The cross-cultural validation of the technology-enhanced social constructivist learning environment questionnaire in the Iraqi Kurdistan Region

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Abstract

This study's primary aim is to validate a research instrument in Iraqi Kurdistan middle and secondary schools to explore learners' perspectives concerning social constructivist learning environments and e-learning outcomes. The research instrument was updated and devised based on Aldridge, Fraser, Taylor, and Chen's (Aldridge et al., International Journal of Science Education 22:37–55, 2000) Constructivist Learning Environment (CLES) Survey. Additionally, it also contains two newly developed rating scales that have been taken from Luckay and Laugksch (Luckay and Laugksch, Research in Science Education 45:1–22, 2015), and a perceived e-learning outcomes scale adopted from Sultan, Woods, and Koo (Sultan et al., Educational Technology and Society 14:149–163, 2011). The instrument included seven prominent social constructivist learning dimensions and plus perceived e-learning outcomes, namely: Respect for Difference, Learner Investigation, Critical Voice, Learner Negotiation, Individual Relevance, Shared Control, Uncertainty and Perceived e-Learning Outcomes. For this study, empirical data were gathered from 1289 upper primary and secondary school students in the Iraqi Kurdistan Region. The research instrument possessed factor structure, discriminant validity, and internal consistency reliability based on the results of data analysis. Consequently, the validity and reliability of Arabic language and Kurdish language versions of the survey were verified. Hence, the principal data are sufficient for additional empirical research involving path model evaluation in order to discern any correlations between the variables included in the research model.

Keywords: Social constructive learning environment, e-learning technology, Structural equation modeling (PLS-SEM)

Introduction (Theoretical background)

Learning from a constructivist standpoint includes creating knowledge and self-organizing it. Accordingly, learning begins with experience or observation, and then evolves to creating meaning, as well as connecting current experiences with cognitive systems that the learners have previously developed. As the learners begin to differentiate or integrate their newly attained knowledge, the new knowledge creates a new equilibrium

in their cognitive system. As underlined by Nguyen and Williams (2018) constructing this learning principle, teachers can offer school students educational chances to directly experience and observe material in a learning context, which facilitates students' active learning. It is crucially essential while teaching content to take into account the learners' existing knowledge. Consequently, this learning principle can help teachers provide the necessary assistance to learners so that they are able to connect new information with their prior cognitive systems and make changes to enhance their understanding.

Constructivist learning theory tentatively suggests that the sociocultural context in which the teaching–learning process takes place is another critical aspect shaping the creation of knowledge. According to the sociocultural position, established knowledge is built by formulating meaning on the basis of what has already been learned through former life experiences. Each stage within the teaching–learning process had a purpose related to displaying the activity result, like making preparations for assignments, having access to educational materials and extra-curriculum activities, in-depth peer and group discussion. The determination of wrong and right and of the subject contents are necessary conditions for the learning social structure; furthermore, all these learning procedures or stages themselves demand active cooperation among learners. This cooperation has foremost significance during the learning process (Peters & Stout, 2006). Therefore, the teacher's educational role in this process is to promote the learning process rather than transmit knowledge. As a result, in order to ensure meaningful learning, teachers must provide teaching materials as well as learning situations to every student (Peters & Stout, 2006).

From a constructivist learning perspective, ICT can be regarded as a teaching–learning tool that learners can use for constructing knowledge. Through ICT, learners can access resources and contemporary learning material to help them to recognize and investigate new phenomena, as well as gain experiences in a supportive learning environment to better understand what they encounter. As noted by Jonassen et al. (1998), ICT tools, including search engines, visualization tools, and hypermedia, are able to aid learners in developing their knowledge. The researchers stated that as the information is extensive and continues to grow rapidly, learners must have an educational tool that can be used for accessing as well as processing information. Learners can use search engines, including Google, Yahoo, and Bing, for accessing and locating the source of information (in this case, websites) that specifically address their requirements. Typically, these websites provide information in different forms, such as texts and visual ads, including videos, photos, audio, and diagrams.

In addition, technology can offer educational opportunities for learners to construct their knowledge symbolically, such as through words, photos, and diagrams, as well as arrange the knowledge structurally, using, for example, databases, mind maps, or structured folders (Salomon, 1998). As stated by Jonassen et al. (1998), ICT visualization tools support learners in reasoning visually and then conveying the mental images that they have. Software utilized in drawing mind maps such as MINDMAP, FreeMind, and SmartDraw can effectively help students structure and organize their ideas. Some examples of ICT tools include drawing software and animation design software.

E-learning is a term that encompasses more than simply online learning, distributed learning, virtual learning, networked learning, or web-based learning. E-learning

resources comprise learning premises and technology enablers, including laptops, internet access, multimedia, and CD-ROMs. E-learning resources are constantly being updated and can therefore be more current than textbooks. Yeo and Tan (2010) point out that e-learning resources include an extensive range of scientific and cultural knowledge that has been continuously gathered over time. These kinds of resources actively encourage students to learn and develop their critical thinking skills, since they facilitate finding links between practical and theoretical knowledge, and help students to connect different ideas (Palmer, 2007).

E-learning often involves learning activities that include the concurrent use of interactive networks and computers. The educational material or the learning activity's fundamental component is not necessarily provided by or centered on the computer, although as Tsai and Machado (2002) noted, the learning process must incorporate a substantial network and computer component.

Additionally, Tsai and Machado (2002) defined web-based learning as linked to learning resources provided by an internet browser, even when the materials are up-packed into a CD-ROM or other audio-visual media. Tsai and Machado (2002) characterized online learning as involving computer-based educational resources that are readily available, either through the hard disk or CD-ROM installation or via the internet.

Wang, Zhu, Chen, and Yan (2009) appraised China's e-learning environment and progression, and reviewed e-education, e-teaching, and e-delivery as the three main modes of e-learning representation.

Constructivism, without a doubt, has a significant theoretical impact on modern educational philosophy (Matthews, 2002). To illustrate the reason beyond editing Social Constructivist Learning Environment Survey (SCLE) and e-learning outcome, it is necessary to understand the interactive nature of the relationship between social studies, constructivism, and technology.

According to Doolittle and Hicks (2003), constructivism is a significant departure from a conventional positivistic influence of the social sciences. Traditionally, the search for knowledge within social science equates with the search for a truth that reflects a singular reality. In contrast, constructivism places greater focus on a perspective that is more malleable and inclined toward cultural relativism and contemplation, wherein knowledge is created via personal or social experience. Thus, according to the constructivist model, the role of the learner must be prioritized in knowledge construction, and the significance of the personal and social experience is emphasized in the learning process. Hence, it must be appreciated that the knowledge accrued by learners possesses different levels of accuracy in terms of its capacity to reflect extrinsic reality. The acceptance of these assumptions shifts the focus of social studies from the search for objective truth toward the search for perspective.

Another important element that has transformed the way we teach and learn is technology. Many learning theories are being applied in a manner designed to effectively incorporate technology. Technology and constructivism have a strong bond and mutually benefit, as the use of one supports the objectives of the other (Gilakjani et al., 2013). Therefore, using computer technology in a constructivist environment appears promising in the context of social studies. As an example that is specifically relevant to social studies, Akinola's (2011) research that concluded that web-based education enhanced

students' academic performance and had a beneficial impact on constructing a more democratic approach to the learning process.

