



E-content development of English language courses during COVID-19: a comprehensive analysis of students' satisfaction

Laleh Khojasteh¹ · Zahra Karimian² · Amir Yousef Farahmandi¹ · Elham Nasiri¹ · Nasim Salehi³

Received: 15 June 2021 / Revised: 7 February 2022 / Accepted: 17 February 2022 /
Published online: 26 March 2022
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Abstract There was a sudden switch to online learning approaches because of the COVID-19 pandemic. Universities were under pressure to provide a variety of e-learning designs during a short time, impacting the quality of the learning. This study tended to evaluate the quality of e-content development related to English language courses by Shiraz University of Medical Sciences (SUMS) faculties. The

Practical implications: Faculty academics have deemed it necessary to provide quality e-content and compile e-learning criteria, with a satisfactory outcome. This content was largely a substitute for student–teacher interactions and presentations during the pandemic.

Originality/value: Although this research primarily focused on the perception of students regarding language e-contents presented to them, a researcher-made questionnaire which was developed and validated for the first time can be used as a checklist for language teachers who are willing to make their e-contents based on the most key principles in multimedia

✉ Zahra Karimian
z_karimian_z@yahoo.com; Karimian@sums.ac.ir

Laleh Khojasteh
Khojastehlaleh@yahoo.com

Amir Yousef Farahmandi
Afarahmandi@gmail.com

Elham Nasiri
Elhamnasiri2010@gmail.com

Nasim Salehi
Nasim.Salehi@scu.edu.au

¹ Department of English Language, School of Paramedical Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

² Department of e-Learning in Medical Sciences, Virtual School and Center of Excellence in E-Learning, Shiraz University of Medical Sciences, Shiraz, Iran

³ Faculty of Health, Southern Cross University, Gold Coast, QLD, Australia

survey was conducted on 610 undergraduate students of SUMS who had an English course in the first semester which was during the same time that the pandemic started. A self-devised questionnaire including 30 items in five main domains: physical design, affective design, cognitive design (e-content organization and multimedia principles), flexibility, and ease of use was used to achieve students' satisfaction around the quality of the e-content developed by their teachers. Data were analyzed using SPSS 22 via one-sample *t*-test, Independent *t*-test, and ANOVA. Despite the limitations of e-content development by teachers, students had a satisfactory perception overall. Among the dimensions of e-content quality, physical design, cognitive design, ease of use, and flexibility had a score higher than the cut-off point but the score of the affective design was less. In addition, the differences were significant concerning age, gender, degree, type of digital device, and the faculties. It seems that in the situation of pandemics and lack of access to students, faculty members in terms of structural and cognitive dimensions have been able to develop satisfactory e-content in a short and intensive time, but it is necessary to be motivating, interactive, and up-to-date.

Keywords English courses · E-learning · Multimedia · Students' satisfaction · Quality · COVID-19 · Pandemic

Abbreviations

SUMS	Shiraz University of Medical Sciences
LMS	Learning Management System
EGP	English for General Purposes
ESP	English for Specific Purposes
ESL	English as a Second Language

Introduction

The COVID-19 pandemic resulted in a diverse range of e-learning designs and platforms, as well as adjustments in teaching delivery (Rose, 2020; Karimian et al., 2021). Overnight, educators had to learn how to develop, edit, and upload their multimedia content on the new platforms launched, as well as meeting and conducting classes over the Internet. This was a double burden for developing countries in terms of both e-learning infrastructure and culture, which were deeply challenged. As a result, during the pandemic, inevitably, an increasing number of universities implemented a technology-based learning system for the continuation of their education (Aghakhani & Shalbafan, 2020; Sahi et al., 2020) and, as a result, constructing qualitative e-content became the main focus for many educational institutions. However, this digital push for making e-content for language classes for adult university students was not an easy task in times of coronavirus-induced lockdown. The present study mainly explored university students' perceptions of the quality of teacher-made e-content in English courses, including three categories: English for General

Purposes (EGP), English for Specific Purposes (ESP), and English for Academic Purposes (EAP).

E-content development for languages and related studies

Building high-quality e-content for language learning has recently surfaced as a major challenge for many language institutes throughout the world. While many academics have studied computer-assisted language acquisition, little is known about building fully online English courses and delivering offline e-contents for EFL (English as a foreign language) students who have suddenly become immersed in the usage of digital technology. Regardless of the pandemic, instructional designers are constantly challenged with the task of designing e-learning courses for languages, and they seek out the best tools, the most valuable pedagogical principles, and the most efficient interface in order to create the perfect e-content (De Paepe 2014; De Paepe et al. 2018).

According to one study that explicitly evaluated English language e-contents offered to Turkish university students, the nature of English language e-content was neither manageable, flexible, or interactive (Kizilet & Özmen, 2017). Furthermore, it was stated that the audio and video resources were not truly authentic, which is a key principle in second language acquisition (SLA) theory.

Perveen (2016) investigated the impact of synchronous and asynchronous e-language learning activities at the Virtual University of Pakistan and in another study done in Bangladesh (Parvin & Salam, 2015). She noted that the majority of participants admitted to not actively participating in the synchronous sessions (about 1%), presumably because of the students' low level of English language listening and speaking proficiency. Asynchronous modalities, on the other hand, were preferred by English language learners. However, nothing has been said about the popularity of asynchronous content (the subject of this study) other than the fact that it is not time restricted.

Thach' study (2020) regarding the learners' interaction in English language courses indicated that Vietnamese students were not happy with the reading and speaking skill course contents; they believed automated feedback and listen and repeat nature of the lessons from the system did not provide the learners with explanations why their answers were wrong, unlike in the traditional context.

Sulistiyani and Riwayatiningasih (2020) investigated the effect of combining synchronous and asynchronous e-language learning in an Indonesian university. The results showed that employing a blended model of education was a very pleasant experience for their pupils. Although the researchers did not specifically mention the e-contents that were presented to the students in English writing classes, and the researchers did not distinguish between synchronous and asynchronous e-language learning, the results indicated that introducing a combination of discussion board and content materials had positive effects.

