Effectiveness of MOOCs on learning efficiency of students: a perception study

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Abstract

Purpose – The study is aimed at analyzing the perceptions of students and teachers regarding the effectiveness of massive open online courses (MOOCs) on learning efficiency of students and also evaluating MOOCs as an ideal tool for designing a blended model for education.

Design/methodology/approach – The analysis was carried out by using the data gathered from the students as well as teachers of University of Mysore, Karnataka, India. Two separate sets of questionnaires were developed for both the categories of respondents. Also, the respondents were required to have prior experience in MOOCs. Further, the collected data was analyzed using statistical package for social sciences (SPSS).

Findings – The study showed that MOOCs have a more positive influence on learning efficiency, as opined by both teachers and students. Negative views such as cheating during the assessment, lack of individual attention to students and low teacher-student ratio were also observed.

Practical implications – Many educational institutions view that the MOOCs do not influence learning efficiency and also do not support in achieving their vision. However, this study provides evidence that MOOCs are positively influencing the learning efficiency and also can be employed in a blended model of education so as to promote collaborative learning.

Originality/value – Technology is playing a pivotal role in all fields of life and the education sector is not an exception. It can be rightly said that the technology-based education models such as MOOCs are the need of the hour. This study may help higher education institutions to adopt MOOCs as part of their blended model of education, and, if already adopted, the outcome of the present study will help them to improve the effectiveness of the MOOCs they are offering.

Keywords Education, Online education, Blended model of education, MOOCs, Learning efficiency

Paper type Research paper

1. Introduction

With changing life patterns and rapid advancements in technology, educational institutions and learners are trying to follow newer ways in their teaching and learning process. There are many platforms available that accommodate the teachers and learners to carry out their educational activities online. However, they are distinct from the traditional methods

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followed. Thus, there arises the need of having a blended model for education which must create a collaborative learning environment and enable the stakeholders in building shared understandings. The blended model of education is a method which offers a flexible mode of teaching and learning (Ayoub *et al.*, 2020). One such way is massive open online courses (MOOCs). MOOCs are a new and innovative method of offering a blended model of education with several key features such as online lectures, video sessions, slide shows, discussion forums and a host of several combinations. This new model of education is available for anyone interested in learning without any restrictions (Wong, 2016). According to the Coursera platform, 170 leading universities offer more than 7,000 courses through MOOCs [1].

We live in a globalized and technology-based environment which demands the skilled and competent workforce. The knowledge, skills and competencies acquired by learners through education must suit the current market requirements (Tailor *et al.*, 2020). MOOCs have a greater role in fulfilling this demand. MOOCs enable the learners to access a wide range of courses relating to an even wider array of topics such as career development, supplementary learning, corporate learning and training and so on [2]. One of the major benefits of acquiring education through MOOCs is that it offers collaborative sharing of knowledge by world-class teachers. Further, it enables a teacher to address millions of students and exchange thoughts at the global level by surpassing all the geographical boundaries. These days the students, teachers and other professionals alike are preferring MOOCs for their personal and career development. Further, it consumes relatively less resources and allows the learners to have access to global standard courses (Viswanathan, 2012; Anand Shankar Raja and Kallarakal, 2021). This in turn enhances the learning quality and efficiency of students at large (Bekele, 2010; Stokes *et al.*, 2015; Sun *et al.*, 2016; Ahmed *et al.*, 2021). Now MOOCs have been identified as a tool for improving the traditional education models and also enhancing the learning efficiency of students through technology-driven methods of teaching (Bordoloi *et al.*, 2021). Here, learning efficiency means the patterns of learning which uses minimal resources such as time and efforts while maintaining higher learning outcomes (Ghazali *et al.*, 2020).

There is a debate over whether MOOC-based education system is more effective and influential in improving the learning efficiency of students or not. Therefore, in order to analyze the effectiveness of MOOCs on learning efficiency of students, the present study intends to analyze the perceptions of teachers and students of MOOCs offered by University of Mysore and to know the effectiveness of MOOCs on the learning efficiency of students. The subsequent part of the paper is organized as literature review, research questions, objectives, methodology, discussion and conclusion.

2. Literature survey and research gap

2.1 Technology based education and blended model of education

Morris and Hayes (1997) opined that the purpose of education can be achieved only when there is an existence of a collaborative learning environment. Such an environment enables the learners to build shared understandings. Further, it should be characterized by interaction, group activities, discussion forums and other activities which aids in improving communication and interpersonal skills among both teachers and learners. In addition to this, studies (Petraglia, 1998 and Bekele, 2010) noted that a collaborative learning environment creates a realistic teaching and learning environment and also enhances the learning abilities of students. Inducement of technology in education certainly creates a way for building collaborative learning environments (Glaser, 1990; McAlpine, 2000; Johnson and Johnson, 1992).

Another study (Wieser and Seeler, 2018) noted that the adoption of technology in the education system provides an opportunity to serve the students in an advanced way. The authors also pointed out that there is a need for initiatives to be taken by higher education

institutions to induce various technology-based teaching-learning tools. Further, they also opined that due to the development of online learning models the virtual learning spaces are transforming into social learning spaces.

As noted by several authors (Liang and Chen, 2012; Kim Bonk, 2006; McKiernen and Wilson, 2014; Sursock, 2015), online education is becoming a standard instruction model in near future. Interestingly, they also opined that the online model of education certainly differentiates the mode of instruction with that of traditional methods of instruction.

In studies by Wu *et al.* (2010) and Wieser and Seeler (2018), it was found that due to distance and social isolation feelings among learners in online model of education, the success of online mode of education is unconfirmed. They also noted that there is an increasing trend in number of dropouts in online courses as compared to traditional class room courses offered by higher educational institutions.