To understand the rationale for editing SCLEs, the researchers wish to provide concise summaries regarding aspects of society in the Kurdistan Region of Iraq and the education system. This region is less well known than Iraq because its inhabitants are integrated within mainstream society in Iraq and the Kurds are a minority in Iraq (Sharif, 2013).

The current population of the Kurdistan Region is estimated to be approximately 5.2 million. However, not all inhabitants of this region are Kurdish – the area is ethnically diverse and includes Assyrian, Chaldean, Turkmen, Armenian, and Arab communities that have coexisted peacefully in this region for centuries (Sharif, 2013).

Overview of the Iraqi Kurdistan educational system

Many developing countries, including Iraqi Kurdistan, have been making education reforms to ensure that they maintain an international standard of education. To maintain this standard, they have changed their teaching philosophy from traditional education standards to a knowledge-construction-based teaching approach. Their implementation of new curricula aimed at new teachers has significantly affected primary and secondary education. According to the new system, teachers must be qualified by completing a four-year-long bachelor's education. This new educational approach emphasizes learners' progress and social effectiveness by ensuring a learning environment that supports education (Balisane, 2015). The Kurdistan Regional Government (KRG) has thus been focused on improving education.

The education system in Iraq before 2003, including the curriculum, has been utilized for political purposes (Mohammed, 2015). After 2003, with the regime change, Iraq had a new government as well as curricula. It was necessary that education in Iraq encouraged communication, reconciliation, and respect among all sects of the society so that Iraq's diverse ethnicities and sects could be united. Thus, as noted by Issa and Jamil (2010), the government had to introduce new curricula that encouraged coexistence and respected diversity. From 1991 to 2003, Iraq's history education (HE) textbooks did not refer to Kurds and Iraq's other ethnic groups, including Turkmen and Chaldo Assyrian, while the updated history textbooks did include the city of Halabja and acknowledge the thousands of victims of the city's chemical attack after 2003.

It is noteworthy that Iraqi Kurdistan's peace and stability has inspired various nongovernmental organizations to move to the region and work in collaboration with local government on the development of many areas, including education. The high level of security and economic development supported a growing number of private schools in the capital city, Erbil. This helped NGOs to work in collaboration with the Ministry of Education of Iraqi Kurdistan to introduce changes concerning human rights education and civic education in schools' curricula, subjects, and textbooks (Issa & Jamil, 2010).

Moreover, the Kurdistan Regional Government worked closely with the Swedish government to apply the Swedish education system in Iraqi Kurdistan. The KRG thus ensured that the region became familiar with moral values and universal ethics such as democracy, human rights education, and civic education. The collaboration with the

Swedish government helped the KRG to present an image of the modern, liberal government to the people (Mohammed, 2015).

Learners who receive education to a global standard tend to develop open-mindedness, which helps them realize their right to express divergent opinions. This is crucial in Iraqi Kurdistan because the region has various ethnic groups co-existing in harmony, which include Turkmen, Yezidis, and Christians (Darweish & Mohammed, 2018).

Following the 2003 regime change, textbooks in Iraqi Kurdistan were revised twice for the foundation and preparatory schools, once in 2004 and again in 2007. Iraqi Kurdistan's education and curricula changes were a significant positive sign and were crucial for teachers to understand how they could convey these new subjects, including new content. Tejel (2015) stated that Iraqi Kurdistan education needed to instill the global moral values such as self-discipline and self-reliance among learners so that they become aware of issues related to responsibility, social equality, challenging opportunities, and gender issues.

Nowadays, the implementation of constructivist pedagogy in Iraqi Kurdistan Region educational system still faces many challenges and remains in starting stages despite many attempts to change social studies curriculum, and adding many terms related to global moral values, gender issues, and social equality. These challenges can be summarized as the following:

1) Lack of written documents for educational policy, teacher guidance, and social norms dominating school culture: Teachers struggle to understanding the new system and its aims, as well as how they should cooperate with its integration. There is also an evident lack of documented guidelines and strategies in the Ministry of Education as well as classrooms concerning the goals of new teaching. The policies outlined by the Ministry of Education tend to be verbal instructions and not supervisory written rules or school principals' decisions (Muhammad, 2021).

Moreover, teachers are responsible for encouraging students to develop values such as modesty and morality. This may make students feel shy, and they may not actively ask questions about things that can help in increasing public awareness regarding their political and cultural problems, and bright students learn patiently and respectfully without any disruptions (Muhammad, 2021).

2) Lack of social interaction, active involvement of students in the learning environment and classroom management skills: several public schools tend to develop an atmosphere of fear, competition, and lack of student engagement or collaboration because of banking education methods.

There has been limited implementation of methods that include the social constructivist approach. Teachers may find it challenging to apply collaborative learning methods as they may not have practiced it before or are not adequately qualified. The Ministry of Education policy recommendations state that rote memorization is an acceptable approach wherein learners should learn the text in the books by heart. In this case, the exam questions for students are recall questions, and students are tested in terms of the facts that they manage to learn from their textbooks. Thus, their grades tend to depend not on their reflective thoughts and opinions but facts (Muhammad, 2019).

Abbott and Badley (2020) argued that this banking education method, which is a traditional method, has the potential to restrict the students' imaginative capacity.

They also stated that students learning under these or similar old teaching methods lack the potential to critically explore or discuss their beliefs and thus are not given tools to understand and makes changes in their life.

Despite the Ministry of Education suggesting teachers implement a learner-centered approach that highlights such instructions, several teachers find it challenging to implement. Qualified teachers have also been observed to apply the student-centered initially and then regress to a teacher-centered approach as they tend to be under considerable stress to complete the textbook content and prepare the students for tests. Further, these new teaching approaches, which encourage students to express their views freely and give them time to discuss them, are difficult to implement in overcrowded classes as teachers lack the skills or resources (Muhammad, 2019).

Muhammad (2021) noted that teachers in the majority of public schools experience bureaucratic difficulties. For example, in the case of making a scientific trip, the new teaching system requires consent from the school principals to take the students out of the schools and submit a request for confirmation to the Directorate of Education board of directors. The parents' approval and agreement are required as well.

Regarding teachers' effective teaching goals, the new education platform mainly promoted dialog based on positive relationships between students and teachers. Further, teachers require more experience dealing with students so that they can reduce any unsteady interactions between students and teachers. Dialogical practices also allow and promote democracy among teachers and students (Darweish & Mohammed, 2018).

Here, depending on previously mentioned factors about the correlation between technology, constructivism, and social studies, and nature of Iraqi Kurdistan community, the researchers worked on editing the Social Constructivist Learning Environment survey in this study and think that the revised SCLE Instrument will prove to be a suitable instrument for exploring the educational culture of the Iraqi Kurdistan Region.

Development of constructivist learning environment survey

A great deal of students' time is spent at school: around 7000 h in fact by the end of primary schools, 15,000 by the end of secondary school, and almost 20,000 after university. Nonetheless, regardless of the importance of activities within the classroom, a majority of teachers and researchers depend largely on the evaluation of learning outcomes and other academic achievements to determine the effectiveness of their work in the classroom environment (B. J. Fraser, 2015).

