International Journal of Technology Enhanced Learning

ISSN online: 1753-5263 - ISSN print: 1753-5255
https://www.inderscience.com/ijtel

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DOI: 10.1504/IJTEL.2022.10044649

Article History:

Received:	16 August 2021
Accepted:	14 October 2021
Published online:	22 December 2022

Analysis of e-content of Khuzestan Province teachers during the COVID-19 period based on Mayer's principles

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Abstract: The current study investigates the e-content prepared by teachers during the COVID-19 period in terms of observing the principles of e-content design. Meyer's theory with 12 principles has been used for design principles. To this end, a checklist with 12 components with face validity and reliability of 0.78 from Cronbach's alpha test, and 275 educational videos produced by teachers in Khuzestan province based on available sampling method and based on 12 components of Mayer theory were reviewed by three educational technologist. The results revealed that the contents prepared in only three components 'spatial contiguity', 'segmentation' and 'multimedia' at the level of 1% were significantly above average and the rest of the components were all significantly below average that include 8 components. The 'pre-training' component was not significantly different from the mean. Generally, the results indicated that the e-content design principles were not significantly observed in the prepared e-content at the level of 1%.

Keywords: content analysis; e-learning; content design; Mayer's principles; Khuzestan.

Reference to this paper should be made as follows: Hamdani, M. (2023) 'Analysis of e-content of Khuzestan Province teachers during the COVID-19 period based on Mayer's principles', *Int. J. Technology Enhanced Learning*, Vol. 15, No. 1, pp.95–103.

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1 Introduction

Though the sudden outbreak of COVID-19 posed many challenges to the world's healthcare systems, it also affected other areas, including education. With the beginning of the COVID-19 epidemic around the world, health protocols have highlighted social distance. In this regard, in many countries, including Iran, to reduce the prevalence of coronavirus, face-to-face training in schools and universities was closed. Numerous solutions were provided so that the education of students would not be interrupted during the period of social distance and the curricula would continue based on the pre-determined schedule. In the field of education, education was provided through television and with the cooperation of the education network, and its chief aim was to observe educational justice. While successful experiences were attained in this field, but due to the diversity of degrees and fields of study, it was not possible to offer virtually all courses in the form of educational television. On the other hand, one of the most significant disadvantages of this type of educational activity was the one-sidedness and lack of interaction between teacher and student. Then an application was designed in the context of a social network called students' social network (Shaad), and educational activities was provided in this context. Although this network had its limitations and problems, gradually its problems were solved and it was able to attract the teachers' and students' relative satisfaction, although it is still far from the ideals of e-learning (Ghafouri Fard, 2020).

E-learning is one of the modern world phenomena that has appeared in the information age and the knowledge-based society and has a rapid expansion in its short history. For this purpose, some countries of the world, while providing the necessary facilities to students and teachers, also educate them and prepare them for life in the e-world (Rafiei Charmahini and Qomi Kahrizi, 2019).

E-learning is a distinctive type of distance learning in which, education or retraining, using web-based technologies and transfer platforms, such as the Internet or intranet, and tools such as multimedia, animation, and simulators in a virtual interactive environment, are provided (Rabiee and Faryadi, 2016). E-learning is an artistic education system and a comprehensive solution, which provides access to new educational methods for institutions that want to move in the direction of modern technology and change their teaching methods and environments. In e-learning, the content presentation changes based on the learners' needs and, context is created for the learner to engage in the desired activities with ease and away from anxiety and maintain independence and self-confidence. E-learning offers a single educational system for several learners that leads to the creation of different educational opportunities (Borun, 2018).

On the other hand, El Mhouti et al. (2017) believe that with the introduction of Web 2 (a new advantage of the Internet that allows two-way communication for users and authors of Internet content), the spread of e-learning and information sharing on the Web is increasing and has become easier. This interactive method is one of the necessities of today's world and is undisputable.

To produce e-content, various principles must be considered, including psychological, aesthetics principles, etc. (Mayer et al., 2020). Among the authoritative theories that have been accepted in this field by educational content designers and producers, we can mention Mayer's 12 principles. Mayer (2009, 2014) and Clark and Mayer (2016) have proposed the following principles for designing multimedia and e-content:

1 *Coherence principle*: People learn better when they remove extra words, images, and voices (Mayer, 2021; Castro Alonso et al., 2021; Mayer and Fiorella, 2014).

2 *Signalling principle*: People learn better when cues are added that highlight the organisation of the essential material (Kutbay and Akpinar, 2020; Derlina et al., 2018).

3 *Redundancy principle*: People learn better from graphics and narration than from graphics, narration, and on-screen text (Kutbay and Akpinar, 2020; Ramsin and Mayal, 2019).

4 *Spatial contiguity principle*: People learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen (Park et al., 2015).

5 *Temporal contiguity principle*: People learn better when corresponding words and pictures are presented simultaneously rather than successively (AltMayer et al., 2020; Mayer, 2014).

