



ENHANCING THE E-CONTENT SKILLS OF INSTRUCTORS THROUGH THE USE OF CLOUD-BASED MOBILE LEARNING ENVIRONMENT: A CASE OF A SAUDI ARABIAN UNIVERSITY

Ahmed Majoon Alenezi

The research aims to design a mobile learning environment based on cloud computing applications to enhance the designing and publishing e-content skills of the faculty members of Northern Borders University, Saudi Arabia. The researcher used the semi-experimental approach to measure the impact of the mobile learning environment on the cognitive and performance aspects of the faculties. Two research tools were used in the study: an electronic achievement test to measure the cognitive aspect and an observation sheet to measure the performance aspects of designing and publishing e-content skills of faculty members (N=53). A training programme on mobile learning environment based on cloud computing was conducted to enhance the faculty members' e-content designing skills. There was a statistically significant difference between the average scores of the members in their pre-and post-study assessment of the cognitive and performance aspects of designing and publishing e-content skills. Following the training programme, the faculty's achievement scores increased to 84% from 42% in the pre-test; their performance to apply the learned skills in various activities improved to 91% from 43%. Based on the results of the study, it can be recommended that the mobile learning environment based on cloud computing applications is quite helpful in developing the skills of using technology by the faculty members.

KEYWORDS: Mobile Learning Environment, Cloud Computing, Educational Technology, E-Content

INTRODUCTION

Well-designed e-content improves the efficiency of education and training (Aziz & A, 2008). El-Desouki (2006) indicates that e-content changes the

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training environment in all its aspects, as it depends on modern technologies in terms of the content as well as the form. It has proved to be efficient, cost-effective, and flexible. In addition to these, it has great capabilities of enhancing the trainees' learning experience and improving their educational level effectively by providing a productive environment not only for trainees, but also for trainers as it gives them the freedom to decide their comfortable time and place (Faraj, 2005; Umair, Muneer, Zahoor, & Malik, 2016). Al-Hadi (2005) pointed out that diverse electronic content across the internet included images, texts, sound, animation, and others (Al-Hadi & Al-Tabakh, 2005).

Al-Sharqawi (2013) indicated that there was a growing interest in training institutions, especially those involved in higher educational institutions, in the quality of the educational and training process. Rapid development in the field and the emergence of new concepts, such as distance education, e-learning, and distance training, have caused a qualitative shift in the mission of training institutions. Therefore, it is very important to focus on providing faculty members with the skills that enable them to face the challenges of this age; the skill of designing, publishing, and employing electronic content in the educational process is the most important one. Accordingly, it is necessary to link training with the current technological developments. The use of educational technology in training ensures the progress of trainees by effectively transferring and communicating the content of training courses (Al-Aasiani, 2013). Therefore, the importance of employing mobile learning technology enables access to information as well as distance interactivity very quickly and thus saves time and effort as well as learning time (Khamis, 2011). Attewell (2005) also pointed out that mobile learning has a positive impact because learners can study anywhere with immediate feedback, which prepares them for automatic learning.

Cloud computing (CC, hereafter) applications are considered one of the most important technological innovations in mobile learning environments because they provide a variety of endless capabilities and applications that suit learners' needs and help them acquire knowledge and skills as desired in their academic curriculum (Asadi, Abdekhoda, & Nadrian, 2019; Umair et al., 2016). Al-Maniri (2011) confirmed that cloud computing appeared as one of the ways in which computer resources are provided as services; users can use them via the internet (the cloud), without the need to possess knowledge, experience, or even control over the infrastructure that supports these services. Thus, it becomes necessary to determine the effectiveness of a mobile learning environment based on cloud computing applications to develop designing and publishing e-content skills of faculty members. Therefore, this study assessed the effectiveness of a training programme that aimed to enhance teachers' desired skills in e-learning.

REVIEW OF LITERATURE

The study of Pilgrim (2006) aimed to know the role of the WebCT system in supporting the faculties of Ontario university and to teach them the skills of electronic content design. The study emphasized the importance of training in electronic content design. This is consistent with what was confirmed by many studies (Abdel & Abdel, 2012; Abdel-Aty, 2006; Amin, 2012; Kassab, 2009; Khalil, 2008) upon the need of faculty members to train on technological innovations skills, designing and publishing interactive e-learning programmes and educational pages.

