EFFECTIVENESS OF LEARNING PROCESS USING "WEB TECHNOLOGY" IN THE DISTANCE LEARNING SYSTEM

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ABSTRACT

Web is a globally distributed, still highly personalized media for cost-effective delivery of multimedia information and services. Web is expected to have a strong impact on almost every aspect of how we learn. 'Total Quality' is the totality of features, as perceived by the customers of the product or service.

Totality of features includes stated as well as implied needs and expectations of all types of customers. No quality improvement is possible without its unambiguous measurement. But, 'Total Quality' of the learning experience in 'Open and Distance Education System' cannot be measured unless it is expressed in measurable clear terms which include complete spectrum of student support and educational services.

A model for 'Total Quality' of an open and distance education system was used to measure impact of the "Web Technology" on the 'Total Quality' of the learning experience in 'Open and Distance Education System'. Evidence indicates that application of the proposed model for 'Total Quality' and 'Web Technology' can simultaneously optimize quality, access and cost. Thus, a better learning experience can be provided even in open and distance education system, which can be comparable with the best.

This study found that it was difficult for the subjects to decide the clear cut superiority regarding the effectiveness of 'Traditional Classroom' or 'Virtual Classroom'.

Keywords: **Open education, distance education, online education, e-learning, total quality management, quality feedback**

INTRODUCTION

Impact of any new technology cannot be fully explored unless whole system is totally redesigned to exploit all its benefits. New design requires full understanding of all quality parameters and their relative importance in formulating the perception about total quality, by each type of customer.

This research hopes to provide this insight for the designers and developers of "Open and Distance Learning System". 'Total Quality' is the totality of features, as perceived by the customers, of the product or service. Totality of features includes stated as well as implied needs and expectations of all types of customers.

No quality improvement is possible without its unambiguous measurement. But, 'Total Quality' of the learning experience in 'Open and Distance Education System' cannot be measured unless it is expressed in measurable clear terms which include complete spectrum of student support and educational services.

A model for 'Total Quality' of an open and distance education system was used, which allows this clear measurement of 'Total Quality' and improvement in it, if needed.

It also provides clear guidelines for how to use and integrate various components of web technology to improve 'Total Quality' of the learning experience in 'Open and Distance Education System'.

"Open and Distance Learning System" is normally considered and perceived as a cheap and low quality alternative to the conventional educational system. Rich multimedia capability, easy interaction possibilities and distributed access of web technology may have potential to revert this perception.

This research may help developers to explore appropriate systems and procedures, for world class, highly flexible and cost effective, virtual "Open and Distance Learning System" of the future. But, "Total Quality" is very subjective term and its perception will change for everyone. Hence, the only way it can be measured is to ask multiple number of respondents about their perception of "Total Quality" and then measure the "Total Quality' as a perception of the total group after statistical analysis of the data. Evidence indicates that application of the proposed model for 'Total Quality' and 'Web Technology' can simultaneously optimize quality, access and cost.

Thus, a better learning experience can be provided even in open and distance education system, which may be comparable with the best.

REVIEW OF LITERATURE

Internet will impact every aspect of how we learn and how we communicate. Quality and efficiency of academic and administrative services will be significantly better when compared with present status. (Killedar M., 2001). The flexibility is such that teaching and learning can take place at any time and place convenient to both course instructors and participants. Online learning and teaching are definitely the future direction (Cheng & Myles, 2003).

Open and distance learning (ODL) gives learners control of the time, place, and pace of learning, often being characterized as 'Flexible Learning'. However, this flexibility goes hand□in□hand with procrastination and non-completion. (Tattersall, Waterink, Höppener, & Koper, 2006). The study shows equivalent learning activities can be equally effective for online and face-to-face learners (Neuhauser, 2002).

The results of this study suggests that students can learn equally well in either delivery format, regardless of learning style, provided the course is developed around adult learning theory and sound instructional guidelines (Aragon, Johnson, & Shaik, 2002).

This study conducted two experiments to assess effectiveness of interactive e-learning. Students in a fully interactive multimedia-based e-learning environment achieved better performance and higher levels of satisfaction than those in a traditional classroom and those in a less interactive e-learning environment (Zhang D., 2005).

Managing education effectively is all about optimizing tensions between three vectors of the 'Eternal Triangle of Education' so that all three aspects that is, access, quality and cost, are improved simultaneously. About this basic challenge of education one uncomfortable fact is clear. Conventional methods of teaching and learning cannot produce the changes required.

