




Effectiveness of E-learning for university students: evidence from Bangladesh

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ABSTRACT

The aim of current study is to analyse the effectiveness of e-learning for the students at university level. Data have been collected through questionnaire and it was given to 700 students. The questionnaire was returned by 667 students and 94.9% of them are using different e-learning tools, techniques or platforms. Eight variables have been used to measure the effectiveness of e-learning. Cronbach's alpha test is used to measure the reliability and internal consistency of the associated factors. The exploratory factor analysis is used to extract the variables and to measure the factors loading in the study. One sample t-test has been performed to test the hypotheses. The outcome of the study supports that e-learning is faster, time and cost friendly, appropriate to work independently, add value to the learning of the students, usable for the purpose of active learning, faster, quick response, applicable outside the class room and quality of e-learning is satisfactory which indicates e-learning is effective.

Contribution/ Originality

The paper attempts to investigate the effectiveness of e-learning using some crucial and fundamental factors. The outcome of all the determinants endorses that e-learning is effective for university students. The study will contribute to encourage both students and academicians to grab the benefits of electronic tools, techniques and platforms by using it for the purposes of acquiring and sharing knowledge.

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1. INTRODUCTION

The use of e-learning is increasing day by day and it has become widespread in higher education. E-learning can give the opportunity to learn wherever and whenever they want, without the restrictions of an agenda. Learning is a process of acquiring knowledge and skills through study or other means for any specific purposes. The trend and way of learning has been changed over the years. Most of the students are likely to use mobile phones, tabs, laptops, notebooks and many other tools to acquire knowledge regarding academic and non-academic issues. Gradually, the traditional way of learning has been reduced and students are becoming more interested to learn quickly and easily by using technology. In today's world learning cannot be confined into traditional classroom and it may not require any physical presence (Zhang and Nunamaker, 2003). As the technology improved electronic learning is becoming significant for modern education. Technology should be used as the learning partner and the focus should be given on how people can learn as a result of the advancement of technology (Jonassen *et al.*, 1999). Technology-driven learning system appeals to learners because of the convenience and learning is not limited by facilitators or teachers and time and distance cannot separate the learners (Raab *et al.*, 2002). Computer is using as an important tool for e-learning purposes. People can utilize diversified tools such as tablets, mobile phones apart from computers from anyplace. Users can also access the learning content from anywhere through multiple devices. Moreover, internet has become a great platform of e-learning. Different kinds of learning issues are rapidly accumulated, changed and updated over the internet. Especially for university students, e-learning can be a great source for acquiring knowledge and keep them updated in the knowledge-based world. A large number of factors can be used as the parameters to measure the effectiveness of e-learning. This paper used some crucial factors that can ensure the effectiveness of e-learning for the students at university level.

The advancement of technology has facilitated the learning process. A lot of students both undergraduate and graduate are using a wide array of e-learning tools and techniques for academic and non-academic learning purposes. But how far the e-learning is effective for the students? Many students can be misguided if they don't able to understand the effectiveness of the learning materials. It is required to scrutinize the extent to which e-learning is effective for the students at university level. This paper will be helpful for the students, instructors and practitioners to get an insight about the effectiveness of e-learning.

2. LITERATURE REVIEW

"E-learning" stands for "*electronic learning*". E-learning can be denoted as a mechanism of learning through electronic tools or techniques without using paper printed instructional material. It can be used for the purpose of both learning and teaching. E-learning can be defined as both online and offline learning engagements that are carried out by any individual or group (Naidu, 2006). E-learning can be viewed as a mechanism of obtaining knowledge through using a range of electronic media (Urdu and Weggen, 2000). In the narrow sense, e-learning can be defined as any learning activities which takes place over the Internet (Wang *et al.*, 2007). In this paper, e-learning is defined as a technique through which individuals can learn by using a wide variety of tools (personal computer, notebook, mobile, laptop, tablet etc.) in different platforms (google, face book, online library, google scholars, twitter, e-mail, wikipedia, you-tube). E-learning is the use of information, communication and internet technologies for the purposes of enriching knowledge to ensure better performance. E-learning provides the opportunities to learn via computers and other electronic devices using technology that will help to improve the performance of individual, group and organization (Pollard and Hillage, 2001). So, e-learning is an electronic based learning process which can be used through electronic media by the learners and obviously they can learn with or without access over the internet.