Another research, conducted by Sahay and Ranjan (2020), documented the development of e-contents in a Spanish course in India. The separation of e-text and video content was noted to be troublesome since students could either watch

the videos or read the e-texts. Additionally, a time period of 30 min of video lectures interspersed with a few interactive tasks resulted in boredom. It was noted that, while English was employed as a vehicular language for basic level courses, the majority of the learners was uneasy with it. The absence of regional language subtitling for the videos was also demotivating for language learners. It is critical to highlight, however, that none of the content writers had received training in instructional design for online courses and only a few were familiar with the type of technical pedagogical content they were required to provide in their lessons.

Mostly, other studies reviewed in the literature have focused on the e-content making itself for language learning and not necessarily the effects of these contents on students. Even those studies that have focused on the effect of pedagogical e-contents on adult learners usually have covered areas like biology (Nachimuthu, 2018), mathematics (Borko et al., 2008; Pio Albina, 2018), physics (Aravindan & Ramaganesh, 2010), and alike. The nature of language learning is totally different, we believe, from other disciplines because learning another language, foreign from learners' native language, has always been very challenging, especially for low proficiency students who are less motivated to learn the language (Escobar Fandiño et al., 2019).

Furthermore, not like many developed countries that even prior to the Covid-19 pandemic had had the advantage of infrastructure rich, reliable, and capable of providing the courses with the necessary tools to make the delivery process as smooth as possible, many developing countries went through the pandemic facing numerous challenges, including familiarity with tools and media, support, and financial restrictions to name a few.

Going through the same challenges and many more, as Mehrabi (2019) stated, it is important to organize a team for e-content development that is both familiar with the subject matter and multimedia content. Those who have prior exposure to online teaching–learning related activities such as creation of online content, course design, delivery, and so on. Therefore, the team behind doing this research comprised of language lecturers as lesson developers and e-learning lecturers as multimedia experts in e-content development, all teaching at the same context (Shiraz University of Medical Sciences), familiar with students' needs. We started to dig deep and look for a check list based on which we could help language teachers to make e-contents that could be presented to thousands of students within various disciplines studying English as a foreign language, both for general courses and ESP courses. Presented as compulsory courses made our job even harder to consider very deliberately the physical and affective design in the content making.

As for evaluating the effectiveness of the language e-contents, we can see from the above-mentioned studies that there are mixed findings. Those studies that specifically targeted the perception of students and language learners regarding the quality of the teacher-made language e-contents and language courses were not really satisfied with the effects, while those studies that had a more general approach through synchronous and asynchronous language learning report favorably on the experience. Therefore, to fill the knowledge gap in research on the making and application of language e-contents, we thought it is vital to carry out this research.

Theoretical conceptualization of e-content development and the key indicators

E-learning is the adoption of Internet technologies (and replacing, in part or completely, the human instructor) for delivering a great range of solutions that lead to improved knowledge and performance (Cook et al., 2008; Howlett et al. 2009). Technology-mediated education can make learning more personalized, student-centered, engaging, and productive (Dhawan, 2020). E-learning can be implemented via two key approaches. One is named synchronous learning environment through which, as the term denotes, interaction occurs in a real-time manner. In this mode, which is collaborative and requires the attendance of both the instructor and the students, electronic activities are collaboratively performed; for example, the instructor presents a lecture with the possibility of raising questions by the students and receiving the answer from the instructor (Salmon, 2013). The other environment is called asynchronous learning, in which, contrary to the synchronous mode, the students do not need to attend the session to receive the instruction; instead, they can follow the education by receiving the e-contents and working on them at their convenience (Salmon, 2013; Garrison et al., 2015, Yadav et al., 2021). Certain indicators (as explained below) are impacting the quality of e-learning and the usage of multimedia.

One of the foundations of successful e-learning is the *interactive aspect* of the online platform (Almaiah et al., 2020). Student *interactivity* indicates the active and ongoing interaction of students with other students, their instructors, and the content (Pradono et al., 2013). According to Moore (1989), interaction can be classified as an interaction between the student and the content, the student and the instructor, and the student and other students. Newberry and Davis (2008) believe that the quality of interaction is as important as the quality of e-content presented to the students. Since there are not sufficient opportunities for learners to socialize via online education, only carefully designed multimedia content can maintain students' engagement and participation (Perveen, 2016). Interactivity factor is more paramount in English language courses. According to Vygotsky's sociocultural theory, language is considered a communicative/psychological tool, mediating the meaning between the person and the linguistic goal, supporting cognitive development. In a study conducted by Annamalai (2018), the importance of online interaction in a meaningful way was highlighted in English-as-a-second Language (ESL) students. Therefore, innovative and practical multimedia approaches/platforms are required to enable ESL students to exchange their ideas/experiences asynchronously.

Goal-oriented and, at the same time, flexible e-learning has been proposed by Newberry and Davis (2008) as another key indicator of successful online education. Simplifying the sophisticated course materials, according to Phipps and Merisotis (2000), can be achieved through a good organization of the contents through a clear and step-by-step process. Lack of structured content, and/or not being able to break down the content via multimedia approaches, can significantly impact the success of the online course design and delivery (Alsadhan et al., 2014). For example, studies conducted at Saudi universities indicated that the limited quality of course content/design has been the most influential factor that impacted students' acceptance of new e-learning approaches (Salloum et al., 2019). In addition, students need to be in

a flexible environment to adjust their learning based on their capacity/needs (Dhawan, 2020). Poulouva and Simonova (2014) point to the fact that students are free to choose the right time and place to study via e-learning approaches, assisting them with time management, more personalized and sustainable approach to learning.

Affective responses to the information perceived and received are a key indicator in the e-learning process (Organero & Kloos, 2007). Emotion has a central role in any learning and particularly in e-learning (Shen et al., 2009). Based on the engaged learning perspective, learners need to be engaged in their learning intellectually, behaviorally, and emotionally (Bangert-Drowns & Pyke, 2001; Wang & Kang, 2006). Some examples of motivational factors that can impact engagement, students' retention, and satisfaction can be typographical cueing, graphical images, color, animation, and sound in the interactive multimodal learning tools/software (Lee & Boling, 1996). Shen et al. (2009) reported that based on emotion detection technologies from biophysical signals, engagement and confusion were the most common indicators during online learning. Olasina (2019), as well as Bojan and Bentz (2020), also reported that stress, satisfaction, and fatigue are important in students' behavioral intention to accept e-learning. Notably, simply incorporating flashy multimedia and the application of spoken words and graphics to draw learners' attention does not guarantee effective learning (Kebritchi et al., 2017). In the second or foreign language learning domain, Stevick (1980) commented that "Success [in language learning] depends less on materials, techniques, and linguistic analyses and more on what goes on inside and between the people in the classroom" (p. 4).

