and their associated constructs, demonstrating that the indicators reliably reflect the underlying constructs (Bolt et al., 2016).

An AVE value exceeding 0.5 suggests that the construct accounts for more variance from its indicators than is attributed to measurement error, meeting an essential criterion for convergent validity (G. W. Cheung et al., 2024). Furthermore, a CR value surpassing 0.7 reflects strong internal consistency among the indicators, reinforcing the construct's reliability. By adhering to these established thresholds, the methodology employed in this study conforms to best practices in structural equation modeling, ensuring the credibility and rigor of the findings. These benchmarks not only enable meaningful comparisons with prior research but also solidify the theoretical and empirical foundations of the constructs, thereby enhancing the overall validity of the study (G. W. Cheung et al., 2024).

As depicted in the table (2), all item loadings exceeded the 0.5 threshold. Due to the reliability issues caused by inadequate loadings, the researchers omitted specific items from both the Arabic and English datasets. Additionally, Fornell and Larcker (1981) emphasized that every Cronbach alpha exceeded the 0.7 benchmark for factor reliability. Table (4) displays the internal reliability of the study, established through Cronbach's Alpha. All constructs within the Arabic and English samples achieved alpha values above the accepted 0.7 threshold, barring three exceptions. For the Arabic sample, "uncertainty" (0.554), "negotiation" (0.679), and "critical voice" (0.699) fell below this value. Similarly, in the English sample, "uncertainty" (0.530), "critical voice" (0.602), and "learning facility" (0.689) also did not meet the threshold. Nonetheless, based on Taber's standards (Taber, 2018), these figures may be deemed satisfactory. The tolerable span for Cronbach's Alpha value lies between 0.45-0.96. It is also noteworthy that in certain cross-cultural investigations, such as those conducted by Aldridge et al. (2000) and Anagun and Anilan (2010), the reliability and validity of the constructivist learning environment surveys for students were confirmed. However, several of the original thirty items were discarded due to their minimal factor values, attributed to differences in cultural and teaching practices as revealed in the data analysis. Attaining semantic equivalence across all survey questions may not always be possible, considering the utilization of translated surveys in vastly different cultural settings (Uk, 2001).

In an academic context, the studies carried out by Johnson et al. (2004), Aldridge, Fraser, and Sebela, (2004) and Kim, Fisher, and Fraser (1999) yielded relatively analogous findings, with Uncertainty's Cronbach's Alpha recording values of 0.61, 0.64, and 0.64 respectively. The recurring low alpha values can be attributed to the use of individuals instead of classroom as the analysis unit. This highlights a capability for the scale of classroom environment survey to effectively distinguish difference in learner perceptions within varied classroom settings. Essentially, a similar perception should be observed among learners within the same classroom, while it should be apparent that the average perceptions vary significantly among different classes.

The instrument's reliability used in both study groups is confirmed by the outcomes that presented in Table (4). However, The results presented in Table 3 indicate that the items deleted from the research model for both Arabic and English samples had factor loadings that exceeded the 0.5 threshold. However, there were some notable exceptions. For the Arabic sample, the Uncertainty construct (UCT3) had a factor loading of 0.423, which was below the threshold. Similarly, for the English sample, UCT3 had a factor loading of 0.492, also below 0.5. For the Attitude toward Technology construct, the English sample exhibited factor loadings below the threshold for ATU3 (0.420) and ATU6 (0.421). Additionally, ATU5 fell below the threshold for both samples, with a loading of 0.486 for Arabic and 0.467 for English. Furthermore, the Learning Facility construct (LFC3) had a factor loading of 0.677 for the English sample, which, while higher than 0.5, was still relatively low compared to its counterpart in the Arabic sample (0.883). These low factor loadings contributed to low Average Variance Extracted (AVE) values for the associated constructs, ultimately raising concerns about convergent validity in the research model for both Arabic and English medium schools. Should it be possible to improve the composite reliability and (AVE) Average Variance Extracted by eliminating outer loadings within the range of 0.4 to 0.7, such action should be taken to ensure these outer loadings exceed 0.7 (Hair Jr. et al., 2021).

The instrument's reliability, as reflected in the outcomes presented in Table 2, was confirmed for both study groups. However, low AVE values for certain constructs pointed to issues of convergent validity. For the Arabic classrooms sample, the AVE values for Attitude toward Technology (0.427), and Uncertainty (0.410) were below the acceptable threshold of 0.5. Similarly, for the English classrooms sample, the AVE values for Attitude toward Technology (0.390), Uncertainty (0.439), Critical Voice (0.475), and Learning Facility (0.483) were also insufficient to establish convergent validity.

Table 2. Results: Assessment of Reflective Measurement model After Deletion of Items

Constructs	Items	Loadings		Constructs	Items	Loadings	
		Arabic	English			Arabic	English
Relevancy	RLV1	0.663	0.807	Perceived Usefulness	PUF1	0.796	0.784
	RLV2	0.713	0.702		PUF2	0.640	0.670
	RLV3	0.812	0.702		PUF3	0.789	0.752
	RLV4	0.745	0.715		PUF4	0.780	0.747
Uncertainty	UCT1	0.743	0.833		PUF5	0.632	0.745
	UCT2	0.812	0.767	Perceived Ease to Use	PEU1	0.858	0.809
	UCT4	0.611	0.540		PEU2	0.765	0.750
Critical Voice	CTV2	0.766	0.736		PEU3	0.858	0.633
	CTV3	0.822	0.784		PEU4	0.798	0.787
	CTV4	0.778	0.717		PEU5	0.768	0.775
Shared Control	SCT1	0.756	0.803	Learning Facility	LFC1	0.954	0.667
	SCT2	0.797	0.847		LFC2	0.923	0.743
	SCT3	0.890	0.806		LFC4	0.834	0.621
	SCT4	0.849	0.600		LFC5	0.750	0.815
Negotiation	NGO1	0.709	0.749	Perceived E-Learning Outcomes	PLO1	0.774	0.842
	NGO2	0.823	0.788		PLO2	0.817	0.880
	NGO3	0.723	0.78W5		PLO3	0.738	0.728
	NGO4	0.591	0.660		PLO4	0.839	0.829
Attitude toward Technology	ATU1	0.767	0.801				
	ATU2	0.847	0.843				
	ATU4	0.808	0.764				

