

To Ascertain Factors of Learning Objectives Facilitating Quality Education Factor Analysis and Modelling the Relationship Among the Factors by Regression Model

Sheetal Aditya^{1*} and Neha Singh²

¹Department of Management, Shri Jagdishprasad Jhabarmal Tibrewala University, Rajasthan, India

²Department of Management, Dr. Rammanohar Lohia Avadh University, Uttar Pradesh, India

*Corresponding author: sheetal.adityas@gmail.com

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ABSTRACT

The relationship between learning objective of online learning acquired by students and learning outcome achieved by them is studied through understanding the association 24 factors in learning benefits and learning satisfaction. Learning objective under the research were assumptions or statements which are expected to be achieved by a student or learner at the end of a course or unit or qualification. They can be consequences a student or learner must know, evaluate and be able to exhibit after completion of a process of learning. Association of factors were studied through Exploratory Factor Analysis with principal component with 173 respondents of students with Kaiser-Meyer-Olkin Measure of Sampling Adequacy value of 0.932 and Bartlett's Test of Sphericity giving 0.00 sig. value. The Cronbach's alpha is 0.995, which indicates a high level of internal consistency in the variable of study to understand online learning among students. After the rotation and extraction of fixed 3 factor component, given by scree plot and Varimax with Kaiser Normalization, F1 factors are derived comprising of 12 factors. These 12 factors were studied through linear regression model assuming these 12 factors as independent variable on dependent variable significant benefit in online learning. The model summary gave the values of R = 0.665, R Square = 0.443 and Adjusted R Square = 0.401 with ANNOVA significant value = 0.00. With the backward regression applied of range of 0.05 to 0.51, there were 8 excluded factors.

The regression equation can be predicated as follows:-

Y (Significant benefit in online learning) = a (Constant) + b_1 (Coefficient of Better Learning retention) × 1 (Better Learning retention) + b_2 (Coefficient of Cost effective score) × 2 (Cost effective score) + b_3 (Coefficient of Helps to increase interest) × 3 (Helps to increase interest) + b_4 (Coefficient of Learning on own's pace) × 4 (Learning on own's pace) + b_5 (Coefficient of Mobility and ease of use of online learning tools) × 5 (Mobility and ease of use of online learning tools).

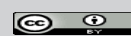
Keywords: Online learning benefits, Online learning, Linear Regression Model, Exploratory Factor Analysis, learning objective

The demand of creative and Innovative pedagogical approach in today's pandemic has increased greatly. The teaching and learning process is embracing several innovations like use of technology through blended learning (combination of face-to-face and online teaching and learning). Online learning which has been a component of Open and Distance learning (ODL) institution is now getting weight age among most conventional higher education providers as

well as among students. Advancement and creation in Information communication technology as well as in Instructional Design method have given

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result in designing of e-learning platforms that can be used to present or effective deliver learning content with recent and enhanced opportunities for student engagement, interaction and learning (Ituma 2011). (Paetcher 2010) Proposed that such frameworks must have at least five segments for designing an e-learning course including: (1) course design, learning materials and electronic course environment; (2) communication among between stake holder; (3) communication between student peers; (4) Personal learning framework; and (5) course outcomes result. Studies have shown that students’ online experience can be academically challenge.ng (Dobbs 2009) (Wyatt 2005).

The programmes offered by any education provider must be evaluated in order to ensure the effectiveness of the programme in achieving its objectives like learning objective, learning satisfaction and learning benefits. During such flow one largest obstacle is about how the stakeholders can successfully adopt the usage of technology and ensuring participants’ contribution given the each learner nature and encounters with advancement of technology (Hofmann, 2014). The notion of using innovation and technology along with blended learning, need inclusive with reinforcement of factors of learning objective along with learning satisfaction and learning benefit. The study focuses on understanding the factors achieving learning objective along with learning satisfaction and learning benefits.