The interconnectedness between affective and cognitive mechanisms has vital implications for theoretical models for designing instructional multimedia materials (Plass & Kaplan, 2015). Regarding the cognitive-affective theory of learning with media, Mayer (2014) believes computer-based lessons should be designed in a way that three main effective features of an instructional message are considered all the time. These include less-is-more, more-is-more, and focused-more-is-more. Emotionally appealing elements and decorative illustrations, when combined with challenging learning tasks, can increase motivation if ample time and guidance are provided to the learner to fulfill the lesson objectives (Mayer, 2014). Mayer's (2009) cognitive theory of multimedia learning provides ample guidelines on how multimedia instruction can be designed in a way that maximizes learning. In the same vein, Baddeley's working memory model (Baddeley, 1999) is considered important because, for designing sound multimedia content, we need to be aware of how much information the working memory can process and how this information is stored in the human mind. Most consistent with Baddeley's working memory model, Mayer suggested that the most effective way to enhance the capacity of working memory (long-term memory) is the incorporation of auditory/verbal, as well as visual/pictorial channels (at the same time) (Mayer, 2005). Especially important in designing e-content, cognitive load theory suggests that too much or too complex information can hamper learning and impose extra load that exceeds learner's total working memory capacity (Sweller et al., 2011). Dylan Wiliam believes Sweller's cognitive load theory is the single most vital factor for educators to be aware of (CESE, 2017). Although multimedia can impact the students' engagement and encouragement in the learning process,

standard texts should not lose their effectiveness. Multimedia features (including video, audio, and animation) can be used as vehicles to assist in elaborating content, particularly the complex concepts in an engaging way (Tchoubar, 2014).

Although multimedia education has always been very important and has been mentioned in many studies, but the conditions of COVID-19 and students' lack of access to educational resources and interaction with teachers doubled the importance of access to e-content.

Due to the COVID-19 outbreak, universities in Iran including Shiraz University of Medical Sciences (SUMS) rapidly transitioned to online formats. Although there have been already some existing e-learning platforms before the pandemic, faculty members preferred face-to-face methods and in-person classes to e-learning, and they were not sufficiently prepared to deal with the crisis. On the other hand, General English and ESP courses at SUMS are the most demanding courses, and English professors, using a range of course books and materials, deliver lessons to a range of classes, age groups, and degree levels including undergraduate, graduate, and post-graduate students. Since, for almost all of the English instructors at SUMS, making e-contents was their very first experience, it is crucial to study medical students' perceptions of the quality of teacher-made e-contents, and delivery methods to enhance the quality of the education based on the students' needs (Choi & Jeong, 2019).

Methods

Participants

This study was conducted among 610 undergraduate students of SUMS using a descriptive survey methodology. Only students were included that undertook 2–4 mandatory units of English courses to fulfill the requirements of their semester during the COVID-19 pandemic. The sample size was determined utilizing Kergesi Morgan's Table, and data collection was done through simple random sampling. A total of 645 students studying at different schools were considered to fill the forms.

Research tool

While there are models (Cunningsworth, 1995; Tomlinson, 1998) that analyze the materials before, while, and after use, there are also other material analysis models (see McDonough et al., 2013) that analyze the e-contents in terms of organization and content. The present study described the while-use analysis, i.e., analysis of the currently used e-contents. The first step of the analysis was to set the criteria and create the checklist to describe the characteristics of e-content based on the multimedia principles suggested by Mayer (2014). Then, a researcher-made questionnaire was developed; the questionnaire included socio-demographic factors (e.g., gender,

age, place of residence status before Covid-19, degree, school, etc.), and five main domains around e-content development including physical design (1–6), affective design (7–10), cognitive design including content organization (11–16) and multimedia principle (17–23), flexibility (24–27), and ease of use (28–30). The questionnaire was Likert type, ranging from strongly agree (6), agree (5), relatively agree (4), relatively disagree (3), disagree (2) to strongly disagree (1), with the mean score between 1 and 6 and the cut-off point of 60% (or 4).

The content validity index (CVI) and the content validity ratio (CVR) were used to assess the validity of the questionnaire. The questionnaire was reviewed by 10 experts in the fields of English language, medical education, and e-Learning. The CVI for the questionnaire was 90%, demonstrating high agreement among the content experts. The CVR of the questionnaire for the three indicators was relevance (94%), clarity (96.3%), and simplicity (97.8%), respectively. In addition, the face validity of the questionnaire was assessed as well, including modification of eight questions regarding grammar and eloquence. After data collection, the reliability of the questionnaire was assessed through Cronbach's alpha (n : 40), indicating high reliability (0.958). After data collection, the final reliability of the questionnaire with 610 participants was recalculated (Cronbach's alpha: 0.976). The reliability value for each subscales was also calculated as follows (Table 1):

Data were collected in August 2020 during the COVID-19 pandemic quarantine. All SUMS undergraduate students who had an English course were invited to complete the questionnaire after signing the consent sheet. The data were collected within two weeks with the help of all the English instructors.

Due to the need for the urgent use of multimedia contents, rapid e-content software including Camtasia, Snagit, and I-Spring was utilized to create most of the content. The articulate studio was also used though not as much. The outputs were mostly in SCORM 1.2 or MP4 formats. The contents were primarily made in PowerPoints and then converted to e-contents of a maximum of 90 megabits through the aforementioned software. Subsequently, corresponding to each content, at least 5 multiple choice questions were made and uploaded in the self-assessment section in an interactive mode. Before commencing any content provision, the faculty members attended 3 general workshops on introduction to PowerPoint and principles of e-contents development while none had previously received specialized training. The e-contents were made available for the students through the LMS system with the options to both visit and download the e-contents.