Table 3. Items Deleted for Both Samples (Arabic Medium Schools and English Medium Schools)

Constructs	Items	Factor Loading	
		Arabic	English
Uncertainty	UCT3	0.423	0.492
Critical Voice	CTV1	0.746	0.551
	ATU3	0.484	0.420
Attitude toward Technology	ATU5	0.486	0.467
	ATU6	0.573	0.421
Learning Facility	LFC3	0.883	0.677

Table 4. Result of Cronbach's Alpha for Arabic and English Classroom Samples Before and After Deletion of Items

Constructs	Cronbach's Alpha Before Items Deletion		Cronbach's Alpha After Items Deletion	
	Arabic Classroom Sample	English Classroom Sample	Arabic Classroom Sample	English Classroom Sample
Attitude towards Technology Use	0.726	0.680	0.733	0.724
Critical Voice	0.724	0.637	0.699	0.602
Learning Facility	0.891	0.742	0.925	0.689
Negotiation	0.679	0.735	0.679	0.735
Perceived e-learning outcomes	0.802	0.836	0.802	0.836
Relevancy	0.717	0.713	0.717	0.713
Shared Control	0.851	0.766	0.851	0.766
Uncertainty	0.489	0.571	0.554	0.530
Perceived Usefulness	0.822	0.829	0.822	0.829
Perceived Ease to Use	0.869	0.809	0.869	0.809

Table 5. Results of AVE Before and After Deletion of Items in the Research Model for Both Samples (Arabic and English Medium Schools)

Constructs	AVE Results Before Items Deletion		AVE Results After Items Deletion	
	Arabic Sample	English Sample	Arabic Sample	English Sample
Attitude towards Technology Use	0.427	0.390	0.653	0.645
Critical Voice	0.544	0.475	0.623	0.557
Learning Facility	0.566	0.483	0.755	0.504
Negotiation	0.513	0.559	0.513	0.559
Perceived e-learning outcomes	0.629	0.673	0.629	0.673
Relevancy	0.540	0.537	0.540	0.537
Shared Control	0.680	0.593	0.680	0.593
Uncertainty	0.410	0.439	0.528	0.525
Perceived Usefulness	0.531	0.539	0.531	0.539
Perceived Ease to Use	0.657	0.568	0.657	0.568

Table 6. Results of Composite Reliability (CR) Before and After Deletion of Items in the Research Model for Both Samples (Arabic and English Medium Schools)

Constructs	CR Results Before Items Deletion		CR Results After Items Deletion	
	Arabic Sample	English Sample	Arabic Sample	English Sample
Attitude towards Technology Use	0.811	0.781	0.849	0.845
Critical Voice	0.827	0.781	0.832	0.790
Learning Facility	0.866	0.823	0.924	0.801
Negotiation	0.806	0.834	0.806	0.834
Perceived e-learning outcomes	0.871	0.891	0.871	0.891
Relevancy	0.824	0.822	0.824	0.822
Shared Control	0.894	0.852	0.894	0.852
Uncertainty	0.724	0.750	0.768	0.763
Perceived Usefulness	0.871	0.875	0.871	0.875
Perceived Ease to Use	0.905	0.867	0.905	0.867

The removal of specific items with low factor loadings significantly improved the AVE values for these constructs, as detailed in Table 5. For the Attitude toward Technology construct, removing items ATU3, ATU5, and ATU6 increased the AVE to 0.653 for Arabic classrooms and 0.645 for English classrooms. Similarly, eliminating CTV1 from the Critical Voice construct raised the AVE to 0.623 for Arabic classrooms and 0.557 for English classrooms. For the Learning Facility construct, the removal of LFC3 resulted in AVE values of 0.755 for Arabic classrooms and 0.513 for English classrooms. Lastly, deleting UCT3 from the Uncertainty construct improved the AVE to 0.528 for Arabic classrooms and 0.525 for English classrooms.

This improvement aligns with recommendations in the literature (Hair Jr. et al., 2021) to remove items with factor loadings between 0.4 and 0.7 to enhance composite reliability and AVE. By selectively removing items with low outer loadings, the constructs were able to achieve acceptable AVE values, thereby addressing the issue of convergent validity. These results highlight the importance of refining measurement scales by eliminating problematic items to ensure the reliability and validity of the research model.

Ultimately, the deletion of the six problematic items identified in Table 3 led to substantial improvements in AVE values across constructs in both Arabic and English classroom contexts, as shown in Table 5. These adjustments successfully resolved the issues of convergent validity in the research model, providing a robust foundation for further analysis and interpretation.