Today’s modification in Education can become transformative when stakeholder i.e., Teachers and students synthesize and synergise information across subjects and experiences, critically weigh significantly different perspectives, and incorporate various inquiries. Educators and felicitator are able to construct opportunities by applying critical learning spaces, in which students are encouraged to enhance their capacities of creative analysis, imagination, and critical synthesis, creative expression of thoughts, self-awareness, and intentionality.

Objectives of the study

To study the learning benefits and satisfaction acquired in online learning among undergraduate students facilitating quality education.

Hypothesis of the study:-

- ❑ H0: There is no significant learning and satisfaction benefits acquired in online learning among undergraduate students
- ❑ Ha - There is a significant learning benefits and satisfaction acquired in online learning among undergraduate students

Review of Literature

Sl. No.	Title of research article with author name	Summary	Key words
1	The impact of online interaction on student learning outcome Chou (Chou, Peng, & Chang, 2010)	Has defined active interaction in online learning activities including the types of interaction: the learner –self learner, among different learner- learner, interaction between learner - instructor, exchange among learner -content, and learner interface. The results of their study showed that students with better results and need less time learning when interacting more with the system	Online learning activities, learning analytics, blended learning
2	Factors of learner instructor interaction which predict perceived learning outcomes in online learning environment Kang and colleagues (Kang & Im, 2013)	The interactive activities between teachers and students have a great impact on various learning outcomes process of students while implementing number of learning modes such as various learning assistance, & others social intimacy, interaction & other instructional Q & A, teachers presence.	Student - teacher interaction, traditional teaching, blended learning environment
3	A Study on teachers’ perceptions of and their satisfaction with interaction type in blended learning environments by Brian R. Schroder, Andrew E.	Walker and Belland, Kerstin E. Blended learning is an approach that combines technology based learning. With face-to-face interactions, Within their article, the blended learning model approach.	Blended learning, technology based learning
4	Factors that influence students’ decision to drop-out of online courses (Willging & Johnson, 2009)	Research shows that absence of learner interaction causes failure and eventual drop-out in online courses and the lack of learner connectedness was noted as an another internal factor leads to different learner drop-out in various online Program. It was found that learners may not continue in e-learning and blended learning if they fail to make friends thereby being disconnected and enhancing feelings of separation during the process of blended learning.	Feelings of isolation, blended learning experiences, learner interaction

5	The Effect of Using Blended Learning on the Achievement of Students and Information Retention of Fifth Graders in the Biology Course Maccoun, Hussein Salem (2016).	Paper aimed to find the effect of using the blended learning in students' achievement and information preservation for the fifth graders in the biology course. The results showcase the superiority of the experimental group to the control group in the achievement test and information retention.	Students' achievement, Information preservation, Information retention
6	The Effect of Using Blended Learning in Teaching English Language on the Direct and Delayed Achievement among the Sixth Graders. Al-Rimawi, Firas Tharwat (2014).	Author aimed to focus the effect of blended learning on the direct and delayed achievement of the sixth graders in the English language course and to achieve the objectives of the study and the quasi experimental approach was adopted. The study also showed the presence and achievement of statistically relevant significant differs among the means of the direct & delayed purpose and achievement for the group of the experimental team.	Blended learning, Direct and Delayed achievement.
7	Critical thinking, cognitive presence, and computer conferencing in distance education. Garrison, D. R., Anderson, T. & Archer, W. (2009).	The researcher motivating empirical results related to various attempt to create an efficient and most reliable source of instrument to pass the features & quality of critical outcome and related thinking in a text-based educational context. The authors suggest that cognitive presence (i.e., critical, practical inquiry) can be created and supported in a computer-conference environment with appropriate teaching and social presence	Reliable instrument, cognitive presence
8	Online education: Best practices to promote learning. Finch, D. & Jacobs, K. (2012).	Qualitative method was used to collect the relevant responses. This paper discusses best practices & evidence literature related to online education. Big Level of quality educational experiences in human related factors & ergonomics (HFE) are of interest to the global ergonomics community in reference to promote the development of the high profession, enhance the related skill set of HFE followers, and facilitate the translation of knowledge into practice.	Online education, global ergonomics community, human factors and ergonomics