Fearon *et al.* (2012), in their study suggested that the distance and social isolation feelings among learners can be removed by initiating a blended model of education which consists of both traditional and virtual models of education. For instance, past research (Garrison and Kanuka, 2004; Owston *et al.*, 2008) found that blended learning methods are best suitable for redesigning education models in a technology-based learning environment. They also pointed out that the blended models possess the features and merits of both traditional and virtual teaching approaches.

The blended model of teaching may comprise face-to-face classes, flipped classrooms and online face-to-face classes. The use of these combinations in teaching may help the learners to gain a shared understanding realistically and to achieve success in their higher education life (Ayob *et al.*, 2023).

Several authors (Harding *et al.*, 2006; Wang *et al.*, 2009; Yen and Lee, 2011) have noted a higher student involvement under a blended teaching environment which in turn increases the students' quality in terms of their commitment and perseverance. In other studies (Stacey and Gerbric, 2008; Williams *et al.*, 2008; Gosper *et al.*, 2010) it was noted that the success of blended learning can be measured in terms of quality of learning outcomes, learner experience, level of teacher satisfaction and time created for a teacher to involve in research. However, Poon (2014) highlighted that the rapidly changing technology poses a significant challenge in adopting the blended model of teaching. Therefore, higher education institutions should be well prepared for timely updating the education system on par with technological advancements.

2.2 Technology-based education and learning effectiveness

According to studies by many authors (Looney *et al.*, 2008; Mashaw, 2012; Mitchell *et al.*, 2017) opined that learning effectiveness means the degree to which the actual learning outcomes have been achieved. Further, it is a function of influential pedagogical practices and it is actually related to success and can be assessed through the students' appraisal of pedagogical and instructional design and their impact on students' attitudes, beliefs, emotions, expectations and their behavior at large.

Past studies (Chowdhury, 2020; Sharma *et al.*, 2022) have noted that technology-mediated education enhances overall learning effectiveness and satisfaction among learners. They also emphasized that the ease of use of technology-mediated teaching tools rapidly impacts on the adoption of online education by learners. Further, the predeveloped educational videos moderately impact the learning effectiveness of students. For instance, in the studies by (Lizzio *et al.*, 2002; Poon, 2014) it was highlighted that the predeveloped educational videos and contents certainly enhances the learning experience and student engagement. They also opined that predeveloped contents create and enhance a positive attitude among learners in their learning domain. However, in the studies by (Lizzio *et al.*, 2002; Poon, 2014) it was highlighted that the major problems faced by students in a technology-mediated education

system is related to limited internet downloading capacity and broadband width. In support of this, many authors (Chowdhury, 2020; Adams *et al.*, 2021), have also emphasized that the readiness of students to pursue their education under a blended model is an essential aspect. Therefore, they suggested that the education institutions should provide training and demonstration to students on technology-mediated tools before they are actually implemented in education system.

2.3 MOOC and learning efficiency

Many authors in their study (Rasch and Schnotz, 2009; Steffens and Reiss, 2010) explained that the learning efficiency is key determinant of any education instruction design and which explains the capability of educational resources to help the learners in retaining, recalling and understanding a particular concept in a more effective manner.

According to a study by Onah *et al.* (2021), effective implementation of a blended model of education requires new methods which can be used simultaneously with face-to-face teachings like MOOCs. Further, MOOCs are a modern education innovation which can be used for distance learning. They also noted that it is a part of the blended teaching model in which learning takes place in both face-to-face and online settings. For instance, several authors in their study (Bates, 2012; Taneja and Goel, 2014; Singh and Sharma, 2021; Anand Shankar Raja and Kallarakal, 2021; Hossain *et al.*, 2022) have highlighted that there is a high-level social collaborative learning and shared understandings in MOOC based education system.

Wang *et al.* (2022a, b) emphasized that MOOCs are significantly influencing the learning behavior of students due to its perceived usefulness and ease of use during the learning process.

In another study by Wang *et al.* (2022a, b), it was noted that even in the case of MOOCs, there is an increasing rate of dropouts due to various factors such as psychological, social, personal, course-related, time factors and the hidden costs. They also emphasized the need for motivation and interaction with students to minimize the dropout rates in MOOCs. Further, to enhance the degree of interaction and motivation among learners, appropriate course designs are very significant.

In another study (Cheng, 2022), it was found that the knowledge quality of students is influenced by system quality, interface design quality, degree of learner-teacher interaction and degree of collaboration in MOOCs. Further, they also noted that high quality MOOCs significantly influence on perceived usefulness, overall satisfaction and learning experience of students with continuance intention with MOOCs.

By analyzing the earlier literature on various aspects outlined above it was discovered that the majority of studies have been conducted on online teaching methods and blended models of teaching and fewer studies have focused on conceptual and foundational aspects of MOOCs. And no studies have made an attempt to examine the impact of MOOCs on the learning efficiency of students by considering the perception of both teachers and students. Therefore, the present study is intended to empirically analyze the effectiveness of MOOCs on the learning efficiency of students by considering the perception of both teachers and students who are involved in the MOOCs offered by the University of Mysore, India.

Based on the outcome of the literature survey, the following research questions are framed:

RQ1. What is the perception of teachers on the effectiveness of MOOCs on learning efficiency?

RQ2. What is the perception of students on the effectiveness of MOOC on learning efficiency?

RQ3. Is MOOCs an ideal tool for designing the blended model of education?

RQ4. What are the challenges involved in participating in MOOCs?