6 *Segmenting principle*: People learn better from a multimedia lesson presented in user-paced segments rather than as a continuous unit (Chen and Yang, 2020; Mayer et al., 2018).

7 *Pre-training principle*: People learn better from a multimedia lesson when they know the names and characteristics of the main concepts (Mayer, 2021).

8 *Modality principle*: People learn better from graphics and narrations than from animation and on-screen text (Dawson et al., 2021).

9 *Multimedia principle*: People learn better from words and pictures than from words alone (Ayub et al., 2018).

10 *Personalisation principle*: People learn better from multimedia lessons when words are in conversational style rather than formal style (Wang and Crooks, 2015; Schrader et al., 2018).

11 *Voice principle*: People learn better when the narration in multimedia lessons is spoken in a friendly human voice rather than a machine voice (Kühl et al., 2014).

12 *Image principle*: People do not necessarily learn better from a multimedia lesson when the speaker's image is added to the screen (Brame, 2016; Mayer, 2021).

These principles are valid and have been used in many similar information and research sources and have been the subject of much discussion. An example is the research done by Soicher and Becker-Blease (2020) on the principle of segmenting, which confirmed the success of this method in previous research, but has not been able to achieve those successes again in the field of health. On the other hand, many studies, such as Castro-Alonso et al. (2021), and AltMayer et al. (2020) have confirmed the effectiveness of using multimedia in improving learning. In addition, researchers such as Derlina et al. (2018) point out that not applying or implementing content design principles does not only improve learning but may also impair the quality of learning.

This study aims to analyse the electronic content (e-content) prepared by teachers in the COVID-19 period in terms of observing the principles of e-content design based on the principles proposed by Mayer. For this purpose, the quality of e-content produced by

teachers in Khuzestan province is judged separately based on the 12 principles of coherence, signalling, redundancy, spatial contiguity, temporal contiguity, segmenting, pre-training, modality, multimedia, personalisation, voice, and the image and at the end, it is estimated cumulatively.

2 Research questions

1 What is the quality of e-content produced by teachers in Khuzestan province based on the following Mayer's principles?

- Coherence
- Signalling
- Redundancy
- Spatial contiguity
- Temporary contiguity
- Segmenting
- Pre-training
- Modality
- Multimedia
- Personalisation
- Sound
- Image

2 What is the general status of the quality of E-content produced by teachers in Khuzestan province based on the 12 principles?

3 Method

This research is applied from the point of view of purpose, in terms of approach is quantitative and based on the method is descriptive. The process of conducting research is a non-linear process that studies the phenomenon with a deep and comprehensive view. For this purpose, the content analysis method is used based on the evaluation checklist. To this end, the evaluation checklist is prepared and the sample of works produced by the evaluation team is judged quantitatively. Then, the results obtained by applying the opinions of the assessment team and presenting their interpretations of the obtained works are summarised. Validity of this research was based on face and content validity method and under the supervision of educational technology experts. Besides, Cronbach's alpha method was used to evaluate the reliability of the research tool which reached a reliable level by 0.78.

4 Population and research sample

The population of this study includes all e-contents prepared by teachers in Khuzestan province, from which a sufficient sample was obtained by a convenient sampling method, which has led to theoretical saturation. Based on the expectations of the General Directorate of Education of Khuzestan, only the selection of educational videos was considered from the prepared content, because other types of educational content such as photos, audio, etc. could not be evaluated based on Mayer's 12 principles. For this purpose, 275 educational videos were reviewed, which are distributed according to the educational levels according to Table 1.

Table 1 Statistical sample of research in three educational levels

Grade	*Number of educational videos*
Elementary	143
First-year high school	78
Second-year high school	54

5 Research tools

To analyse the contents from the point of view of content designing standards, an evaluation checklist based on Mayer's 12 principles was used. These principles were approved by experts based on Mayer's theory and were used, which included 12 cases. To evaluate the checklist, a 5-point Likert scale was used, which includes very weak to very strong options. The validity of this tool was also of the type of face and content validity. To confirm the validity of this checklist, the 3educational technology experts' opinion was obtained concerning the research topic and the final corrections were applied in the checklist. The final version of the revisions was re-examined and approved by experts and then used for research. Cronbach's alpha method was used to evaluate the reliability of the research tool. For this purpose, 30 initial checklists were examined, which reached a reliability of 0.78. Due to the higher reliability of the tool than 0.7, this checklist can be trusted for evaluations in terms of reliability.

6 Results

In terms of raw data at the level of inferential statistics, it was found that the content produced in two multimedia principles with a raw score of 4.12 and spatial contiguity with a raw score of 4.1 has the highest value and three principles of personalisation with a score of 1.82, redundancy with a score of 1.61 and voice with a score of 1.68 had the lowest value. On the other hand, for inferential analysis of the data, the first two-way Kolmogorov-Smirnov test was used to determine the homogeneity of experimental information with selected statistical distributions, which was performed on the average of the data obtained from the questionnaire related to each of the research factors. Based on the obtained results, the hypothesis of normality of the mean distribution of factors was confirmed (as a null hypothesis) as opposed to the mismatch of the distribution of these

means with the normal distribution (as the opposite hypothesis). After determining the normality of the data, and based on the results of the univariate t-test, Table 2 was obtained.