Table 7. Result of Discriminant validity assessment for first order constructs (Arabic classrooms)

Constructs	ATU	CTV	LFC	NGO	PEU	PLO	PUF	RLV	SCT	UCT
Attitude toward Technology	0.808									
Critical Voice	0.053	0.789								
Learning Facility Conditions	0.156	0.203	**0.869**							
Negotiation	0.320	0.432	0.103	**0.716**						
Perceived Ease of Use	0.507	0.049	0.074	0.106	**0.811**					
Perceived e-learning Outcomes	0.567	0.250	0.091	0.340	0.342	**0.793**				
Perceived Usefulness	0.786	-0.033	0.052	0.225	0.536	0.500	**0.729**			
Personal Relevancy	0.252	0.464	0.022	0.555	0.171	0.354	0.232	**0.735**		
Shared Control	0.133	0.611	0.109	0.426	0.024	0.247	0.094	0.455	**0.825**	
Uncertainty	0.249	0.390	-0.032	0.448	0.117	0.290	0.185	0.478	0.426	0.727

Note: Square roots of average variance extracted (AVE) shown on the diagonal in bold.

Table 8. Result of Discriminant validity assessment for first order constructs (English classrooms)

Constructs	ATU	CTV	LFC	NGO	PEU	PLO	PUF	RLV	SCT	UCT
Attitude toward Technology	0.803									
Critical Voice	0.182	**0.746**								
Learning Facility Conditions	0.191	0.303	**0.710**							
Negotiation	0.161	0.411	0.240	**0.747**						
Perceived Ease of Use	0.558	0.179	0.218	0.210	**0.754**					
Perceived e-learning Outcomes	0.378	0.325	0.343	0.348	0.283	**0.820**				
Perceived Usefulness	0.701	0.140	0.243	0.182	0.554	0.420	**0.734**			
Personal Relevancy	0.229	0.469	0.313	0.342	0.308	0.351	0.289	**0.733**		
Shared Control	0.097	0.355	0.308	0.396	0.111	0.332	0.101	0.316	**0.770**	
Uncertainty	0.225	0.418	0.299	0.323	0.220	0.327	0.224	0.479	0.283	**0.724**

Note: Square roots of average variance extracted (AVE) shown on the diagonal in bold.

During the examination of the measurement model, convergent validity was assessed, focusing on the relationships among constructs. This analysis was undertaken using methods such as composite reliability, factor loadings, and average variance extracted, as emphasized by Hair Jr et al. (2021). Notably, every variable in the samples from both the Arabic and English classrooms exceeded the baseline average variance extracted (AVE) value of 0.5. Additionally, composite reliability of the model score surpassed the recommended 0.7 benchmark, registering values from 0.768 to 0.946 for the Arabic cohort and 0.763 to 0.891 for the English cohort. This clearly demonstrates the attainment of convergent validity, as detailed in Tables 7 and 8. To facilitate the discriminant analysis, the heterotrait-monotrait (HTMT) correlation ratio was employed. The originally proposed structural orientations were validated through the HTMT analysis outcomes. According to Henseler et al. (2015), discriminant validity is achieved when the HTMT value between two constructs is less than 0.9. Consequently, all primary factors in both Arabic and English classroom samples verified discriminant validity, as all recorded values were below 0.9, as shown in the tables 7 and 8.

Validating the Higher-Order Measurement Model

Before evaluating the structural framework, the analytical model of a Constructivist Learning Approach was analysed as a higher-order reflective construct, utilizing a two-stage approach that incorporated the use of the extended repeated indicators technique. During the analysis of the measurement model of a reflective higher-order construct, it is essential to confirm three central criteria: 1) Discriminant validity; 2) Item reliability; and 3) Convergent validity (Hair Jr. et al., 2021).

The assessment of the reliability and validity of the high-order Constructivist Learning Approach construct is based on its connection to its sub-components. Thus, the interrelationship between the Constructivist Learning Approach and its sub-components involves five constructs: Uncertainty, Personal Relevance, Shared Control, Critical Voice, and Student Negotiation. In the path model, what are viewed as loadings are actually path coefficients. The analysis reveals that loadings for the Arabic classroom sample are as follows: Critical Voice (0.709), Negotiation (0.811), Relevancy (0.818), Shared Control (0.719), and Uncertainty (0.746). In contrast, the English classroom sample exhibits loadings of Critical Voice (0.739), Negotiation (0.694), Relevancy (0.762), Shared Control (0.632), and Uncertainty (0.718). These findings affirm the reliability of the indicators for both sample sets. Additionally, the internal consistency for the CLA construct was determined through Cronbach's Alpha, yielding results of (0.825) for the Arabic sample and (0.754) for the English sample. These values surpass the recommended 0.700 cut-off for factor reliability (Fornell & Larcker, 1981).

Table 9. Result of Cronbach's Alpha After Establishing Second Order Construct

Constructs	Cronbach's Alpha	
	Arabic Classroom Sample	English Classroom Sample
Attitude towards Technology Use	0.733	0.724
Learning Facility	0.925	0.689
Perceived e-learning outcomes	0.802	0.836
Constructivist learning Approach	0.825	0.754
Perceived Usefulness	0.822	0.829
Perceived Ease to Use	0.869	0.809

Table 10. Result of Factor Loading for Second Order Construct

Constructivist Learning Approach	Factor Loading	
	Arabic Classroom Sample	English Classroom Sample
Critical Voice	0.709	0.739
Negotiation	0.811	0.694
Relevancy	0.818	0.762
Shared Control	0.719	0.632
Uncertainty	0.746	0.718

Table 11. Result: Discriminant validity assessment for Second order constructs (Arabic classrooms)

Constructs	CR	AVE	ATU	LFC	PLO	CLA	PUF	PEU
ATU	0.849	0.653	**0.808**					
LFC	0.924	0.755	0.156	**0.869**				
PLO	0.871	0.629	0.567	0.091	**0.793**			
CLA	0.873	0.580	0.277	0.109	0.384	**0.762**		
PUF	0.870	0.531	0.787	0.053	0.501	0.196	**0.728**	
PEU	0.905	0.657	0.507	0.074	0.342	0.120	0.536	**0.811**

Note: Square roots of average variance extracted (AVE) shown on the diagonal in bold.