Al-Harthi (2008) confirmed the effectiveness of using Short Message Service (SMS) on mobile phones in the learning process, as these messages helped the study sample fulfil the requirements of the course, its related themes, and review of its effectiveness. This was consistent with the findings of the various other studies (Andrews, 2012; Cook, 2010; El-Sherbiny & Hassan, 2012). It is evident from studies that mobile learning enhances learners' experience, as it gives them the independence to access learning at their convenience (Aljaser, 2019). Mobile learning programmes aim to enable learners to achieve their desired proficiencies; hence, the programme includes many activities, exercises, and feedback. The study of Iskander and Hamdi (2013) concluded that the use of mobile device technologies can be used to provide textbooks in the form of digital e-books content, to enable members to study them anywhere and anytime, inside or outside the walls of educational institutions. They can thus contribute effectively to advancing their educational experience despite their limitations, such as small screen-size, as well as their limited arithmetic ability.

Khamis (2011) defined it as an e-learning system based on wireless communications and the use of portable digital devices so that it forms a learning style based on the application of learning and delivering electronic content anywhere and at any time. (Yunus & Salehi, 2012) defined it as a form of distance learning using small hand-held wireless devices to achieve flexibility in interaction in the teaching and learning process at any time and place. Mobile learning allows the learner to quickly communicate with the international information network (through wireless application protocol) at anytime and anywhere (Al-Rubaie 2010). The design of the mobile learning environment is not limited to the use of devices and cell phones, rather it must be a dynamic and open system, in which the software and technology are integrated with the means, devices and development tools. Therefore, it can be used and re-used on logical and objective criteria, to increase the flexibility and effectiveness of distance education (Desmond, 2016). Therefore, it facilitates the services in multiple roles for the teachers and the students: safe transfer of data, easy access and management of information, library, cards, and language translation service,

easy delivery of scientific content (Al-Dahshan, 2007).

Furthermore, a study conducted by Elumalai and Veilumuthu (2011), highlighted the importance of using a technique for computing cloud-based e-learning for easy access and sharing of educational electronic content from anywhere, at any time. The necessity of using this technique was to reduce the high infrastructural costs for information technology in universities and also to reduce their maintenance costs. This is consistent with the findings of the importance of using cloud computing technology in electronic education in universities to overcome problems distantly and reduce the cost of building and developing information systems (Erkoç & Kert, 2010). Mrdalj (2011) and Hameetha, Sheeba, and Rani (2013) confirmed that cloud computing is an ideal solution for implementing cost-effective and dynamic learning environments for course instruction. Moreover, cloud computing service based on the Theory of Planned Behaviour (TPB) investigated the cognitive determinants of cloud computing among higher education faculties, and this has been a recent trend in the direction of CC implementation in the educational sector. In developing countries, socio-economic and political issues have limited the investment in expensive cloud computing (CC) to meet the global standards in the education sector (Sabi, Uzoka, Langmia, & Njeh, 2016). The government-owned universities are not facing any challenges from private or international institutions, rather the internal social and political dynamics govern the employees' attitudes toward inducting cloud computing in educational settings (Shahzad et al. 2019). Many studies focus on the technological aspects such as cloud computing in education (Arpaci, 2017; Hussein & Khalid, 2016; Klug, 2014). However, very few have focussed on organizational, environmental aspects of the implementation of CC, except Shahzad's et al. (2019) which included all the three aspects in the context of developing countries. A high-income country such as Saudi Arabia, which is resourceful in terms of investment in expensive information systems, has been striving to develop a system to make the use of technological advancements (Aljaber, 2018).

THEORETICAL FRAMEWORK OF THE STUDY

The current research endeavours to achieve its goals in two main components:

The First Stage: Cloud Computing Applications in Mobile Learning Environments

Along with the rapid innovations in the areas of internet, mobile networks, mobile applications, and cloud computing, Mobile Cloud Computing (MCC) has been introduced as a potential technology for mobile phones (Mitra, Kode,

& Cheruvu, 2015; Pachler, Cook, & Bachmair, 2010). As the infrastructure of mobile networks is constantly improving, their data becomes increasingly available and affordable; hence, it allows all customers to use any Internet-based applications. Cloud computing provides services, programmes, and online processing operations, as well as reduces costs, enhances automated systems, and provides information flexibility and mobility (Kitanov & Davcev, 2012). Mobile cloud computing provides many benefits for cloud computing and mobile network operators, such as increasing production rates, reducing costs, and reducing dependence on devices, hardware and software (Cuervo et al., 2010; Oberheide, Veeraraghavan, Cooke, Flinn, & Jahanian, 2008).