Table 2 Univariate t-test results for the 12 principles individually and as a whole

Row	*Content quality based on the principle*	*Statistical indicators*				
		Mean	*Count*	*Test Value = 3*		
				Univariate t	*df*	*Sig. level*
1	Coherence	2.88	275	–2.29	274	0.001
2	Signalling	2.84	275	–3.379	274	0.001
3	Redundancy	1.61	275	–27.086	274	0.001
4	Spatial contiguity	4.1	275	20.91	274	0.001
5	Temporal contiguity	2.79	275	–4.89	274	0.001
6	Segmenting	3.29	275	6.22	274	0.001
7	Pre-training	2.97	275	–0.636	274	0.001
8	Modality	2.65	275	–8.233	274	0.001
9	Multimedia	4.12	275	22.724	274	0.001
10	Personalisation	1.82	275	–19.115	274	0.001
11	Voice	1.68	275	–24.391	274	0.001
12	Image	2.04	275	–20.061	274	0.001
13	Total 12 principles	2.73	275	–17.078	274	0.001

According to the data in Table 2, it was found that the e-content produced by teachers in Khuzestan province during the COVID-19 period was significantly lower than the average expected regarding some content design principles. These principles are coherence, signalling, redundancy, temporal contiguity, quality, personalisation, voice, and image. In fact, in these 8 principles, teachers have not been able to achieve a satisfactory level of content production. On the other hand, teachers have worked significantly higher than expected on some design principles, including the three principles of spatial contiguity, segmentation, and multimedia. In the field of pre-training principles, the content produced by teachers has been at an average and expected level. But as shown in the table above, generally, the average of the dual principles of content design was lower than the average and ultimately was significantly unfavourable.

7 Discussion

Explaining the results obtained from the analysis of e-learning content produced by teachers in Khuzestan province, it can be said that teachers do not have enough knowledge about the principles of e-content design and the content produced according to Mayer's theory has no qualitative value. The components of 'segmentation', 'spatial contiguity' and 'multimedia' have also been positively meaningful due to teachers' previous experiences because the content organisation and longitudinal relevance of content are among the basic principles in determining educational content. On the other hand, the combination of audio, video, and text as a multimedia principle originates from

the previous experiences of teachers because it is far from other components that need sufficient and professional attention to this issue.

On the other hand, teachers' weakness in emphasising important content based on the principle of 'signalling', the way of using voice, image, synchronising content with narration and images, and other components shows the operational weakness of teachers and the content produced. It seems, there may be technological limitations for teachers who are unable to produce better quality products. Paying attention to this point can also pave the way for the province's planners in this regard.

It seems that the key problem in educational content is the lack of knowledge of teachers about designing quality educational content. To this end, it is vital that e-content design training courses be prepared for teachers and that their practical results be reviewed.

Based on the conditions obtained from the results of the research, it is appropriate that the General Department of Education of Khuzestan Province, prepare a database to store quality content for teachers. This database should be categorised based on different variables such as e-content implementation platforms (Windows, Android, etc.), tools used (mobile, computer, etc.), audience characteristics, etc. so that teachers choose relevant educational content according to their time, place and facilities.

Regarding the importance of producing quality content, it is necessary that the content provided by teachers, as well as their teaching, be reviewed and evaluated. In this way, it is conceivable to create external motivation to improve the content produced and more appropriate educational content is provided by teachers. The criteria for evaluating educational content should be communicated to teachers in advance and the methods for reviewing and resolving problems should be clear.

It is also possible that teachers did not have access to appropriate technological tools or software. For this reason, it is recommended that facilities be provided for teachers in this regard so that teachers are equipped with suitable technological tools and applications and produce proper content. In addition, a comparative comparison study of electronic content in different countries during the COVID-19 can be considered

8 Conclusion

The importance of content production in the e-learning environment has become an issue for all managers and educational planners today. As stated earlier, having quality content helps to improve and enhance learners' learning and to refer to e-content when the learner needs information resources. Though the use of e-content has become an integral part of formal education today, with the outbreak of coronary heart disease from 2019 until now, the production of E-content and the use of this space has become extremely necessary.

In this study, the quality of E-content design for teachers in Khuzestan province was studied based on Mayer's 12 design principles. The results indicated that the content produced by teachers was not of acceptable quality and was not prepared based on scientific principles. By reflecting more on the results and reviewing the conditions of content production in schools, teachers' lack of knowledge of techniques and principles of content design is a major problem in the educational system.

For other research, it is suggested to pay attention to the principles of content design based on gender and cultural characteristics. It is also suggested that the content design

that have been done by teachers be examined by different theories and compared with Mayer's theory. In addition, e-content which designed during the COVID-19 period can be considered in different countries for a comparative study.

Acknowledgement

This article is extracted from a research project sponsored by Farhangian University with a contract number 51300/1795/100 on 15 January 2022.

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