Table 1 Reliability of subcomponents of questionnaire

Subscales	N	Reliability
Physical design	1–6	0.897
Affective design	7–10	0.896
Cognitive design	11–23	0.956
Flexibility	24–27	0.924
Ease of use	28–30	0.865

Due to the situation of Pandemic, we sent the survey to all relevant students via diverse ranges of social media platforms, to convince sampling was the most feasible way to achieve the highest numbers of participants due to the situation. The reason that English courses were considered was due to the importance of the courses and at the same time, its popularity across diverse ranges of discipline. This provided us a good opportunity to compare different faculties and their practices of online delivery during the pandemic.

Data analysis

SPSS 22 was used for data analysis. One sample *t*-test was used to determine the status of quality indicators of e-content. First, the mean score of each item and, then, that of each component were calculated. The minimum scores for each item and component were considered 1 and the maximum was 6 with the cut-off point of 4 (equal to 60%). In other words, scores above 4 indicated an acceptable level of content quality. Independent *t*-test and ANOVA were used to evaluate the quality components by demographic variables. The correlation between the scores of multimedia quality components was determined via Pearson's correlation test.

Ethical considerations

All material and methods have been prepared following the instructions and regulations of the Vice Chancellor for Research at Shiraz University of Medical Sciences. This study was approved by the SUMS Ethical Committee (Ref. No. R.SUMS.REC.1399.623).

Results

Participant's descriptive characteristics

The socio-demographic information of participants indicates that most students were female with the age range of 18–63. Detailed descriptive information of the participants is shown in Table 2.

Inferential findings

The mean and standard deviation of the participants' viewpoints (N: 610) are illustrated in Table 3. The mean score ranged from 1 to 6 and the cut-off point was $60\% = 4$. Also, a comparison of the mean components of the questionnaire based on a one-sample *t*-test can be seen in Fig. 1.

Findings indicate that all variables except the Affective design component have obtained a score of over 60%. Although Affective design met the minimum acceptable score, it did not receive a score of 60%. This can be attributed to the low average score of two items in this section. The first item is that "e-contents cannot be a

Table 2 Descriptive characteristics of SUMS students who participated in the research

Demographic characteristics	Frequency	Percentage
Gender		
Male	250	41
Female	360	59
Age		
18–21 years old	408	66.9
22–25 years old	116	19
26–63 years old	86	14.1
Mean	22.8 ± 6.23	
School		
Medicine	162	26.6
Dentistry	48	7.9
Pharmacy	21	3.4
Nursing	148	24.3
Paramedical sciences	85	13.9
Rehabilitation sciences	41	6.7
Health	47	7.7
Nutrition and food sciences	28	4.6
Health care management and information	30	4.9
Degree		
Continuous bachelor degree*	311	51.1
Discontinuous Bachelor degree**	76	12.6
Professional doctorate degree	223	36.6
English courses		
ESP	213	34.9
General English 1	160	26.2
General English 2	148	24.3
Academic writing	61	10
Pre-university English course	28	4.6
Residence status before COVID-19		
Living in their home	291	48
Living in their dormitory	319	52
Students' technical skill		
Low to average	379	62
Sufficient Skills	231	38
Facilities		
Personal PC or laptop+ Mobile	386	63.3
Only Mobile phones	224	36.7
Prior to Covid-19		
Experienced e-learning	185	30.3
No experience	425	69.7

*At Shiraz University of Medical Sciences, two groups of students are studying for a bachelor's degree. The first group, continuous bachelor's, is the one whose students are accepted for a 4-year degree program

** Students in this group are initially accepted in a two-year associate degree and then continue their education to complete their full-term bachelor's degree. Because of the gap between a two-year program and the remaining years to complete their education, these students are usually older than continuous bachelor's degree programs and almost all of them are already employed, having a full-time job

complete replacement for the face-to-face interaction with the teacher,” and “e-contents made me curious and motivated to follow the lessons.”

The results of the independent *t*-test indicate a significant difference across gender regarding instructional multimedia (e.g., videos). However, the difference for the ‘ease of access’ factor was not significant. Note that the mean for the responses of the female participants was higher than that of the male students on all of the items (Table 4).

Please be advised that the scores are based on the Likert Scale, starting from 1. Hence, the distance between each point is calculated as 20%. Based on this, 3.5 will be 50% and a score of 4 will be considered as 60%.

We used ANOVA to compare students’ responses based on their age. The students were divided into three groups: 18–21, 22–25, and over 25 years (Table 5).

In Table 5, the results showed a significant difference in the mean of the students’ responses to the questionnaire items concerning the age factor ($P < 0.001$). Moreover, significant differences were identified for physical design ($P < 0.001$), affective design ($P < 0.001$), cognitive design (e-content organization: $P = 0.001$ and multimedia principles design: $P = 0.012$), and flexibility factor ($P = 0.001$). Nonetheless, there was no significant difference in terms of the ease of use factor ($P = 0.299$). Post hoc investigations indicate that the mean of the satisfaction in the +25 group was higher than that of other groups.

The mean satisfaction of the e-content for the students with access to PC or laptop was higher than that of the students having access to only mobile phones. This difference was significant for total quality ($P = 0.001$) and in subdomain: physical design ($P = 0.042$), cognitive design ($P = 0.001$), and flexibility of e-contents ($P = 0.007$). In other words, the students’ perspectives are highly affected by their access or lack of it to the necessary infrastructure (Table 6).

At Shiraz University of Medical Sciences, the Department of English Language offers general and ESP (English for specific purposes) courses to all students studying at various disciplines. Instructors and course content for all students who receive a similar course title are the same; however, in terms of general English courses, students from different schools (e.g., dentistry and medicine) may participate in one course. Considering the possible effect of school, degree, and offered courses, the effect of course type, school, and degree on students’ satisfaction were investigated. It is worth noting that due to the homogeneity of teaching approaches trained and managed by English language department officials, e-contents were designed, recorded, and compiled in the same format based on the principles of multimedia principles. Specifically, at the beginning of each lesson, the general and specific objectives of the lesson were explained; key concepts were presented based on the principle of pre-training; the content of the lesson was fragmented for easy comprehension, and at the end of each lesson, up to five questions for review and the summary of the lesson were presented. All the e-contents were checked for quality assurance by the panel of at least two senior lecturers at the department before delivery.