The Second Stage: E-Content Designing and Publishing Skills

The process of designing e-content and submitting it via the internet is the most recent use of the internet for training and using e-learning to make the scientific subject more interactive. Moreover, it can reach us to various e-educational resources offered by different countries around the world and establishes cooperation between the faculty members and educators. In addition, the publishing process provides the faculty members with information on how to use e-content. Several studies have indicated the importance of e-content and the importance of its use in training in general educational stages and in other educational and training courses. Of which the studies of Khalil (2008), Kassab (2009), Ibrahim and Al-Qasabi (2013), and Metwally (2013) have confirmed that the use of e-content improves distance teaching and learning experience, builds knowledge resource through technology, realistic training of needed skills etc. According to Hendradi, Khanapi, and Mahfuzah (2019) and Ciolacu et al. (2018), what makes the process of delivering the content of courses over the internet different, is its ability to provide a training environment that includes texts, video, and audio and also provides easy and relatively flexible interactions between the trainee and the various elements of the training environment. E-content is reliable in providing the training material and supporting content to the traditional content in the book. Moreover, some are published freely on internet, but others require subscription fee to access the services (Haugen, Ask, & Bjørke, 2010; Hendradi et al., 2019; Mhouti, Erradi, & Nasseh, 2018). Hence, the present study explores the effectiveness of a training programme on cloud-computing based mobile application in handling the e-content by the teachers.

OBJECTIVES OF THE STUDY

The present research seeks to achieve the following objectives:

1. To acknowledge the effectiveness of the cloud-based mobile learning environment on developing the knowledge aspects related to designing and publishing e-content skills of faculty members.
2. To assess the effectiveness of the cloud-based mobile learning environment on developing the performance aspects related to designing and publishing e-content skills among faculty members.

RESEARCH QUESTIONS

The present research attempts to achieve the objectives by answering the following questions:

1. Is the mobile learning environment based on cloud computing applications effective in developing designing and publishing e-content skills of the faculty members?
2. Does the mobile learning environment based on cloud computing applications enhance faculty members' performance in designing and publishing e-content?

RESEARCH HYPOTHESES

Research hypotheses are as follow:

1. There is a difference in the pre, and post applications of the achievement test related to the cognitive aspects of e-content designing and publishing skills.
2. There is a difference in the pre, and post applications of the observation sheet related to the performance aspects of the e-content designing and publishing.

RESEARCH METHODOLOGY

The researcher conducted an exploratory study on the faculty members from various specializations of Northern Border University, Saudi Arabia. The researcher used a quasi-experimental approach to measure the effectiveness of the mobile learning environment based on cloud computing applications in developing the designing and publishing e-content skills of faculty members. To suit the nature of this research, the researcher selected the pre and the post-quasi-experimental design group.

SAMPLE FOR THE STUDY

A pilot study (n=15) indicated that 70% of the members had deficiencies in the basic skills for designing and publishing e-content, and that 80% of the members were unable to employ cloud computing applications within mobile learning environments in their teaching process. Faculty members (n = 53) from various specializations of Northern Border University, Saudi Arabia randomly selected for the study. The sample was determined on the basis of their willingness to carry out the tasks assigned to them, their positive attitude towards teamwork and their ability to think abstractly and logically. To ensure the reliability of the educational resources, it was made sure that learning environment worked through any web browser and through any device, be it a personal computer, laptop or iPad, as long as it was connected to the internet.

TOOLS USED IN THE STUDY

The following tools were used in the current research: an achievement test to measure the knowledge of designing and publishing e-content skills (Alpha Reliability = 0.76), and an observation sheet to measure the performance aspects of the e-content designing and publishing skills (Alpha Reliability = 0.73). Both tools were prepared by the researcher.