9	The Impact of Blended Learning on Student Outcomes: is there room on the horse for two? J. Mitchell O'Toole & Douglas J. Absalom	The research exists regarding the impact of ICT on the achievement of student outcomes in specific undergraduate courses, particularly how student utilization of varying modes within blended provision relates to their achievement of course outcomes. The study shows that ICT access formats by themselves are of limited benefit in achieving course outcomes. The study also provides some insight into the complexities of the blending flow in attempting to incorporate new advance technology into recent teaching scenario, and trying to identify more practical path to accept in advancing the process of technological teaching.	ICT, Blended Learning process, practical directions, technological teaching.
10	Online education and its effective practice: A research review. Sun, A. & Chen, X. (2016).	Qualitative content analysis approach was used in assessments of online learning environment. The paper shows actual recommendation for those who are thinking to develop online available courses so that they can come across informed decisions in the implementation. Based on the authors findings, the authors portrayed that effective online learning instruction is dependent upon (a) very well-developed designed course content, motivated talk between the instructor and learners, another fully learned and fully-supported order and instructors; (b) making and creating of a sense of online learning community; and (c) great move in development technology.	Online education process, online teaching frame work, online learning community and group, asynchronous learning, cognitive presence and attainment, social presence and achievement, teaching presence, online higher education institution.

Research Methodology

Primary Data Sources: Questionnaire devised for students among Management, Information Technology and Commerce Students under graduation level from different colleges.

SPSS Software used for testing Linear Regression Model

Descriptive Statistics

- The mean, mode, median and range
- Variance and standard deviation
- Frequencies
- Cross tabs

Reliability analysis using Cronbach's Alpha

Secondary Data Sources: Research papers, Journals, Reports, weblibliography links

Sampling: Purposive Sampling Method

Sample: 174 respondents

Data Interpretation and Data Analysis

1. Understanding devices used for online learning by students across Commerce, Management, Mass Media and IT/CS

Devices used for online learning						
Count	Devices used for online learning					Total
	Cell or digital phone	Personal desktop computer	Personal Laptop computer	Smart phone		
Stream of study	Commerce	2	1	4	44	51
	IT/CS	0	1	0	0	1
	Management	0	2	5	37	44
	Mass Media	5	3	11	59	78
Total	7	7	20	140	174	

Devices Used for Online learning					
	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Cell or digital phone	7	4.0	4.0	4.0
	Personal desktop computer	7	4.0	4.0	8.0
	Personal Laptop computer	20	11.5	11.5	19.5
	Smart phone	140	80.5	80.5	100.0
Total	174	100.0	100.0		

Interpretation: 80.5 % of students use smart phones as device for online learning

2. To understand Skill level of students under various streams of study

Skill Level of students under Email usage						
Count	Email					
	Do not use	Skilled	Unskilled	Very Skilled	Total	
Stream of study	Commerce	10	29	7	5	51
	IT/CS	0	0	0	1	1
	Management	5	29	3	7	44
	Mass Media	3	60	5	10	78
Total	18	118	15	23	174	

Skill Level of students under Web surfing						
Count	Web surfing					
	Do not use	Skilled	Un-skilled	Very Skilled	Total	
Stream of study	Commerce	5	31	10	5	51
	IT/CS	0	0	0	1	1
	Management	7	20	6	11	44
	Mass Media	4	48	12	14	78
Total	16	99	28	31	174	

Skill Level of students under Word Processing, Power point Presentation, Excel						
Count	Word Processing, Power point Presentation, Excel					
	Do not use	Skilled	Un-skilled	Very Skilled	Total	
Stream of study	Commerce	14	26	8	3	51
	IT/CS	0	1	0	0	1
	Management	5	26	3	10	44
	Mass Media	6	47	18	7	78
Total	25	100	29	20	174	

Interpretation

The students of skilled with usage of Email, Web surfing for information and Word Processing, Power point Presentation, Excel and it implies students rely on this tools for learning.