If we put more students in each class, access may go up, cost may go down, but quality will deteriorate. Conventional ways of improving quality tend to reduce access and raise costs. The challenge is clear. The question is, can technology simultaneously increase access, improve quality and lower cost? The evidence shows that it can simultaneously optimize all three parameters (Daniel J. , 13 Nov 2003).

TQM is systematic way of guaranteeing that all activities within an organization happen as planned. It is the management attitude that concerns with preventing problems at source, rather than allowing problems to occur and then correcting them afterwards. The essence of TQM is the simple but extremely powerful belief that it is better and hence cheaper, to do every process right at first time, rather than not to do it right and then correct it afterwards.

Doing things right at first time requires no money. Doing things wrong is what only costs money. Thus, longer it takes to identify problem, more will be the cost incurred to correct it (Eriksen, 1995) (Killedar M., 2007).

'Any Where, Any Time' access to formative feedback about Self-Study, allows the distance learner to concentrate his Self-Study precisely on those content areas where his/her understanding is weak. Immediate recognition of Self-Study achievements of a distance learner in comparison with other fellow students is a strong motivation for further Self-Study. (Killedar M., 2002).

RESEARCH DESIGN

Aim

The main aim of the study was to measure the extent to which Web technology has influenced quality of education and student support services through 'Open and Distant Learning System (ODLS)'.

Scope and Limitations of the Problem

This research focused on "Open and Distance Learning System" of India, with the specific example of electronics and mechanical engineering programmes, offered by the School of Science and Technology, Yashwantrao Chavan Maharashtra Open University (YCMOU), India.

Hypothesis

Assuming that the other factors are kept constant, it is hypothesized that;

- **Virtual classroom is significantly more effective, in learning process, than traditional classroom.**

Sample of the Study

Sample selection was not a difficult task because the study is restricted to electronics and mechanical engineering programmes of the "Yashwantrao Chavan Maharashtra Open University Nashik". Complete admission data was available with the researcher.

During July–December 2004, total 2532 students were enrolled for the first batch, which includes 2305 male students and 227 female students. But, 2156 students (about 85.15% of total enrolled students) were from only 4 major urban and industrialized regions of the Maharashtra state.

Both of these academic programmes were technology programmes and thus, it is natural that they attract maximum student enrolment in urban regions having good number of industries. This assumption was strongly supported by the fact that total 85.12 % enrolment was just in 4 regions, that is, Mumbai, Nagpur, Nashik and Pune.

All these regions are mostly urban having much higher number of industries. Hence, researcher decided to use "Purposive Sampling" of only these 4 regions (that is, Mumbai, Nagpur, Nashik and Pune), which are mostly urban with large number of industries as fairly representative samples for the target student population for these academic programmes.

Hence, all students and counselors from all study centers from only these 4 regions were invited for providing their feedback about quality, during the face-to-face contact sessions. But, only 287 male students (about 12.45% of the total 2305 male students during 2004) and 58 female students (about 25.55% of the total 227 female students during 2004), 49 (18.99 % of total 258 Counselors during 2004) counselors, 21 distance education experts provided their feedback willingly. Thus, the total effective sample comprised of those 415 subjects only.

Questionnaire Design

It was decided to prepare a questionnaire following the guidelines given by Likert (1932). Considering variables under study, a scale was constructed and standardized by using psychometric techniques such as item analysis, reliability etc., and it was administered on the sample of the study.

The researcher was very careful to phrase questions clearly and unambiguously so that respondent is in no doubt which answer to give. Researcher purposefully decides to use a four-point scale; which is a forced-choice method where the middle option of "Neither agree nor disagree" or "Undecided" is not available, and thus minimizes central tendency bias.

The researcher has carefully organized items in the questionnaire, in an unpredictable mixture of positive and negative statements about the attitude object, so that acquiescence bias is minimized.

Relationships of total 60 items with the major factors were examined and their relevance with the objectives of study was verified. It was found that 48 items best fitted with the 10 major quality factors, and 12 items though were very well related to the aim and objectives of study, it was difficult to categorize them because these statements could be fitted into more than 1 factor but because they were having high relevance they were retained in the scale.

Analysis of these 12 items was done separately; whereas 48 items were used for determining the reliability of the scale. Split half reliability of the scale was 0.81. Since, no other scales was available, validity could not be determined. So the 48 items were given to 5 judges who were experts in this field and considering their opinion the face validity of the scale was finalized, it was 0.69.

Both the reliability and validity are high so the scale could be used for collecting the data. In the final form of the scale there were 60 items and each item was provided with 4 point scale, ranging from strongly agrees to strongly disagree.

