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Editorial

A Moon Shot for Education

Donald G. Perrin

For close to half a century, researchers, teachers and administrators have struggled with the theory and practice of Curriculum Design. The best blueprints have come from the Bloom Taxonomies, research by J. J. Guilford, and the eminently practical approaches of Robert Mager. The majority of teachers and trainers embraced the Cognitive Domain of the Bloom Taxonomies; a lesser number understand rubrics and performance objectives. These are the basis of a blueprint when related to the overall goals of education and the physical and social environments where learning takes place.

American education needs a radically different master plan and structure to meet the needs of the 21st century. When an architect constructs a building, he creates more than work spaces. He plans an environment for people and activities that can adapt to change and function long into the future. Great structures are not built with piecemeal budgets and meaningless renovations. That is why American education, once a world leader, has become dysfunctional and impossible to maintain in its present form.

American Education needs the kind of planning, resources, and commitment used to put a man on the moon in a period of less than ten years. President Kennedy's program required intensive and focused research, accelerated development of existing sciences and technologies and creation of new ones. New management techniques with a total systems approach integrated all relevant knowledge about man and space to enable him to set foot on the moon and return safely to earth.

Sputnik stimulated changes in U.S. education and provided the impetus for the space program. The flattening of world economies, fierce competition from third world nations, and low ranking in science, mathematics and engineering demonstrate that traditional education systems are failing. It is time to build a new 21st century system of education using the kind of planning, resources, and commitment that put a man on the moon almost 50 years ago.

Editor's Note: This study raises some interesting questions about the level of learning that results from distance learning as compared to face-to-face instruction. Other research needs to be conducted in other settings with different students and motivations to determine if this is the tip of a yet to be explored iceberg, or an isolated incidence.

"No Significant Difference" Only on the Surface

Thomas K. Ross and Paul D. Bell

United States

Abstract

The purpose of this study was to compare the effectiveness of an asynchronous online platform and its traditional F2F classroom based counterpart in promoting deep learning or higher levels of learning according to Bloom's taxonomy. Equivalency between the two modes of instruction was assessed using course grades as the outcome measure. The ANOVA results suggested that on-line education is comparable to classroom education at lower levels of abstraction (recollection) but as work progresses to higher orders of abstraction (application) significant performance differences arise that place on-line learners at a disadvantage. Regression analysis was then employed to understand why the performance difference between the two groups existed or if it existed when other explanatory variables were introduced. Finally, regression results were analyzed and reasons offered for why this difference in learning outcomes occurred for the two instructional delivery modes.

Keywords: surface learning, deep learning, no significant difference, asynchronous web based learning, face to face learning, Bloom's taxonomy, learning outcomes, ANOVA and regression.

Introduction

The growth in asynchronous web based undergraduate courses has been dramatic. It has, in large part, been spurred by the motivation to hold down costs while simultaneously expanding access to higher education (Jones, 2003). However, the legitimacy of this expansion in Asynchronous Web-Based Learning (AWBL) has been based on a genre of academic research known as "media comparison studies" (MCS). This genre of research is based on the finding of no significant difference between average achievement scores for learners in online versus classroom-based versions of the same course. The conclusion reached based on this lack of difference in student achievement is that online learning is as effective a modality for learning as is conventional face to face learning (Bell, 2001; Hadidi & Sung, 2000).

Some have argued that MCS (Diaz, 2002; Bendixen and Hartley, 2001) are inappropriate for establishing the effectiveness of asynchronous online courses. This is because such studies fail to assess the learning environment according to some specific blueprint or definition of effectiveness. Biggs, 1999; Ramsden, 1992; and Weigel, 2002 have further argued that the true measure of course effectiveness is related more to whether it promotes deep learning over surface learning than to whether a particular medium serves as the learning platform. They have defined deep learning as the critical analysis of new ideas and linking them to already known concepts and principles. It leads to understanding and long-term retention of concepts that can be used for problem solving in unfamiliar contexts. Deep learning promotes understanding and application for life. In contrast, surface learning is the tacit acceptance of information and memorization as isolated and unlinked facts. It leads to superficial retention of material for examinations and does not promote understanding or long-term retention of knowledge and information. Thus, a better

gauge of course effectiveness would appear to be how well it promotes deep learning over surface learning. Accordingly a better method of comparing different course learning environments should include a comparison of how successful each is in promoting deep rather than surface learning.

Bloom's taxonomy provides a practical rubric for measuring deep learning. It specifies six types of learning (or levels of abstraction) that can be used to describe one's depth of learning. These include knowledge, comprehension, application, analysis, synthesis, and evaluation (Huitt, 2004) In the current study learners were compared on five of the six types of learning. They included knowledge, application and synthesis.

As different levels of abstraction require different study skills, the depth of student learning can be assessed according to the study skill employed. For example, Bloom's taxonomy is used to categorize test questions that are reflective of a particular taxonomy or level of learning. Furthermore, if a student successfully answers a question at a certain taxonomy level then it can be inferred that specific study skills have been mastered. The mastery of certain study skills can, in turn, give information about the particular level of learning achieved according to Blooms taxonomy. Thus, an analysis of the number and type of questions and problems correctly answered by both face to face (F2F) learners and distance education (AW) learners can then be used to compare the depth of learning in each group.

The purpose of this study was to assess the ability of an asynchronous online platform and its traditional classroom counterpart to promote deep learning or higher levels of learning according to Bloom's taxonomy. Equivalency between the two modes of instruction will be assessed using course grades as the outcome measure.

Method

Course Materials:

A Quality Management course delivered in Spring 2007 provides an appropriate case for determining if asynchronous web based (AW) online courses are equivalent to face to face classroom based (F2F) education. In this course the only difference between the AW and F2F students was the latter group came to class and the AW students viewed the in-class lectures via the internet. The class was built on the Blackboard course management system and all lectures were recorded using Mediasite. PowerPoint slides to accompany the lectures were provided in the Course Docs section of Blackboard and available to all students prior to the lectures. The Mediasite lectures were streamed almost simultaneously with the class lectures and remained on-line for the duration of the course. F2F students had the option to: 1) attend class, 2) view the lectures on Mediasite or 3) attend class and review lectures via Mediasite. Class attendance was not mandatory and was not considered in calculating student grades.

Class lectures began with a review of the homework assigned in the prior class (if applicable) and proceeded to new material. The new material drew heavily on the text (theory) and was documented in the PowerPoint slides. Class lectures provided the opportunity to flesh out ideas, draw additional examples of applications, and demonstrate cross-industry uses of quality techniques. Some of the lecture material may not have been covered or only introduced briefly in the PowerPoint slides.

The study group/descriptive statistics:

There were 79 students enrolled in the course, 44 F2F and 35 AW. All but two of the students were junior or senior majors in the department offering the course and the two non-majors were enrolled in a five year accelerated Masters program within the same college.

Exhibit 1

Descriptive Statistics

	AW	F2F
N*	32	43
% Female	75.0%	86.0%
Average Age	28.09	22.30
Average GPA	3.23	2.78

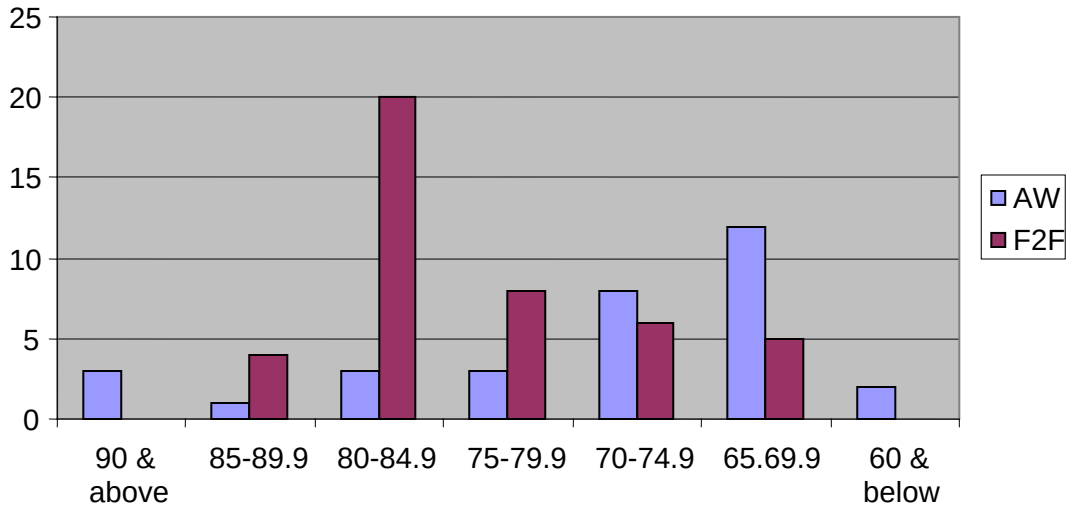
* Final sample reduced by four due to withdraws and non-majors.

Student performance in the course was based on ten homework assignments (10% of total course grade), a midterm exam (40%), and a final exam (50%). Assignments and due dates were identical for both groups. The same exams were given to both groups and both groups completed the tests on-line. Grades on exams were determined largely on mastery of the subject rather than effort while timeliness and effort were major components of homework grades.

Two AW students withdrew after the midterm exam due to low scores. The average grade for this course was 76.11% and the standard deviation was 8.31%. On the standard four point GPA scale the grade was 2.16. Exhibit 2 displays the distribution of scores. The grades show wide variation in performance providing a good sample to study differences in performance between groups and identify the potential explanatory variables that could impact grades.

Exhibit 2

Grade Distribution by Setting



Results

ANOVA - Overall Course Grade

ANOVA analysis of final course scores reveal that the F2F students scored on average 6.1 points higher than their AW counterparts and the difference was statistically significant ($p = 0.001$). Not only were the F2F scores higher but the scores suggest that F2F students are also more consistent performers. The standard deviation for the F2F group was 0.0608 versus 0.0949 for AW students. An F test shows the variance difference is statistically significant ($p = 0.001$). The difference in performance is evident in exhibit 2, while the F2F students range from 88.9 to 65.2 (23.7 points), the AW earned both higher and lower scores, 90.8 to 54.2 (36.6).

Given the significant difference between the two groups on the overall course grade as well as in the consistency of performance, further ANOVA analyses were undertaken to identify the source or sources of the performance difference. First the scores for the midterm and final exams were analyzed. F2F students scored 8.28 points higher on the midterm ($p = 0.003$) and the difference narrowed to +6.55 on the final exam but remained statistically significant ($p = 0.002$). The narrowing of performance was expected given the withdrawal of two low performing AW students after the midterm.