E-learning is becoming a popular medium of learning as the number of internet users are increasing day by day (Goyal, 2012). Stability, security, reliability and responsiveness, ease of use, user-

friendliness, organization, and personalization are the parameters to measure the effectiveness of e-learning (Tseng *et al.*, 2011). Gamage *et al.* (2014) used ten factors to analyze e-learning effectiveness and they ranked the top five which are interactivity, collaboration, motivation, network of opportunities and pedagogy. The experiment conducted by Zhang *et al.* (2006) showed that the effectiveness of e-learning through video depends on the provision of interactivity. Another study found that the e-learning effectiveness is highly interlinked with interactive learning activities, multimedia instruction and the quality of e-learning (Liaw, 2008). Wang (2003) developed a model in his study which contains four factors affecting e-learning and these are learner interface, learning community, content, and personalization. We used eight determinants to measure the e-learning effectiveness including contents of learning issues, usability of the information, faster learning, quick responsiveness, learning quality, time and cost friendly, usability outside of the class and appropriateness for working independently. Islam *et al.* (2010) found that variables such as reaction and satisfaction, learning outcome and achievement, and familiarity with online learning technology significantly affect the effectiveness of e-learning but it is not supported for participation and interaction. The findings of the study performed by Tseng *et al.* (2011) endorsed that the quality of the e-learning system and learner attractiveness are the most significant measures of e-learning effectiveness. Furthermore, reducing the waiting time and responsiveness of instructor's response to learner's question can improve the learning quality which lead to e-learning effectiveness. The study conducted by Salter *et al.* (2014) to determine the e-learning effectiveness on pharmacy education found that e-learning effectively contribute to increase the knowledge of pharmacist and pharmacy students but no evidence for long term perspective of knowledge. But the study could not conclude that whether e-learning can effectively improve skills or professional practice. On the other hand, it was found from the study of Noesgaard and Orngreen (2015) that it is tough to ensure e-learning effectiveness to improve the enactment of teaching since a teacher can apply various strategies as required.

The outcome of the study of Goyal (2012) reveals that e-learning is time and cost effective and it can be easily used and updated to meet the learning requirements. Furthermore, e-learning provides the freedom of learning which is interactive and entertaining. E-learning can be more effective than traditional classroom learning for students which will provide them updated knowledge to achieve the goals (Johnson *et al.*, 2000). The similar outcome supported by the study of Rosenberg *et al.* (2003) and he added it is at least as effective as traditional instructional methods. E-learning significantly reduces the cost of learning, contributes to improve learning quality, and increases the access to education as well as training (Gilbert *et al.*, 2007). Welsh *et al.*, (2003) found that e-learning ensures saving and he suggested e-learning as a potential replacement of classroom learning. E-learning is comparatively less expensive than learning through traditional class room (Strother, 2002). E-learning is a learner centered that facilitate to acquire skills by wide range of ways including image, video, text etc. Unwin (2008) conducted a survey on e-learning in Africa and the study showed that most of the respondents remarked that e-learning is valuable and crucial to meet their learning and teaching needs. E-learning saves the learner's time and the learners can learn at their convenient time. Moreover, learning quality can also be better if learner can use the learning contents wisely. E-learning facilitates learners to take the control over the content, manage the learning sequences, determine the pace of learning, fix time and choose media to meet their learning objectives as well as to manage access to e-learning methods and materials (Jethro *et al.*, 2012).

2.1. Development of hypotheses

H_{A1}: The content structure of e-learning is effective for the students.

H_{A2}: E-learning is effective for the purpose of active learning.

H_{A3}: E-learning is effective to learn faster.

H_{A4}: E-learning is effective to get quick response.

H_{A5}: The quality of e-learning is good.

H_{A6}: E-learning is time and cost friendly.

H_{A7}: E-learning is effective to apply outside of the class room.

H_{A8}: E-learning is effective to work independently.

3. RESEARCH FRAMEWORK

In the study, the data were collected from the students of different backgrounds. Questionnaire was sent to 700 students, received from 667 and the response rate is almost 95%. The study covers 6 public universities and 34 private universities in Bangladesh to collect data from the students. A structured questionnaire is used as the data collection instrument. Most of the statements of the questionnaire have been taken from the study of Song (2010). In the first part of the questionnaire contains 5- point Likert scale and fixed alternative questions and the second part includes the questions regarding the demographic state of the respondents. Eight variables are used to measure the effectiveness of e-learning including contents structure, usability, faster learning, quick responsiveness, learning quality, time and cost friendly, usability outside of the class and appropriate for working independently. Cronbach's Alpha test is used to test the reliability of the data. Frequency distribution and the percentage have been shown to analyse demographic state of the respondents. Factor analysis has been performed to measure the factors loading. To prove the hypotheses developed in the study, one sample t-test has been performed. SPSS 20.0 has been used to analyse all the data.