In order to answer the research questions developed, the study aimed at analyzing the perception of students and teachers regarding the effectiveness of MOOCs on the learning efficiency of students and also to evaluate MOOCs as an ideal tool for designing the blended model of education based on the perception of the target population.

3. Research methodology

The study followed quantitative descriptive research design to answer the research question. This method describes the characteristics of variables and also explains the relationship between variables (Bloomfield and Fisher, 2019). Here, researcher collected opinions of the respondents through structured questionnaire in close ended form of questions.

3.1 Participants

The present study examined the perception of stakeholders (student-teachers) of MOOCs conducted by the University of Mysore in 2021 (see Appendix 1 for list of MOOCs offered by University of Mysore). University of Mysore is one among the oldest universities in India and is the first state university which initiated MOOCs in its educational programs to students who were studying at graduation and above levels. The present study is descriptive quantitative research to gather the data concerning the objective of the study. The respondents are teachers who delivered MOOCs and also the students who are postgraduates and undergraduates who studied MOOCs offered by the University. It was observed that there are around 32,000 students who have taken MOOCs offered by the University during 2021 and these courses are taught by 52 teachers [3]. For the present study, respondents among these teachers and students were randomly selected. These respondents were from a varied academic domain such as commerce, management, science and humanities. They are also varied in their demographic profile such as age, gender and place of origin.

3.2 Sampling procedure

To determine the sample size, a two-step procedure was followed. *In the first step*, a preliminary study was conducted to know the population proportion concerning students who are learning through MOOCs in a class. A pilot study was conducted among students of University of Mysore. 280 students were asked whether they took up MOOCs during their learning or not. Out of 280 students, 52 students reported to have enrolled for MOOCs and this comes to 18.57% and is rounded off to 19%. Therefore, the population proportion for the present study is 19%.

In the second step, Krejcie and Morgan (1970) formula was employed to determine the sample size. The final sample size of students as per the formula is 211.60 and rounded off to 212. And on the other hand, all the teachers who taught under MOOCs of University are considered as teacher participants for the study. The final sample size of both students and teachers is 264.

3.3 Collection of data

Two survey questionnaires were designed, one each for the students and teachers. The questionnaires gathered the opinions from the students and teachers regarding the effectiveness of MOOCs on learning efficiency of students and the suitability of using MOOCs as the blended model of education.

The survey questionnaire was designed with a five-point Likert scale. Where five indicated 'strongly agreed' and one indicated 'strongly disagreed'. The questionnaire collected demographic details of both students and teachers. Questions on the impact of MOOCs on learning efficiency were framed for the student respondents. Questions on MOOC as a tool for blended education and ease of learning and teaching were framed for teacher respondents. Questionnaires were distributed through Google forms. Two reminders with a gap of fifteen days were sent to fill the questionnaires by the participants.

Email-id of students and teachers who have been involved in MOOCs were collected from administrative office of the University. A total of 500 Google forms were sent to students out of which 368 responses were received. Out of the received responses, 357 were completed questionnaires. From 357 responses 212 responses were randomly selected for further analysis.

On the other hand, questionnaires were sent to all 52 teachers who have taught MOOCs. 49 filled questionnaires were received from the teachers out of which 43 were completed questionnaires and which are considered for the further analysis.

Data was collected and accounted for scientifically and then analyzed with the help of the statistical package for social sciences 2020 (SPSS 2020) version. Exploratory factor analysis and confirmatory factor analysis used to evaluate the validity and reliability of newly developed instruments. Descriptive statistics like percentage analysis and mean analysis and *t*-test were used to describe the perception of respondents. The outcome of data analysis is presented as demographic profile and opinion of respondents. Apart from the primary sources of information, the secondary sources of information were also employed in the present study to examine the conceptual aspects and to review the earlier literature and support the outcome of the present study.

3.4 Exploratory factor analysis

Exploratory factor analysis was conducted to identify the dimensions of perception on impact of MOOCs on learning efficiency of the students. Kaiser-Meyer-Olkin (KMO) was conducted to check sample adequacy and the results showed a value of 0.92, which is a good indicator of sampling adequacy (Pallant, 2011). Later, Bartlett's test of sphericity was conducted to check whether the correlation matrix fits an identity matrix and results showed a chi-square value which was significant (X^2=1,523.68, $p < 0.001$), meaning correlation matrix is significantly different from identity matrix and is best suited for factor analysis. The exploratory factor analysis test was conducted with principal component analysis under the varimax method. The decision was based on Eigen value 1 and suppress factor loading less than 0.5. Table 1 shows the dimensions extracted, statements and factor loadings for each statement. A total of four dimensions were extracted, namely, (1) teachers' positive perception (2) teachers' negative perception (3) students' positive perception (4) students' negative perception with 63% of total variance explained. Statements with factor loading less than 0.5 are removed (highlighted in italic) from further analysis as they are not highly correlated with the dimension.