Given the consistency of the higher performance of the F2F group across exams and using Bloom's taxonomy as a guide, performance on the various components of the exams was analyzed. The midterm was composed of 25 multiple choice (knowledge/ comprehension), a cause and effect diagram (application/analysis/synthesis) and chart construction and interpretation (application/analysis/synthesis). F2F students scored 1.56 points higher on the 40 point multiple choice section (+3.9%) but the difference was insignificant ($p = 0.232$).

The cause and effect diagram (20 points) and charting problems (40 points) required a higher level of abstraction and it is this type of work where the impact of different educational settings may be apparent. On the cause and effect diagram, the F2F students scored 2.20 points (+11.0%) higher than the AW students ($p = 0.003$). Similar results occurred on the charting problem, F2F students scored 2.97 points (+7.4%) higher ($p = 0.014$).

The components of the final exam were similar to the midterm with multiple choice questions (30 points), essays (16 points), and charting and statistical process control (SPC) problems (54 points). Results for the multiple choice questions followed the midterm, F2F students performed marginally better (1.15 points or 3.8% higher) than their DE counterparts and the difference remained insignificant ($p = 0.191$).

On the essays, F2F students scored 0.01 points (-0.1%) lower than AW students but the difference was not significant ($p = 0.973$). The application, analysis, and synthesis problems (charting and SPC) accounted for the majority of the performance differential and was the only component statistically significant ($p = 0.000$). F2F students scored 5.43 points (+10.6%) higher than their AW counterparts. This difference in deep learning accounted for 82.9% of the total performance difference on the exam.

The remaining 10% of the course grade was based on homework assignments and there was no significant performance difference between the two groups on the ten assignments leading up to the exams. The F2F group scored 1.61 points (+1.6%) higher on these assignments but this difference was not statistically significant ($p = 0.550$). This result was unsurprising as grading of homework was designed to encourage students to attempt and turn in assignments versus measuring mastery. Subsequent in-class review of assignments was designed to highlight and correct student errors. Based on the data and grading scheme, both groups submitted similar assignments.

Regression

Regression analysis was used to understand why the performance difference between the two groups (F2F and AW) exists or if it exists when other explanatory variables are introduced. Regression provides a mechanism to study the impact of educational setting on student performance when other variables are controlled. According to previous research studies other variables including age (Alstete & Beutell, 2004), prior educational performance, (Garavilia & Gredler, 2002; Wang & Newlin, 2000), and utilization of course materials including completion of homework (Wang & Newlin, 2002) may affect performance. Regression was used to determine if age, GPA, homework performance, and use of on-line lectures explain any of the observed difference in performance between the two groups of students and their impact, if any, on overall course grade.

Statistics were gathered on whether or not a student viewed the on-line lectures – these statistics did not record how long the lectures were viewed but simply if any portion of the lecture was viewed. AW students on average accessed 68.3% of the posted lectures; in contrast F2F students accessed 22.5%. While the F2F students use of the on-line lectures was much lower than that of the AW students this was expected given that the on-line lectures were supplements to class attendance for F2F students and not the primary vehicle for delivering information.

Independent regressions were run on each group as the effect of viewing the lectures should be different for each. The Mediasite on-line lectures were the exclusive means of viewing the lecture material for the AW students while the Mediasite lectures were a supplement to classroom attendance for F2F students. The regression samples were reduced by two because of the absence of age and GPA information for the two non-majors, one F2F and one AW.

For AW students, age, GPA, homework performance, and number of lectures viewed on-line explained 70.1% of the difference in course grade, Exhibit 3. All variables were significant. The regression shows course grade increased by 1.10 points for every lecture viewed on-line ($p = 0.000$). Course grade was also positively correlated with performance on homework assignments. Course grade increased by 0.36 points for every point earned on homework ($p = 0.000$). Homework was a component of the overall course score but the magnitude of the coefficient, 0.36, greatly exceeds the percent of the overall grade contributed by homework performance, 10% or 0.10.

Exhibit 3

Dependent variable = course score

	AW (n = 32)		F2F (n = 43)	
	Coeff.	p-value	Coeff.	p-value
Intercept	26.25	0.001	55.72	0.000
Lectures viewed online	1.10	0.000	-0.54	0.040
Homework	0.36	0.000	0.18	0.015
Age	-0.36	0.007	-0.37	0.020
GPA	5.66	0.005	6.58	0.002
Adjusted R^2	0.701		0.363	

As expected course grade was positively correlated with GPA, and overall course score increased by 5.66 points for each one point change in GPA ($p = 0.012$). Unexpectedly overall course grade decreased by 0.37 points for every one year increase in age ($p = 0.007$). This is unexpected as the

descriptive statistics, exhibit 1, demonstrate that the older group of students, the AW students, had the higher GPA, 3.23 versus 2.78 for the younger F2F students. The intercept, the expected grade when the explanatory variables are zero, was 26.25 and significant ($p = 0.001$).

For the F2F students, the four independent variables explained 36.3% of the difference in course grades. All variables were significant. Unlike the AW results course grade decreased by 0.54 points for every lecture viewed on-line ($p = 0.040$) by F2F students. The relationship between homework performance and overall course grade was positive and significant ($p = 0.015$) but the coefficient was much lower for F2F students. F2F student grades increase by 0.18 points for every point earned on homework assignments versus 0.36 for AW students.

The coefficients on GPA and age were in the same direction and had a similar magnitude to those observed in the AW class. The coefficient for GPA and probability was 6.58, $p = 0.002$ for F2F students versus 5.66, $p = 0.005$ for AW students. The coefficient for age and probability was -0.37, $p = 0.020$ for F2F students versus -0.36, $p = 0.007$ for AW students. The intercept was 55.71, considerably higher than the AW class, and significant ($p = 0.000$).

The major differences between the two groups were the impact of on-line lectures and homework assignments and other unmeasured variables. In both regressions the intercept is positive and significant. The intercept for the F2F class is more than twice as large as the AW coefficient (55.72 versus 26.25). Obviously excluded variables have a major impact as the intercept predicts much higher performance in the F2F class.

Discussion

The ANOVA results suggest that on-line education is comparable to classroom education at lower levels of abstraction (recollection) but as work progresses to higher orders of abstraction (application) significant performance differences arise that place on-line learners at a disadvantage.

This finding may be a result of the differences between how the two groups of learners chose to engage in their learning. That is, whether or not learners attended lectures, accessed them via Mediasite electronic recordings, and/or whether they completed homework assignments.

Course content was presented in face-to-face class lectures, video recordings of class lectures, and summarized in PowerPoint slides. Moreover students had the opportunity to practice and learn course material via homework assignments. These different modes of learning content can be conceptualized in terms of how well they support active learning. If these modes of learning are viewed on a continuum of active to passive learning the most active form of learning would be doing homework assignments followed by attending the in-class lectures, viewing the recorded lectures, and lastly, reading the PowerPoint slides for course information content. This is because each type of learning listed above requires less purposeful educational activity on the part of students. Prior research on college student development shows that the time and energy that students devote to educationally purposeful activities is the single best predictor of their learning success (Kuh, Kinzie, Schuh,Whitt et al, 2005) In keeping with this prior research, the current results suggest that those students who took advantage of opportunities to engage in active learning were the most successful learners regardless of whether they were AW or F2F students.

Differences between F2F and AW students

Despite this global finding, a key difference between the two classes is the adjusted R^2 (coefficient of determination) statistic. The adjusted R^2 for AW students is nearly twice as large as that for the F2F students. However, it should be recognized that the decrease in the adjusted R^2 in the F2F group is probably related to the fact that classroom attendance was not required or recorded. Had classroom attendance been recorded we would expect class performance would

vary positively with attendance and a larger percentage of the variance in course grade would be explained. Furthermore, while the larger adjusted R^2 for the AW group might have been impacted by viewing on-line lectures, it should be noted that other non-quantified factors such as reading the textbook and amount of time spent viewing lectures, could affect student performance.

While viewing on-line lectures was a positive and important factor in predicting an AW student's grade, the negative coefficient for F2F students suggests that viewing on-line lectures is not a good substitute for class attendance. For example, a AW student who viewed all the lectures and received the maximum available points from homework assignments could expect to score 13.3 points lower than a F2F student who viewed no on-line lectures holding other variables constant. The difference in course grades would narrow as F2F students view the on-line lectures that is, substitute on-line lectures for class attendance. If a F2F student elected to view all the lectures on-line rather than attend class the difference in course score would shrink to 6.3 points.

As stated earlier AW students only accessed 68.3% of the recorded lectures indicating that the on-line lectures were frequently not used to obtain course material. Many students preferred to access course material via the PowerPoint slides. The low use of on-line lectures by the AW students may be attributed to a difference in opinion between the students and professor concerning the most effective and efficient means for learning course material. The professor viewed on-line lectures as the primary information delivery vehicle for AW learning; the on-line lecture usage statistics indicate that AW students often felt the PowerPoint slides were the primary vehicle for learning course material. The problem and risk of relying on this passive method of obtaining information is that students may believe that a cursory reading of slides is sufficient for attaining mastery of the subject. Yet, if they do not attend lectures or at least view the video recordings, they will miss extemporaneous remarks made during the lectures that do not appear in the prepared PowerPoint slides. Relying solely on PowerPoint slides, failing to attend or view entire lectures, and inability to recognize the importance of in-class remarks presented a major obstacle to successful test performance.

On the other hand, in-class students who were physically present for the lectures not only were exposed to in-class remarks but could also pick up the verbal and non-verbal clues from the instructor and/or their classmates as to the usefulness of these remarks. Obviously the availability of the professor's notes via PowerPoint and the internet have increased the ease and risk of passive acquisition of information. Class notes, whether those of their fellow students or the professor, are inferior substitutes for actively attending class or viewing a lecture.

In addition to how course material was accessed (in person or via video recording), course scores were also correlated with homework assignments. As stated earlier both groups had similar performance on homework assignments but similar to the utilization of on-line lectures, regression shows these assignments had a larger impact on the overall course score for AW students. An AW student earning 90 points on homework could expect this performance to translate into a 32.4 point increase in their overall course grade, a F2F student earning the same number of homework points could only expect a 16.2 increase in their course grade.

The larger impact for AW students may emanate from the reduced opportunity for exposure to course material in this group. F2F students were observed working together in the classroom, consequently, it was probably easier for students to build study and support groups in the classroom setting. Expanded opportunity for extra-classroom cooperation may improve outcomes given the greater ability to learn from one's peers or the opportunities for guiding and coaching one's fellow students (and thus reinforce material in the student's mind) in a face to face setting. The reduced opportunities for exposure and interaction (especially those of a spontaneous nature) in on-line environments may place additional importance on those instructional devices that are readily available to AW students.