Table 1: Demographic characteristics of respondents

	Frequency	Percentage
Gender		
Male	420	63.0
Female	247	37.0
Total	667	100.0
Education		
Graduation	497	74.5
Post-Graduation	155	23.2
Above post-graduation	15	2.2
Total	667	100.0
Weekly Use of E-learning		
Missing value	35	5.2
1-2 days	146	21.9
3-4 days	164	24.6
5- 6 days	74	11.1
Everyday	248	37.2
Total	667	100.0

4. FINDINGS AND DISCUSSION

The study found that among the 667 students 94.9% is using different e-learning tools, techniques or platform for academic learning or any other learning purposes. Students were asked that weekly how many days you like to use e-learning as a learning mechanism. The outcome of this statement reveals that most of the students use e-learning at least one day in a week and 37.2% percent students are using e-learning every day in a week.

4.1. Reliability test

We have used Cronbach's alpha test to evaluate the reliability of the factors and to understand how far they are internally consistent. The outcome of the test can be seen from table 2 and it shows that the coefficients ranged from 0.667 to 0.519, indicating that factors are considered to be internally consistent. The values of all the factors are higher than 0.50 except for the factor-06 (Time and Cost friendly) which indicates there is a strong association and correlation among the factors used in the study.

Table 2: Reliability statistics

Factor's Name	Cronbach's Alpha	No of Items
Factor-01: Contents Structure	0.578	3
Factor-02: Usability	0.655	4
Factor-03: Faster Learning	0.589	3
Factor-04: Quick Responsiveness	0.595	2
Factor-05: Learning Quality	0.519	3
Factor-06: Time and Cost Friendly	0.370	3
Factor-07: Usability of the outside of the class	0.581	3
Factor-08: Appropriate for Working Independently	0.667	3

4.2. Factor analysis

An exploratory factor analysis has been performed to identify the underlying relationships among the variables which have been used to measure the effectiveness of e-learning in learning process of university students of Bangladesh.

Table 3: KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.860
Bartlett's Test of Sphericity	Approx. Chi-Square	2920.530
	df	276
	Sig.	0.000

The findings demonstrate that Bartlett's test of sphericity (with a value of $\chi^2 = 2920.530$, $df = 276$, $p < .001$) and Kaiser Meyer-Olkin statistic calculated as 0.860, which denotes that the data used for this research appropriate for factor analysis. To evaluate the factor dimensions, we have used principal component and varimax rotation. Principal component factors with eigen values of 1.0 or greater has been rotated by the varimax analysis. A total of 24 items from the factor analysis results in seven factor groupings and has explained 52.839% of the variance. The factors loadings are greater than 0.41 for all the factors which endorses that there is a good association between the items and the factor groupings to which they belong. The outcomes of the factor analysis are shown in table 04.

Table 4: Rotated component matrix^a

	Component						
	1	2	3	4	5	6	7
CS-1	0.612						
CS-2	0.642						
CS-3	0.581						
U-1	0.456						
U-2	0.411						
U-3						0.514	
U-4	0.595						
FL-1		0.712					
FL-2		0.701					
FL-3		0.554					
QR-1		0.302					
QR-2		0.571					
LQ-1		0.452					
LQ-2	0.358						0.526
LQ-3			0.564				
TCF-1			0.706				
TCF-2			0.684				

TCF-3			0.734
UOC-1	0.765		
UOC-2	0.686		
UOC-3	0.485		
AWI-1		0.563	
AWI-2		0.649	
AWI-3			0.828

The factors of the study include contents structure (factor 1), faster learning (factor 2), time and cost friendly (factor 3), usability of the outside of the class (factor 4), appropriate for working independently (factor 5), usability (factor 6) and learning quality (factor 7). The variance for contents structure 22.24%, faster learning 6.905%, time and cost friendly 5.528%, usability outside of the class 5.163%, appropriate for working independently 4.478%, usability 4.357%, learning quality 4.469%. The above table of exploratory factor analysis shows that all the factors used in the study are highly loaded except learning quality.

4.3. Descriptive statistics and hypotheses testing

The researchers developed eight hypotheses to measure the effectiveness of e-learning for the students at university level. The result shows that the degree of freedom is 653. The outcome of the test of hypotheses is presented in table 5.