THE TRAINING PROGRAMME

The training programme addressed the skills related to script writing static images, digital video snapshots, and web page design. For script writing Articulate Storyline 2 was used to write all of the scripts related to introduction, goals, and content elements. For still images, technical and educational specifications of Adobe Photoshop CS6 programme were used, and for digital educational footage of educational modules for e-content design skills were recorded and published along with voiceover using the Camtasia Studio 8 programme (this facilitated reviewing of these skills to the faculty members). For web pages, Microsoft Expression Web 4 was used to design web pages which included features such as learning environment interface, instructions pages, pop ups, welcome screen, gestures and effects of buttons, movement, flipping screens, and feedback.

RESEARCH PROCEDURE

The researcher analysed a number of educational design models that were built to design electronic training environments, in order to determine the most important stages and steps which are required to be followed in designing

the current learning environment. The researcher adopted the Algazar model (Al-Sharkawi, 2013) for its suitability to the nature of the current research, its comprehensiveness and simplicity.

Research tools were applied upon the research sample during the experiment. The website for the achievement test was emailed to the faculty members. Once every faculty member entered the test, a quadruple name was issued to specify his group. Then, he entered the test instructions page and the test phrases. After completion, the answers were recorded directly to the test's achievement spreadsheet. For the observation sheet, TeamViewer10 programme was sent on their email addresses so that they could download on faculty members' devices; it allowed observing and recording their performance remotely and accurately, as each member was allotted with a specific date for his/her submission. The achievement test and the observation sheet were applied upon the sample during the period 15th to 18th March 2020. The research experiment lasted for thirty-five days. Post-measurement tools were applied upon faculty members; these tools included the achievement test to measure the cognitive aspects of the e-content design and publish skills, and an observation sheet to measure the performance aspects thereof.

RESULTS AND DISCUSSION

After completing the experiment procedure for the existing mobile learning environment based on cloud computing applications, test correction and observation sheet scores monitoring, the data was statistically processed using the Statistical Package for the Social Sciences (SPSS 20), to test the hypotheses of research. To test the validity of the hypotheses, the researcher used the t-test on the related samples, to find out the significance of the differences between the mean scores of the research sample in pre and post applications of the training programme (Table 1).

Table 1

t-test to Compare the Pre and Post Mean Averages in the Achievement Test with an Indication of the Effect Size .

Stages	Member	Avg.	SD	df	t	Sig.	Effect Size
Pre	53	13.78	2.24	32	66.93	0.01	Very Significant
Post		29.15	2.18				

It is clear from Table 1 that there is a statistically significant difference between the mean scores of the research sample in the pre and post applications of the achievement test related to designing and publishing e-content

skills. The difference is in favour of the post application of the training programme with an average of 29.15. The calculated value of t (66.93) is greater at the significance level (0.01) and the degree of freedom (32).

The data shows here that the post-application of the achievement test proved the mobile learning environment helpful in general and the use of cloud computing applications in particular. This importance is realised in the ease of sending exercises and projects, and easy access to tests, exercises and submitted projects from members. Moreover, it facilitates the provision of feedback and communication among members, and also between members and the researcher. It allows the participants to use a set of applications without downloading them to their devices and helps them access the files stored from any computer by connecting to the internet; this is consistent with the findings of other studies (Crews, Brown, & Miller, 2009; Liebowitz & Frank, 2010; Shaltout, 2015). To measure the effectiveness of the mobile learning environment based on cloud computing applications, the researcher used the modified gain ratio from McGugian, which is the ratio between the average actual gain of the research sample and the expected average gain. McGugian sets a percentage (0.6) in order to have an acceptable efficacy. Table 2 shows the percentage of this achievement test.

Table 2
Average Scores of the Members in the Achievement Test and the Modified Gain Ratio of McGugian.

Members Figure	Avg Pre-test	Avg Post-test	McGugian Gain Ratio	Sig Level
53	13.78	29.15	0.84	Acceptable

From Table 2, it is clear that the effectiveness of the mobile learning environment based on cloud computing applications is acceptable according to the percentage determined by McGugian. Impact of employing cloud computing applications in the mobile learning environment is observed upon providing educational content to the participants. Figure 1 shows the rise of the members' average scores in the post application compared to their average scores on the pre-application of the achievement test.

To test the validity of the second hypothesis, the researcher used the t -test to find out the significance of the differences among the mean scores of the research sample in the pre and post applications. Table 3 shows the results.