Another prime difference between F2F and AW students involves the student's ability to selectively view course materials. Students who attend class have little choice but to review prior assignments and be exposed to the elaborations on the new material (obviously daydreaming would be one way of maintaining physical presence without paying attention). In the asynchronous on-line environment a student who assumes he or she knows the prior material could skip that part of the lecture or put it on fast play in addition to not attending (viewing) or paying attention. Similarly AW students could decide after the basic material was introduced that further elaborations were not needed and terminate the session. On the other hand, premature termination in the classroom, i.e. walking out, is constrained by social convention.

Reason for selecting one medium vs. another

Previous research concerning the reasons for taking an on-line course has demonstrated an association between learning achievement and student reason for selecting a particular medium for his/her learning. Studies involving on-line learners [Roblyer 1999 and Collins & Pascarella 2003] showed that those learners who earned the highest learning outcome scores in on-line learning environments belonged to those who actively selected on-line learning because they wanted to regulate their own learning. In the group of AW learners some actively chose to learn on-line instead of taking a face-to-face class. On the other hand, other students had little or no choice of their learning medium because they lived at a great geographic distance from campus or were full time working adults with little opportunity to come on campus for their learning. Regardless of the reason, self selection by learners into one medium of learning versus another may have played a role in affecting the outcomes achieved by both groups of learners.

Asynchronous web-based learning is different than learning in a classroom!

Another factor that may have affected the study results is on-line learning is different than learning in a traditional classroom setting. That is, processing information from on-line lectures is more challenging than from classroom lectures. For example, in the classroom the number of distracters is deliberately kept to a minimum (no TV, computer, phone, refrigerator although we are aware that students surf the internet and use cell phones in class). Each lecture was approximately three hours and students in the classroom setting were committed to spending this time in their learning with classroom breaks allotted in a controlled fashion. Moreover, the presence of other students paying attention in class provided an example and support for maintaining attention in class. To the contrary, AW students have to rely on their own capacity to self regulate and control their learning. Not all students are prepared to exercise such control (Turnbull, 2003). Therefore, some AW students may not have been prepared to control their learning and needed external control imposed by the instructor in the classroom to focus their attention. Furthermore, these AW students may not have anticipated putting in the same number of hours as "traditional" classroom students. Trouble in self regulating their learning is evidenced by their belief that reviewing the PowerPoint slides was sufficient to master the course material.

On the other hand, many AW students may have approached their learning in the same manner as they would traditional classroom courses. They recognized that PowerPoint slides were supplements to lectures and invested time and effort in viewing the on-line lectures. Differences in the willingness to learn from on-line lectures demonstrated that some students were adequately prepared for the independent environment of on-line learning while others were less capable of handling the demands of self-regulation required by on-line classes. This could partially explain why variance in learning outcomes was greater for AW students than F2F students.

Age

Many educators assume that older students are more diligent in their study habits than younger students because they are more autonomous, self directed, and goal oriented in their learning

compared to younger students (Knowles, 1984). As a result they are expected to succeed at a higher rate in their learning than their younger cohorts. However, previous research in on-line learning environments has yielded mixed results in this area. Some studies indicate that older learners are more successful learners (Alstete & Beutell, 2004),while other studies find no difference in rates of learning achievement among age groups (Tucker, 2001). In the current study older students had lower course scores than their younger colleagues. The age coefficients in the regression analyses were negative, similar in magnitude, and significant for both groups of students. This finding may reflect the higher burdens that older students face when they go back to school. As opposed to traditional college students, these students may have full-time jobs and families that require attention.

Previous academic achievement

Prior academic achievement was associated with higher course scores in the present study. Prior course grades, as measured by academic GPA, were a strong predictor of grades in the course: the difference between a B student (3.0) and a C student (2.0) translated into an additional 5.66 points on course grade for AW students and 6.58 for F2F students. This supports earlier research findings that demonstrate importance of previous academic achievement for predicting subsequent academic learning achievement.(Bell, 2006; Ishitani, 2003; Garavila & Gredler, 2002)

Conclusion

The present study demonstrates a large and statistically significant performance difference between AW and F2F students where the only difference between the two groups was the means by which lectures were delivered. F2F students performed better than their AW counterparts which is attributed to the more active learning environment provided by the traditional classroom setting versus computer based, on-line learning. Additionally it was shown besides performing at a higher level, F2F students were more consistent performers than AW students.

Similar to previous studies that found “no significant difference” between traditional and on-line class environments, this study found comparable performance for certain levels of learning. Specifically at lower levels of learning, knowledge and comprehension, performance was comparable across learning environments. However outcome differences arose when students were asked to apply, analyze, and synthesize information. While we show that higher level performance is positively correlated to use of course materials, completion of homework assignments, and prior academic performance, the learning environment continues to play a large and significant role in student performance.

We cannot conclude that the learning environments are comparable at anything other than the lower levels of learning. If we wish to achieve “no significant difference” between environments this study suggests that we will need to implement additional activities into the on-line environment to more actively engage AW students or become more selective in accepting students into on-line degree programs. This study shows identical activities (except for in person versus recorded lectures) do not result in similar student outcomes so more activity will be required in the less active, on-line learning environment. The study also demonstrates that certain members of the on-line community are well prepared for the demands of on-line learning so another possible step toward “no significant difference” may be to identify and accept only those students who have a high probability of succeeding in this environment. This study demonstrates that using the same learning and student selection techniques in traditional classroom and on-line learning environments produces dramatically different student outcomes when higher order learning is required.

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Editor's Note: This study uses a hybrid face-to-face and online model where WebCT tools are used to expand opportunities for interaction. It provides an interesting contrast to the previous study.

Supplementing WebCT Tools into Developmental Studies Instruction

Melissa L. Burgess

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Abstract

The purpose of this research was to explore what would happen to developmental students' comprehension and motivation in reading when the online learning community, WebCT was supplemented. My role, in addition to instructor, was that of participant-observer. Over a four-month period, I supplemented WebCT tools such as discussion board and chat into my instruction to enhance comprehension and motivation to read in my Developmental Studies in Reading II classroom. Using both qualitative and quantitative research methods, my findings indicate that there were improvements in both motivation and comprehension by using these online tools. By incorporating this technology into the developmental studies curriculum, we as developmental educators will be encouraging and supporting our students' needs to become independent thinkers and learners.

Literature Review

At the beginning of my literature research, I was under the false assumption that there would not be enough literature or research to support my focus question. It is commonly agreed among scholars that research in new literacies has not caught up with the technological advances that exist today. Although there is an abundance of recent research addressing online learning, there are a handful of resources that discussed a possible connection between online learning program tools such as discussion board and chat and increased student motivation and comprehension. In the last few years much research has been conducted in the area of online learning, and issues have been discussed concerning the benefits for students and future direction of online learning at many conferences around the world. Educators are asking probing questions on how to effectively incorporate technology into their classrooms. The developmental studies classroom is no different. NADE (National Association for Developmental Education) provides a current definition of developmental education, a field that has dramatically changed over the last ten years:

> *Developmental education is a field of practice and research within higher education with a theoretical foundation in developmental psychology and learning theory. It promotes the cognitive and affective growth of all postsecondary learners, at all levels of the learning continuum. Developmental education is sensitive and responsive to individual differences and special needs among learners. Developmental education programs and services commonly address academic preparedness, diagnostic assessment and placement, development of general and discipline-specific learning strategies, and affective barriers to learning.*
> *(NADE website, 2001)*

For developmental studies students, critical and analytical reading is a challenge. Motivation and attitudes are common underlying issues they face as learners and thus, issues we face as instructors.

Uncharted Territory?

Perusing through mounds of research articles and literature, it was surprising that there was little research that *specifically* addressed my focus question: ***What happens to student's comprehension skills when WebCT technology is implemented--specifically, discussion board and chat tools?*** The possibility that my focus question had not been explored made my curiosity pique even higher and my determination to conduct this research even stronger. Developmental education as a field of study sits at a turning point, dependent upon the use of modern technology to assist reading comprehension in students. My hope is that this research will encourage instructors to experiment with available technologies and remain open to new learning tools. This type of learning "may provide ways for educators to reach students before they fail. It may provide a way to bring instruction to the student, when and where learning is happening" (Caverly & MacDonald, 2000, p. 39).

Characteristics of the Developmental Studies Classroom and its Students

For many years, the developmental studies classroom has been "dominated by the ancient paradigm typified by the lecture method" (Brothen, 1998, p. 53). As a developmental study in reading education, I feel the need to break from this lecture/presentation mold so that my students are able to become independent, self-regulated learners. Students who have been tested into a *developmental studies in reading* course often lack motivation, independent learning skills, effective strategies for learning, reading comprehension and analytical thinking skills. Not only are they not prepared for the rigors of college courses, they are also ill-prepared for other life challenges that require skills in reading. Currently, there are estimates that "40% of first-time students entering the average community colleges are underprepared for college-level work" (National Center for Educational Statistics, 1996). Figure 3. shows the demographics of developmental studies students:

Student Demographics

Gender	Female	55%
	Male	45%
Average Age		24
Race	White	67%
	African-American	23%
	Hispanic	6%
	Asian	3%
	American Indian	1%
Married		25%
Income less than $20,000		54%

(National Center for Educational Statistics, 1996)

Figure 1. Demographic Characteristics of Community College Developmental Studies Students

It is evident from this figure that poverty is a significant characteristic and research has shown "a strong correlation with poverty and academic under preparedness" (Lavin & Hyllegard, 1996; McCabe & Day, 1998). Even though Whites comprise most of the incoming freshman taking

developmental studies courses, African-Americans and Hispanics are the fastest growing populations that also need these courses.

Only by understanding and communicating the advantages of online learning can communities potentially change this pattern of under preparedness.