3.5 Confirmatory factor analysis

Measurement model was developed based on exploratory factor analysis and 29 items were considered for the structured model. Later, measurement model assessment, construct validity and reliability was checked using Cronbach's alpha, composite reliability and average variance extracted (AVE) value. Table 2 showed Cronbach's alpha values which ranged between 0.717 and 0.869 (I < 0.6). This indicates that the scale items are highly reliable. The AVE values are greater than 0.5, which indicates the existence of convergent validity among the items of each dimension. The Fornell-Larcker test was conducted to check

Dimensions	Statements	Factor loadings
Teachers' Positive Perception (TPP)	MOOCs provides opportunity to learn from world class teachers (TPP1)	0.720
	It enhances learning interest through video lectures, audio files, etc. (TPP2)	0.762
	Standardized certification and badges attracted me to enroll to MOOCs (TPP3)	0.616
	MOOCs replaces traditional teaching model with live video broadcast which identifies evidence of teacher's presence (TPP4)	0.681
	Sufficient quizzes, MCQ tests, discussion forums and assignments encourages and improves learning involvement (TPP5)	0.700
	Discussion forums, boards, chat rooms backed by social networking sites builds learning contacts and association (TPP6)	0.752
	It ensures liveliness through continuous feedback (TPP7)	0.702
	Visuals, examples used in video lectures and live sessions ensure fast learning and retaining the information for longer time in the mind (TPP8)	0.702
Teachers' Negative Perception (TNP)	In MOOCs, acquiring customized knowledge is difficult as course designed is standardized (TNP1)	0.643
	MOOCs in standardized language discourage enrollment (TNP2)	0.700
	There is no strict accountability during assessment in MOOCs (TNP3)	0.666
	MOOCs with prerecorded lectures cannot clear doubts in a lively manner (TNP4)	0.780
	Many MOOC lectures are of long duration which loses the interest of the learners (TNP5)	0.755
	Many MOOCs are academic certificate oriented and not skill oriented (TNP6)	0.796
	Deadlines in quiz, tests and assignments along with videos lectures creates stress during learning (TNP7)	0.722
	There is more scope for cheating during computer graded quizzes and tests (TNP8)	0.748
Students' Positive Perception (SPP)	MOOC provides opportunity to teach millions of learners at a time (SPP1)	*0.419*
	It eases delivery of information through video lectures, audio files, etc. in an attractive manner (SPP2)	0.727
	MOOCs with live video broadcast creates traditional learning environment (SPP3)	0.728
	Sufficient quizzes, MCQ tests, discussion forums and assignments encourages and improves learner's involvement (SPP4)	0.664
	Discussion forums, boards, chat rooms backed by social networking sites builds good teacher-students relationship (SPP5)	0.733
	MOOCs enable the teachers to understand the diversified learner's expectation (SPP6)	0.713
	MOOCs make the teachers continuously updated as they face millions of students from diversified environment (SPP7)	0.632
	Visuals, examples used in video lectures and lives sessions enables teachers to easy convey of knowledge (SPP8)	*0.162*
Students' Negative Perception (SNP)	In MOOCs, there is a low teacher-student ratio which creates burden on individual attention towards learners (SNP1)	0.764
	Designing of MOOCs require more technical skills than traditional skills and many teachers' lack these skills (SNP2)	0.753
	Designing MOOCs individually is difficult and needs to be funded by authorities (SNP3)	0.614
	Interdisciplinary effort is essential to develop a MOOC but arrangement is difficult (SNP4)	0.543
	Developing computer graded questions to assess day-to-day improvement requires more time and effort (SNP5)	0.627
	There is more scope for cheating in watching videos, attending quizzes and tests (SNP6)	0.676
	In MOOCs, as there are more learners, peer assessment becomes burden (SNP7)	0.699
	Prerecorded videos less impact on learning efficiency than live sessions in MOOCs (SNP8)	*−0.261*

Source(s): Compiled by authors

Table 1. Factors, subitems and loadings

discriminant validity among independent variables and Table 3 showed that square of AVE (Italic) is greater than values under that, therefore discriminant is not an issue. Table 4 shows the result of collinearity and values are less than 3, therefore multicollinearity does not exist. Finally, the goodness of fit test conducted for the measurement model and Table 5 showed normative fit indices (NFI) is 0.947 (greater than the threshold level of 0.9) and standardized root mean squared residual is 0.016 (lesser than 0.06), which showed the measurement model is a good fit.

Table 2. Construct reliability and validity

	Cronbach alpha	Composite reliability	AVE
SNP	0.869	0.868	0.518
SPP	0.850	0.868	0.588
TNP	0.717	0.856	0.537
TPP	0.754	0.811	0.385

Source(s): Compiled by authors

Table 3. Discriminant validity-Fornell-Larcker criterion

	SNP	SPP	TNP	TPP
SNP	*0.720*			
SPP	0.411	*0.699*		
TNP	−0.093	0.143	*0.587*	
TPP	−0.023	0.198	0.521	*0.620*

Source(s): Compiled by authors

Table 4. Collinearity statistics

TPP		TNP		SPP		SNP	
Items	VIF	Items	VIF	Items	VIF	Items	VIF
TPP1	1.598	TNP1	2.815	SPP2	2.124	SNP1	1.513
TPP2	2.428	TNP2	2.565	SPP3	1.465	SNP2	1.724
TPP3	1.843	TNP3	1.742	SPP4	1.688	SNP3	1.558
TPP4	1.600	TNP4	2.454	SPP5	1.807	SNP4	2.182
TPP5	1.687	TNP5	1.792	SPP6	1.864	SNP5	2.010
TPP6	1.937	TNP6	1.961	SPP7	1.571	SNP6	2.015
TPP7	1.559	TNP7	1.586			SNP7	1.728
TPP8	1.213	TNP8	1.261				

Source(s): Compiled by authors

Table 5. Model fit

	Structured model	Estimated model
SRMR	0.016	0.016
d_ULS	7.108	7.108
d_G	2.283	2.283
Chi-square	958.839	958.839
NFI	0.947	0.947

Source(s): Compiled by authors

4. Results and discussions

4.1 Demographic profile of the respondents

Table 6 depicts the demographic profile of the target respondents, which shows that males comprise the majority of the respondents in both the groups, that is, teachers (53.5%) and students (58.5%). The majority of teachers is falling under the age group of 30–49 years (72.1%) and is young. This shows that younger teachers are more involved in conducting MOOCs. Many teachers (48.8%) are having less than 3 years of experience in MOOCs. Among the students, the majority is from the commerce stream, i.e. 157 (74.1%). For studying through a blended model of education computer literacy is essential. Therefore, students were asked about their computer literacy level and it was found that 74.1% of the students have rated their level of computer literacy to be medium.