It is clear from Table 3 that there is a statistically significant difference between the mean scores of the research sample in the pre and post applications of the observation sheet. It is evident from the table that there is a

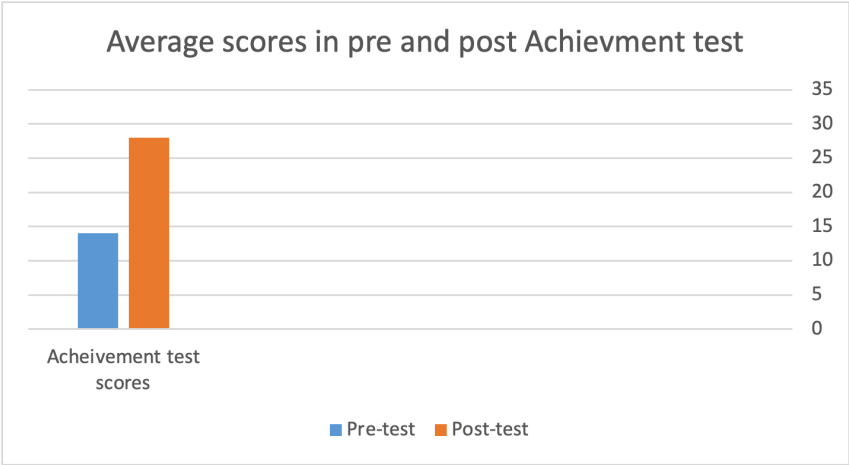


Figure 1. Average scores of the sample in the pre and post applications of the achievement test in e-content design and publish skills .

Table 3
t-test For the Comparison Between the Pre and Post Averages on the Performance Aspect .

App.	Participants	Avg.	SD	df	t	Sig. level	Effect size
Pre	53	126.63	3.18	32	363.02	0.01	Very Significant
Post		254.45	4.36				

sharp increase in the average by 127.82 in the post study results. The value of t (363.02) is thus greater than the t-value (2.74) detected at the significance level (0.01) and the degree of freedom (32).

To measure the effectiveness of the mobile learning environment based on cloud computing applications, the researcher used the modified gain ratio for McGugian. Table 4 shows the percentage of the observation sheet.

It is clear from Table 4 that the effectiveness of the mobile learning environment based on cloud computing applications is acceptable as per the percentage set by McGugian. Accordingly, the research sample accomplished well in the performance aspects in the post application of the training, which was significantly reflected in the observation sheet. This is consistent with the generalizations made in other studies (Koole, Mcquilkin, & Ally, 2010; Traxler,

Table 4
Average Members’ Scores on the Observation Sheet and the Modified Gain Ratio to McGugian.

Members	Avg Pre-test	Avg Post-test	McGugian Gain Ratio	Sig. level
53	126.63	254.45	.94	Acceptable

2009) it illustrates the effectiveness of a mobile learning environment which facilitates easy exchange of files and e-books among the learners, and between the learners and the teachers as well.

Furthermore, it is also possible through mobile devices to broadcast lectures and discussions directly to members and enhance learner-centric learning experience to meet their needs. In addition, it allows the internet to be connected wirelessly through Infrared/Bluetooth and this is done anywhere, which facilitates easy internet access to enhance learners’ motivation and personal commitment to learning. In other words, it allows learners autonomy over their learning process and gives them a sense of responsibility towards their commitments. Moreover, students can receive urgent announcements or administrative decisions, such as cancelling a specific exam date or lecture cancellation or setting reminders of the deadline for projects. The use of mobile devices ensures greater participation of students in mobile learning irrespective of the devices they use in their everyday lives. Figure 2 shows the increase of the faculty members’ scores in the post application as compared to their scores in the pre application of the observation sheet.

Syeda (2014) found that in terms of technical efficacy, learning aptitude, time management skills and preferred mode of instruction, 73% of Saudi learners prefer traditional classroom teaching to individual learning through e-learning. The reasons for such preference could be stipulated in studies like Lian, Yen, and Wang (2014) which outlined complexity of the high system negatively impacted the practitioners’ attitude toward adoption of CC, and compatibility with the existing applications was also a major factor that concerned the faculties of universities in developing countries (Shahzad et al. 2019); improvement in this direction would certainly enhance performance (Pathan et al., 2017). Nonetheless, the COVID pandemic has opened an opportunity for the faculties to gear up to face the challenges and be innovative in effective content design, and they have realized that they must go the extra mile to maintain the quality not only in content, but also in the effective delivery through distance mode (Alanazi & Alshaalan, 2020).