Tool Descriptions & Hybrid Online Model

In order to lay the foundation for the desired results of this research, it was necessary to design my syllabus incorporating both WebCT discussion board and chat sessions throughout much of the semester in addition to regularly-held traditional classes. The course was taught using a hybrid online model. This model illustrates the learner-centered nature of a hybrid class and serves as a solid foundation for introducing developmental students to online learning. The hybrid model gives flexibility with classes, allows instructors to accomplish course objectives successfully, and increases interaction and contact among students (Garnham & Kaleta, 2003). My department is currently laying the groundwork for this format of learning and through my research and findings will proceed appropriately with its future implementation. See *Figure 2.* below to view the dynamic nature of faculty-student interaction as well as student-student interaction. The Hybrid Course Project (2001), conducted by faculty at the University of Wisconsin-Milwaukee, is an ongoing research project highlighting the benefits of hybrid models,

> Our faculty participants almost universally believe their students learned more in the hybrid format than they did in the traditional class sections. Instructors reported that students wrote better papers, performed better on exams, produced higher quality projects, and were capable of more meaningful discussions on course material. (Garnham & Kaleta, 2003)

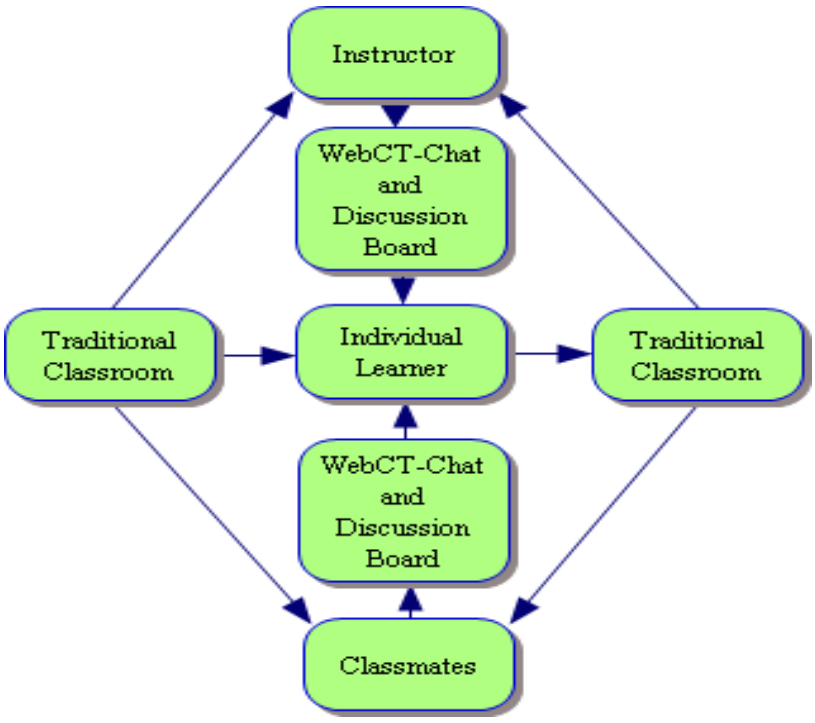

Figure 2. The hybrid online model

The discussion board tool is an asynchronous (not real time) tool which allows students to answer or post content-oriented questions. The chat tool on WebCT is delivered synchronously (in real time) where students and teacher can discuss, converse and share ideas.

I decided to use the backward design approach to create and develop my instruction. The backward design approach operates under the condition that "curriculum should lay out the most effective ways of achieving specific results" (Wiggins, 2005, p. 14). By following the backward design approach, I was able to design my course with the end result in mind: having my students motivated to read and having all or most of my students being able to understand what they read.

Designs, management and strategies in synchronous and asynchronous learning are good indicators of online learning success (Tu, 2003). While chat sessions created a means for electronic communication (Martyn, 2003), the quality of chat interaction depends heavily upon the instructional delivery (Roberson, 2001). By acting as a discussion facilitator instead of deliverer, students were able to engage in inductive reasoning and understanding. Keeping chat sessions small in size (four to five students) was also beneficial with this mode of communication.

Advantages of Chat and Discussion Board Tools

Discussion Board. Discussion board provided a communicative forum where students could work collaboratively and share thoughts and ideas. In traditional classrooms, time constraints and divided attentions sometimes prohibit in-depth discussions. By using the discussion board tool, students benefit in many ways: a). "think time" before responding, b). the opportunity to respond thoughtfully without interruptions, c). opportunities to read other classmates' responses and think about them before responding, d). opportunities to converse with fellow classmates without limits (Lindsey-North, 2000, p. 4). Students have the ability to think and reflect on what they post to the discussion board therefore increasing the quality of discussion.

Chat. There were advantages to chat sessions as well. According to Almeida d'Eca (2003), there are different types of interactions evident in chat sessions: a). student-to-student (generates sharing of personal experiences, viewpoints, etc., b). student-to-teacher (allows for individual or group help), c). student-to-online-resource (encourages timely analysis and discussion of materials online) (d'Eca, 2003). Other advantages included exercising communication skills and etiquette, expressing ideas and receiving immediate feedback, developing personal (independence and autonomy) and interpersonal skills (helping, listening, discussing, debating, suggesting), and time management skills (arriving to session on time). Both discussion board and chat encouraged students who are were typically shy in the traditional classroom to actively participate.

Disadvantages of Chat and Discussion Board Tools

As with any rose, there are thorns. Some issues that have been documented include: (1) difficulty of synchronizing chat times with busy schedules, (2) competing for Internet access at home, (3) previous experience with computers, (4) computer glitches (i.e., DSL, dial-up) and (5) cost (as more institutions use hybrid courses, there will be pressure to develop more computer labs) (d'Eca, 2003).

Underpinning Theories and Principles

Self-efficacy & intrinsic motivation. By putting developmental students in the driver's seat to steer their own learning abilities, educators can foster feelings of self-efficacy. Self-efficacy is defined as "the belief that one is capable of executing behavior or performing tasks successfully"(Ormrod, 2004, p. 456). Many developmental students come to the classroom lacking the self-efficacy to succeed in reading. Having self-efficacy, in turn, influences intrinsic motivation—motivation that "lies within the individual and task…" (Ormrod, 2004). Increasing

intrinsic motivation is a critical component for developmental reading students in gaining the self-regulation, independence and self-direction that has been lacking in their academic career (Brothen, 1998).

Social Constructivism. Another underpinning theory for this research is the social nature of learning, or social constructivism. With roots in the work of Lev Vygotsky and Jean Piaget, constructivism can be best described as a "poststructuralist theory that regards learning as an interpretive, recursive, building process by active learners interacting with the physical and social world" (Wulff, Hanor and Bulik, 2000). Catherine Twomey Fosnot (1996) offers a clear understanding on the origins of social learning and outlines the five key tenets of social constructivism and Web-based pedagogy in *Constructivism: Theory, Perspectives, and Practice*:

1. **Learning is development**. Learning and development are synonymous in that development does not determine the depth and breadth of learning. Learners must be self-directed in structuring and managing these actions. Regarding design and implementation of Web-based pedagogy, educators must integrate learning experiences that cultivate social presence and engage or motivate psychological presence with the content and actions of learning.
2. **Disequilibrium facilitates learning**. For Web-based pedagogy to be effective, educators need to factor "role, balance, and presence of disequilibrium. Suggestions for achieving this include creating opportunities for the online group to take the time to respect mistakes and "honor frustrations" through display and interaction.
3. **Dialogue within a community engenders further thinking**. This is initiated by redistributing learning control and power by supporting synchronous and asynchronous tools to cultivate social presence.
4. **Reflective abstraction is the driving force of learning**. Expressing reflection evokes a presence of self. This, in turn, deepens the construction of knowledge prompted by learning experiences.
5. **Learning proceeds toward the development of structures**. Students engaged in the process of learning build, shape, and reshape learning experiences into patterns of meaning and arrangements of knowledge (Fosnot, 1996).

This Vygotskian perspective also asserts that meaning is made by transferring inner speech to outer speech (Lee, 2005). When students offer their ideas and thoughts on the discussion board or chat, they are making this transformation and encouraging this social interaction.

Motivation(personal and situational). Motivation, even at the postsecondary level, needed to be considered and included in my research in two distinctive ways. Research indicates a strong correlation between motivation and technology and how students benefit from this learner-centered approach. It is strongly suggested by theorists that teachers take advantage of students' personal and situational interests in the classroom (Alexander et al., 1994). By concentrating on a *personal interest* (social aspect of technology, i.e., chat & discussion board)—interest in a "particular topic or activity" (Ormrod, 2004), motivation can be initiated. By providing a *situational interest* (i.e., WebCT online learning community), students can thrive in an environment where they can experience, collaborate and learn. The effects of interest are exponential. "Interest promotes more effective information processing" (Ormrod, 2004). When students are interested in a topic or situation, they are likely to "process information in a meaningful, organized, and elaborative fashion — for instance, by relating it to things they already know, interrelating ideas, drawing inferences, forming visual images, generating their own examples, and identifying potential applications" (Hidi & Anderson, 1992).

Bloom's Taxonomy. Bloom's Taxonomy of educational objectives (Bloom et al., 1956) served as the theoretical framework from which I measured higher-level thinking skills in my chat sessions and discussion board postings. "Evaluation of critical thinking and reflection requires assessment methods that encourage individual expression …"(Conrad & Donaldson, 2004, p. 25). This was accomplished by assessing responses in chat sessions and on the discussion board.

Good Practice. For this research, I have also drawn support for the course design from the Seven Principles for Good Practice in Teaching and Technology (Testa, 2000). These principles emphasize student-faculty contact, student-student collaboration, active learning; prompt feedback, time on task, high expectations, and respect for diverse talents. The underlying presupposition guiding these principles is that by incorporating these into instruction, learning will occur (Frederickson, 2000).

By using WebCT discussion board and chat tools coupled with proper guidance and instructional direction, students are able to collaboratively contemplate and critically analyze course material and discussion topics. This higher-level learning, in turn, leads to active and interactive learning, which is an important component in the learning process.

Identifying Motivation and Comprehension When Using Discussion Board and Chat Tools

Motivation. It is well-established in research that a well-designed online learning community creates a strong sense of community among students (Hasselbring, 2004). For an online educator, it is necessary to ensure that learning is actually occurring in an online learning community. In that respect, it is important to define the depth of learning students will glean when using the discussion board and chat tools by identifying and measuring both motivation and comprehension.

Comprehension. With discussion board and chat, depth of understanding can be assessed by monitoring the conversations and recording key words or phrases indicative of understanding. Exposure to thought-provoking discussions prompts us to varying ways of organizing and interpreting information and even rearranging or adding to previously held ideas or thoughts (Beeghly, 2005).

Based upon the literature review, using WebCT tools such as the Discussion Board and Chat has the potential to increase motivation, self efficacy, learning community and ultimately, reading comprehension for developmental students. The design and development of the course is crucial, and should have catalytic components which spark active learning. As technology continues to evolve, new literacies will also. I believe that online learning communities will eventually be a strong influence in developmental education for both reading and writing success and effectively prepare students for college-level courses. How *soon* depends upon the application of this research in developmental classrooms across the country.

Methodology-Data Collection, Analysis & Interpretation

Data Collection

The data collection portion of this paper reflects a Developmental Studies in Reading classroom at a community college in southeast Texas during the spring 2007 academic semester. There were 20 students total: 12 males, and 8 females. There were no ESL or Learning Disability students in the class. I chose to devote traditional class time on Mondays and Wednesdays as computer lab time to work with WebCT tools. The division of time provided a balance where my students could gradually get their feet wet without feeling pressure to jump right in. A preliminary questionnaire given at the beginning of the course indicated that all of my students had a

computer at home with Internet capabilities; however none of my students had previous experience working with WebCT and were unsure of its purpose and structure:

> *"I'm not sure yet but I will give it a try! It would be a great thing for me personally because I get bored easily, so I like stuff that I have to figure out!" Angie (student)*

The crux of the data included transcripts from both WebCT chat and discussion board tools which effectively measured and monitored both comprehension and motivation. Observations were recorded in weekly journals and were inter-woven with interviews that provided thorough information about the data. It also served to cross-reference the data compiled in observations. Formal and structured interviews were audio recorded, conducted individually and then later transcribed. The survey at the end of the activities included questions reflecting student satisfaction and perceived learning using WebCT tools. Tests and quizzes also provided solid data evidencing both motivation and comprehension. Comprehension was measured by scores achieved toward the end of the semester compared to test scores marked at the beginning of the semester. Motivation was measured by attendance and participation in chat sessions.