Table 3 The mean of the items of the questionnaire from students' perceptions (cut-off point = 4)

Component	Items	Mean	SD
<i>Component 1</i> Physical design	The electronic contents were visually and auditory appealing	4.04	1.37
	The font size and type of the texts were legible and appropriate	4.61	1.14
	The professor's sound quality was good	4.57	1.27
	The combination of texts and images were appropriate	4.44	1.17
<i>Component 2</i> Affective design	The quality and resolution of the images in the slides were good	4.59	1.12
	Appropriate images and tables were used to convey the complex contents	4.17	1.31
	E-contents made and presented by the professor were understandable and informative	4.34	1.33
	E-contents could make up for lack of access to the professor and face-to-face interaction	3.52	1.70
	E-contents made me motivated to study and follow the course	3.45	1.60
<i>Component 3</i> Cognitive design	E-contents were scientifically and educationally rich and updated	4.18	1.34
	Component 3-1. E-Content organization		
	The goals of the lesson were well presented in the first slides	4.22	1.34
	E-contents were presented in an organized manner and sensible sequence	4.30	1.33
	The titles and subtitles were presented in regular order	4.50	1.11
	The way the professor expressed and presented the content was good	4.48	1.25
	The professor summarized the lesson in the ending slides	3.99	1.42
	The duration of the presentations of the e-contents was appropriate	4.37	1.31
	Component 3-2. Multimedia principles		
	Revisions were done before the main topic would begin	4.01	1.39
	At the beginning of the presentation, the professor addressed the students and provided a warm-up	4.20	1.31
	The contents were well divided (not presented all at once and in a crowded manner)	4.40	1.35
	When the professor was talking, the related content (text, sign, image, etc.) were shown	4.59	1.20
The images and the voice of the professor were well synchronized and had no delay	4.62	1.26	
Various audio, visual, and textual tools were used well in presenting the contents	4.38	1.24	
Combination and arrangements of the text, images, and voice were appropriate and sensible	4.48	1.18	

Table 3 (continued)

Component	Items	Mean	SD
<i>Component 4</i> Flexibility	E-content made me able to adjust my study time to suit my circumstances	4.09	1.58
	With e-contents, I could repeat studying more complicated lessons according to my learning speed	4.17	1.57
	In e-contents, I can select the slides to watch according to my needs	4.34	1.44
	With e-contents, I can choose to study in my convenient place	4.44	1.53
<i>Component 5</i> Ease of use	Downloading the electronic content was easy (in terms of content size)	4.08	1.59
	I could easily open the e-contents on a laptop or PC	4.41	1.49
	I could easily see and use the electronic content on my mobile phone	4.48	1.45

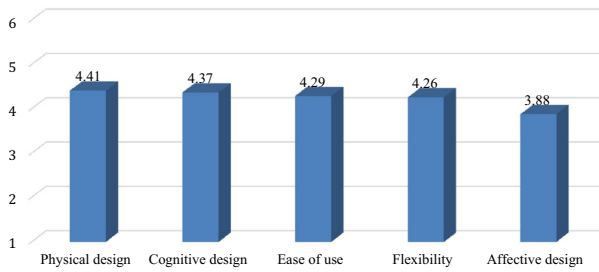


Fig. 1 Comparison of the mean of the components (Cut-off point = 4)

Table 4 Differences in students' views on the dimensions of the multimedia quality by gender

Components	Gender	Mean	SD	<i>t</i>	<i>P</i> value
Physical design	Female	4.56	0.97	4.30	< 0.001
	Male	4.19	1.01		
Affective design	Female	4.03	1.30	3.45	0.001
	Male	3.66	1.29		
Cognitive design	Female	4.47	1.02	3.04	0.002
	Male	4.20	1.05		
• E-content organization	Female	4.43	1.05	3.05	0.002
	Male	4.15	1.13		
• Multimedia principles design	Female	4.51	1.05	3.12	0.002
	Male	4.23	1.05		
Flexibility	Female	4.37	1.35	2.33	0.020
	Male	4.10	1.40		
Ease of use	Female	4.31	1.35	0.56	0.573
	Male	4.25	1.34		
Total quality	Female	4.39	1.05	3.09	0.002
	Male	4.09	1.06		

English courses

In this study, five English courses were included: pre-university English, ESP, general English 1, general English 2, and academic writing. ANOVA test was used to investigate students' satisfaction with the e-content of various English language courses. The result showed no significant difference in the average of total quality and any of the subdomains ($P > 0.05$).

Faculty/schools

We used ANOVA to compare students' responses based on their schools. The mean for the quality of e-content for English courses in different faculties was significant.

Table 5 Differences in students’ views on the dimensions of the multimedia quality by age

Components	Mean ± SD			Total mean	F	P value
	Age group					
	18–21	22–25	> 25			
Physical design	4.34 ± 1.0	4.36 ± 0.9	4.82 ± 0.9	4.41 ± 1.3	8.24	<0.001
Affective design	3.75 ± 1.3	3.88 ± 1.2	4.50 ± 1.1	3.88 ± 1.0	11.62	<0.001
Cognitive design	4.27 ± 1.0	4.43 ± 1.0	4.73 ± 0.97	4.37 ± 1.0	6.26	0.001
• E-content organization	4.22 ± 1.1	4.34 ± 1.0	4.72 ± 0.9	4.32 ± 1.0	7.24	0.001
• Multimedia principles	4.32 ± 1.0	4.46 ± 1.0	4.69 ± 1.0	4.40 ± 1.3	4.42	0.012
Flexibility	4.17 ± 1.3	4.22 ± 1.4	4.78 ± 1.1	4.26 ± 1.3	7.01	0.001
Ease of use	4.25 ± 1.3	4.26 ± 1.4	4.51 ± 1.4	4.29 ± 1.0	1.20	0.299
Total Quality	4.16 ± 1.0	4.28 ± 1.0	4.76 ± 0.9	4.27 ± 1.0	9.27	<0.001

Table 6 Differences in students’ views on the dimensions of the multimedia quality by types of digital device