Table 5: Test of hypothesis

	t	df	Mean	Sig. (2-tailed)
Contents Structure (CS)	26.79	653	3.70	0.000
Usability (U)	17.94	653	3.64	0.000
Faster learning (FT)	14.82	653	3.44	0.000
Quick Responsiveness (QR)	13.84	653	3.47	0.000
Learning Quality (LQ)	27.74	653	3.73	0.000
Time and Cost Friendly (TCF)	25.40	653	3.87	0.000
Usability of the outside of the class (UOC)	25.87	653	3.73	0.000
Appropriate for Working Independently (AWI)	21.92	653	4.68	0.000

The above table shows that for one sample t-test at 5% significant level and at 95% confidence level the p-value [Sig. (2-tailed)] for content structure (CS) is .000 ($p < .05$) which supports the hypothesis H_{A1} and approves the content structure of e-learning is worthy to add value to the learning of the students. The p value for usability (U) is smaller than .05 which approves that e-learning is usable for the purpose of active learning. Hypothesis H_{A3} has also been proved because the p value for faster learning (FT) is below than .05 which supports that the e-learning is effective for faster learning. For the variable quick responsiveness (QR) p value is less than .05 which supports the hypothesis H_{A4} (e-learning is effective to get quick response). The outcome of t-test for learning quality (LQ) is $p < .05$ and the H_{A5} has been proved which supports that the quality of e-learning is good. The p values for the variable time and cost friendly (TCF) is smaller than .05 which proved H_{A6} and supports that e-learning is time and cost friendly. The p value for the outside of the class (UOC) is $p < .05$ which approved the hypothesis H_{A7} that e-learning is applicable outside the class room. Hypothesis H_{A8} has been proved by the outcome of p value which is lower than .05 and it supports that e-learning is appropriate to work independently (AWI). So, the hypotheses are statistically proved by not accepting the null hypothesis because the p values of the variables are far below from .05. The study shows that the mean of all the factors almost near to 4 which indicates most of the students agreed with the statement.

The outcome of the study reveals that almost 95% students are engaged with e-learning and they are aware of it. In overwhelming rate students are using different kinds of e-learning, tools, techniques and platform for the purposes of learning. Almost 94.8% of the students are using e-learning at least

once in a week. There are eight hypotheses developed in the study and all of them are significantly accepted that indicates that e-learning is highly effective for the students. The outcome of the study discloses that the content structure of e-learning is worthy to add value to the learning of the students, it is usable, time and cost friendly, faster and applicable in the learning process. Except the variable learning quality, all the items in each factor are highly loaded which indicates that e-learning is effective.

5. CONCLUSION

The study reveals that e-learning is effective for university students without regard to their background. But learning effectiveness may vary from students to students. The study highlights some variables to consider the effectiveness of e-learning. The existence of some variables virtually appear that e-learning is beneficial to some students and only for those variables e-learning may not be equally beneficial to others. The study considers some limited number of variables. Further research may be continued by covering a wide range of variables. The outcome of the study shows that students support e-learning is less time consuming, easy to use and cost friendly. It didn't show the extent to which e-learning is time and cost friendly. Another important issue is that the self-efficacy of students is also very important to get privileges from e-learning. The students having good knowledge about technology are abler to capture the benefits than those who don't have. But this paper did not consider this issue. More research can be conducted to analyse the impact of student's ability and their perception on the effectiveness use of e-learning.

6. LIMITATIONS

Though the researchers collected data from the students of different universities in Bangladesh, most of the universities are located in Dhaka City. Among the respondents, most of the students are from business background. The study didn't express the extent to which e-learning is effective for students. Furthermore, in this study researcher did not cover the learner's attitude, perception and motivation to determine the effectiveness of e-learning.

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Appendix

Total variance explained

Component	Initial Eigen values			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.338	22.240	22.240	5.338	22.240	22.240	2.535	10.565	10.565
2	1.657	6.905	29.145	1.657	6.905	29.145	2.354	9.807	20.372
3	1.327	5.528	34.672	1.327	5.528	34.672	2.054	8.560	28.931
4	1.239	5.163	39.836	1.239	5.163	39.836	1.771	7.381	36.312
5	1.075	4.478	44.314	1.075	4.478	44.314	1.617	6.738	43.050
6	1.046	4.357	48.671	1.046	4.357	48.671	1.228	5.115	48.165
7	1.000	4.169	52.839	1.000	4.169	52.839	1.122	4.674	52.839
8	0.945	3.936	56.775						
9	0.917	3.820	60.595						
10	0.907	3.777	64.372						
11	0.795	3.311	67.683						
12	0.784	3.265	70.948						
13	0.773	3.220	74.168						
14	0.752	3.135	77.303						
15	0.695	2.896	80.199						
16	0.632	2.633	82.832						
17	0.606	2.523	85.355						
18	0.576	2.401	87.756						
19	0.566	2.357	90.113						
20	0.536	2.232	92.345						
21	0.501	2.088	94.434						
22	0.484	2.016	96.450						
23	0.431	1.797	98.247						
24	0.421	1.753	100.000						

Extraction Method: Principal Component Analysis.