Procedure of Data Collection

For collecting the data, the scale was transmitted in print form during face-to-face contact sessions with all the students and counselors from all study centers from only 4 major geographic regions of the state of Maharashtra, where about 85.15 % students were enrolled. Along with the instructions the subjects were provided with one or two examples of how to put a tick mark on the answer they have selected after clarifying their doubts, if any. Sufficient time was given to the respondent for responding to of the scale.

Variables under Study

The four variables namely male students, female students, counselors, and distant education experts were associated with the respondent's category, where as the factors which were treated as the dependent variables were as follows:

1. **Effectiveness in learning process,**
2. **Economy regarding time and money,**
3. **Usefulness in understanding,**
4. **Acquisition of more knowledge,**
5. **Organized approaches,**
6. **Easy access to communication,**
7. **Objectivity, quality and standard,**
8. **Effective examination system,**
9. **Human appeal and**
10. **Attractiveness and interesting.**

In addition to these there were 12 items which were treated independently for the simple reason that they were related to more than one factor. Analysis of first dependent quality parameter, that is, 'effectiveness in learning process' is the topic for this research paper.

Research Design

A multifactor survey process was used in which between the groups research design was employed. In fact, in one way, this is a kind of attitude survey in which both students and other authorities are involved.

Statistical Treatment of Data

Those statements which were treated independently were treated by frequency counts, percentages, and Chi Square Test of significance. But when each dependent factor of scale was treated then parametric statistical technique was used.

Means and standard deviations were computed, One Way Analysis of Variance was used, and finally Duncan's New Multiple Range Test was employed.

ANALYSIS AND INTERPRETATION OF DATA

The study was designed to examine the impact of web technology on total quality of educational and students services in open and distance education system. In such topics it is necessary to have a reference point and in present study, the reference point was conventional educational system.

During the last decades through web technology it is possible to impart knowledge and education. It is believed that the total quality could be better through web technology in education system.

The questionnaire was framed to assess the impact of web technology on the basis of ten different quality factors. The assumption was web technology is significantly more effective than the traditional classroom teaching.

If the hypothesis is to be retained then all the four groups must agree with the statements associated with these ten quality factors.

Mean and standard deviation obtained by the four groups on these ten quality factors are given in the table 1. Means and standard deviations, obtained between the four independent groups on the ten different quality factors, showed that on a good number of factors four independent groups does not show sufficient agreement.

Table: 1
Showing means and standard deviations obtained by the four independent groups on ten different factors

		Male Students	Female Students	Counselors	Distant Education Experts
Effectiveness	$\bar{X}$ s	**15.22** **1.98**	**14.34** **1.50**	**16.27** **1.56**	**14.90** **1.55**
Economy	$\bar{X}$ s	**14.71** **1.77**	**14.12** **1.50**	**15.61** **1.71**	**16.00** **1.52**
Useful in Understanding	$\bar{X}$ s	**15.85** **1.49**	**16.28** **1.25**	**16.63** **1.22**	**15.95** **1.20**
Acquisition of More Knowledge	$\bar{X}$ s	**20.17** **2.96**	**19.50** **2.66**	**20.94** **2.73**	**17.62** **3.54**
Organized Approaches	$\bar{X}$ s	**4.62** **1.43**	**4.62** **1.32**	**4.73** **0.81**	**5.24** **0.83**
Easy access to Communication	$\bar{X}$ s	**13.90** **2.20**	**12.78** **1.39**	**11.76** **1.59**	**13.24** **1.73**
Objectivity, quality & standard	$\bar{X}$ s	**9.14** **1.90**	**10.16** **0.87**	**9.88** **1.27**	**8.71** **1.42**
Effective examination System	$\bar{X}$ s	**9.74** **1.69**	**9.09** **1.50**	**8.24** **1.59**	**11.48** **1.21**
Human appeal	X s	**7.49** **1.72**	**6.47** **1.54**	**6.73** **1.43**	**8.10** **2.86**
Attractive, Interesting	$\bar{X}$ s	**6.98** **1.05**	**6.69** **1.08**	**5.94** **1.33**	**6.00** **1.30**