Although the classroom environment is a very subtle concept, there has been a considerable progress regarding the conceptualization, evaluation, and systematic study of it. Much work has been carried out in various countries to explore the evolving methods for researching teachers' and students' perceptions of their working environments. In the past few decades, many researchers have created questionnaires to systematically evaluate students' perceptions of their learning environments. Such questionnaires are specifically designed to obtain information concerning the extent to which a class is teacher-directed or student-directed, and whether students participate actively or passively in the class activities. Other topics that are explored include the extent to which students interact socially with each other during learning, the extent of independent

work, the support offered by the teacher, the extent to which students play a role in determining how they are taught and assessed, and whether the teacher makes room for different learning speeds and the interests of the students. The most common questionnaires used to explore classroom settings, in addition to their specific dimensions, are outlined below (B. J. Fraser, 2015):

• What Is Happening In this Class? (WIHIC)–This explores teacher support, investigation, student cohesiveness, cooperation, task orientation, involvement, and equity.

• Constructivist Learning Environment Survey (CLES)–This explores critical voices, personal relevance, uncertainty, and students' ability to negotiate and shared control.

• Science Laboratory Environment Inventory (SLEI)–This explores clarity of rules, open-endedness, student cohesiveness, the material setting, and integration.

Researchers in a number of Western and Eastern countries have used the questionnaires listed above to explore different school grade levels. The questionnaires are adopted and translated into different languages, such as Spanish, Korean, Chinese, Arabic, Thai, Indonesian, South African and the North Soto language. A vast numbers of researchers, teachers, and students from across the globe have used these questionnaires, a majority of whom find them simple and convenient to use when acquiring information about the learning environment (B. J. Fraser, 2015) (see Table 1).

Educational researchers investigating learning environments have made many attempts over the last forty years to address topics of interest, such as: whether a classroom's environment impacts student attitudes and their learning process, whether

Table 1 Recent internationalization of the CLES questionnaires

Country	Language	Methods	Teaching classroom	Authors
Australia	English	Quantitative & Qualitative	Science studying	(Taylor et al., 1997)
Korea	Korean	Quantitative	Science Teaching	(Kim et al., 1999)
		Quantitative & Qualitative	Science Teaching	(Lee & Taylor, 2001; Uk, 2001)
Singapore	English	Quantitative & Qualitative	English Teaching	(Wilks, 2000)
Australia and Taiwan	English and Mandarin	Quantitative & Qualitative	Science Teaching	(Aldridge et al., 2000)
Australia	English	Quantitative & Qualitative	Information technology	(Maor & Fraser, 2005)
South Africa	English	Quantitative, Qualitative & experiment	Mathematics Teaching	(Aldridge et al., 2004)
USA	English	Quantitative	Science Teaching	(Johnson & McClure, 2004)
USA	English	Quantitative & Qualitative	Science Teaching	(Nix & Fraser, 2011; Nix et al., 2005)
USA	English and Spanish	Quantitative	Science classroom	(Peiro & Fraser, 2009)
Turkey	Turkish	Quantitative		(Anagün & Anilan, 2010)
Malaysia	English	Quantitative	Information technology	(Sultan et al., 2011)
Singapore	English	Quantitative	Science classes	(Peer & Fraser, 2015)
South Africa	Afrikaans and isiXhosa	Quantitative & Qualitative	Science Teaching	(Luckay & Laugksch, 2015)

teachers are able to effectively assess the atmosphere of their own classrooms, and whether these environments can be changed. Furthermore, topics such as the differences between student's preferred and actual classroom environments have been explored, as well as the importance of this for student learning outcomes. Do teachers have the same perceptions as students regarding the classroom setting? Does a teaching strategy or new curriculum alter the classroom environment? Do demographic factors such as sex, ethnic background, and academic ability impact perceptions of the classroom? Fraser (2012) points out those questions have been explored in depth throughout the last four decades.

A wealth of research has explored the relationship between the quality of the school environment's learning atmosphere and students' academic outcomes. These empirical research studies have been conducted in various countries and different grade levels, with tens of thousands of students involved. It has consistently been found that there is indeed a relationship between the classroom environment and learner outcomes (both cognitive and affective). Teachers must thus understand the importance of investing time and energy in developing their classroom environments, since the research shows that a positive classroom setting is highly likely to improve student learning outcomes (B. J. Fraser, 2015).

Many studies have attempted to create a rating scale upon which the constructivist learning environment can be developed. For example, Taylor and Fraser (1991) initially proposed the Constructivist Learning Environment Survey (CLES), which is made up of four dimensions: autonomy, negotiation, student-centeredness, and prior knowledge. Further research has been carried out with the purpose of re-developing and updating this scale. Taylor (1994) put forward a new version of the CLES from the critical constructivist perspective in order to highlight sociocultural restrictions on the independent learners' cognitive constructive capacities. This change addressed the weaknesses related to society and culture present in the original version. The new version's design was such that it could assess the fundamental aspect of a critical constructivist learning environment from the perspective of the students. These elements were: the extent to which their studies were **personally relevant**; whether the students have any level of **shared control** when it comes to their learning; whether students feel like they can express concerns regarding their learning (**critical voice**); whether students can effectively work together to enhance their abilities and understanding (**student negotiation**); and whether scientific knowledge is regarded as an ever-changing concept (**uncertainty**) (Taylor et al., 1995, 1997).

Within the field, there is an established trend of maths and science classroom environment research. To enhance such an education setting, Wolf and Fraser (2008) concentrated on maths and science classrooms. Furthermore, the nature of the environment in the computer classroom has been effectively illuminated by Fraser et al. (2010), while the biology school classroom environment was assessed by Moss and Fraser (2001). Several researchers, such as Chionh and Fraser (2009), have also investigated geography's classroom environment.

In terms of the educational environment across Asia, studies have been conducted in Thailand (Puacharearn, 2004), Korea (Lee et al., 2003), India (Koul & Fisher, 2005), Japan (Hirata & Sako, 1998), Singapore (Seng & Fraser, 2008), Taiwan (Aldridge et al., 1999),

Indonesia (B. J. Fraser et al., 2010; Margianti et al., 2004) and Brunei. Regarding the educational environment of the Kurdistan Region of Iraq, there is limited existing research, making this investigation somewhat original.

Likewise, the CLES's development in the Australian context was pursued by Taylor et al. (1997) as a means of continuing to improve the constructivist school classroom environment while also offering a tool for constructivist teaching strategies to be monitored by teachers and education specialists. 41 grade 8 and 9 science classes, comprising a sample of 494 students, received the CLES. Through drastically shunning certain traditional educational environment norms, a 30-item CLES version was developed by academic researchers. Items that were worded negatively were removed, with the different scales used for collating items. Overall, particularly strong levels of independence and internal consistency were established for the five CLES scales.