4.2 Students' perception of the influence of MOOC on learning efficiency

Students' feedback on teaching methods matters a lot in any education system. In the future, MOOCs are expected to become popular in the blended education environment. However, it is highly impossible to implement and adopt MOOCs without the acceptance of students. Therefore, by keeping this aspect in mind, students were asked about the influence of MOOCs on their learning efficiency in both positive and negative contexts.

4.3 The positive influence of MOOCs on learning efficiency (students' perspective)

To analyze the influence of MOOCs on learning efficiency, responses from students were gathered on both positive and negative aspects of MOOCs. Students are the ones who experience the impact of MOOCs in their learning life. Table 7 depicts the summary of descriptive and inferential statistics results on the responses of students towards the positive influence of MOOCs on learning efficiency. They strongly agreed that MOOCs provide an opportunity to learn from world-class teachers ($M = 4.09$, standard deviation = 0.654). This is because MOOCs are conducted online by expert teachers of many world-class institutions. This finding is in par with the findings of Bekele (2010), Stokes *et al.* (2015), Sun *et al.* (2016), Wong (2016), Kundu and Bej (2020).

Learners strongly believed that MOOCs create a high interest in learning (M = 4.00, SD = 0.725). This is due to the use of animated videos, pictures and examples during lectures

Demographic profile of teachers'		*N* (%)	Demographic profile of students'		*N* (%)
Gender	Male	23 (53.5)	Gender	Male	124 (58.5)
	Female	20 (46.5)		Female	88 (41.5)
Age (Years)	Below 29	7 (16.3)	Stream	Science	29 (13.7)
	30–49	31 (72.1)		Commerce	157 (74.1)
	50 and Above	5 (11.6)		Humanities	13 (6.1)
Academic experience (Years)	0–10	18 (41.9)		Engineering	7 (3.3)
	10–20	17 (39.5)		Other	6 (2.8)
	20 and Above	8 (18.6)	Computer Literacy	High	17 (8.0)
Experience in MOOC(Years)	Less than 3	21 (48.8)		Medium	157 (74.1)
	3–5	11 (25.6)		Low	38 (17.9)
	5 and Above	11 (25.6)			

Source(s): Primary data

Table 6. Demographic profile of respondents

Statements on positive influence of MOOC on learning	*N*	Mean	Std.	*t*-value	Sig (two-tailed)
SPP1	212	4.09	0.654	24.382	0.000
SPP2	212	4.00	0.725	19.980	0.000
SPP3	212	3.90	0.743	17.497	0.000
SPP4	212	3.88	0.767	16.750	0.000
SPP5	212	4.01	0.743	19.731	0.000
SPP6	212	3.92	0.718	18.747	0.000
SPP7	212	3.93	0.728	18.576	0.000
SPP8	212	4.02	0.737	20.096	0.000
Overall Mean	*212*	*3.9734*	*0.47882*	*29.250*	*0.000*

Source(s): Primary data

Table 7. Positive influence of MOOC on learning efficiency

(Liyanagunawardena *et al.*, 2013). Students agreed (M = 3.90, SD = 0.743) that standardized certification and badges granted after the successful completion of MOOCs attracted them to enroll for the course. This is because learners usually enroll on any course with some outcome-based goals such as getting certification, gaining technical skills and so on. This was also emphasized in the study by Sinclair and Kalvala (2015). They also agreed (M = 3.88, SD = 0.767) that live video broadcasts in MOOCs replace the traditional model of teaching as they felt there is evidence of teacher presence during the lecture. This is also supported by the studies by Petraglia (1998) and Bekele (2010) where they emphasized that a collaborative learning environment creates a realistic teaching and learning environment.

Learners strongly agreed that (M = 4.01, SD = 0.743) sufficient quizzes, multiple choice questions tests, discussion forums and assignments encourage and improve their learning involvement. This is consistent with the findings of Shao and Chen (2021). They also agreed that the discussion forums, boards and chat rooms backed by social networking sites build learning contacts and associations among them (M = 3.92, SD = 0.718). For example, several authors (Morris and Hayes, 1997; Petraglia, 1998; Bekele, 2010) explored that learning contacts and associations build a collaborative learning environment and enhance brainstorming and knowledge sharing. This point was also stressed by Wieser and Seeler (2018) as they noted that virtual learning spaces are gradually transforming into social learning spaces. Similarly the study by Ayob *et al.* (2023) also supported this finding. Students also agreed that continuous feedback in MOOCs ensures the liveliness of learning (M = 3.93, SD = 0.728).

Further, they strongly agreed that visuals and examples used in video lectures and live sessions ensure their fast learning and retain the information for a longer time in their mind (M = 4.02, SD = 0.737). The overall mean and standard deviation are 3.97 and 0.48, respectively. This indicates MOOCs have a positive influence on the learning efficiency of students and the results of the *t*-test also showed statistical significance. The studies by Chowdhury (2020) and Sharma *et al.* (2022) also complemented this finding by suggesting that technology-mediated education enhances the overall learning effectiveness of the learners.