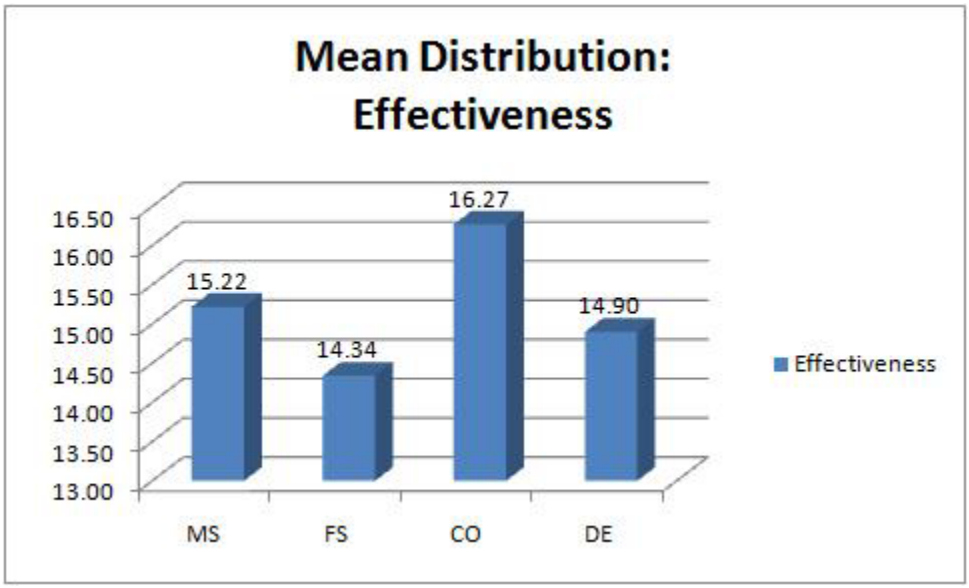

Figure: 1
Mean Distribution: Effectiveness

On effectiveness highest-agreement was found among the counselors ($\bar{\bar{X}}$=16.27, SD =1.56), and the lowest agreement was seen with female students ($\bar{\bar{X}}$= 14.34, SD=1.50). The difference in the means is large, but they really differ significantly or not, cannot be decided only on the basis of means and standard deviations, hence the data were treated by ANOVA. Summary of ANOVA is given in the Table 2.

Table: 2
Complete summary of One Way ANOVA (Effectiveness*)*

Source of Variation	SS	df	MS	F
Between	99.93	3	33.31	
Within	1411.06	411	3.43	9.71**
Total	1510.99	414		

** Significant at .01 level

From the ANOVA summary, it is clear that the four independent groups differ from each other significantly. An F value of 9.71, for 3 and 411 df is significant at .01 level. Obviously the four groups perceive the effectiveness of web technology in different manner.

The difference in the means had not occurred by chance only. The univariate ANOVA do not provide information about the significance of inter group mean differences.

Table: 3
Inter group means differences and relevant Rp values (Effectiveness)

Gr Nos.	1 $\bar{\bar{X}}$ = 15.22	2 14.34	3 16.27	4 14.90
1	X	0.88 (0.51)	1.05 (0.58)	0.32 (0.88)
2		X	1.93 (0.73)	0.56 (0.99)
3			X	1.37 (1.03)
4				X

Means arranged in ascending order

Gr Nos.	2	4	1	3
$\bar{\bar{X}}$	14.34	14.90	15.22	16.27

Hence, further the data were treated by "Duncan's New Multiple Range Test (DNMRT)". When the cell frequencies are equal then several other tests could be used to search the significance of inter group mean differences. In present case the cell frequency is unequal hence DMNRT for unequal cell frequencies was used. Its results are presented in Table 3. In the table inter group mean differences are given, and to find out whether the difference is significant or not relevant Rp values are given beneath the mean differences. The Rp value is just like 't' value or the F value used for testing the significance of inter group mean differences.

When the relevant Rp values are computed, the mean differences are examined with reference to them, if the mean difference is larger than the relevant Rp value then the two groups differs significantly from each other.

It could be seen that in table 3 most of the mean differences are significant.

DISCUSSIONS

The hypothesis of the study was, "Virtual classroom is significantly more effective in learning process than traditional classroom." This hypothesis got very strong support from the respondents of the study.

Open and Distance Learning System (ODLS) of India mostly operates through network of recognized study centers, where normally part time counselors offers face-to-face counseling support. Following few points may be noted in this regard:

1. **Due to part time nature of the counselor's job, it may not be always possible for the counselor to devote minimum required time for advance preparation. Naturally, in such situation, students may not get counseling support of appropriate quality.**

While, development process of virtual classroom modules always ensures this minimum time through "quality evaluation" process. Thus, lack of appropriate quality due to this factor may not applicable to virtual classroom system.