In Korea, Kim et al. (1999) examined the degree to which the Korean grade 10 science class-based teaching environment has been affected by the new, constructivist-oriented general science curriculum. A Korean rendering of the CLES was adopted. Twenty-four science teachers and 1,083 learners across twelve schools were provided with the CLES's preferred and actual versions. The researchers found out that learners who received a new science curriculum experienced a more constructivist educational environment than learners who not received this curriculum. The findings also confirmed the Korean version's factor structure and reliability, and reported statistically significant correlations between the school classroom environment and the attitudes of students toward science.

Furthermore, Korean senior high school learners and educators were surveyed with the CLES in Uk's (2001) PhD research. Four hundred tenth and eleventh-grade science learners across thirteen classes received the Korean language CLES version, comprising of a five-factor structure. However, the items' comprehension was difficult for the participants, as Uk observed. The CLES developers, who were Australian, were characterized by a markedly different culture compared with the Korean learners and educators. Ultimately, the original items and translated items do not necessarily have semantic equivalence, although a number of investigations have shown that a translated survey applied in a cultural context varying from that for the original survey can achieve fair results.

In Singapore, junior college English learners studying the 'General Paper' course were investigated using the amended and enlarged CLES by Wilks (2000). Two new scales are included in the updated GPCLES: Political Awareness Scale (appraising the degree to which students evaluate sources of social injustice's reasons and promote political reform in accordance with Habermas' definition of emancipatory interest) and Ethics of Care scale (assessing the extent of class-based emotional warmth). Both of these are fundamental subjects in General Paper teaching. The questionnaire demonstrated fair internal consistency, reliability, and factorial validity when the GPCLES was distributed among 48 junior college classrooms with 1,046 learners (Wilks, 2000).

Aldridge et al. (2000) investigated the Constructivist Learning Environment through cross-national research in Taiwan and Australia. In Taiwan, 50 classes with a total of 1879 learners received a Mandarin version of the CLES, while in Australia, 50 classes with a total 1081 learners received the original English CLES version. The

CLES Mandarin and English versions were each found to have robust validity in terms of distinguishing the classes, reliability, and factor structure. These researchers have stated that compared to Taiwanese students, Australian students were practised more constructivist learning in their classrooms, particularly regarding learner negotiation and critical voice. The quantitative data were taken to direct both country's qualitative data collection processes. The learner interviews have presented some useful precautionary and procedural information about the comprehension of certain survey items by students and how to use and assess Eastern nations' constructivist learning environments via a Western questionnaire. We adopted Critical Voice, Learner Negotiation, Individual Relevance, Uncertainty and Shared Control scales from Aldridge et al.'s study (2000) in the SCLEs survey that we developed for our study.

Maor and Fraser (2005) carried out research in Australia to improve and validate the Constructivist Multimedia Learning Environment Survey (CMLES). The constructivist-oriented questionnaire development dynamically concentrated on the constructivist learning approach, evaluating the multimedia program-based educational procedure, as well as the program's characteristics. The survey's preferred and actual versions were responded to by 12 high school grade 10 and 11 classes taking the IT course, comprising of a sample of 221 learners. Consequently, educational contexts involving constructivist learning strategies and multimedia programs could be effectively analyzed from teachers' and students' perspectives based on the CMLES, given its validity and reliability.

Aldridge et al. (2004) undertook research into 43 grade 4–9 student classes in South African intermediate and senior schools, with 1,864 students receiving the English language CLES in its amended, preferred, and actual version, despite the nascent character of the learning environment studies in South Africa. Accordingly, the capacity to distinguish among school classrooms, internal consistency reliability, and the factorial validity of the CLES version were all subject to cross-validation. Improving the reflective nature of South African educators' day-to-day classroom instruction was the principal aim of the research. Over the three-month research period, certain interventions to the school classroom constructivist orientation were achieved by adopting CLES as part of educator action research.

To offer insights about the educational context of the science classroom in Minnesota, USA, the standard CLES comprising of 30 items was adopted by Johnson and McClure (2004). 209 pre-service and in-service science teachers at elementary, middle, and high schools completed the CLES survey. Robust reliability and validity of the factors was established. However, the item that was worded negatively was omitted, while four rather than six items made up the five scales, to produce a briefer and amended 20-item CLES version, on the basis of the comment and feedback of respondents regarding the items, as well as every item's internal consistency, reliability, and exploratory factor analysis. Johnson and McClure showed that the latest and more affordable CLES version showed robust validity and reliability for a different sample of students and teachers at the upper-elementary, middle, and high schools.

An original type of Constructivist Learning Environment Survey (CLES) was devised by Nix et al. (2005) in the USA. It was titled a comparative student (CLES-CS) version as a marginally amended original CLES format. Drawing on the Integrated Science Learning Environment (ISLE) model, a novel effectiveness program from a teacher

development initiative was appraised through the CLES-CS. Student Negotiation, Critical Voice, Shared Control, Uncertainty of Science, and Personal Relevance were the five CLES dimensions incorporated into the CLES-CS. Fifty-nine (59) teaching classes in North Texas, comprising 1079 learners, were the research's targeted population. The CLES was found to have robust validity. Four items were eliminated, with the twenty-six items that remained able to account for a variance of 45.5% in total, achieving a minimum factor loading of 0.40 on its specific scale, as well as 0.40 on every remaining scale. The analysis showed that students whose science teachers had participated in the ISLE training program perceived greater degrees of uncertainty of science and personal relevance in their classrooms compared to the classrooms of other nonscience and science teachers within the same educational facility. Applying the original and briefer CLES by Johnson and McClure (2004), which comprise of twenty items, Nix and Fraser (2011) undertook further research in Texas. 845 students and 17 teachers were assessed over three semesters, using the ISLE model. Ultimately, transformations in middle-school school classroom environments were mirrored by those in higher education class contexts, as the qualitative information and CLES showed.

A Spanish version rendering of the CLES was developed by Peiro and Fraser (2009), with 739 Miami-based science learners between kindergarten and grade 3, who were provided with the Spanish and English versions. The validity of the updated English and Spanish versions, which were provided to such young children, was confirmed based on the data analysis assessment. Robust positive correlations were observed between the attitudes of students and the sociocultural nature of the classroom setting. A three-month intervention in the classroom led to substantial and significant educational improvements.

Aldridge et al.'s (2000) student CLES version was amended for the Turkish context by Anagün and Anilan (2010), who undertook a confirmatory factor analysis. Inner-city primary schools from Istanbul and Eskisehir were the focus of the study, with a random sampling of 1094 students who were surveyed to test the CLES' reliability and validity. The five subscales that comprised the original scale's five-factor structure were retained. However, nine items with low factor values out of 30 original items were ultimately eliminated due to connection to cultural differences based on the data analysis.

Laptop-based adoption of a Constructivist Learning Environment (CLE) in Malaysia was analyzed by Sultan et al. (2011). The Constructivist Learning Environment Questionnaire's (CLEQ) Malaysian version offered to teachers professional knowledge about how to attain high standards in the educational process. The research population was students drawn from ten chosen schools across ten Malaysian states. A total of 304 students were selected randomly from a 608-strong population to engage in the CLEQ study. The average variance extracted (AVE) was 0.53 and the Composite Reliability (CR) was 0.92, thus providing convergent validity, while an alpha in excess of 0.70 for internal reliability was calculated for each of the six subscales. Therefore, in the constructivist educational environment, constructing learners' understanding via creative thinking was found to be linked to various aspects of learning outcomes. We adopted perceived e-learning outcomes scales from Sultan et al.'s study (2011) in the SCLEs survey that we developed for our study.