Course Preparations and Adjustments. Before beginning my research, I was aware that motivation was an underlying issue with some of my developmental students, and they were in my class because of low levels of reading comprehension. This is why I made the important decision to supplement WebCT into my classroom. I weaved activities into my course design in such a way that both reading comprehension and motivation would be encouraged and evidenced. By trying chat and discussion board with last semester's students and experiencing some of the "kinks", I was able to make adjustments and enhancements and conduct the research with this semester's students. One of the issues I encountered last semester was conducting chat sessions outside of classroom time. For my course this semester, I decided to have chat sessions in the computer lab at school instead of the students "meeting" with me outside of class. Students' scheduling conflicts with work and families caused me to change this aspect of chat and by doing so, a few of the problems were eliminated.

When the course was designed to my satisfaction for the purpose of this study, I divided my students into four groups of five for both discussion board and chat activities. I decided to use the same groups for both for ease, consistency, and to strengthen student interaction.

Orientation and Follow-up. Before engaging in any WebCT activities, I devoted an entire class period to introducing WebCT and its various components. I inserted a "welcome to class" video which outlined a description of the entire course, course objectives and requirements as well as readings and materials. We visited the chat room, the discussion board, and I showed them our Intranet class email. They were fascinated by knowing that they could access their grades under the tool "My Grades" at any time to keep track of their progress. By installing an assignment section where each daily assignment could be posted, students could keep abreast if they happened to be absent on a certain day. By the end of class everyone had successfully navigated the course and I felt confident that they were comfortable using it.

I also adhered to course management tips to ensure the experience was positive for my students. I made certain to do the following on an ongoing, regular basis:

- Logging onto the course everyday,
- Checking and immediately responding to student email several times a day,
- Grading and returning assignments, quizzes and tests as quickly as possible,

Checking with each student periodically via WebCT to answer any questions, to see if they had any concerns about either the traditional class portion or the WebCT portion.

Chat Sessions. For the chat sessions, I assigned a different reading each week from one of our texts, *Essays in Contemporary Culture*, by Katherine Ackley. Among the four chat sessions, this paper specifically focuses on the selection, "Silence" by Larry Watson. The students prepared for chat sessions by (1) reading the text and (2) taking an online quiz on the reading. After the students finished these preliminary activities, I allowed them to enter the chat rooms on Wednesdays to discuss the readings. I decided to use these preliminary activities to make certain they read the material and would be prepared for thoughtful discussion. I also decided that I would be an active participant in the chat sessions for each group to help initiate and guide discussions. A rubric was developed to grade, monitor attendance and assess active participation.

Discussion Board. Although my class concentrated on reading comprehension skills, the discussion board provided a space where writing skills were also used and where further research could be explored. For the discussion board activities, I assigned each group readings from *Essays in Contemporary Culture* over the course of four weeks (four readings/discussions per week). I posed a different question to each group to answer and discuss. The questions came from "Reader Response" section of the essay and represented questioning levels based upon Bloom's Taxonomy. Among the four discussion board readings, I chose the essay, *Making the Grade*, written by Professor Kurt Wiesenfeld to use in my research. The rubric I designed to assess this activity required one well-developed initial posting to the original question and two insightful responses to two other classmates' responses in any of the other three groups. I did this in order to expand the opportunities to respond to other groups as well as to encourage the reading of most or all of the other discussions. I also chose *not* to participate in these discussions as I did not wish to squelch student interaction.

Data Analysis & Interpretation

Both qualitative and quantitative methods were used to categorize the research. Quantitatively, data from quiz and test scores, number of discussion board posts, survey results and scores from the discussion board activity yielded clear evidence of motivation and comprehension when using WebCT tools. Qualitatively, the student interview, survey and journal observations complemented and supported the qualitative data. Names of those involved in the research were changed to protect confidentiality. To measure comprehension skills, I used Bloom's Taxonomy to analyze the data from the discussion board taking into account that there would be varying levels of understanding gleaned from the readings.

Sub-Question #1

What happens to students' motivation to read when they use the Chat tool?

Data Sources used: Chat transcripts, chat quiz scores, journal entries, student interviews, and the Survey of Student perceptions of Online Threaded Discussions and Chat Tools.

Chat Transcripts (Data #1)

One wonderful feature associated with the WebCT chat tool is that the chat sessions are automatically recorded. An instructor may go back and analyze the chat transcript for a number of instructional purposes. Each chat session lasted approximately 110 minutes which allowed each of the four groups about 25 minutes per group. For my research, chat sessions provided wonderful insights to my students' motivation. There were two things I wanted to learn from this data source: Would my students enjoy chat? If so, would the chat tool motivate my students to attend class? On the first day I introduced chat, I asked my 20 students to go to Chat Room 1. We all filed in where I suddenly saw a flurry of statements from my students such as:

John: cool

Mark: I can't wait

John: for what?
Eric: Man [sic], this is O-tay!
Mark: I have done this before
Eric: I did blackboard but this is better!
Mark: yes it is

These comments pleased me and I knew right away that this would motivate them. But would it motivate them to *read*? To come closer to this answer, I also looked at the chat room transcripts to mark attendance. Before the chats began, I explained to my students that if they were to miss a chat session, they would have to answer questions from their text on the story and turn them in to me as a substitute for a missed chat. During the four weeks of chat, I documented only two students who had to turn in questions once. Otherwise, everyone was punctual and attended every chat session in its entirety which was another indication of motivation. From this point forward, there was a domino-effect of motivation to read.

The Domino-Effect

Chat Quiz Scores (Data #2)

In order to get my students to read the required readings, I made an online quiz for each reading worth 20 points each. According to my syllabus, quizzes account for 20 percent of their overall grade, so from the beginning, my students knew that they comprised a good portion of their grade. This was, in and of itself, motivation for them to read. Using the online quiz grades for "Making the Grade" as an example, this presents strong evidence of not only motivation to read, but understanding of the material as 80-percent of my students passed the quiz.

Table 3

Quiz grades for "Making the Grade" online quiz

Number of Students	Quiz Grade (out of 20 points)	Grade Percentage
2	12.0	60%
4	14.0	70%
4	16.0	80%
6	18.0	90%
2	20.0	100%

Because the mandatory quiz motivated them to read the text, the likelihood for critical reading was positive. If the student read critically, took the quiz and did well, then the chances of having an insightful chat discussion with the student were increased.

Journal Entries (Data #3)

During the chat sessions, I quickly jotted down any thoughts, reactions, concerns, or ways to improve chat. From this data, I wanted to observe (1) my students' reactions to chat and (2) to record anything that indicated motivation. What I learned from the journal entries supported both my goals. In my November 9, 2006 entry I wrote:

> *Wow, lots of grading lately, but have finally put WebCT discussion board and chat to work. The students love it. I've seen more positive reaction coming from chat over discussion board, but overall the students like it (Burgess, 2006).*

My entry on February 2, 2007 continued to echo the same observations as earlier:

> *We had our first chat session and although it went quickly, I think my students got the hang of it and they also seemed to like it. All you could hear was the harmonious clicking of keyboard keys! I will try to organize a regular computer room for the class so we can have it a bit longer. I have scheduled the chat and discussion board portion of the syllabus at the beginning so I can gather additional data right away (Burgess, 2007).*

Student Interviews (Data #4)

The fourth data source I used to measure motivation was student interviews. From this particular data, I wanted to individually speak with students to learn specifically what they liked or disliked about the tool and if they perceived that they were learning:

> ***Melissa:*** *We also use the chat tool to discuss the essays we have read. Do you like this tool? Why or why not?*
>
> ***Brittany:*** *I love getting on chat. At first I'm nervous because I know that I could be asked something that I don't know the answer to, but after a few minutes I get comfortable and what I read comes back to me. Sometimes other people ask the same question I was going to ask.*
>
> ***Melissa:*** *Do you prepare for the chat session by reading the essay beforehand? Why?*
>
> ***Brittany:*** *Yes, just like for discussion board. Like I said before with discussion board, I want to know what I'm talking about.*
>
> ***Melissa:*** *When we chat as a group, do you feel you are learning? Specifically, do you feel that you comprehend the essay more by discussing it via this format? Why or why not?*
>
> ***Brittany:*** *Yes, I feel I am learning because I also learn from other people in my group. They may say something about the essay that I hadn't thought of before. I seem to understand more because I ask more questions with chat than I do in the classroom.*
>
> ***Melissa:*** *Is there anything about the chat tool that you do not like?*
>
> ***Brittany:*** *No.*

Student Survey (Data #5)

Similar to the individual interviews, I wanted to document my students' perceptions of discussion board and chat, but this time to have them evaluate it at the end of the semester. By using this documentation at the end of the semester, I can glean from the data the overall perceptions and experiences with the tool. I used a survey to accomplish this with varying levels of satisfaction: 1=Strongly Disagree, 2=Disagree, 3=Unsure, 4=Agree, and 5=Strongly Agree.

Table 4

Survey of students' perceptions of WebCT chat tool

Survey of Student's Perception of WebCT Chat Tool	Average
1 Participation increased scores on practice tests, tests, and quizzes	4.2
2. Participation increased total course points	4.0
3. Participation increased understanding of content	4.0
4. Participation increased reading comprehension	3.8
5. Participation increased motivation to read	4.0
6. Participation increased understanding of technical aspects	4.3
7. Participation increased interaction with instructor	4.1
8. Participation increased feeling of community	3.3
9. I enjoyed participation in online chat sessions	4.4
10. Chat sessions should be used again for this course	4.3
*Scale 1=Strongly Disagree 2=Disagree 3=Unsure 4=Agree 5=Strongly Agree	

The results from this survey reflect 100-percent response rate and included comments such as:

> *"At first the WebCT was a small concern for me. But then as time went on I [became] fairly [sic] good with it. Now it's a lot of fun, especially checking out grades, assignments, and chatting with others."*

> *"I enjoy chat. It's cool! I like when we interact with each other, and talk. It's another side of the teacher, then just [lecturing]."*

The bottom line: when a student experiences success, this motivates him/her to achieve it again. This domino-effect proved to be true with the framework with which I designed the chat sessions. The data sources I used to answer my first sub-question more than answered my question; they offered an encouraging path to move forward and explore the many possibilities the chat tool has to offer.