2. **Although, all counselors across all study centers, normally satisfy minimum specified qualification and experience norms, still 'knowledge and teaching skills' invariably varies among counselors at different study centers. Hence, few students at the specific study center may get good quality counseling support due to knowledgeable and skilled teacher. But, at some other study center it may not be the case. Hence, with traditional classroom approach, counseling support of same consistent better quality cannot be ensured for all students across all study centers. On the other hand, development process of virtual classroom modules normally can ensure selection of highly knowledgeable and skilled teacher as it is centralized function at the university. Thus, with virtual classroom, it is naturally easier to ensure counseling support of same consistent better quality, for all students across all study centers.**
3. **Overall percentage of face-to-face contact hours between counselor and students in ODLS is normally just 15-30 % that of conventional system. But 'Online Counseling' is provided to assist in resolving the difficulties to only those students who need it. Normally, single counselor provides counseling support to students only at one particular study center. Naturally, in traditional classroom approach, the impact of 'good' or 'bad' teacher on the quality of counseling support is relatively limited from the perspective of 'low face-to-face contact hours' or 'total number of students across all study centers'. But, if selection of highly knowledgeable and skilled teacher is ensured in virtual classroom approach, then it may substantially improve quality of counseling support, even from the perspective of 'low face-to-face contact hours' or 'total number of students across all study centers'.**
4. **Due to non-availability of wide spread access to web technology and severe shortage of electrical power in rural parts of India, about 70% of population still cannot have web technology based distance education. Although, this situation may improve, web technology based distance education is likely to remain privilege of mostly urban population till near future. This may severely limit its effectiveness at least for those programmes where large numbers of students are from rural parts of India.**

Web technology is useful in many ways and it should be introduced in most of the fields of knowledge. However, in a country like India it is not possible to rely totally on the web technology, both traditional classroom techniques and virtual classroom must function in collaboration with each other.

CONCLUSIONS

On the basis of the result of this study, the following conclusion was drawn: Regarding effectiveness of the system female students and distance education experts had shown more agreement than the other groups. In other words, it was difficult for the subjects to decide the clear cut superiority regarding the effectiveness of 'Traditional Classroom' or 'Virtual Classroom'.

SUGGESTIONS

On the basis of results of the study the following suggestions are made:

1. **In order to make 'Virtual Classroom' approach more acceptable among students and teachers, extra efforts are necessary. Future research can indicate appropriate strategic approaches regarding this.**

2. **Relevance and utility of 'Virtual Classroom' approach need further investigation in rural area with severe shortage of electrical power and other disciplines like social sciences or humanities. There is a need of more research in these areas.**

Acknowledgments

Researcher wishes to express deep gratitude and sincerely acknowledge the detail guidance, motivation, help and support, received from Dr Pandit Palande, for the present research study.

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REFERENCES

Aragon, S. R., Johnson, S. D., & Shaik, N. (2002). The Influence of Learning Style Preferences on Student Success in Online Versus Face-to-Face Environments. *American Journal of Distance Education , 16* (4), 227-244.

Cheng, L., & Myles, J. (2003). Managing the Change From On-Site to Online: transforming ESL courses for teachers. *Open Learning , 18* (1), 29-38.

Daniel, J. (13 Nov 2003). Education For All and The Role of Open and Diatance Learning, The Global Scenario. *Food, Health and Education For All: The Role of Diatance Learning.* Nashik, India: Yashwantrao Chavan Maharashtra Open University.

Eriksen, S. D. (1995). TQM and the transformation from an elite to a mass system of higher education in the UK. ***Quality Assurance in Education , 3*** **(1), 14-29.**

Killedar, M. (2001). Distance Education through Internet Based ELearning. ***Indian Journal of Open Learning (IJOL) , 10*** **(1), 68-79.**

Killedar, M. (2007). Model for 'Total Quality' of the Open and Distance Education System. ***International Journal of Instructional Technology and Distance Learning , 4*** **(7), 51-68.**

Killedar, M. (2002). Online Self-Tests: A Powerful Tool for Self-Study. ***Indian Journal of Open Learning (IJOL) , 11*** **(1), 135-146.**

Neuhauser, C. (2002). Learning Style and Effectiveness of Online and Face-to-Face Instruction. ***American Journal of Distance Education , 16*** **(2), 99-113.**

Tattersall, C., Waterink, W., Höppener, P., & Koper, R. (2006). A Case Study in the Measurement of Educational Efficiency in Open and Distance Learning. ***Distance Education , 27*** **(3), 391-404.**

Zhang, D. (2005). Interactive Multimedia-Based E-Learning: A Study of Effectiveness. ***American Journal of Distance Education , 19*** **(3), 149-162.**