Peer and Fraser (2015) investigated primary school science classroom contexts in Singapore. Fifty-five science classes comprising of 1081 learners received ten scales derived from the surveys 'What is Happening in this Class', the Test of Science Related Attitudes, and the Constructivist Learning Environment Survey. Singapore-based primary school learners' Enjoyment of Science Lessons, Attitude to Inquiry, Student Negotiation, Uncertainty, Personal Relevance, Cooperation, Task Orientation, Investigation, Teacher Support, and Involvement scale had all be effectively analyzed as part of this broadly applicable survey, which has strong reliability and factor analysis results.

Luckay and Laugksch (2015) examined the validity of the instrument, which can be generally used to evaluate the perceptions of students about their educational surroundings as a means of observing and directing developments within social constructivist educational environments. Mixed-method research with a marked preference for the quantitative method of data collection was used in the empirical study. The Social Constructivist Learning Environment Survey (SCLES) was devised as an original data collection method for the quantitative component. The South African Province of the Western Cape was the subject of an increased focus, with 50 schools, 1955 grade 9 students from 52 science classes, comprised the survey sample for the SCLES. The SCLES's validity and reliability were appraised based on the data analysis. Uncertainty in Science, Respect for Difference, Critical Voice, Collaboration, Personal Relevance, Metacognition, and Investigation were the six constructs of classroom educational environment that were tested. Since Western Cape Province students' second or third languages were English, the English version of the items and directions are rendered into Afrikaans and isiXhosa. Overall, for South African high school natural science classes, the validity and reliability of the SCLES's preferred and actual versions were established through this academic research. We adopted the Respect for Difference and Investigation scales for Luckay and Laugksch (2015) in the SCLE survey we developed for our study.

Aim of the study

The research study's goal was to carry out a cross-cultural validation assessment of both the questionnaire survey for the Social Constructive Learning Environment (SCLE) and Perceived e-Learning Outcome by presenting them both in Arabic and Kurdish. A new edition of the Social Constructivist Learning Environment Questionnaire (SCLEQ) has been developed to give teachers and educational specialists valuable knowledge that may help enhance the consistency of the teaching and learning process in social studies classroom at Iraqi Kurdistan schools. Eventually, by validating the instrument, our aim is to join and enrich international research on the subject, to share with experts the results of experiences in the cultural milieu of the Kurdistan Region of Iraq, and to provide empirical data on how to use educational technology based on pedagogic approaches and principles of learning theories.

This study aims to determine the reliability and validity of the measurement model. There are two related research questions:

(1) How valid is SCLEQ and in measuring social constructivist learning among students in the social science classroom?

(2) How reliable is SCLEQ in terms of internal consistency, which is measured using composite reliability and Cronbach's alpha?

Method

Instruments and data collection

This study used quantitative method to answer particular research questions by describing phenomena in a numerical fashion. With the questionnaire used for data collection, PLS-SEM with SmartPLS software was adopted for data analysis, followed by data coding and screening using the SPSS version 24.

Measurement scales

The Social Constructivist Learning Environment Survey (SCLES) is an innovative and valuable instrument consisting of seven scales, with each scale containing four to six subscales. The SCLES includes scales taken from the existing reliable instruments (from the Constructivist Learning Environment Survey) by Aldridge et al. (2000), which are composed of Uncertainty, Personal Relevance, Shared Control, Critical Voice, and Student Negotiation, all of which have a bearing on social constructivist learning. "Respect for Difference" and "Investigation" are two relatively new scales devised by Luckay and Laugksch, (2015) which are also incorporated. The SCLES is technology-based and requires students to take part in different activities and involvement in various meaningful interactions (Johanssen, 1999). CLES students must be given a chance to negotiate ideas, carry out investigations, and express their thoughts in order to improve their cognitive and meta-cognitive outcomes (Taylor et al., 1994, 1997). The items in these questionnaires were answered using a five-point Likert scale, meaning students indicated one of the following answers: Almost Never, Seldom, Sometimes, Often, and Almost Always. The CLES evaluates:

Investigation: This regards the extent to which there is an attention on, and development of, problem resolution and investigative and questioning capacities (Luckay & Laugksch, 2015). The degree to which the skills, processes of inquiry, as well as their investigative use, are focused on.

Personal relevance: This regards to the degree to which students can relate school material with their experiences outside of school. It focuses on ensuring that learning is as relevant as possible to students' everyday experiences, which is crucial in enhancing students' knowledge (McClure & Gatlin, 2007).

Uncertainty: This regards how opportunities are created to enable students to use scientific knowledge relating to human experience and values. This includes knowledge that is evolving, non-foundational, and socially and culturally determined (McClure & Gatlin, 2007).

Critical voice: This regards how the relative social climate is developed and the extent to which students feel able to question the teachers' teaching plans and methods, as well as to express concerns regarding any aspects of their learning (McClure & Gatlin, 2007).

Shared control: This regards the degree to which students are able to have shared control of the classroom with the teaching. It involves the determination of learning objectives, design and management of learning activities, and determination and use of evaluation criteria (McClure & Gatlin, 2007).

Student negotiation: This regards the opportunities provided to students to explain and justify new ideas to other students, as well as to listen and provide feedback on the ideas given by other students (McClure & Gatlin, 2007).

Respect for difference: This regards the capacity of learners to have respect for others' perspectives and listen to them (Luckay & Laugksch, 2015).

E-Learning: The Organization for Economic Corporation and Development (OECD, 2005) defined e-learning as using information and communications technology (ICT) for supporting or improving learning in tertiary education. E-learning not only maintains an interest in advanced applications but also concerns entire online provision as well as the provision of campus-based or distance education that is accompanied by ICT.

Perceived e-Learning outcomes (Student experience): This regards what extent using e-learning resources will be useful for learners to improve their learning outcomes. It was also adapted by the researchers, which comprised one construct and four items (Sultan et al., 2011).

Sample

Data collection was undertaken through quantitative research methods. The Kurdistan of Iraq Region's capital city of Erbil was the specific location studied, and the data was acquired from international, private, and public schools. A survey strategy was adopted to implement the cross-sectional, quantitative research design. Male and female from eight to twelfth grade students were selected for the study using a stratified random sampling method. A paper-based, self-administered questionnaire was used to collect the information.

The sample included two private, three international, and seven public upper primary and secondary schools, making 12 in total, with 1,623 students across the schools comprising the research sample. Questionnaires with missing and extreme values were eliminated, and the remaining 1,289 valid questionnaires were analyzed in terms of the Constructivist Learning Environment Scale as well as perceived e-learning outcome. 667 male and 622 female students were included, accounting for 51.7% and 48.3% of the sample, respectively, thus providing a relatively equal gender representation (Table 2). The majority of students (71.5%) were able to reach the laptop computer and the internet at home.

The public schools are set in both the center and around the city of Erbil. Private schools and international schools are placed in very different geographical locations close to the metropolis and are well-equipped with educational technologies.