Components	Device	Mean	SD	t	P value
Physical design	PC/Laptop	4.54	0.96	2.04	0.042
	Only Mobile	4.35	1.02		
Affective design	PC/Laptop	4.00	1.30	1.50	0.133
	Only Mobile	3.83	1.31		
Cognitive design	PC/Laptop	4.47	0.98	3.27	0.001
	Only Mobile	4.18	1.11		
• E-content organization	PC/Laptop	4.45	1.10	1.96	0.050
	Only Mobile	4.26	1.08		
• Multimedia principles design	PC/Laptop	4.50	1.08	1.60	0.109
	Only Mobile	4.35	1.04		
Flexibility	PC/Laptop	4.50	1.33	2.70	0.007
	Only Mobile	4.16	1.39		
Ease of use	PC/Laptop	4.43	1.27	1.70	0.089
	Only Mobile	4.22	1.37		
Total quality	PC/Laptop	4.39	0.98	3.41	0.001
	Only Mobile	4.05	1.17		

The result of post hoc (Tukey test) investigations indicates that the mean of the responses to the questionnaire items was significantly higher for the School of Paramedical Sciences than those of Medical School ($P=0.001$) and School of Health Care Management and Information ($P=0.01$).

Under the category of cognitive design, our findings indicate that the mean of the e-content organization factor was significantly higher for School of Paramedical Sciences compared to those of Medical School ($P < 0.001$), School of Health ($P = 0.03$), and School of Health Care Management and Information ($P = 0.02$). Concerning the

“observance of multimedia principles” factor too, the mean of the responses of the students of the School of Paramedical Sciences to the questionnaire items was significantly higher compared to the mean of the responses of students to the questionnaire items in Medical School ($P=0.01$).

The mean of affective design was significantly higher for the School of Pharmacy compared to those of Medical School ($P<0.001$), School of Health ($P=0.006$), Nursing School ($P=0.007$), and School of Health Care Management and Information ($P<0.001$). In terms of physical design, the mean of the School of Paramedical Sciences was significantly higher than those of Medical School ($P=0.005$) and School of Health ($P=0.04$). In terms of the “flexibility” factor, the mean of the responses of the students of School of Paramedical Sciences to the questionnaire items was significantly higher than those of medical students ($P=0.003$), students of School of Health ($P=0.002$), and students of School of Health Care Management and Information ($P<0.01$). In the case of the “ease of use” factor, the mean of the responses of the students of the School of Paramedical Sciences to the questionnaire items was significantly higher than that of the responses of medical students to the questionnaire items ($P=0.002$).

Degree

The students were divided into three groups concerning their degree: The professional doctorate (medicine, dentistry, and pharmacy), the continuous bachelor’s degree, and the discontinuous bachelor’s degree. The results of the ANOVA showed a significant difference in the mean of the responses to the questionnaire items in terms of degree ($P=0.01$). In addition to the overall mean, the mean of the physical design factor ($P=0.001$), the affective design factor ($P=0.003$), and the e-content organization factor was significant ($P=0.021$). However, no significant difference was identified in other areas. Tukey post hoc investigations revealed a significant difference between the mean of the professional doctorate group and that of the discontinuous bachelor’s group ($P=0.013$). The mean of the responses of the students to the questionnaire items concerning the quality of e-content was higher than that of other groups. This can be attributed to the age of this group. The findings indicate that the bachelor’s group who were more similar in their age to the discontinuous bachelor’s group had the same perceptions toward the quality of the e-content factor. The results of the ANOVA showed that the mean difference was not significant for the type of lesson.

Also, the correlation between the responses of the participants to the questionnaire items in different parts was investigated by Pearson correlation (Table 7). The findings show that there is a positive correlation between e-content organization and multimedia principles ($r=0.859$), e-content organization and physical design ($r=0.843$), e-content organization and affective design ($r=0.813$), and multimedia principles and physical design ($r=0.808$).

Pearson correlation was used to check the correlation between the participants’ responses in different parts, indicating a positive correlation between e-content organization and multimedia principles ($r=0.859$), e-content organization and

Table 7 Correlation between the components of e-content quality

Components	Physical design	Affective design	Cognitive design		Flexibility	Ease of Use
			E-content organization	Multi-media principles		
Physical design	1					
Affective design	.813**	1				
Cognitive design						
•E-content organization	.843**	.832**	1			
•Multimedia principles	.808**	.751**	.859**	1		
Flexibility	.652**	.757**	.729**	.726**	1	
Ease of use	.623**	.627**	.647**	.683**	.678**	1

**Correlation is significant at the 0.01 level (2-tailed)

physical design ($r=0.843$), e-content organization and Affective design ($r=0.813$), and multimedia principles and physical design ($r=0.808$). In other words, it seems that the subcomponents of the cognitive design, i.e., e-content organization and multimedia principles have the highest correlation with physical and affective designs.

Qualitative data

At the end of the questionnaire, an open-ended question was presented to give students a chance to provide their opinion freely. In the free comment section, students expressed their views in the form of short sentences. In the final content analysis, the results of the qualitative analysis generated two themes: the benefits of multimedia education and its challenges. Some of these comments are as follows:

Some advantages of teaching through multimedia content

Medical student in the fourth semester

Anyway, we need to consider the fact that we would have lost the whole semester if there were no e-learning. I think this method has been able to compensate for the absence of professors to some extent.

BSc student of nutrition

My problem with e-learning is that we have occasional power-cut or Internet issues. Sometimes I am kicked out of the class due to weak Internet coverage. However, the e-content gives me a sense of certainty about having access to the content provided by the professors. I think e-content is reas-

sure. Even when corona is over, e-content can be effective for practice and revision.

BSc student of environmental health

The good point is that I can stay at home and revise my lessons several times free of stress. Previously, in in-person classes, I used to spend most of my time in the class taking notes and couldn't concentrate on the lesson much.

BSc student of anesthesiology

English courses were difficult for me and, at times, I didn't understand the pronunciations. However, with e-content, I can see them and listen to them simultaneously, so I better understand the words, their pronunciations, and the grammar.

BSc student of nursing (Mentioned by many working students)

I could hardly attend many of my classes because I am a working student, but e-content has helped me to revise the lesson at night after work when I have more free time.

Dental student

The synchronicity of sound and image was a very good experience. Seeing the slides and hearing the professor's voice gives me the feeling of close contact with the class, especially when the professor speaks in a good lively voice.