Reliability of Data using Cronbach's Alpha

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.891	.892	6

Item Statistics			
	Mean	Std. Deviation	N
Learning on own's pace	3.95	.961	174
Helps to increase interest	3.48	1.068	174
Mobility and ease of use of online learning tools	3.69	.971	174
Cost effective	3.90	.941	174
Better Learning retention	3.69	.971	174
Significant benefit in online learning	4.10	.795	174

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
22.82	21.238	4.608	6

Interpretation

Cronbach’s alpha is the common measure of internal consistency (“reliability”) as Cronbach’s alpha is 0.891, which indicates a high level of internal consistency in the variable of study to understand online learning benefits among students.

Linear Regression Analysis

Variables:-

Dependent Variable: Significant benefit in online learning

Independent Variables

- (a) Learning on own’s pace
- (b) Helps to increase interest
- (c) Mobility and ease of use of online learning tools
- (d) Cost effective
- (e) Better Learning retention

Output under SPSS

Descriptive Statistics			
	Mean	Std. Deviation	N
Learning on own’s pace	3.95	.961	174
Helps to increase interest	3.48	1.068	174
Mobility and ease of use of online learning tools	3.69	.971	174
Cost effective	3.90	.941	174
Better Learning retention	3.69	.971	174
Significant benefit in online learning	4.10	.795	174

Correlations

	Learning on own’s pace	Helps to increase interest	Mobility and ease of use of online learning tools	Cost effective	Better Learning retention	Significant benefit in online learning
Learning on own’s pace	1	.568**	.666**	.513**	.641**	.846**
	Pearson Correlation					
	Sig. (2-tailed)	.000	.000	.000	.000	.000
	N	174	174	174	174	174

Helps to increase interest	Pearson Correlation	.568**	1	.685**	.490**	.596**	.448**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	174	174	174	174	174	174
Mobility and ease of use of online learning tools	Pearson Correlation	.666**	.685**	1	.567**	.681**	.541**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	174	174	174	174	174	174
Cost effective	Pearson Correlation	.513**	.490**	.567**	1	.542**	.438**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	174	174	174	174	174	174
Better Learning retention	Pearson Correlation	.641**	.596**	.681**	.542**	1	.474**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	174	174	174	174	174	174
Significant benefit in online learning	Pearson Correlation	.846**	.448**	.541**	.438**	.474**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	174	174	174	174	174	174

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

Variables Entered/Removed ^a			
Model	Variables Entered	Variables Removed	Method
1	Better Learning retention, Cost effective, Helps to increase interest , Learning on own’s pace, Mobility and ease of use of online learning tools ^b		Enter

a. Dependent Variable: Significant benefit in online learning

b. All requested variables entered.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.852 ^a	.725	.717	.423

a. Predictors: (Constant), Better Learning retention, Cost effective, Helps to increase interest, Learning on own’s pace, Mobility and ease of use of online learning tools

ANOVA ^a						
Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	79.323	5	15.865	88.796	.000 ^b
	Residual	30.016	168	.179		
	Total	109.339	173			

a. Dependent Variable: Significant benefit in online learning
 b. Predictors: (Constant), Better Learning retention, Cost effective, Helps to increase interest, Learning on own's pace, Mobility and ease of use of online learning tools

Backward Regression Output

Variables Entered/Removed ^a			
Model	Variables Entered	Variables Removed	Method
1	Better Learning retention, Cost effective, Helps to increase interest, Learning on own's pace, Mobility and ease of use of online learning tools ^b	.	Enter
2	.	Mobility and ease of use of online learning tools	Backward (criterion: Probability of F-to-remove >= .100).
3	.	Helps to increase interest	Backward (criterion: Probability of F-to-remove >= .100).
4	.	Cost effective	Backward (criterion: Probability of F-to-remove >= .100).