Sub-Question #2.

What happens to students' comprehension skills when they use the Discussion Board tool?

For this sub-question, I wanted to learn from the data two things, (1) What evidence of understanding or comprehension I could gather from the discussion board, and (2) Would this understanding be enough to successfully master a test with the same format as the final? To answer these questions, I used the following sources of data: discussion board transcripts, discussion board scores based upon a rubric, and pre-test/post-test scores.

Discussion Board Transcripts (Data #1)

This source of data reflected the participation of 100-percent of the students in my class. My students were given this reading and each group was required to answer a different question based upon the reading. They were also asked to respond to two other classmates from any group. The assignment was worth 25 points and I assessed their efforts with a rubric designed to specifically fit the needs of this particular activity. To measure comprehension, I looked for evidence of making connections to previous or current content or to real-life situations. I also

wanted to see rich and fully developed new ideas, connections or applications. These higher-order thinking skills coupled with collaborative learning enhance and support the learning process. This theory closely parallels the constructivist theory and may ultimately demonstrate deeper thought (Martyn, 2003). Although I saw many instances of comprehension in other groups, I decided to use portions of Group 2's initial posts and responses for support. I saw several connections to real-life situations:

> ***Kristy's initial post:*** *The relationship with father [sic] and son is usual[ly] by the father loving and caring for his son as much as the father normal[ly] does. The unusual part about it is how the father kidnapped [sic] the son and risked never seeing his son again. I was able to understand and feel the pain of love the boy and father felt for each other because my parents have been divorced for 15 years… and plus, how many parents are still together today? Not many?*
>
> ***Alan's response:*** *I agree with Kristy about feeling the love even though my parents aren't divorced. My dad and I don't have the best relationship.*
>
> ***Kristy's response to Alan:*** *I agree with Alan with how he hates that the mother only let the dad see him once a Saturday a week because [sic] I hated seeing my dad twice a week, but yet I was thankful to see him at all.*

I also saw evidence of fully developed new ideas in this question posed by a student:

> ***Megan's response to Bill:*** *you know when you are about to do something wrong [sic] and you know that you are going to get into trouble for it but sometimes it is worth it? Is think that's what the father thought about taking his son for the night…there was no logic[al] reason for him not to be able to spend the night but it really [sic] meant a lot to the father. And even if the mother disapproved of it, [sic] the father knew he was going to get caught and he didn't even run from the police. He [sic] just wanted his son to spend the night. I think that even if the father got jail time for kidnapping he thought it was worth [it] and if he could take it back he wouldn't-because it was worth it and meant a lot to him.*

Scores from Discussion Board Posts (Data #2)

The scores from the discussion board posts provided clear confirmation that most of my students were able to effectively read and understand the reading for the discussion board.

Table 5

Scores from "Making the Grade" discussion posts and responses

Number of Students	Grade Received	Grade Range	Letter Grade Equivalent
8	25	20-25	A
3	20	20-25	A
5	19	14-19	B
2	13	8-13	C

Pre-test & Post-test Scores (Data #3)

One of my main objectives with this research was to demonstrate that my students' comprehension skills increased and that they were able to effectively master a test similar to the DCF (District Common Final), which is a final exam administered to all of the Developmental

Studies in Reading classrooms in the college district where I work. The final is a large determinant on whether the student passes or fails the course. The DCF consists of a reading passage and multiple choice and short answer questions. Students must demonstrate critically thinking skills in their answers as well as to be able to identify various literary elements such as tone, pattern, mood and intended audience. I administered a pre-discussion board test comparable to the DCF at the beginning of the semester and compared them to scores on a post-discussion board test with the same format. The scores indicate slight improvement in comprehension skills with the exception of two students.

Table 6

Pre-discussion board test scores vs. post-discussion board test scores

Student	Pre-Discussion Board Test Score (out of 100)	Post-Discussion Board test Score (out of 100)
Student #1	75	82
Student #2	80	79
Student #3	83	85
Student #4	71	83
Student #5	90	95
Student #6	88	89
Student #7	96	98
Student #8	85	83
Student #9	89	92
Student #10	66	69
Student #11	79	84
Student #12	91	93
Student #13	56	60
Student #14	88	90
Student #15	73	74
Student #16	80	83
Student #17	77	85
Student #18	79	81

In conclusion, the results I found in the data sources used to answer the second sub-question indicate that use of the WebCT Discussion Board tool enhances comprehension skills.

Action Research Question

What happens to students' comprehension skills when WebCT technology is implemented?

To answer my action research question, I looked at three data sources: student interview questions, the student survey and chat session transcripts.

Student Interview Questions (Data #1)

The student survey used to illustrate motivation earlier also demonstrates overall comprehension skills with both tools. Consider the following questions and comments from the interview with one of my students:

Melissa: *WebCT is being used here at Kingwood to deliver entire virtual classes as well as to supplement actual courses. As we are using it as a supplement, I chose to add both the discussion board and chat to improve the learning community in our classroom. Do you feel that WebCT has improved the learning community within our classroom? In what ways?*

Brittany: *Yes. When I get on the discussion board and answer the questions you put on and someone else responds with a comment or says something different than what I say, it helps me to get to know them better. I don't talk much in class so I do better by typing it on the computer.*

Melissa*: When I post discussion questions to WebCT for discussion, do you read the assignment or essay before posting? Why or why not?*

Brittany: *I do read the essays before putting a post on WebCT because I won't know what to say unless I read the assignment.*

Melissa: *On the WebCT Discussion Board, do you read other classmates' postings to discussion questions as the assignment asks?*

Brittany: *Yes, because I am curious to know what they said too. Sometimes I see something that I can relate to and post something back to that person.*

Melissa*: Do you feel that your motivation to post your responses is high or low knowing it will be posted for all to see? Please explain.*

Brittany: *Well, when I know that everyone in class might be reading what I write, it makes me write better. I also want to make sure that I understand the assignment, so I make sure I can understand what I read too.*

Melissa: *About how many postings do you read?*

Brittany: *I actually try to read all of them—I like to see what other people wrote.*

Not only is there perceived learning and comprehension shown in this interview, but there is motivation to know more and to read more through piqued curiosity at "what other people wrote". The collaborative nature of the both WebCT chat and discussion board tools fosters the social aspect of learning thereby increasing the opportunity to build new knowledge from others or add to pre-existing knowledge.

Student Survey (Data #2)

This survey reflects the perceived comprehension levels students felt they reached when using WebCT chat and discussion tools. I took only those questions from the survey that indicated comprehension.

Table 7

Survey of student perceptions on online threaded discussions and chat tools

Questions	Average
1. Participation increased scores on practice tests, tests, and quizzes	**4.1**
4. Participation increased understanding of content	**3.8**
7. Participation increased motivation to read	**3.9**
13. Participation increased reading comprehension	**4.0**

*Scale 1=Strongly Disagree 2=Disagree 3=Unsure 4=Agree 5=Strongly Agree

The scores were taken from both the discussion board and chat survey, added and then averaged. The results reveal that many students perceived an understanding and comprehension of the reading assignments.

Chat Transcripts (Data #3)

In the chat session covering the reading "Making the Grade," comprehension was measured in the ongoing dialogue with my students. I designed a rubric for the chat sessions, however I only required that the student attend the chat session, come well-equipped with questions and insightful thoughts about the story, and respect others' opinions and thoughts. I was pleasantly surprised that my students went above and beyond in chat sessions by asking each other probing questions, analyzing actions by the characters, and being able to identify key literary elements of the reading:

Melissa *>>What does Wiesenfeld think about those students who ask for a higher grade (without really earning it)?*

Betty*>>they don't deserved to have a higher grade if they didn't put any effort into [sic] class*

Melissa *>>That's right:-)*

Susan*>>that they are just asking for a grade when they do not try*

Mitch*>>He thinks that it's sad that hard work is overruled by the sadness of a student*

Melissa*>>I don't just hand out grades...I try to be fair...but at the same time, I want you to work for your grade. I am essentially holding you accountable for your own decisions.*

Melissa *>>According to Wiesenfeld, who is to blame for this "erosion"? Parents? Teachers?*

Mitch*>>Tom, what do you think about Mrs. B's class?*

Mitch*>>Teachers*

Betty *>>I [sic] think it's the students that are to blame*

Tom*>>I think it's [sic] a good class*

Melissa *>>Thanks Tom:-)*

Mitch*>>….to tell you the truth, it should be both*

Susan*>>I [sic] think it's [sic] the students*

Mitch>>*Hey [sic] Nancy don't [sic] you agree?*

Melissa>>*What was the author's tone in the essay?*

Susan>>*He was worried*

Mitch>>*concerned*

The chat session demonstrated comprehension of the story by dialogue rich in inquiry and understanding of content. Connections were made and students were metacognitive of their own thinking by sharing their own beliefs about students today asking professors for higher grades without deserving them.

Conclusion

This research paper presented evidence that WebCT tools, chat and discussion board, increase students' comprehension skills. Motivation to use the chat tool sparked a willingness to know more and to read more. It is likely that motivation and learning are "mutually causal-those who are more motivated to learn learn more and those who learn more become more motivated" (Richmond, 1990). It comes as no surprise that online communication methods such as chat and discussion board are so much more than electronic communications. They have the potential to be a key means to increase motivation, therefore increasing the desire to learn.

This research opens many doors for continued research—especially in the area of developmental studies whereby as instructors we are obligated to find ways to combat illiteracy at the college level. My hope is that the research I have conducted will shine a positive light on using online learning communities therefore encouraging more colleges and universities to supplement this new literacy.

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Editor's Note: Assessment is the basis of course development and continuous quality improvement. This comprehensive program improvement strategy developed for the Ajman University Science and Technology program revisits goals and assessment procedures on a regular basis to maintain academic programs that are relevant and high in quality.

Development of an Ongoing Assessment System for Academic Programs

Zuhrieh Shana

United Arab Emerits

Abstract

Ajman University of Science and Technology, like other accredited and reputable higher education institutions, needs to regularly assess the effectiveness of its academic programs. This commitment is documented in its institutional mission "to guarantee pertinence and quality of educational programs through the constant assessment of learning outcomes."

It is a well established fact that a single assessment tool may not give an accurate and reliable result. Consequently, it is recommended to use a variety of assessment tools and programs to ensure fair and objective judgments of real achievement of the graduates. The "Nine Principles of Good Practice for Assessing Student Learning" (AAHE, 1992) supports the significance of broad representation of assessment tools in order to cross traditional boundaries and take an innovative approach in pursuing excellence in student learning's assessments. In this regard, an electronic assessment program, *Objective-Based Course Assessment Program*, is being designed to be used as a systematic and ongoing process of determining if the program is meeting its expectations.