Some challenges mentioned by the students

Students of different majors

Downloading some content with high volume was difficult. Contents with smaller sizes would be much easier to download. This is especially true about e-contents in video format.

BSc student of physiotherapy

I think e-content is even better than face-to-face education in teaching grammar, sentence structure, and vocabulary. However, regarding the conversation, I could learn better in in-person classes. Weak internet coverage also disrupted the class at times.

BSc student in nursing

e-content was great for learning grammar, and practicing and revising the lessons, but I learned conversation and comprehension lessons better in face-to-face classes because I could feel the presence of the professor and I could ask my questions easily.

Medical student

In some electronic content, the professor does not have an energetic voice and it seems more like reading over something. I think, other than the scientific side of the e-content, the professors' tone and energy in teaching are of great importance.

Pharmacy student

In my view, interaction and contact with the professor were much more in face-to-face classes, but Covid's situation left us with no other choice than e-learning. Still, if I had an option, I would prefer my professor to teach English face to face but I would use e-content for practice and revision.

Discussion

This study highlighted that despite the limitations of developing e-content during the COVID-19 pandemic, students were satisfied overall with the quality of e-content. This shows the competency of the instructors and their expertise for content development, particularly during a crisis time such as the current pandemic. The only dimension with a cut-off point less than 4 is related to “affective design.” This can be explained by the lack of access to interactive instructional tools to make the content more engaging. Overall, this study emphasizes the role of affective besides cognition in the learning process (Shen et al., 2009). To enhance the affective aspect of e-learning, it is vital to focus on the motivation aspect of the learning, i.e., “the need to do something out of curiosity and enjoyment” (Hung et al., 2010, p. 1082) to provide a dynamic, interactive, relevant, and student-centered online learning. This finding highlights the principles of andragogy for educators in higher education (Kebritchi, et al., 2017) to enhance e-content that are interactive and engaging through collaborative and reflective activities combined with clear assessment criteria, all of which are necessary (Niess & Gillow-Wiles, 2013).

There was a significant difference across gender regarding e-content development; in fact, females were more satisfied with teacher-made e-content. Adult female students may perform better than males concerning not only arranging and planning their learning but also their online communication, due to their level of e motivation

in distance mode (McSporrán & Young, 2001). Price (2006) assumes that the reason can be because females have a stronger desire to be academically engaged, particularly in higher education online courses. Hence, affective factors such as acceptance and anxiety, according to Ramírez-Correa et al. (2015), highly influence learning situations. Our finding is also consistent with another study conducted by Lowes et al. (2016) but contradicts previous studies (such as Yawson & Yamoah, 2020; Aljaraidh & Al Bataineh, 2019) which indicate that females encountered greater barriers in e-learning.

The results showed a significant difference regarding the satisfaction of the e-content and age range (satisfaction increased by age). The satisfaction applied to the physical design, affective design, cognitive design, and flexibility factor, but not the ease of use factor. This piece of finding is not in line with that of Fleming et al. (2017) and Dabaj (2009). In the former, the age variable did not prove to have a significant influence on either future use intention or satisfaction with e-learning. Although there can be an assumption that the younger generation may have more digital literacy/competency with e-learning, the more adult students may be more experienced in adjusting to the change/new norm. In addition, due to their age, and multitasking situations, more adult students may find e-learning more flexible and more suitable for their life, while younger students may miss the socialization aspect of face-to-face classrooms. Furthermore, there was a significant difference between satisfaction with the e-content quality and students' degree (professional doctorate group and the discontinuous bachelor's group were more satisfied with teacher-made e-content). This further supports our previous result that adult students may have more access to more resources and support (possibly due to their workplace or financial situation). According to McSporrán and Young (2001), female students' motivation to learn in the distance mode is attributable to their maturity and, as a result, to their being able to better plan their learning. This finding is aligned with our result.

Our result also indicated that students with access to PC and laptop are more satisfied with the quality of teacher-made e-content than those with access to mobile phones; Physical design, Affective design, and Flexibility of e-content had a major role in this satisfaction. This indicates the importance of access to infrastructure and variations in the devices that can be used. Only accessing mobile phones can be problematic due to the small screen. Since mobile phones are also used for education purposes, content developers including instructors must take this into account and need to receive specific training on the issue (Sung et al., 2015) as lack of teachers' preparation might lead to the improper use of mobile phones for learning purposes by their students (Frohberg et al., 2009).

There was a significant result also based on the discipline (higher satisfaction among students of the School of Paramedical Sciences). The reason can be the readiness of this school and related disciplines in regards to ongoing teacher in-service training/workshops regarding e-content development, multimedia/online learning. Professional development (in-service teachers) and teacher education (pre-service teachers) play a key role in the digital competency of the educators and their perception regarding the implementation of digital technologies in their courses (Valverde-Berrocoso et al. 2020). Teachers' exposure to e-content development and Mayer's

Multimedia principles had a crucial role in their knowledge and readiness as well as in their professional competencies toward the implementation of various techniques in terms of the physical and cognitive design of the e-contents. Although it is believed that disconnection of content, pedagogy, and technology knowledge (learning theories and models irrespective of teachers' subject-specific pedagogical approaches) does not guarantee effective integration of technology in teaching (Han, et al., 2013; Koehler & Mishra, 2008, 2009), the School of Paramedical Sciences instructors' prior e-learning experiences might have favored them from their counterparts in other schools. The high correlation we found between the Cognitive design as well as the physical design of teacher-made e-contents and the satisfaction level of our students further supports our findings. The reason for high scores at the faculty of Paramedical Sciences in comparison with other Faculties is due to the strong internal policies and practices at the Faculty, as they have been proactive in regards to the implementation of technologies in learning designs and deliveries even before the pandemic. Hence, this readiness/strength positioned them in a great situation to address the crisis, as they have already had the foundations for online teaching. This highlights the importance of situational analysis for organizations on an ongoing basis to make sure how they can use their strengths and opportunities to tackle the weaknesses and threats, particularly during crises (Bastani, et al., 2020; Kalhor, et al., 2014).