Cloud computing (CC) will cause a massive increase in the degree and

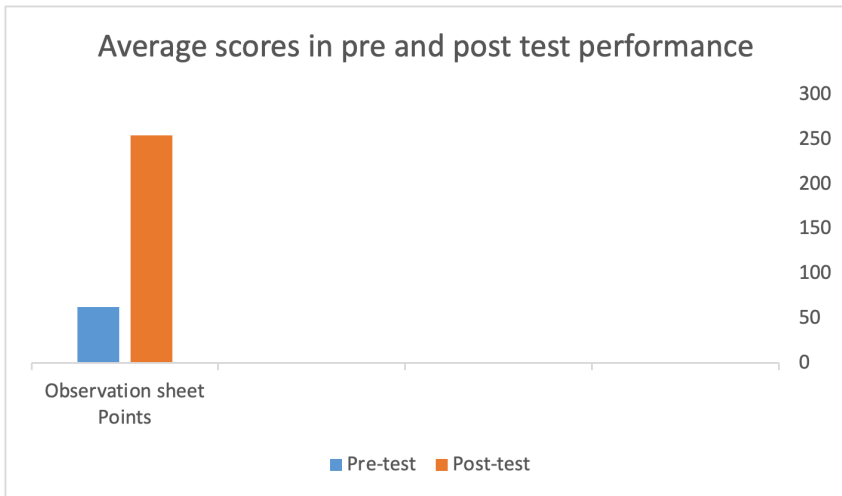


Figure 2. Average scores for the research sample in the pre and post applications of the observation sheet related to designing and publishing e-content skills.

rapidity of digital innovation over the next 5 years (IDC forecast). Most of the studies focus on the influencing factors, theoretical models, benefits and concerns (Qasem, Abdullah, Jusoh, Atan, & Asadi, 2019), but none has taken training as a factor which can have direct implications on the compatibility and teaching efficacy of the practitioners. Efficient practitioners can enhance the learners' learning experience and their attitude toward efficient learning (Ashtari & Eydgahi, 2017; Kayali, Safie, & Mukhtar, 2016). Latest in higher education, Qasem et al. (2019) reviewed the research on taxonomy which provide various perspectives of CC adoption. The research on individual-based factors such as, security; behavioural traits such as anxiety, satisfaction, experience, social influence, trust, attitude; cost effectiveness, technological self-efficacy; and the norms of implementation determine the nature of CC adoption. At the organizational levels, the research studies regarding compatibility, usefulness, ease of use, security, and infrastructure concerning the adoption of CC have been summarised, and it was found that developing nations face challenges related to the adoption of CC, but extensive training of the faculties and the students, who are the prime stakeholders in determining the feasibility as well as the effective implementation of CC have not been counted so far as a crucial factor (Asadi et al., 2019). The present study explored how effective training can make a difference in teachers' preparedness and their skill enhancement in designing e-content which

naturally will have impact on learners' learning; effective e-content might certainly address the individual-based issues as outlined above; (Khedr & Idrees, 2017) it is the nature and modalities of content that enhances distance learning experience (Thaiposri & Wannapiroon, 2015).

CONCLUSIONS AND RECOMMENDATIONS

The research aims to reveal the impact of designing a mobile learning environment based on cloud computing applications on designing and publishing e-content skills of faculty members of Northern Borders University. The research found that there is a statistically significant difference between the average scores of the research sample in their pre and post applications for each of the achievement tests related to the cognitive aspects and the observation sheet related to the performance aspects of designing and publishing e-content skills. The research recommended that the proposed mobile learning environment based on cloud computing applications should be adopted in developing e-content designing skills of the faculty members. This can certainly transform traditional learning environments by employing information technology in accordance with the principles and standards of mobile learning.

Employing cloud computing services and applications in e-learning environments would enhance university learning management systems such as holding seminars, meetings and workshops, and would necessarily remove the concerns of faculty members regarding mobile learning environment and cloud computing, especially with regard to information security. Moreover, e-content is one of the significant components of distance learning, essentially required to meet the learners' needs and to suit their interests. To fully utilise the available features to design and develop a comprehensive and resourceful content, the instructors need specialized training sessions to further enhance their skills in developing and delivery of the content. The present research explored the effectiveness of such training and its positive implications on instructors' professional practices.

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