Table 12. Result of Discriminant validity assessment for Second order constructs (English classrooms)

Constructs	CR	AVE	ATU	LFC	PLO	CLA	PUF	PEU
ATU	0.845	0.645	**0.803**					
LFC	0.801	0.504	0.191	**0.710**				
PLO	0.891	0.672	0.379	0.343	**0.820**			
CLA	0.835	0.505	0.257	0.411	0.473	**0.710**		
PUF	0.875	0.539	0.701	0.244	0.422	0.276	**0.734**	
PEU	0.867	0.568	0.558	0.218	0.283	0.298	0.556	**0.754**

Note: Square roots of average variance extracted (AVE) shown on the diagonal in bold.

Tables (11) and (12) underscore the consistency of the six constructs within Arabic and English samples, as determined by assessing composite reliability and average variance extracted. All six constructs exhibited sufficient credibility, with composite reliability ranging between 0.870 to 0.924 and 0.801 to 0.891 for Arabic

and English samples respectively. Specifically, the composite reliability of the CLA construct exceeded the 0.700 threshold, posting 0.873 for Arabic and 0.835 for English samples. Furthermore, the average variance extracted from the CLA construct stood at 0.580 and 0.505 for Arabic and English samples respectively, surpassing the recommended 5.0 mark as reported by Hair Jr, Hult, Ringle, and Sarstedt (2021). Thus, the measurement items' internal consistency is deemed satisfactory for both Arabic and English samples.

Tables (11) and (12) confirm discriminant validity in both the Arabic and English samples, as demonstrated by the Average Variance Extracted (AVE) values of the reflective second-order constructs, which are significantly higher than the highest squared correlation with any other latent variable. This suggests that the constructs are distinct, reinforcing discriminant validity. Thus, we can assertively affirm discriminant validity for both Arabic and English measurement models.

TESTING THE STRUCTURAL MODEL

Multi-Group Analysis

Ultimately, the study's research hypotheses were thoroughly examined through a Partial Least Squares Multigroup Analysis (PLS-MGA). These hypotheses investigated potential differences between Arabic and English school students regarding the proposed relationships. Henseler, Ringle, and Sarstedt (2016), along with Hair et al. (2016), underscore the importance of validating measurement invariance before conducting a multi-group analysis (MGA) involving two or more groups in structural equation modeling (SEM). Nevertheless, when utilizing Partial Least Squares Structural Equation Modeling (PLS-SEM), a composite-based analysis approach, the use of the measurement invariance of composites (MICOM) becomes more pertinent. Given this study's intent to compare a model across two groups using PLS-SEM, the implementation of MICOM has been chosen. Accordingly, prior to conducting the PLS-MGA, the authors undertook a preliminary stage to verify the measurement invariance of the variables. This was done using a Measurement Invariance of Composite Models (MICOM) test (Henseler et al., 2016), which ensured the validity of the measurement scales across both language groups. This important step laid the foundation for the subsequent analysis and interpretation of the findings.

The coefficient of determination (R^2) value was investigated in accordance with Cohen (2013), and the R^2 of endogenous can be evaluated as weak =0.02, moderate =0.13, and substantial =0.26. The results of the variance analysis (Table 13) indicated that the research model was able to explain approximately 37.7% of the variance in Perceived E-learning Outcomes for the Arabic sample, and 29.5% for the English sample which the values for both samples are substantial. Moreover, Perceived Usefulness and Ease of Use accounted for 64.1% of the variance in Attitude Towards Technology Use in the Arabic sample, and 53.3% in the English sample which the values for both samples are also substantial. However, Perceived Usefulness had a minor impact on the constructivist learning Approach, explaining only 3.8% of its variance for the Arabic sample and 7.6% for the English sample. Similarly, the learning facility had a minimal effect on Perceived Usefulness and Ease of Use, accounting for only 0.3% of the variance in Perceived Usefulness and 0.5% of the variance in Perceived Ease to Use for the Arabic sample. In the English sample, the learning facility's impact on Perceived Usefulness and Ease of Use was also marginal, explaining only 5.9% of the variance in Perceived Usefulness and 4.8% of the variance in Ease of Use.

Table 13. Result of Variance explained.

Constructs	R2	
	Arabic Classroom Sample	English Classroom Sample
Attitude towards Technology Use	0.641	0.533
Perceived e-learning outcomes	0.377	0.295
Constructivist learning Approach	0.038	0.076
Perceived Usefulness	0.003	0.059
Perceived Ease to Use	0.005	0.048