Sampling

The research sample of students was selected through stratified random sampling, with a survey strategy used to implement the quantitative, cross-sectional research design. A random sampling method was adopted for public schools, whereas international and

Table 2 Sociodemographic characteristics of participants

Baseline characteristic	Full sample	
	n	%
Gender		
Female	622	48.3
Male	667	51.7
Type of School		
Public	502	38.9
Private	348	27.0
International private	439	34.1
Student grade		
Eight	319	24.7
Nine	338	26.2
Ten	368	28.5
Eleven	203	15.7
Twelve	61	4.7

private schools were picked using a random sampling selection from the schools' names list.

Adaptation of the instrument

The items in the present research were taken from the CLES and perceived e-learning outcome survey and translated to Arabic and Kurdish. Permission to edit the questionnaires was sought from Dr. Peter Taylor. Permission to implement the data collection process was also granted by the schools and universities involved in the research. Ethical approval for the research project was sought and received from the Institutional Review Board at the University of Szeged. All items underwent a double back translation to make sure that items written in Arabic and Kurdish were correctly translated from the English version and held the same meaning. To carry out the translation, three bilingual school teachers for each language were involved, the first of whom carried out the translation from English to Arabic. The second then translated the new version from Arabic to English without seeing the original version. The third teacher made necessary comparisons between the original and the translated English versions. The same procedures were done for translating the instruments to the Kurdish language. Furthermore, it is recommended that the steps required for cross-cultural validation are followed. These include double back translation, panel translation meetings to verify cultural content, and the identification of potential comprehension issues in relation to the questionnaire content. In addition, pilot study testing is recommended to evaluate the psychometric properties. In this way, it becomes possible to review participant comments and make amendments, where required, to words and phrases in order to render the questions more lucid.

The design of the questionnaire was in the form of a paper–pencil test, which aims to gain demographic details, students' background information, and information about their attitude toward a constructivist learning environment and employing educational technology in classrooms.

Procedure

Before starting collecting data, the researchers got permission from the General Directorate of Education, Erbil City to collect the data. The surveys were given to students at the schools they attended. The students were asked to provide feedback on face-to-face lessons that included social and formal interactions with the teacher. The study's goal was to look at students' perceptions of the school learning environment as well as the efficacy of employing technology. Before starting collecting data, the researchers also got parental consent for participation, it was made clear that the questionnaire would be anonymous, and that no pressure will be applied if they want to return it empty or incomplete. Lastly, participants were informed that no processing of identifying information regarding the courses would take place.

Statistical analysis

The SCLES Model was built through a number of stages. The first stage identified an exploratory list of terms, which included uncertainty, relevancy, shared control, critical voice, students' negotiation, investigation, respect for difference, and e-learning outcomes. The second stage looked at content validity, using carefully chosen dimensions based on literature revisions. The third stage measured and analyzed reliability using composite reliability and Cronbach's alpha. Construct validity was investigated by implementing discriminant validity and convergent validity for loading, looking to see 0.4 or above for each item (Kock, 2015). Bartlett's Test of Sphericity indicates that the significance level (sig) for Sphericity (13,586.518) for the eight-item correlation matrix is highly significant at $p < 0.001$, while the Kaiser–Meyer–Olkin (KMO) value is 0.903. Overall, the significance value is $p < 0.05$.

SPSS 24 and Smart PLS 3.2 were used to examine the validity and reliability of the data gathered from the survey questionnaires. SPSS 24 is used to assess the respondents' demographic profiles, and SmartPLS 3.2 is used to measure and structurally model the research framework. There is a major benefit of employing SmartPLS 3.2 to establish study reliability and validity, as it provides a latent variable score that bypasses the small sample size problem while effectively addressing complicated models that have different variables (Henseler et al., 2009).

Measurement model analysis

Table 3 and Fig. 1 presents the results of the measurement model in terms of the research's proposed conceptual framework. The model includes 35 items classified into 6 items for Investigation, 4 items for Relevancy, 4 items for Uncertainty, 4 items for Critical Voice, 4 items for Shared Control, 4 items for Student Negotiation, 4 items for Respect for Difference, and 4 items from Perceived e-Learning Outcome (Student Experience). Thus, four items were eliminated from the questionnaires.

Reliability and validity

As Fornell and Larcker (1981) clarified, two values may be considered to determine the reliability of a measurement model: composite reliability, where a value of 0.7 or greater is achieved; and Cronbach's alpha, where a coefficient of 0.6 or greater is achieved. A composite reliability value ranging from 0.729–0.882, as well as a Cronbach's alpha coefficient from 0.521 to 0.822, were calculated for the measurement model's composite reliability, as Table 3 presents. Internal consistency based on Cronbach's alpha was also calculated in Table 3. Specifically, for the overall scale, Cronbach's alpha coefficient was 0.88, thereby indicating there was sufficient internal reliability. The domains produced the following results: Investigation (0.718); Relevancy (0.721); Uncertainty (0.521); Critical Voice (0.633); Shared Control (0.763); Student Negotiation (0.710); Respect for Difference (0.813); Perceived e-Learning Outcome (0.822). However, the Cronbach's alpha results for the scales of Uncertainty and Critical Voice were lower – (0.520) and (0.633), respectively. According to Taber's study (2018) which is entitled "The use of Cronbach's alpha when developing and reporting research instruments in science education" (Taber, 2018, p. 1), the values of the Cronbach's alpha for the scales are sufficient. Therefore, we can say the instruments can be consistently measured. A similar result was observed in the research conducted by Johnson and McClure (2004), wherein the Cronbach's alpha value for Uncertainty was ($\alpha = 0.61$). In addition, studies conducted by Kim et al. (1999), and Aldridge et al. (2004) produced ($\alpha = 0.64$) and ($\alpha = 0.60$), respectively. Hence, these low alpha values of the scale were produced when the individual was employed as the unit of analysis. This is because the classroom environment scale must be able to distinguish student perceptions from different classroom contexts. That is, students in the same classroom ought to have comparable perceptions, but average perceptions should differ between classes.

Anagün and Anilan (2010) translated the student CLES used in the research of Aldridge et al. (2000) into Turkish, and performed a confirmatory factor evaluation in primary schools in Eskisehir and Istanbul in order to confirm the reliability and validity of the CLES. The five subscales comprising the original version of the five-factor structure were kept in the translated version. Nevertheless, nine of the original thirty items had low factor values and were removed because they were linked to cultural discrepancies, as indicated in the data evaluation.

Another study that supports this study result is the research into Constructivist Learning Environments conducted by Aldridge et al. (2000) using cross-cultural research in Taiwan and Australia. In this case, the Mandarin and English language version of the CLES were valid in relation to their ability to discriminate classes, factor structure, and reliability. According to Aldridge et al. (2000), it was clear that Taiwanese learners were less practiced and familiar with constructivist learning in terms of learner negotiations and critical voices. Thus, cultural and classroom environment differences, specifically the lack of familiarity with constructivist learning practices, might have accounted for the lack of understanding of some of the survey items by the participants. This accords with Uk's (2001) observation that Australian learners and educators both differed significantly from those in Korea in terms of the educational and cultural practices. Thus, translations of surveys items cannot necessarily be imbued with semantic equivalence since the translated surveys are employed in entirely different cultural contexts. Multiple other studies have also confirmed this supposition.