a. Dependent Variable: Significant benefit in online learning
 b. All requested variables entered.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.852 ^a	.725	.717	.423
2	.852 ^b	.725	.719	.421
3	.852 ^c	.725	.720	.420
4	.851 ^d	.724	.721	.420

a. Predictors: (Constant), Better Learning retention, Cost effective, Helps to increase interest, Learning on own's pace, Mobility and ease of use of online learning tools
 b. Predictors: (Constant), Better Learning retention, Cost effective, Helps to increase interest, Learning on own's pace
 c. Predictors: (Constant), Better Learning retention, Cost effective, Learning on own's pace
 d. Predictors: (Constant), Better Learning retention, Learning on own's pace

ANOVA ^a						
Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	79.323	5	15.865	88.796	.000 ^b
	Residual	30.016	168	.179		
	Total	109.339	173			
2	Regression	79.316	4	19.829	111.618	.000 ^c
	Residual	30.023	169	.178		
	Total	109.339	173			
3	Regression	79.294	3	26.431	149.553	.000 ^d
	Residual	30.045	170	.177		
	Total	109.339	173			
4	Regression	79.157	2	39.579	224.240	.000 ^e
	Residual	30.182	171	.177		
	Total	109.339	173			

a. Dependent Variable: Significant benefit in online learning
 b. Predictors: (Constant), Better Learning retention, Cost effective, Helps to increase interest, Learning on own's pace, Mobility and ease of use of online learning tools
 c. Predictors: (Constant), Better Learning retention, Cost effective, Helps to increase interest, Learning on own's pace
 d. Predictors: (Constant), Better Learning retention, Cost effective, Learning on own's pace
 e. Predictors: (Constant), Better Learning retention, Learning on own's pace

Coefficients ^a					
Model		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
1	(Constant)	1.382	.158	8.721	.000
	Learning on own's pace	.754	.049	.911	15.505
	Helps to increase interest	-.017	.043	-.023	-.402
	Mobility and ease of use of online learning tools	.011	.055	.014	.202
2	Cost effective	.038	.044	.045	.869
	Better Learning retention	-.106	.050	-.130	-2.136
	(Constant)	1.384	.158	8.772	.000
	Learning on own's pace	.756	.047	.914	16.266
2	Helps to increase interest	-.014	.040	-.019	-.353
	Cost effective	.040	.043	.047	.927
2	Better Learning retention	-.104	.048	-.127	-2.172
					.031

	(Constant)	1.381	.157		8.788	.000
3	Learning on own's pace	.752	.045	.909	16.769	.000
	Cost effective	.037	.042	.044	.879	.381
	Better Learning retention	-.109	.045	-.133	-2.399	.018
	(Constant)	1.437	.144		10.004	.000
4	Learning on own's pace	.762	.043	.921	17.593	.000
	Better Learning retention	-.096	.043	-.117	-2.236	.027

a. Dependent Variable: Significant benefit in online learning

Interpretation

(a) H0: There is no significant learning and satisfaction benefits acquired in online learning among undergraduate students using factors such as Learning on own's pace, Helps to increase interest, Mobility and ease of use of online learning tools, Cost effective and Better Learning retention, as the score in ANNOVA is less than 0.05 we reject the null hypothesis.

(b) Initially in the model all the variables were entered with the Dependent variable i.e. Significant benefit in online learning i.e. Learning on own's pace, Helps to increase interest, Mobility and ease of use of online learning tools, Cost effective and Better Learning retention.

(c) With the backward regression applied of range of 0.05 to 0.51, the first excluded variable was Mobility and ease of use of online learning tools then in the second excluded variable along with Helps to increase interest and third excluded variable was Cost effective.