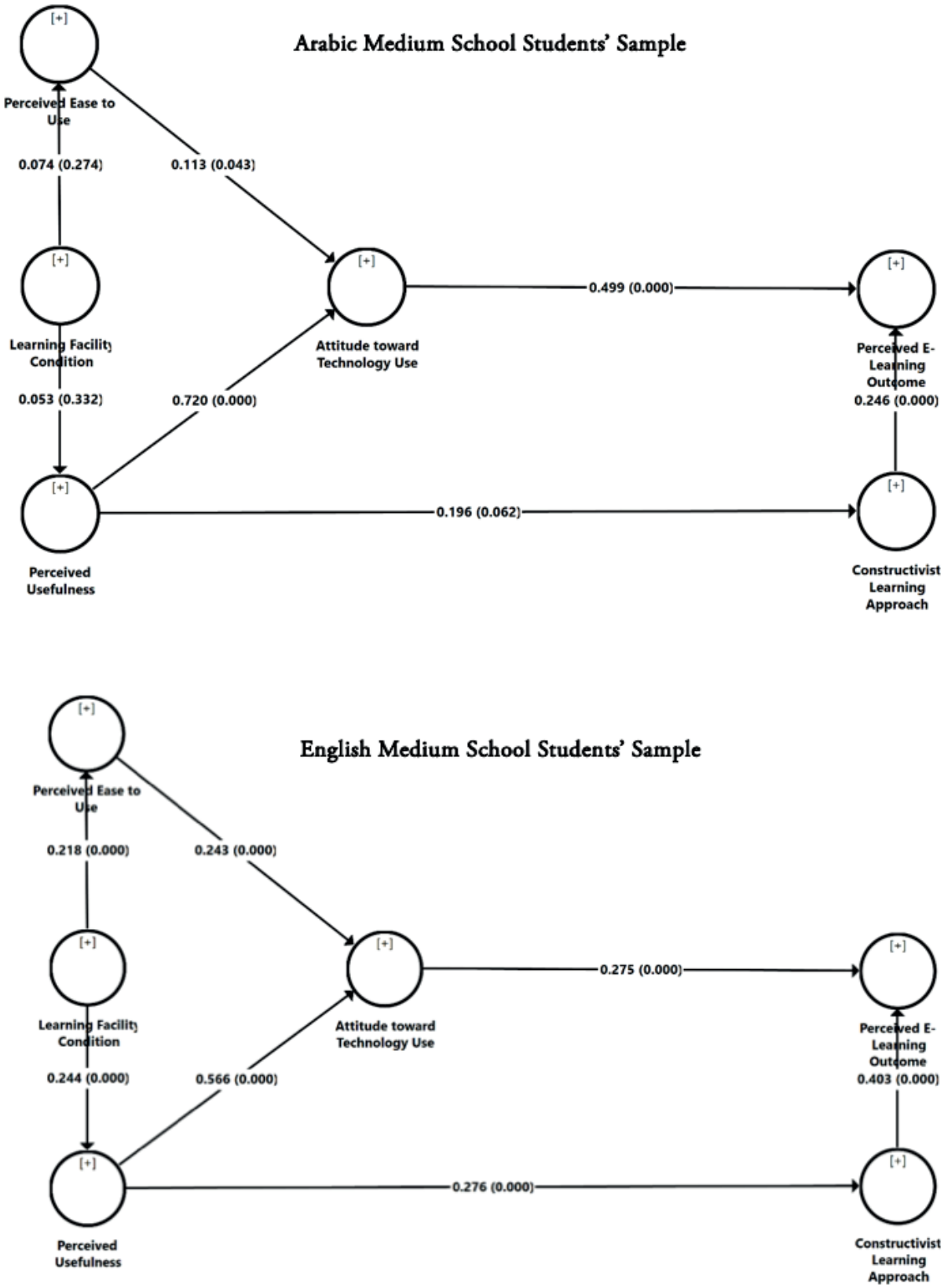

Figure 2: Results of Analysis for Arabic and English School Students

Table 14. Results of invariance measurement testing using permutation (MICOM).

Constructs	Configural invariance	Compositional invariance (Correlation = 1)		Partial measurement invariance established	Equal mean assessment			Equal variance assessment			Full measurement Invariance established
		C=1	Confidence Interval (CIs)		Differences (Arabic – English)	Confidence Interval (CIs)	Equal	Differences (Arabic - English)	Confidence Interval (CIs)	Equal	
ATU	Yes	0.999	[0.997, 1]	Yes	0.068	[-0.141, 0.139]	Yes	-0.032	[-0.285, 0.231]	Yes	Yes
LFC	Yes	0.869	[0.787, 1]	Yes	-0.728	[-0.147, 0.126]	No	0.878	[-0.173, 0.147]	No	No
PLO	Yes	0.999	[0.996, 1]	Yes	0.259	[-0.137, 0.140]	No	-0.029	[-0.205, 0.165]	Yes	No
CLA	Yes	0.996	[0.987, 1]	Yes	0.183	[-0.141, 0.133]	No	0.333	[-0.254, 0.248]	No	No
PUF	Yes	0.999	[0.997, 1]	Yes	-0.095	[-0.141, 0.135]	Yes	0.004	[-0.280, 0.234]	Yes	Yes
PEU	Yes	0.998	[0.995, 1]	Yes	-0.023	[-0.152, 0.132]	Yes	0.229	[-0.285, 0.254]	Yes	Yes

Table 15. Results of hypothesis testing.

Hypothesis	Relationships	Path Coefficient		Confidence Interval (95%) Bias Corrected		Path Coefficient Difference	P-value Difference		Supported
		Arabic	English	Arabic	English		Henseler's MGA	Permutation test	
H1	CLA → PLO	0.246	0.403	[0.140, 0.372]	[0.346, 0.461]	-0.157	0.026*	0.026*	Yes / Yes
H2	ATU → PLO	0.499	0.275	[0.376, 0.615]	[0.221, 0.328]	0.224	0.002**	0.006**	Yes / Yes
H3	PUF → CLA	0.196	0.276	[-0.034, 0.382]	[0.198, 0.352]	-0.080	0.286	0.242	No / No
H4	PUF → ATU	0.720	0.566	[0.585, 0.813]	[0.513, 0.619]	0.154	0.030*	0.016*	Yes / Yes
H5	PEU → ATU	0.113	0.243	[0.026, 0.245]	[0.186, 0.303]	-0.130	0.053	0.059	No / No
H6	LFC → PUF	0.053	0.244	[-0.201, 0.195]	[0.182, 0.313]	-0.191	0.040*	0.014*	Yes / Yes
H7	LFC → PEU	0.074	0.218	[-0.204, 0.209]	[0.158, 0.287]	-0.144	0.101	0.048*	No / Yes