Table 3 SCLEQ list of terms, CA, CR, AVE, and Loadings adapted from (Aldridge et al., 2000; Luckay & Laugksch, 2015; Sultan et al., 2011)

Investigation	Loadings		
CA = .718 CR = .826 AVE = .535	INV1	I am asked to think about the supporting facts for statements. **(item deleted)**	0.538
	INV2	I carry out investigations to answer questions coming from discussions	0.736
	INV3	I explain the meaning of statements, diagrams, and graphs. **(item deleted)**	0.564
	INV4	I carry out investigations to answer the teacher's questions	0.709
	INV5	I find out answers to questions by doing investigations	0.741
	INV6	I find a solution for problems related to social phenomena by using information and data obtained from investigations	0.593
Learning about the world (relevancy)			
CA = .721 CR = .827 AVE = .544	REL1	I learn about the world inside and outside of school	0.780
	REL2	My new learning starts with questions or problems about the real world outside of school	0.709
	REL3	I get a better understanding of the world outside of school	0.732
	REL4	I learn interesting things about the world inside and outside of school	0.727
Learning about the research process (uncertainty)			
CA = .521 CR = .758 AVE = .414	UNC1	I learn that social science has changed over time	0.786
	UNC2	I learn that social science subjects are influenced by peoples' values and opinions	0.716
	UNC3	I learn that social science cannot always provide answers to real-life problems. **(item deleted)**	0.417 < 0.5
	UNC4	I learn that classroom activities are a way to seek better answers and generate new questions	0.593
Learning to speak out (critical voice)			
CA = 0.633 CR = .803 AVE = .498	CRI1	It's OK for me to ask the teacher, "why do I have to learn this?" or how I am being taught. **(item deleted)**	0.611
	CRI2	It's OK for me to ask my teacher for clarification about activities that are confusing	0.753
	CRI3	My teacher encourages me to ask questions to clarify ideas or to deepen my understanding	0.760
	CRI4	It's OK for me to speak up for my rights	0.687
Learning to learn (shared control)			
CA = .763 CR = .850 AVE = .590	SHA1	I help the teacher to plan what I am going to learn	0.813
	SHA2	I help the teacher to decide how well I am learning	0.828
	SHA3	I help the teacher to decide which activities work best for me	0.812
	SHA4	I let the teacher know when I need more or less time to complete assignments	0.595

Table 3 (continued)

Investigation			Loadings
Learning to Share (Student negotiation)			
CA = .710 CR = .821 AVE = .535	NEG1	I talk with other students about how to solve social problems	0.719
	NEG2	I ask other students to explain their ideas	0.788
	NEG3	I am asked by other students to explain my ideas	0.737
	NEG4	My teacher encourages me to raise issues and ask questions with other students in order to clarify and inform our thinking	0.677
Respect for difference			
CA = .813 CR = .871 AVE = .575	RES1	I am aware that my classmates have different opinions about topics related to social science	0.646
	RES2	I listen to my classmates' opinions about social science topics	0.784
	RES3	Before I agree or disagree with my classmates' opinions about social science topics, I first think about what they said	0.785
	RES4	I try to understand my classmates' opinions about social science topics	0.815
	RES5	I respect my classmates' opinions about social science topics	0.750
Perceived e-Learning Outcome (Student Experience)			
CA = .822 CR = .882 AVE = .652	eLEAR1	Using e-learning resources improved my critical thinking	0.804
	eLEAR2	The e-learning resources help me understand the subject contents more in-depth	0.863
	eLEAR3	I enjoy using different learning modes to learn	0.739
	eLEAR4	The e-learning resources help me understand the subject contents quicker	0.819

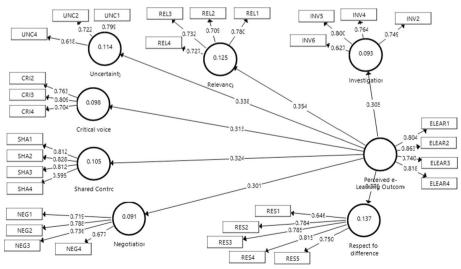*CA* Cronbach's alpha, *CR* Composite reliability, *AVE* Average variance extracted

Fig. 1 The measurement model in PLS-SEM

As noted by Sekaran and Bougie (1993), the validity test helps measure the suitability of the theories represented by the designed test. It can also be assessed using convergent validity as well as discriminant validity test. Hair Jr et al. (2021) stated that convergent validity can be evaluated by examining the results of the measurement model's factor loading, composite reliability, as well as its average variance extracted (AVE) above 0.5. As shown in Table 3, the factor loading regarding every item in the construct was above the recommended value of 0.5 (Hair Jr et al., 2021).

As Table 3 presents, investigation of the factor loadings was undertaken, and those under 0.50, as a typical benchmark value, were eliminated. However, there were certain exceptions. Item 3 (Uncertainty scale (UNC3): "I learn that social science cannot always provide answers to real-life problems"), is the only item in the SCLES that was worded negatively and had a significantly lower factor loading at 0.41 compared with other scale items. Item 1 (Investigation scale (INV1): "I am asked to think about the supporting facts for statements.") also showed a low factor loading at 0.53. Item 3 (Investigation scale (INV3): "I explain the meaning of statements, diagrams, and graphs.") presented a similar low factor loading at 0.56. Items 6 (Investigation scale (INV6): "I find a solution for problems related to social phenomena by using information and data obtained from investigations.") also presented a factor loading below 0.60. Item 4 (Uncertainty scale (UNC4): "I learn that classroom activities are a way to seek better answers and generate new questions.") presented a similarly low factor loading at 0.59, while Item 4, (Shared Control scale (SHA4): "I let the teacher know when I need more or less time to complete assignments..") showed an almost identical factor loading at 0.59. Thus, Table 3 presents the model's validity by presenting the composite reliability value of the model with a 0.758–0.882 range that is above the 0.7 recommended value (Hair Jr et al., 2021).

The results presented in Table 3 show that the reliability of the instrument is good. Nevertheless, there is an issue around establishing convergent validity, as demonstrated by the fact that the Critical Voice, Investigation, and Uncertainty scale values for AVE of (0.498, 0.425, and 0.414, respectively) are low. For the Investigation scale, a stronger AVE value of 0.544 is achieved by the exclusion of Item 1 (INV1), "I am asked to think about the supporting facts for statements," as well as (INV3), "I explain the meaning of statements, diagrams and graphs," as the analysis shows. Moreover, a greater Uncertainty scale AVE value of 0.514 can be reached by eliminating Item 3 (UNC3), "I learn that social science cannot always provide answers to real-life problems." Meanwhile, a stronger Critical Voice scale AVE value of 0.577 can be achieved through excluding Item 1 (CRI1), "It's OK for me to ask the teacher "why do I have to learn this? or how I am being taught." Hair Jr et al. (2021) noted that the outer loadings value must be above 0.70 and must be taken into account for deletion if eliminating the indicators with outer loadings from 0.40 to 0.70 can increase the composite reliability and AVE. Hence, convergent validity can be determined after eliminating these four items with low AVE values from scales.