4.4 Negative influence of MOOCs on learning efficiency (students perspective)

Table 8 depicts the summary of descriptive and inferential statistics results on the responses of students towards the negative influence of MOOCs on learning efficiency. Students agreed (M = 3.78, SD = 0.776) that acquiring customized knowledge through MOOCs is difficult. This is because MOOCs are usually conducted on standardized subjects. If any students want to learn any specific knowledge in a customized manner, for them MOOCs are not highly suitable (Wang and Baker, 2015).

Statements on negative influence of MOOC on learning	*N*	Mean	Std.	*t*-value	Sig (Two-tailed)
SNP1	212	3.78	0.776	14.580	0.000
SNP2	212	3.58	0.893	9.487	0.000
SNP3	212	3.68	0.871	11.351	0.000
SNP4	212	3.71	0.924	11.174	0.000
SNP5	212	3.74	0.901	11.913	0.000
SNP6	212	3.61	0.914	9.691	0.000
SNP7	212	3.60	0.976	8.939	0.000
SNP8	212	3.78	0.970	11.681	0.000
Overall Mean	*212*	*3.6918*	*0.66415*	*14.877*	*0.000*

Source(s): Primary data

Table 8. Negative influence of MOOC on learning efficiency

Learners agreed (M = 3.58, SD = 0.893) that MOOCs designed in standardized language discourage enrollment as they require them to be designed in regional language. Successful dissemination of knowledge from MOOCs is possible only when it is designed in bilingual or multilingual. Because delivery of knowledge in a standardized language creates stress on the students who are not well versed with that language and thereby it negatively influences their learning efficiency (Dreisiebner, 2018; Brisk *et al.*, 2014). Students believed that there is no strict accountability during assessment in MOOCs (M = 3.68, SD = 0.871). This is because of the low teacher-student ratio. In MOOCs, one teacher handles the course for thousands of students at a time. This creates more burden on teachers in completion of the course, individual assessment of students and certification. This in turn impacts the accountability of students to teachers during the course (Shao and Chen, 2021). They also agreed (M = 3.71, SD = 0.924) that the MOOCs with prerecorded lectures cannot clear doubts in a lively manner.

Students agreed that (M = 3.74, SD = 0.901) MOOCs having long duration lectures negatively influence their learning attention. This is because students' attention is of short duration which ranges from fifteen to twenty-five minutes. Therefore, the video lectures presented in MOOCs should have optimum duration. If not, it will lose students' attention and negatively impact their learning efficiency (Mu *et al.*, 2019).

Learners also agreed that there are few skill-oriented MOOCs (M = 3.61, 0.914). They also agreed (M = 3.60, SD = 0.976) that deadlines in quizzes, tests and assignments along with video lectures create stress during learning.

Further, students agreed that (M = 3.78, SD = 0.970) there is more scope for cheating during computer-graded quizzes and tests. This is because in many MOOCs the assessments, quizzes and tests are not proctored. This makes students attend them without any due care of cheating. This negatively influences the learning efficiency of students. This is consistent with the findings of (Costello *et al.*, 2018; Balfour, 2013; Admiraal *et al.*, 2015).

The overall mean and standard deviation are 3.69 and 0.66 respectively. This indicates that MOOCs have a negative influence on the learning efficiency of students. The results of the *t*-test showed statistical significance. However, it is noticed that the positive influence of MOOCs on learning efficiency was found to be greater than the negative influences (3.97 > 3.69).

4.5 Teachers' perception of the influence of MOOCs on learning efficiency

Students and Teachers are like two faces of the same coin. Without considering the teachers' opinions, the outcome of the present study shall not be complete. Therefore, the present study also collected the opinions of teachers on the influence of MOOCs on the learning efficiency of students. The descriptive statistics of their opinions regarding the positive and negative influence of MOOCs are presented in Tables 9 and Table 10.

The teachers strongly agreed (M = 4.49, SD = 0.551) that the MOOCs provide the opportunity to reach millions of learners at a time. This is because MOOCs are online-based and can offer education to students who are situated in different parts of the world at a time through the World Wide Web. This is consistent with the findings of (Wong, 2016; Bekele, 2010; Stokes *et al.*, 2015; Sun *et al.*, 2016).

Educators also have strongly agreed (M = 4.21, SD = 0.709) that MOOCs enable them to deliver information through video lectures, audio files, etc. in an attractive manner. This is because MOOCs allow educators to deliver their lectures by taking the help of animation pictures, instance videos etc. which is consistent with the findings of (Tailor *et al.*, 2020).

Teachers also agreed that MOOCs with live video broadcast creates a traditional learning environment (M = 3.93, SD = 0.828). This is because live video broadcasting ensures the teacher's presence and interactions between teacher-students and vice versa. Educators strongly believed that (M = 4.23, SD = 0.841) sufficient quizzes, MCQ tests, discussion forums and assignments encourage and improve learner involvement. This is because assessment in MOOC is continuous.