Note: In Henseler's MGA approch, a p value lower than 0.05 or greater than 0.95 shows 5% level significant differences across two groups

RESULT AND DISCUSSION

This study aimed to explore how differences in the language of instruction—Arabic or English—may influence students' acceptance of technology and e-learning outcomes in Iraq. Participants were selected from two distinct educational systems (Arabic and English) to examine potential differences in their responses to e-learning technology. Using Partial Least Squares-Multi Group Analysis (PLS-MGA), statistically significant differences were identified between the two groups (as indicated in Table 15). The analysis revealed significant differences in five out of seven pathways associated with the e-learning technology acceptance model. Two exceptions were the correlation between perceived usefulness and the constructivist learning approach (PUF → CLA) and the relationship between perceived ease of use and attitude towards technology use (PEU →ATU). Path coefficient scores were generally higher in the English group compared to the Arabic group, except for the influence of attitude towards technology use on perceived e-learning outcomes (ATU → PLO) and perceived usefulness on attitude towards technology use (PUF → ATU), where the Arabic classroom sample scored higher.

The Figure 2 and Table 15 illustrate that the proposed paths for both samples, such as the relationship between Constructivist Learning Approach and perceived e-learning outcomes (CLA → PLO), attitude towards technology use and perceived e-learning outcomes (ATU → PLO), perceived usefulness and attitude towards technology use (PUF → ATU), and perceived ease of use and attitude towards technology use (PEU → ATU), were statistically significant in both the Arabic and English samples. However, the relationship between perceived usefulness and Constructivist Learning Approach (PUF → CLA), learning facility and perceived usefulness (LFC → PUF), and learning facility and perceived ease of use (LFC → PEU), were only statistically significant in the English sample. Subsequent sections will reveal the results of hypothesis-related comparisons between Arabic and English school students, based on standardized measures, will be discussed:

Constructivist Learning Approach and Perceived E-Learning Outcomes

To address research hypothesis (1), the results of the Permutation and Henseler's MGA tests, as illustrated in Table 15, showed differences in the CLA and PLO relationship between Arabic and English students. Specifically, the coefficient of the CLA and PLO relationship for the English group (β= 0.402, t= 11.670, p= 0.00) is significantly higher than that for the Arabic group (β= 0.246, t= 3.446, p= 0.00). The explanation for this difference may be that students within the context of English Medium Instruction are tasked with acquiring content knowledge while simultaneously honing their English language skills. This process requires effective comprehension of the subject matter and concurrent development of English proficiency (Han, 2023). Consequently, this imposes a greater cognitive and study load on students in the English group. Research in European higher education suggests that the design of English Medium Instruction courses can be improved through student-centred learning. This learning approach encourages student autonomy in determining both the content and methods of their learning. It also offers students the opportunity to practice the English language freely with their peers during group work, fostering enjoyment in their studies and promoting independent knowledge acquisition (R. Wilkinson, 2013). Doan (2021), along with Jiang and Zhang (2017), have revealed that the inverse relationship holds true. Their research suggests that a focus on English Medium Instruction can promote students' self-directed learning, as seen in methods like team-teaching and process-oriented writing exercises. When students take on more responsibility for managing their language learning through content delivery, it proves beneficial for both the understanding of content and language skills. Therefore, the application of English Medium Instruction can enhance constructivist learning at the university level.

In a practical example that illustrates the relationship between English medium instruction and the constructivist learning approach, Mirizon et al. (2019) found through interviews with science teachers in an English medium instruction setting that she employs a unique teaching approach for Biology, specifically for the topic of Animal Structure. She uses Information and Communication Technology (ICT) as a support tool for her instruction in Biology education. She divides her students into teams for group discussions that culminate in presentations. The students use ICT to search for educational resources, acquire animations from the internet, create slide presentations, and take turns in delivering these presentations. The use of ICT becomes particularly valuable when the lessons are taught in English, given the considerably larger availability of online resources in English than in Bahasa (Mirizon et al., 2019).

Attitude towards Technology Use and Perceived E-Learning Outcomes

To address research hypothesis (2), the results from the Permutation and Henseler's MGA tests, as illustrated in Table 15, showed differences in the relationship between ATU and PLO among Arabic and English students. Specifically, the coefficient of the ATU and PLO relationship for the Arabic group (β= 0.499, t= 6.940, p= 0.00) is significantly higher than that for the English group (β= 0.275, t= 8.605, p= 0.00). The difference in academic performance between upper primary and secondary school students studying in English medium instruction and their counterparts using Arabic medium instruction can be attributed to the level of language proficiency. Students studying natural sciences and social studies in English are still in the process of developing a certain level of proficiency, particularly those who study in English medium schools and for whom English is not their native language (Han, 2023).

Moreover, students receiving English medium instruction face a high cognitive load due to the complexity of topics that require abstract thinking, which heavily depends on their knowledge of the target language (Lee, 2023; Mirizon et al., 2019; Zhang, 2018). Non-native language learners, especially those with limited language skills, experience cognitive overload when processing new content and a foreign language simultaneously (Min et al., 2019). Consequently, a low proficiency level in English among non-native students can result in disadvantages to their academic performance across various educational levels, from school through to college and university (Abdeljaoued, 2023; Ghenghesh, 2015).