The paper discusses and describes justifications for this assessment program, conceptual framework, and an example of its usage at the Department of Educational Technology/Ajman University of Science and Technology (AUST). When assessment of each objective of all courses in the curriculum is completed, the degree to which program goals and objectives have been achieved is determined. Although it is designed and utilized for the Department of Educational Technology, AUST, this template-like assessment program can be adapted and used in any academic program at any educational institution.

Keywords: Objective-Based Assessment, Higher Education, Classroom-Based Assessment, Curriculum-Based Assessment, Outcome-Based Assessment, Curriculum Development, Accountability, Assessment, Program's Accreditations, Learning Achievements, Teaching Evaluations , Program Evaluation , Course Evaluation

Introduction

Background

An academic program is defined by Cookson (1996) as "the organized learning activities which have been systematically planned to achieve, in a specific period of time, certain specific learning outcomes for one or more [participants]." In higher education, the rationale for program improvement is to achieve better student learning outcomes. Institutions are increasingly asked to demonstrate the effectiveness of their programs, which has led to the development of many assessment programs campus-wide.

Furthermore, since the performance of the individual students represents the performance of the institution accountable for providing the learning opportunities, the essential aim in assessment programs can be traced to a widespread interest in improving program quality and the need to

respond creatively to internal and external constraints. This requires concrete proof and feedback on how well individual courses, programs, and the university as a whole are accomplishing their stated missions, goals and objectives.

Assessment in higher education has evolved over the years; hence program assessment is not new to educational institutions in general, and to AUST in particular. The majority of current assessment programs depend on collecting and reporting data to accrediting organizations. Assessment data collected by academic program directors, individual administrators and faculty members requires considerable effort. This is a good start, but the process is limited in scope, efficiency, storage, retrieval and planned function of the data.

Schilling and Schilling (1999) support the notion that "the impact of all this assessment on day-to-day functioning of the academy has been modest at best". Moreover, the process is inefficient and results in duplication of effort and failure to collect certain relevant data. Thus, as the number of academic programs continues to grow and more data is collected, there is a need to develop a comprehensive, efficient, organized, and reliable program for the assessment of students' experiences and accomplishments. For this purpose, a comprehensive *Objective-Based Course Assessment Program* was developed at AUST to pursue this goal.

Purpose

It is suggested that assessment is "first and foremost about improving student learning and secondarily about determining accountability for the quality of learning produced." (Angelo, 1999) The main purpose of the *Objective-Based Course Assessment Program* is derived from the above statement by focusing on continuously improved student learning through:

- Definite proof of the students' attainment of specified objectives;
- Appropriate decisions on the curriculum, instruction, and an efficient strategy to overcome weaknesses of the program; and
- A foundation to enhance teaching and learning within program courses.

Research Questions:

The stated assessment program is expected to answer the following questions:

1. What do we want our students to learn?
2. What are we doing to help them learn it?
3. How well are we doing what we are supposed to do?
4. What should we do in the future for improvement?

Related Literature

Assessment

By analyzing the existing literature and research studies related to the academic program assessment, the Palomba & Banta (1999) definition: "assessment … is the systematic collection, review, and use of information about educational programs undertaken for the purpose of improving student learning and development," was adopted for this study. Similar conclusions have been reached by Maki (2004).

Moreover, studies by educators and educational researchers support the claim that assessment has the responsibility of offering valid data of learning achievement in order to inform all participants in the learning process, to facilitate provision of further learning, or to attest that a required level has been attained, (Huba & Freed, 2000; Banta & Associates, 2002; Bresciani, 2003; Driscoll &

Cordero De Noriega, 2006). Literature also corroborated the fact that in many academic programs "students are being evaluated, but there is no evidence that the *program* is being evaluated and improved as a result of these evaluations. The department needs to develop more specific objectives, with an eye toward evaluating curricular and co-curricular learning opportunities provided to the students." (Hardy, 2004)

On the other hand, the findings of Palomba and Banta (1999); Stassen, Doherty and Poe (2001) defines four levels of assessment:

- *Classroom assessment*, involves assessment of individual students at the course level typically by the class instructor;
- *Course assessment*, involves assessment of a specific course;
- *Program assessment,* involves assessment of academic and support programs and is the focus of this study; and
- *Institution assessment,* involves assessment of campus-wide characteristics and issues.

For the purpose of this study, the above levels of assessment have been adopted. This is quite helpful in developing a quick view of the literature.

Classroom and Course Assessment:

Course assessment has always been an implied concern in higher education. Consequently, the exceptional development of classroom and course assessment suggests that the "classroom assessment is the purest form of assessment-for-improvement, because the information gleaned can be immediately used to improve teaching and learning …the further away from the individual classroom you get, the harder it becomes to turn assessment data into useable information." (Miller, 1997)

Since 1932, the distinguished scholar, Ralph Tyler suggested that teachers should "formulate the course objectives, define the objectives in terms of student behavior, collect situations in which students are to indicate the presence or absence of each objective, and provide the method of evaluating the student's reactions in the light of each objective." Moreover, Wright (1999) confirmed that "all the curriculum reform in the world is ultimately useless if students do not learn what faculty teaches. Assessment is a response to the realization that—curricular reform, new teaching technologies, testing and grading, and ever-higher tuition notwithstanding—college graduates do not seem to be learning at a level that matches the expectations of employers, parents, or the general public. If assessment is to improve undergraduate education, it must be a faculty-defined, faculty-controlled activity."

Moreover, assessing learning achievement should be based on assessing the knowledge, skills and attitudes in their curricula and courses. To provide a more comprehensive picture of student learning, Peggy Maki (2006), called attention to the focus on assessment as a process of investigating the efficacy of the educational practices. Consequently, the wide range of activities involved in student learning is considered as direct evidence of how they form meanings. She also added that, "we are educating the next generation of experts in our disciplines. We should be curious about how we are educating those future experts and the pedagogy that underlies that education."

Program Assessment:

Assessment research has offered constructive information and insights on how to ensure quality in educational institutions: "the quality of an institution is marked, more than anything else, by the quality of its departments and its academic programs. Departments…are semi-autonomous organizations…and their vitality is what makes the institution tick. Without program quality, what happens in the rest of the institution makes little difference." (Wergin, 2003)

Program Assessment can be looked upon as "any regular and systematic process by which the faculty designs, implements, and uses valid data gathering techniques for determining program effectiveness and making decisions about a program conducts and improvement." (Metzler and Tjeerdsma, 1998) Program assessment is based on a number of interrelated components and processes in place at the university to ensure institutional effectiveness in accordance with its mission. Thus the results of the assessment are to inform and often change instructional practices and courses, curriculum and program design. The relation between the institutional mission and course learning objectives is illustrated by the following:

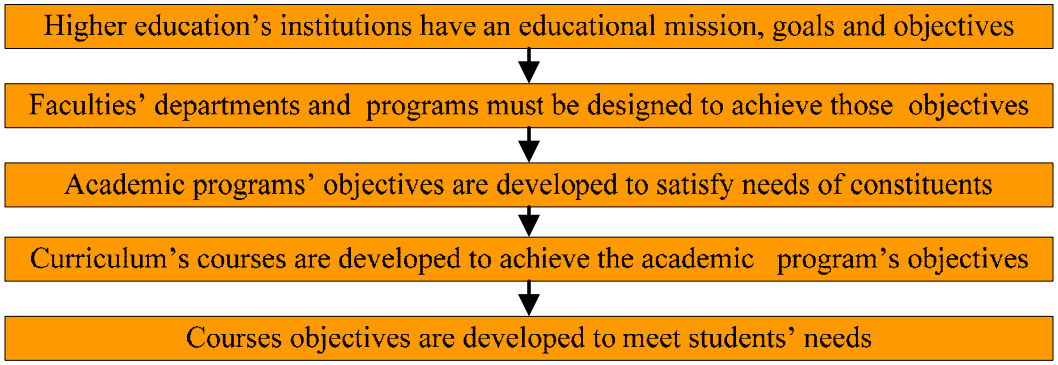

Figure 1: Relationship between institutional mission and learning objectives

Banta reported that (2002), a successful academic program's assessment begins by establishing the program's objectives. These objectives should be based on the institutional goals and mission. However, taking into consideration the fact that institutional and program goals are often ambiguous, it is crucial to state and specify the program's objectives that will be considered as the basis of the program's core curriculum courses. Subsequently, an academic program should state its curriculum course objectives as clearly and specifically as possible before any assessment methods/ instruments are considered or data is collected. In Erwin's words, "one must know what is to be assessed before one knows how to assess it."(Erwin, 1991) For this reason, course objectives must drive the selection of assessment methods and instruments.

By assessing the students' achievements in each course, we can evaluate the course, and if we evaluate all the courses we can judge the effectiveness of the curriculum, programs, faculties and the total institution. This relationship amongst the different components of higher education institutions shows the complexity, importance and necessity of an ongoing assessment to ensure that all educational components are focused to accomplishing its mission. It emphasizes the need of an assessment plan that applies at all levels, from the institutional level to major programs and specific courses.

Institution Assessment

In a study by Gray (2002), he stated that institutional assessment is a form of systematic investigation that results in improvement or accountability. However, there are a large number of definitions given by different researchers. Distinctions between these definitions have been summarized by Ewell (2002) as follows:

a) Assessment initially refers to the processes used to determine an individual's mastery of complex abilities, generally through observed performance.

b) The performance of the individual students has been combined to reflect the performance of the institutions responsible for providing the learning opportunities.

c) Assessment in higher education is currently seen as a special type of program evaluation whose purpose is to gather evidence to improve curricula and pedagogy with the intent of identifying means to improve the academic program's effectiveness.

To foster a greater and deeper understanding of institutional assessment, assessment guidelines provided by Driscoll & Cordero De Noriega (2006), have been examined from a logical perspective. The guidelines are:

- Define and clarify program goals and outcomes for long-term improvement.
- Make assessment-for-improvement a team effort.
- Embed assessment into campus conversations about learning.
- Use assessment to support diverse learning abilities and to understand conditions under which students learn best.
- Connect assessment processes to questions or concerns that program decision makers or internal stakeholders really care about.
- Make assessment protocols and results meaningful and available to internal and external stakeholders for feedback and ultimately improvement.
- Design an assessment model that aligns with the institutional capacity to support it.

The above guidelines show that the main characteristic of assessment in higher education has been altered from focusing on institution-centered to learner-centered. This is in accordance to Huba and Freed (1999), who "encourage(s) us to focus on the student learning component of our teaching as it takes place within the entire system of our institution and within the smaller systems of our academic programs and courses." In fact, much of the examined literature supported this fact by implying that the full cycle of the assessment will not be complete, beneficial and worth the effort unless the results can be used for an ongoing educational improvement. (David et al., 1989; Glickman, 1991; Meier, 1987; Miles & Louis, 1990; O'Neil, 1990). Through a precise and comprehensive assessment program, vital information can be derived for the maintenance of the college's integrity and its educational programs.