The findings of the qualitative section also confirm that students prefer short and segmented lessons. New trends in the preparation of electronic content also recommend micro-learning approaches, which, based on Mayer's Multimedia principle, lead to better quality learning (Mayer, 2005). Another point is the principle of sound and image in presenting the electronic content. Students' qualitative comments on the quality of multimedia also showed that teacher's tone had an effect on the attractiveness of the content, and if the teacher's tone was very formal, the lesson would not have been so interesting. However, the common point in students' comments was that the nature of repetition and practice of electronic content had a greater effect on deepening their learning, and the nature of its lack of time and space allowed them to better adapt their learning to their circumstances and environment.

Overall, this paper highlighted some key factors which add to the existing knowledge around the evolution of education (particularly online education), considering the pandemic. First, this paper focused on exploring the effectiveness of offering online courses (designed by educators) during the outbreak of COVID-19, particularly popular courses such as the English language across health-related disciplines/faculties. It indicated the successful process and outcome, despite all the challenges throughout the way for different partners including educators, educational system developers, and students. The key focus on English courses (in a developing country such as Iran) is of important attention. The competency in the English language provides a great opportunity for health-related students to be able to follow international sources, as well as communicate with international audiences for exchanging experiences, and generation of ideas. Hence, exploring the key factors that impacted students' perception about the new delivery and their adjustment is paramount to provide a roadmap in future direction of the online English courses, and beyond.

Second, this study showed that online courses offer similar quality as face-to-face courses and can be used even after COVID-19 to enhance the flexibility of learning, engagement, and depth of education. The sudden switch from face-to-face to online learning due to the pandemic requires this sort of research, to show how effective the process has been in a short period, and with the main focus on educators, as the primary drivers of changes. As the current paper showed considering all the pressure universities were facing, which could impact the quality of learning designs, and delivery, the results have been satisfactory. This indicates that there can be great potential and opportunities for leveraging technology in regards to the development of more advanced e-learning courses (considering this practice as a trial). This paper also highlights that we should think about an evolutionary approach to education beyond COVID-19, to provide innovative, flexible, and personalized approaches to learning designs, platforms, and deliveries to adjust based on different situations, for achieving an optimum outcome.

Third, a researcher-made questionnaire has been developed and validated for the first time in the current study. A checklist of e-content quality can be useful in evaluating the quality of e-content in others' studies. This implies the contribution in instrument development for practical use, if not a methodological contribution. We recommend considering the self-developed questionnaire (with possible expansion and adjustment) to be used in future studies and be assessed in terms of reliability and validity, its importance, and the benefit at an international level.

Conclusion

The results showed that despite the limitations of e-content development by the faculty members, students had a satisfactory perception overall. Among the dimensions of e-content quality, physical design, cognitive design, ease of use, and flexibility had a score higher than the cut-off point but the score of affective design was less. Also, the differences were significant concerning age, gender, degree, type of digital device, and the faculties. It seems that in the situation of pandemic and lack of access to students, faculty members in terms of structural and cognitive dimensions have been able to develop the satisfactory e-content in a short and intensive time, but it is necessary to be motivating, interactive, and up-to-date to get more attention.

Overall, this study recommends two key interconnected suggestions. First, it is suggested to implement training workshops for educators concerning the ways that e-content can be developed via a more holistic and personalized approach, considering the flexibility, interactivity, engagement, and effective designs. In addition, to implement a successful personalized approach to e-learning, it is paramount that content and platform be adjustable based on learners' characteristics (e.g., age, gender, residence, digital literacy, digital devices used, e-learning experience, and degree of study). Hence, we need to stay away from the approach "one size fits all" to provide a more practical and sustainable approach to online education.

Limitation of the study

In terms of generalization of the study, as the study was conducted among 610 undergraduate students, it can provide a relatively strong indication around issues students had during COVID-19. This will provide a direction around online education overall beyond the English courses and beyond pandemic. However, as this study focused on one tertiary institution, it may not be generalized to a bigger population, and/or different education levels, which may require further studies. The validity and reliability of the questionnaire and/or the generalizability of the results would further improve in future studies in different countries. Also, the viewpoints of other partners involved in e-learning programs and implementation could add more to the understanding of the students' views regarding teacher-made e-content.

Suggestions for future research

This study was conducted to evaluate the e-content quality of English language courses, but due to the diversity of course content, a comparative study in different disciplines and courses is necessary. Also, the difference in the quality of the contents according to the software used can be investigated.

Acknowledgements This research has been reviewed and approved by the Research Vice Chancellor of Shiraz University of Medical Science. We thank all the teachers who participated in the preparation of the e-Contents of the English language course and the all students who completed the questionnaires.

Author contributions LKH devised the study concept and involved in study planning, developed the questionnaire, and created the first and final draft of the study. ZK devised the study concept and involved in study planning, developed the questionnaire, ran the reliability and validity tests, and analyzed and interpreted the statistical data. AYF and NS helped editing the final version of the manuscript and contributed to study design and oversaw it. EN collected the data and AYF helped editing the final version of the manuscript. All authors read and approved the final manuscript.

Funding Not applicable.

Data availability The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest The authors declare that they have no competing interests.

Consent for publication Not applicable.

Ethical approval Written ethical approval was taken from the Shiraz University of Medical Sciences's local ethics committee (approval number (Ref. No. R.SUMS.REC.1399.623).

Informed consent Written informed consent obtained from all the participants.

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Laleh Khojasteh She is an Assistant Professor of Teaching English as a Foreign Language, Department of English Language, School of Paramedical Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

Zahra Karimian Ph.D in Higher Education Administration and MSc in Medical Education. She is currently assistant professor in the Department of e-Learning in Medical Sciences, Virtual School and Center of Excellence in e-Learning, Shiraz University of Medical Sciences, Shiraz, Iran

Amir Yousef Farahmandi He is an Assistant Professor of Teaching English as a Foreign Language, Department of English Language, School of Paramedical Sciences Shiraz University of Medical Sciences, Shiraz, Iran

Elham Nasiri She is an Assistant Professor of Teaching English as a Foreign Language, Department of English Language, School of Paramedical Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

Nasim Salehi She is a Senior Lecturer & course coordinator of Master of Healthcare Leadership (MHL), Faculty of Health, Southern Cross University, Gold Coast, QLD, Australia