Researchers have explored the effects of English language proficiency on students' academic performance, particularly in Arab contexts. Inadequate mastery of listening, speaking, reading, and writing skills has been identified as a hindrance to the progress of Arab students at the university level (Suleiman, 1983). Similar findings in Oman indicate that the lack of English proficiency impacts the performance of engineering students (Sivaraman et al., 2014). Moreover, a positive relationship between English language performance and GPA has been observed in two tertiary education institutions in Oman (Roche & Harrington, 2013). Denman et al. (2019) highlight significant challenges faced by students studying their subject content in English, including limited understanding of course content and communication difficulties with family members regarding help with their studies. These challenges can be mitigated through instruction in the students' mother tongue, leading to increased linguistic comfort and improved perceived learning outcomes.

Perceived Usefulness and Constructivist Learning Approach

To address research hypothesis (3), the results of the Permutation and Henseler's MGA tests, as illustrated in Table 15, showed no significant differences in the PUF and CLA relationship between Arabic and English students. Despite the coefficient of the PUF and CLA relationship for the English group (β= 0.276, t= 5.932, p= 0.00) is slightly higher than that of the Arabic group (β= 0.196, t= 1.539, p= 0.062). The slight differences between the English and Arabic groups could be attributed to the fact that the perceived usefulness of technology largely depends on the language barriers and capabilities, and the quality of information (Alassafi, 2022; Alsabawy et al., 2016; Ngo et al., 2016).

The role of language as an instrument of culture in global online education is underscored by the research of Al-Huwail et al. (2007). Confirming this position, the investigation by Ngo et al. (2016) revealed an interaction between students' language capability and their views on the perceived usefulness and ease of use of e-learning technology, particularly in a Vietnamese context. Citing a language barrier example, Vu et al. (2011) expressed concerns that the inadequacy of Vietnamese-language software hampers the exploitation of the Internet for educational purposes. Edmundson (2007) further noted that individuals who do not speak English might feel excluded from the benefits of technology if they cannot understand the content. Even among those who speak or understand English, its use is often confined to certain contexts, such as email and entertainment. All these findings and hypotheses support the notion that English medium school students who are studying in English are more able to leverage the usefulness of technology compared to their counterparts studying in Arabic.

Further, research conducted by Roca et al. (2006) demonstrated that the quality of information was a significant determinant of user satisfaction. This, in turn, directly influenced users' ongoing intention to continue utilizing e-learning platforms. Knowledge, information quality, and technology fit are the primary

elements influencing students' perceived ease of use and usefulness of technology (Alassafi, 2022; Younas et al., 2021). The lack of educational values in Arabic e-learning resources can be seen in the study conducted in Saudi Arabia by Al-shehri (2012), who discovered that a significant obstacle within the domain of e-learning pertains to the insufficiency of cultural adaptation for content and a lack of educational values. This has been substantiated by an empirical study carried out at King Khalid University, which revealed an interference between educational and non-educational learning materials on social media platforms.

Perceived Usefulness and Attitude towards Technology Use

To address research hypothesis (4), the results of the Permutation and Henseler's MGA tests, as illustrated in Table 15, showed significant differences in the PUF and ATU relationship between Arabic and English students. The coefficient of the PUF and ATU relationship for the Arabic group (β= 0.720, t= 10.455, p= 0.00) is higher than that of the English group (β= 0.566, t= 17.358, p= 0.00). The differences between Arabic and English groups may be attributed to the fact that quality English-medium education is predominantly monopolized by elite families from high socioeconomic backgrounds in society (Manan et al., 2015). Li and Qiu (2018) found that the educational background of parents and per capita income of the family are both positively correlated with the quality of children's school attendance and their participation in tutorial classes. The researchers also noted that urban children have a higher probability of attending superior quality schools, enrolling in extracurricular tutorial classes, and accessing technology and internet connectivity. However, disadvantaged children typically do not gain as much benefit from using computers, including those in their own homes (Du et al., 2004; Pohlmann, 1956). Accordingly, the impact of perceived usefulness on attitudes towards technology use may have been stronger for Arabic-speaking groups than for students studying in English. This could be because English learners often come from a more socio-economically advantaged background and have a stronger presence of modern technology in their family culture. For students who are studying in English, it may be more challenging to make lessons with Information and Communication Technology (ICT) tools appealing, given their already significant exposure to technology in both the home and school environment (Z. Li & Qiu, 2018). Despite students from higher socioeconomic backgrounds demonstrated superior ICT literacy skills (Scherer & Siddiq, 2019).

Perceived Ease to Use and Attitude towards Technology Use

In addressing research hypothesis (5), the results from the Permutation and Henseler's MGA tests, as illustrated in Table 15, revealed no significant differences in the PEU and ATU relationship between Arabic and English students. Despite this, the coefficient of the PEU and ATU relationship for the English group (β= 0.243, t= 6.898, p= 0.00) was slightly higher than for the Arabic group (β= 0.113, t= 1.719, p= 0.043). Despite the fact that language capability has a substantial direct impact on Perceived Ease of Use, and an indirect influence on Attitude towards Technology Use through the mediation of Perceived Ease of Use (Ngo et al., 2016), the impact of perceived ease of use on attitudes towards technology use is more pronounced among English-speaking groups than the Arabic group. This could be attributed to the prevalent use of English-language terminology in technology, coupled with the availability of a broader range of resources and educational materials in English (Alkharang & Ghinea, 2013; Statista, 2023). Hence, the availability of resources in English can positively impact their perceived ease of use by offering more comprehensive and diverse information on technology. However, the lack of software in the mother tongue language affects the use of the internet in educational applications for students who are studying in their native language, as exemplified in the Vietnamese context (Vu et al., 2011) as well as in Palestine where a significant percentage of both students and teachers reported being perplexed by English ICT terminology, expressing a preference for Arabic (Shraim & Khlaif, 2010).