(d) Correlation tables gives the values.

Correlation

		Learning on own's pace	Helps to increase interest	Mobility and ease of use of online learning tools	Cost effective	Better Learning retention	Sig. benefit in online learning
Sig. benefit in online learning	Pearson Correlation	0846**	.448*	.541**	.438*	.474**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	174	174	174	174	174	174

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

So, it can be derived that impact on Significant benefit in online learning by Learning on own's pace is 0.846, Helps to increase interest 0.448, Mobility and ease of use of online learning tools is 0.541, Cost effective is 0.438 and Better Learning retention 0.474.

(e) As the sigma value in Annova table is less than 0.05 we can reject the null hypothesis and test it further

(f) The adjusted R value

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.852 ^a	.725	.717	.423
2	.852 ^b	.725	.719	.421
3	.852 ^c	.725	.720	.420
4	.851 ^d	.724	.721	.420

a. Predictors: (Constant), Better Learning retention, Cost effective, Helps to increase interest, Learning on own's pace, Mobility and ease of use of online learning tools

b. Predictors: (Constant), Better Learning retention, Cost effective, Helps to increase interest, Learning on own's pace

c. Predictors: (Constant), Better Learning retention, Cost effective, Learning on own's pace

d. Predictors: (Constant), Better Learning retention, Learning on own's pace

The adjusted R value is close to 0.8 that is 0.721 so linear regression model can be used for predication with the least square method.

Y (Significant benefit in online learning) = a (Constant) + b1 (Coefficient of Better Learning retention) x1 (Better Learning retention) + b2 (Coefficient of Cost effective score) x2 (Cost effective score) + b3 (Coefficient of Helps to increase interest) x3 (Helps to increase interest) +b4 (Coefficient of Learning on own's pace) x4 (Learning on own's pace) + b5 (Coefficient of Mobility and ease of use of online learning tools) x5 (Mobility and ease of use of online learning tools)

But in Backward method Mobility and ease of use of online learning tools, Helps to increase interest and Cost effective was removed so the equation becomes:-

Y (Significant benefit in online learning) = a (Constant) + b1 Coefficient of Better Learning retention) x1 (Better Learning retention) + b4 (Coefficient of Learning on own's pace) x4 (Learning on own's pace)

The regression equation can be predicated as follows:-

4 (Constant)	1.437	.144		10.004	.000
Learning on own's pace	.762	.043	.921	17.593	.000
Better Learning retention	-.096	.043	-.117	-2.236	.027

a. Dependent variable: Significant benefit in online learning.

Y (Significant benefit in online learning) = a (Constant) + b1 Coefficient of Better Learning retention) x1 (Better Learning retention) + b4 (Coefficient of Learning on own's pace) x4 (Learning on own's pace)

Y (Significant benefit in online learning) = a (Constant)+ b1Coefficient of Better Learning retention) x1 (Better Learning retention) + b4 (Coefficient of Learning on own's pace) x4 (Learning on own's pace)

Y (Significant benefit in online learning) = 1.437 + 0.762 x1 (Better Learning retention) – 0.96 x4 (Learning on own's pace)

Recommendations and Suggestions

- ❑ Through the statistical analysis it is evident that online learning has gained immense importance in education system by its acceptance by students and teachers as well.
- ❑ There are various multifaceted online learning mediums available according to learning pattern, teaching pattern, students' ability etc.
- ❑ Online learning mediums which would radically change the traditional pedagogy for prospective future technological change happening
- ❑ Students would benefit immensely with the integration of online learning as it would help them learn and grasp effectively
- ❑ Challenges of traditional pedagogy can be minimized or reduced
- ❑ Under the various available online learning mediums for students according to Factor Analysis explains that an online learning medium becomes relevant for students if factors of Quality learning, learning retention, Better Communication and Understanding of concepts are focused on.

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