Many MOOCs grade students' learning level by considering their continuous involvement in quizzes, MCQs and discussion forums n addition to their performance in the terminal exam. This is consistent with the findings of Ghazali *et al.* (2020). Teachers strongly agreed (M = 4.07, SD = 0.936) that the discussion forums, boards, and chat rooms backed by social networking sites build good teacher-student relationships. This is in conformity with the studies by Glaser (1990), Johnson and Johnson (1992), McAlpine (2000) and Wieser and Seeler (2018), who all noted that technology induced education creates a collaborative teaching

Table 9.
Teachers' perception of the positive influence of MOOC on learning efficiency

Statements on positive influence of MOOC on learning	*N*	Mean	Std.	*t*-value	Sig (two-tailed)
TPP1	43	4.49	0.551	17.718	0.000
TPP2	43	4.21	0.709	11.184	0.000
TPP3	43	3.93	0.828	7.368	0.000
TPP4	43	4.23	0.841	9.616	0.000
TPP5	43	4.07	0.936	7.495	0.000
TPP6	43	3.91	0.971	6.123	0.000
TPP7	43	4.09	0.921	7.782	0.000
TPP8	43	4.19	0.794	9.789	0.000
Overall Mean	*43*	*4.1395*	*0.50534*	*14.787*	*0.000*

Source(s): Primary data

Table 10.
Teachers' perception of negative influence of MOOC on learning efficiency

Statements on positive influence of MOOC on learning	*N*	Mean	Std.	*t*-value	Sig (Two-tailed)
TNP1	43	3.88	0.823	7.045	0.000
TNP2	43	3.63	1.047	3.932	0.000
TNP3	43	3.84	0.949	5.782	0.000
TNP4	43	3.93	0.828	7.368	0.000
TNP5	43	3.95	0.899	6.959	0.000
TNP6	43	3.86	0.966	5.843	0.000
TNP7	43	3.72	1.076	4.392	0.000
TNP8	43	2.74	1.415	−1.19	0.000
Overall Mean	*43*	*3.6905*	*0.55508*	*8.062*	*0.000*

Source(s): Primary data

environment which enhances the teacher-student relationship. They also agreed that (M = 3.91, SD = 0.971) the MOOCs enable them to understand the diversified learner's expectations. Educators strongly agreed (M = 4.09, SD = 0.921) that MOOCs make the teachers continuously updated as they face millions of students from a diversified environment. This is because teachers interact with students from different geographical areas and this creates the need for teachers to advance their knowledge and improve themselves to produce academically sound courses.

This is consistent with the findings of Wong (2016). They also strongly believed (M = 4.19, SD = 0.794) that the use of visuals and examples in video lectures and live sessions enables them to share knowledge more easily. The overall mean and standard deviation are 4.14 and 0.50, respectively. This indicates that the teachers' perceive MOOCs to have a positive influence on the learning efficiency of students. The result of the *t*-test shows statistical significance.

4.6 Negative influence of MOOCs on learning efficiency (teachers perspective)

The opinion towards negative aspects of MOOCs on learning efficiency is also collected from the teachers. Table 10 shows the results of descriptive statistics on the teachers' perception of the negative influence of MOOCs on learning efficiency. Teachers agreed that (M = 0.388, SD = 0.823) there is a low teacher-student ratio in MOOCs and that makes the burden on them to take individual attention to learners. This is because in MOOCs students may be from many parts of the world and their number may also be large. This creates a burden on taking individual attention.

The learning efficiency of students is also based on individual attention by teachers. If individual attention is not possible then the mode of instruction is invalid. This finding is consistent with the findings of (Bekele, 2010; Stokes *et al.*, 2015; Sun *et al.*, 2016). Educators agreed that (M = 3.63, SD = 1.047) designing of MOOC requires more technical skills than traditional skills and many teachers lack these skills.

If a teacher lacks technical skills such as the inclusion of audio-visuals, attractive animated pictures, video-editing and others, MOOCs will be ineffective and it can negatively influence learning efficiency. Poon (2014) also suggested that rapidly changing technology and its adoption is a challenge in a blended model of teaching. This requires a teacher and the education institutions to continuously update with newer technologies.

Teachers also agreed that (M = 3.84, SD = 0.949) designing MOOCs individually is difficult and needs to be funded by authorities. This is because there is a need for mobilizing various resources (video recorders, technical support team, content developers and resource persons) to conduct MOOCs effectively. If any of the resources required is short, then the course will not be effective and it will negatively influence the learning efficiency of students. This is consistent with the findings of (Bakogianni *et al.*, 2020; Tailor *et al.*, 2020; Ghazali *et al.*, 2020). Teachers agreed that (M = 3.93, SD = 0.828) the interdisciplinary effort is essential to develop a MOOC but arrangement of the same is difficult. This is because MOOCs are getting more importance these days as they are holistic. Therefore, the course designed under MOOC should be created by experts from various disciplines. If this is the reality students are more attracted to the course and they will be more involved in learning. If not their involvement in learning will be less and which negatively influences their learning efficiency. This is consistent with the findings of (Bakogianni *et al.*, 2020; Tailor *et al.*, 2020).

Teachers agreed that (M = 3.95, SD = 0.899) development of computer-graded questions to assess the day-to-day improvement of students requires more time and effort. This is because MOOC designers are always under pressure during the course. Therefore, managing all course-related activities by a single person is highly difficult. Due to this, there may be a chance of missing day-to-day assessment questions by students and this discourages their involvement. They also agreed that (M = 3.86, SD = 0.966) there is more scope for cheating

during watching videos and attending quizzes and tests. This is because there are fewer proctored controlled classes, assessment tests and quizzes in MOOCs. If this is the reality students do not consider the course seriously and which negatively influences their learning efficiency.

Educators also agreed (M = 3.72, SD = 1.076) that in MOOCs as there are more learners, peer assessment becomes a burden. This negatively influences on learning efficiency of students due to the low-quality assessment of students in MOOCs. This is consistent with the findings of (Camilleri and Tannhauser, 2013). Teachers are neutral (M = 2.74, SD = 1.415) in their opinion that prerecorded videos have less impact on learning efficiency than live sessions in MOOCs. The overall mean and standard deviation are 3.690 and 0.555 respectively. This indicates that MOOCs also have a negative influence on the learning efficiency of students as per teachers' opinions and the results of the t-statistic are statistically significant.