Learning Facility Condition

Perceived Usefulness and Perceived Ease to Use Technology. In addressing research hypotheses (6) and (7), the results from the Permutation and Henseler's MGA tests, as illustrated in Table 15, revealed significant differences in the LFC and PUF relationship between Arabic and English students. The coefficient of the LFC and PUF relationship for the English group (β= 0.244, t= 6.067, p= 0.00) was higher than that for the Arabic group (β= 0.053, t= 0.435, p= 0.332). However, unexpectedly, the results of the Permutation and Henseler's MGA tests (hypothesis 7), as illustrated in Table 15, showed different outcomes regarding the differences in the coefficients of the learning facility condition and the feeling of ease of use. The Permutation test revealed a (p-value of 0.048), indicating significant differences in the coefficient of the LFC and PEU relationship between these two groups. Conversely, the Henseler's MGA test yielded a (p-value of 0.101), suggesting no significant differences in the coefficient of the LFC and PEU relationship across these two groups. The coefficient of the LFC and PEU relationship for the English group (β= 0.218, t= 5.514, p= 0.00) was higher than that of the Arabic group (β= 0.074, t= 0.602, p= 0.274), with a path coefficient difference of approximately -0.144. These differences in the path coefficient results between these two groups are due to two reasons: (1) progress in Arabic content development, such as incorporating cultural and traditional aspects, has been slow, and the e-learning tools still heavily rely on English content (United Nations Development Programme & Regional Bureau for Arab States, 2011). Despite the many efforts by Arab governments and universities to provide faculty members with personal computers, they still couldn't effectively take advantage of technology and adopt it because they are still struggling with English (Kenan et al., 2013; Shraim & Khlaif, 2010). (2) Commonly, students studying in English medium instruction schools are from a better socio-economic status (Manan et al., 2015). This suggests that parents with higher socio-economic status tend to provide their children with more resources, including technological facilities, extracurricular activities, and educational outings (Merritt & Buboltz, 2015). As a result, the English student group tends to have greater exposure to educational technology and demonstrate superior ICT literacy skills (Scherer & Siddiq, 2019), as the availability of facilities has a direct effect on computer self-efficacy (Lai, 2013).

CONCLUSION AND IMPLICATIONS

Learning process has already been changed within Iraqi Secondary and Upper primary schools specially after 2007 educational reform and adopting western curriculums (Artosh, 2016), however, policymakers of Iraqi Ministry of education should investigate and consider students' usage and acceptance of e-learning technology prior to development and implementation process. Based on statistical findings of this study, previous studies, and literature related to technology acceptance and pedagogical practices in English medium instruction context in the Arab world, this study underscore the importance of Arabic language education for Arab students, particularly in primary and secondary school levels, to enhance students' learning outcomes and performance. However, in the context of e-learning, the majority of educational applications and materials available on the internet are in English (Alkharang & Ghinea, 2013; Statista, 2023; W3Techs, 2023). The lack of learning material in Arabic and inadequacy of English language proficiency can causes a significant barrier for students studying in Arabic, for whom English is a second or third language, when trying to adopt technology for educational purposes and fully leverage its benefits (Al Masri & Rimawi, 2022; Alkharang & Ghinea, 2013; Kenan et al., 2013; Shraim & Khlaif, 2010).

Moreover, this research study suggests modifications to e-learning material to align with the Arabic language, culture, and religious beliefs of Iraq's society. The findings of this study highlight the necessity to develop Arabic content that integrates cultural and traditional aspects (Al-shehri, 2012; Ameen et al., 2017), and to make this content readily available online for Arabic learners in the e-learning context in Iraq. However,

despite the broad availability of educational material for students who use English as a medium of instruction, most of these learning resources lack cultural and social adaptations. The absence of cultural adaptation for learning material can lead to confusion, especially when these educational materials were developed in a cultural context different from the student's own. This issue is particularly critical in primary and secondary school education as e-learning materials and applications are predominantly developed in the Western world (Ameen et al., 2017; Andersson & Gronlund, 2009). In addition, teachers working within an English medium instruction context should consider incorporating constructivist learning practices to facilitate both the student's comprehension of the content and language acquisition simultaneously, and to reduce cognitive load for students with low English proficiency (Min et al., 2019; R. Wilkinson, 2013).

Limitations and Future Research

Like all research endeavors, this study is not exempt from certain limitations, which have resulted in more questions than resolutions. These limitations are classified under three broad categories. Firstly, our methodology, which heavily relied on self-reported questionnaires, inherently invited a level of response bias as the students' responses were based on their subjective evaluations. This limitation opens up room for future studies to gain a more comprehensive understanding of the reasons students accept or reject new technologies in a Constructivist learning environment. A potential solution could be the adoption of a mixed-methods approach, incorporating both questionnaires and focus group interviews for a more holistic understanding of the subject matter.

Secondly, an area of improvement for future research is the expansion of the E-Learning Technology Acceptance Model (ETAM). This could include additional constructs such as social influence, learning motivation, proficiency in international languages, language capability, information quality, knowledge quality, technology fit, self-directed learning, computer self-efficacy, study load, cognitive load, students' socio-economic status, parental educational level, and students' academic outcomes (GPA). By integrating these additional scales, future studies could provide more empirical answers to the questions that arose from our study. More importantly, it would enhance our understanding of the interplay between classroom environments in Iraq and the corresponding learner outcomes. Lastly, the geographic scope of our study was a constraint, as the research was conducted exclusively within urban regions. We suggest that future studies widen the research parameters to include rural and semi-urban areas. Such an expansion would not only allow for a broader data set but also offer richer, more varied insights into the implementation and acceptance of new technologies in different educational settings.

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