Table 4 shows that convergent validity was measured using Average Variance Extraction (AVE), discriminant validity was measured using matrix correlation, and Composite Reliability (CR) was also calculated. Table 4 shows how construct validity

Table 4 The Composite reliability (CR), the square root of the average variance extracted (AVE) (in bold), and correlations between constructs (off-diagonal)

Latent constructs	CR	AVE	Latent constructs							
			CRI	INV	NEG	ELEAR	REL	RES	SHA	UNC
Critical voice (CRI)	0.803	0.577	**0.760**							
Investigation (INV)	0.826	0.544	0.206	**0.738**						
Negotiation (NEG)	0.821	0.535	0.383	0.288	**0.731**					
Perceived e-Learning (ELEAR)	0.882	0.652	0.313	0.305	0.301	**0.808**				
Relevancy (REL)	0.827	0.544	0.442	0.335	0.341	0.354	**0.737**			
Respect for difference (RES)	0.871	0.575	0.343	0.340	0.447	0.370	0.400	**0.758**		
Shared Control (SHA)	0.850	0.590	0.420	0.328	0.366	0.324	0.356	0.291	**0.768**	
Uncertainty (UNC)	0.758	0.514	0.415	0.311	0.333	0.338	0.466	0.418	0.330	**0.717**

The diagonal part (in bold) is the values of the square root of AVE for every construct

with the implementation of discriminant validity used to determine that correlation among the constructs was lower than 0.9.

The Fornell–Larcker criterion may be implemented for examining discriminant validity (Fornell & Cha, 1994). In this method, the AVE's square root is compared with the correlation of latent constructs. A latent construct can provide efficient reasons for the variance of its own indicator compared with the variance of other latent constructs. Hence, the square root of the AVE of every construct must have a value higher than the other latent constructs' correlations (Hair Jr et al., 2021).

Table 4 shows that the CR of all constructs is higher than 0.70, while the AVE values are between 0.514 and 0.652. Fornell and Larcker's method was used to examine the discriminant validity, where every AVE's square root in the diagonal was compared with the correlation coefficients (off-diagonal) of all constructs in the concerned columns and rows (Hair Jr et al., 2021). No disputes were observed the Uncertainty-Relevancy constructs, the Relevancy-Critical Voice constructs, and the Respect for Difference-Negotiation constructs. The values of the square root of each of these constructs are higher than their correlation coefficients' values, each by 0.251, 0.311, and 0.295, respectively. Overall, discriminant validity can thus be accepted concerning this measurement model and aids the constructs' discriminant validity.

Discussion

The proposed model's measurement analysis findings show that loadings exceeding 0.40 were calculated for every item for the constructivist learning context's seven constructs (Investigation, Relevancy, Uncertainty, Critical Voice, Shared Control, Students' Negotiation, Respect for Difference, and Perceived e-Learning Outcomes).

Cronbach's alpha was used to measure the consistency and reliability coefficients for each scale, with the results showing that six subscales have internal reliabilities higher than 0.70. Uncertainty and Critical Voice scales have lower values for the Cronbach's alpha consecutively (0.520 and 0.633); however, in accordance with Taber's (2018) minimum ranges for the value of Cronbach's alpha, these may be deemed satisfactory (0.58–0.97) and sufficient (0.45–0.96). The corroborative evidence to support the result of the study are Aldridge et al. (2000), Johnson and McClure (2004), Kim et al. (1999), and Lee and Taylor (2001) studies, which have shown that certain items have been altered for

different cultural and language contexts, while the scale's factor structures were retained in other instances. Cultural divergence may be the reason why certain scale items were eliminated on the basis of low factor values. In research in Taiwan, the scale was adapted by Aldridge et al. (2000), with the scale adaptation and one-to-one learner interviews providing the basis of the research results. It was established that rather than adopting responsibility for their own learning, Taiwanese learners typically accept what their teacher instructs and try not to question them, due to the nation's cultural structure. For example, Taiwanese teachers are deemed to be qualified specialists in their field and are esteemed in society as professionals. Aldridge et al. (2000) exemplified this through the perspective of one learner, who considered, "The teacher plans the lessons very well. I can't think of anything better" (Aldridge et al., 2000, p. 47).

Moreover, the composite reliability (CR) for all subscales was greater than 0.70, while each construct also has an Average Variance Extraction (AVE) value of higher than 0.5. (Hair et al., 2007).

Table 4 has presented the convergent validity based on CR and AVE, with no discernible cross-loadings, and each item has factor loadings in excess of 0.40 as the benchmark value. Thus, the convergent validity shows the validity of each questionnaire construct according to Hair Jr et al. (2021).

Due to the cultural difference between Iraqi Kurdistan environment and the Western survey, the items INV1, INV2, UNC3, and CRI1, are a mismatch with the cultural context of Iraqi Kurdistan Region. This means that the Uncertainty, Investigation, and Critical Voice constructs are non-discriminant because of the low value of AVE. Consequently, based on qualitative reasoning, four items that the factor analysis revealed as having low loading were eliminated.

The cut-off criteria for fit indexes in Covariance Structure Analysis was taken into consideration (Hair et al., 2007) and used in this measurement model. It can be seen that SCLEQ has achieved good criteria. Hence, the measurement model demonstrated sufficient reliability and validity to be implemented when examining the structural model and hypotheses.

Conclusion

A quantitative method was followed to undertake cross-national research of school classrooms in the context of the Iraqi Kurdistan Region. The SCLES was adopted to obtain quantitative data, with the Arabic and Kurdish versions of the instrument confirmed as upholding validity and reliability. The main data is sufficient for further study that carries out path model analysis. The study examined the proposed conceptual framework on the basis of the existing e-learning outcome and constructivist learning environment literature. For the linkages between learner outcomes and classroom environments in the Kurdistan Region of Iraq to be effectively understood in future studies, academic achievement and learner attitude measures should be incorporated.

Abbreviations
CLE   Constructive learning environment
SCLE   Social constructive learning environment
SCLES   Social constructive learning environment survey
SCLEQ   Social constructive learning environment questionnaires

PLS-SEM   Structural equation modeling
INV   Investigation
REL   Relevancy
UNC   Uncertainty
CRI   Critical voice
SHA   Shared control
NEG   Negotiation
RES   Respect for difference
ELEAR   Perceived e-learning outcome
CA   Cronbach's alpha
CR   Composite reliability
AVE   Average variance extracted
KRG   Kurdistan regional government

Author contributions
This study reported in this academic article is a part of the Ph.D. degree research project which is conducted by Saif Mohammed. Kinyo Laszlo is the supervisor. The manuscript was written by Saif Mohammed. Kinyo Laszlo has an important contribution to plan and prepare the instrument materials for collecting the data and reviewing the manuscript. The authors read and approved the final draft of the manuscript.

Availability of data and materials
Data are available, but it is not applicable.

Declarations

Ethics approval and consent to participate
All participating students, and their parents, gave their written consent to participate in the research study.

Consent for publication
All authors consent to the publication of this paper.

Competing interests
The authors declare that they have no competing interests.

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