Independent sample *t* test conducted to identify whether there is a significant difference in the mean value of positive perception and negative perception. The test result tabulated in Table 11, which showed a significant difference in the mean value of positive perception and negative perception of MOOCs among students, further it showed that positive perception (M = 3.97) is higher than negative perception (M = 3.69) among students. Table 8 also revealed a significant difference in the perception about MOOCs among teachers. It exhibits that positive perception (M = 4.14) is higher than negative perception (M = 3.69). By analyzing the responses of both students and teachers on MOOCs' positive and negative aspects on learning efficiency it was found that it is more positively influencing learning efficiency.

5. Conclusion and recommendation

MOOCs are an emerging way of offering both formal as well as informal education to all those having the thirst to learn. It has made a positive impact on teaching-learning efficiency. The application of technology-based teaching tools in MOOCs improves the quality of learning. Both students and teachers have positive views towards the influence of MOOCs on learning efficiency. However, with the current pace of technological advancements, there is always room for improvement as far as MOOC-based learning is concerned.

It is evident that MOOC-based education has more significant benefits such as it gives an opportunity to the learners to learn from the learned academia across the globe and also provides education to all without any restrictions of any kind (Wong, 2016). However, for the effective implementation of such tech-based education tools in a country like India, there is a need to consider a host of factors. These include aspects relating to providing infrastructure facilities such as video recording studios, allowing private institutes to conduct MOOCs (currently, only the higher education institutions which meet certain quality benchmarks are allowed to design and develop MOOCs) and developing more MOOCs projects other than a few existing ones like NPTEL, mooKIT, IITBX and SWAYAM.

Table 11. Comparative mean result

Sample	Categories	Mean	*T* value	Sig.	Remark
Students' Perception	Negative	3.69	15.67	0.000	HS
	Positive	3.97			
Teachers' Perception	Negative	3.69	19.24	0.000	HS
	Positive	4.14			

Source(s): Primary data

In addition to this, to make MOOCs more effective certain technological advancements are to be focused on. Such aspects are relating to the implementation of proctored controlled classes, proctored controlled assessments and expert system-based quizzes to increase the sanctity of the assessment of students. Further, to reach many students from different geographical parts, multilingual courses should be offered. As a teacher's capacity is limited by the language barriers, artificial intelligence and other allied technologies can be relied on to translate the course to various regional languages.

In order to overcome the limitations of MOOCs relating to absence of live interactions, live classes should be conducted more frequently along with the prerecorded video lectures. This makes the experience of both teachers and students similar to that experienced in traditional classes.

The study also provided the proof that the MOOCs are having a more positive influence on learning efficiency. The study also points out that MOOCs can be used in a blended model of education, but not independent of the traditional classroom teaching. This is because MOOCs are not an alternative to traditional education. However, the people who are willing to be lifelong learners by passion can adopt MOOCs to achieve their dreams.

6. Limitations, contributions and implications

This study made a sincere effort in uncovering the student-teacher perception regarding the effectiveness of MOOCs in enhancing the learning effectiveness. Both the respondent groups approved the positive impact of MOOCs on the learning efficiency of students. However, the study collected the opinion from the students and teachers of only one State University. MOOCs are being offered by many other State and Central Universities and institutions of national prominence which are both public and private. Also, the courses offered by international entities such as edX, Coursera and others are also accessed by the students in India. This study, however, excludes such courses. A further study can therefore be undertaken to evaluate and review the effectiveness of other online courses offered by various other entities and institutions across the country. Nevertheless, the present study emphasizes the influence of MOOCs on the learning efficiency of the student community and thus urges the teaching fraternity to complement their teaching efforts by leveraging MOOCs.

The outcome of this study helps higher education institutes by providing inputs in implementing MOOCs as the part of blended model of education. Further, it also helps to the teachers in overcoming the pitfalls and challenges faced in MOOCs based education.

7. Research ethics and consent

Present study involved human participants; therefore we performed research procedure in accordance with principles stated in Declaration of Helsinki. We obtained ethical approval prior to study from the Institutional Review Board of DoS in Commerce of Mysore University. A committee conducted meeting on 02-06-2022 and approved our questionnaire. Further, respondents were informed about the purpose of the study and free consent was obtained from the respondents before the collection of data.

Notes

1. https://www.coursera.org, as of 5 May 2022.
2. https://www.mooc.org/, as of 28 April 2022.
3. https://www.uni-mysore.ac.in/, as of 7 March 2022.

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(The Appendix follows overleaf)

Appendix

Table A1.
List of MOOCs offered by University of Mysore

Si. No.	Name of the MOOC	No. of students enrolled
1.	Business statistics	3,141
2.	Tourism and travel management	569
3.	Business research methodology	3,366
4.	Hospitality industry in tourism	856
5.	Geography of tourism	796
6.	Geography of India	2,820
7.	Plant pathology and soil health	1,705
8.	Tourism resources of India	540
9.	Tourism, transport & travel services	604
10.	International tourism destinations	753
11.	Food microbiology	1,640
12.	Food chemistry	1,637
13.	Human genetics	1,588
14.	Virology	1,417
15.	Microbial physiology and metabolism	660
16.	International business	1,990
17.	Biography	1,038
18.	Food preservation & technology	1809
19.	Food & nutrition	4,603
	Total no. of students enrolled	32,192

Source(s): https://www.unimysore.ac.in/englishversion/sites/default/files/content/massive_open_online_course_-jul_to_dec.pdf

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