The literature provides an overview of general assessment issues, but lacks in-depth investigations to develop more reliable assessment tools and programs. Program assessment "can have negative effects - unnecessary apprehension, distraction of time from teaching and research, and unfulfilled promises and expectations." (Fulks, 2004) However, the continued existence and growth of program assessment practices suggest that results can be advantageous. Given the accumulation of program assessment at all levels of higher education, there is a need for a systematic study to develop assessment tools to support individual and collective program needs.

Communication of Assessment Data

After collecting the data, the following questions must be answered: what are we going to *do* with all of this data? Will anyone actually read it? Keep in mind that the activities leading to the reporting of the data may be just as valuable—or more valuable—than the data itself. (Peter Dlugos, 2003)

CAP assessment data are to be submitted in an electronic format, using University supported software programs (spreadsheets for data and e-mail or word processing programs for reports).

The flow of assessment information is illustrated in the chart below:

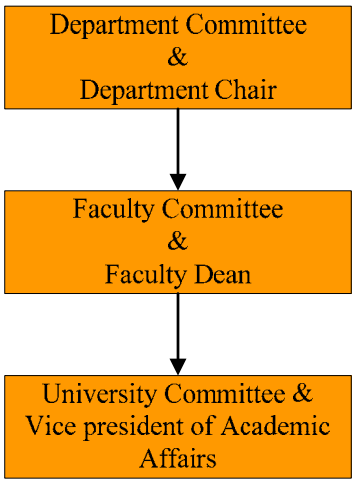

Figure 2. Flow of Assessment Information

Participants, Roles and Responsibilities:

1. Departmental Committee

- Reports to the faculty committee and faculty
- Subcommittees may be formed to enhance effectiveness and efficiency

a. Membership

- Academic program's chairperson
- The selected course instructor
- Department's faculty members
- Student Services Dean
- Director of Institutional Information Technology

b. Roles and Responsibilities

- Selection of four courses a year, one from each level
- Submission of portfolio to the selected courses. Each course has to document all the course activities (samples of all tests, individualize and group projects, assignments)
- Specify course intended goals and objectives
- Indicate level of difficulty of each objective / whether it is easy, average or hard (based on blooms taxonomy and IQ normal distribution)
- Assign, based on the previous step, points/ grades out of hundred for each objective (this has to be based on the emphases, complexity and importance
- Specify a criteria / standard of achievements for each objective
- Assign teaching methods, strategies and evaluation instruments/ exercises (examination, lab assignment, other written exercise, etc.) for each objective

- Assess students' performance on the specified tools for each objective
- Assess student performance on all program courses to assess program effectiveness
- Evaluate the assessment data collected
- Facilitate department-wide discussions regarding the specific assessment findings and the assessment program;
- Create an assessment report and convey the findings to the dean

2. Faculty Committee

- Reports to the University committee & Vice president of Academic Affairs
- Subcommittees may be formed to enhance effectiveness and efficiency

a. Membership

- Faculty Dean
- Faculty Departments' Chairs
- All Faculties Deans can participate

b. Roles and Responsibilities

- Collection of the program/department specific data
- Analysis of program/department specific and relevant assessment data
- Evaluation of the collected data with emphasis on the difference between the desired and actual result
- Recommending a plan for closing the gap between where we are now(according to the results) and where we need to be(according to our mission)
- Reporting program/department specific data through appropriate channels to Vice President of Academic Affairs

3. University Committee

- Reports to the University President
- Subcommittees may be formed to enhance effectiveness and efficiency

a. Membership

- Vice President of Academic Affairs
- Campus Director
- Dean of Students Affairs
- Dean of Records and Admission
- Dean of Libraries and Resources Center
- Dean of University Requirements
- Head of IT Division

b. Roles and Responsibilities

- Revision of the final report and discussion of any clarification, verification, suggestions or recommendations with the program/department chairperson and faculty dean
- Acceptance of the final report and incorporating it into the annual Assessment Program report for dissemination to the University community
- Making reports available for external accreditation committee
- Establishing a plan for communicating and using results for improvement
- Monitoring the improvement plan.
- Communicating any assessment data collected through the appropriate channels

The Assessment Program

Objective-Based Course Assessment Program requires the faculty of the academic programs to have agreed upon goals and specific objectives for the students to achieve in each course in order to assess the students directly against those objectives. Each student's grade in the course depends solely upon the objectives he/ she has achieved. The assessment program describes how objectives and the means of attaining them can contribute to a student's achievements and to the course's degree of success which can be determined directly from the number of objectives met (figure1).

The Objective-Based CAP© Course Template allows instructors to record student performance on a variety of assessment tasks, and tabulates that information over the semester. Once the data is entered and the performance criteria are set, a click of a button can generate multiple reports to show how students have performed on their objective based assessments. It also entails gathering, analyzing, and interpreting evidence to determine how well performance matches those expectations and standards; in addition to using the resulting information to document, explain, and improve performance.

Course No:	**Instructor Data**
Course name:	Name:
	Depart:
	Phone:
	Email:
Goals & Objectives:	
Goal-1:	
Objective 1-1:	
Description {Teaching method – Strategy – Criteria for assessing the achievement}	
Means of Assessment {Quizzes, Portfolio, T/F, … etc)	
Accomplishments {Students scores}	

Objective 1-2:

Description {Teaching method – Strategy – Criteria for assessing the achievement}

Means of Assessment {Quizzes, Portfolio, T/F, … etc}

Accomplishments {Students scores}

Objective 1-3:

Description {Teaching method – Strategy – Criteria for assessing the achievement}

Means of Assessment {Quizzes, Portfolio, T/F, … etc}

Accomplishments {Students scores}

Goal-2:

Objective 2-1:

Description {Teaching method – Strategy – Criteria for assessing the achievement}

Means of Assessment {Quizzes, Portfolio, T/F, … etc}

Accomplishments {Students scores}

Objective 2-2:

Description {Teaching method – Strategy – Criteria for assessing the achievement}

Means of Assessment {Quizzes, Portfolio, T/F, … etc}

Accomplishments {Students scores}

Figure 3: Course Presentation in *Objective-Based CAP Template*

Objective-Based CAP© Cycle:

The Assessment Cycle applies the systematic methodology of ADDIE, the instructional design model, to the assessment, design, development, implementation and evaluation of academic programs (**Ryder, 2006).**

This entire discussion on objective assessment has posed some important questions that can be given serious consideration when designing an assessment program/plan. Questions regarding standards include:

- What level of performance and by what percentage of the students is considered adequate?
- At what point do we decide that there is a problem?

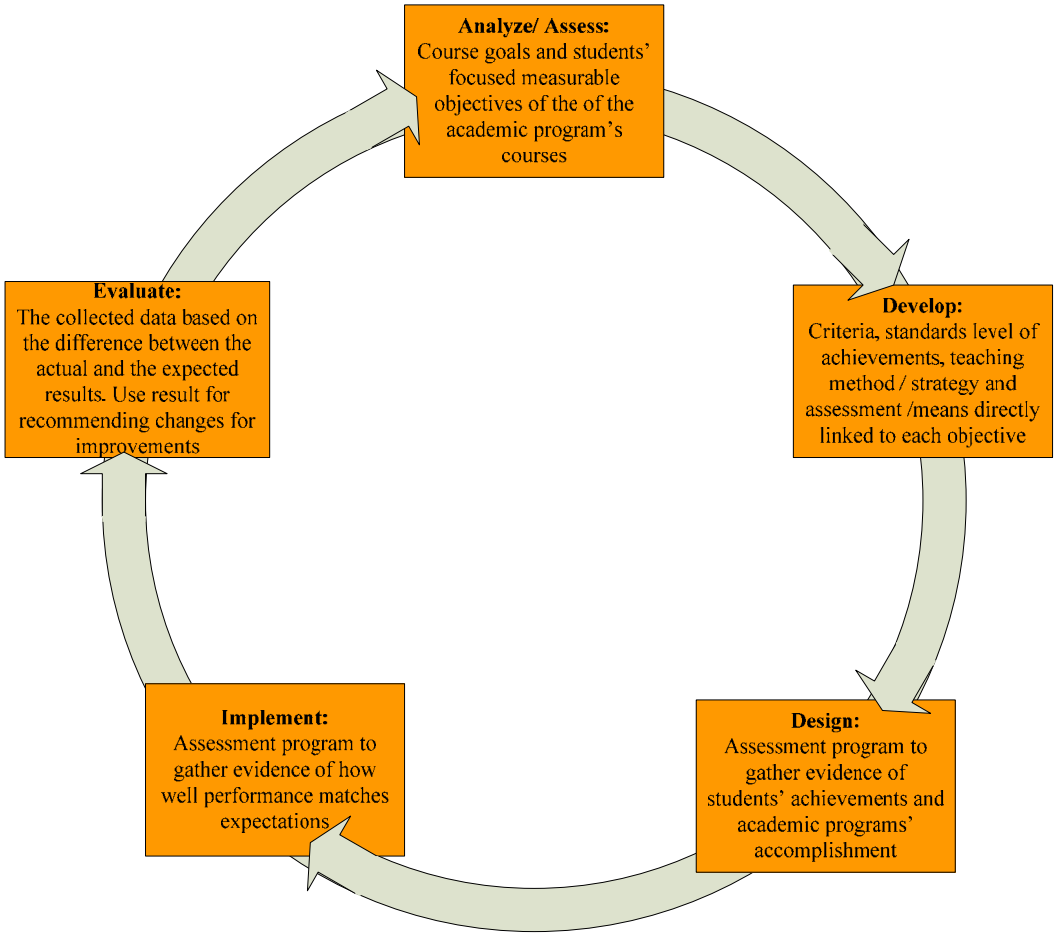

Figure 4: Objective-based CAP Cycle

There are no definite quick answers to these questions; however, experts say that at least 75% of the students must achieve at least 75% of the course objectives, for the following reasons:

1. ***The Normal Distribution (Normal Curve):***

   Intelligence can be defined as the ability to learn or understand or to deal with new or trying situations. According to CTB /McGraw-Hill "in a normal distribution, approximately two-thirds (68.3%) of the scores lie within the limits of one standard deviation above and one standard deviation below the mean. One-sixth of the scores lie more than one standard deviation above the mean, and one-sixth laid more than one standard deviation below the mean(figure 2). For example, deviations IQs are standard scores with a mean of 100 and, usually, a standard deviation of 16. (See *http://www.ctb.com/articles/article_information.jsp?CONTENT*)

   The **normal curve** represents the normal distribution of IQ. It illustrates that 68% of the scores lie between -1 and +1 standard deviation (Talman, 2007).

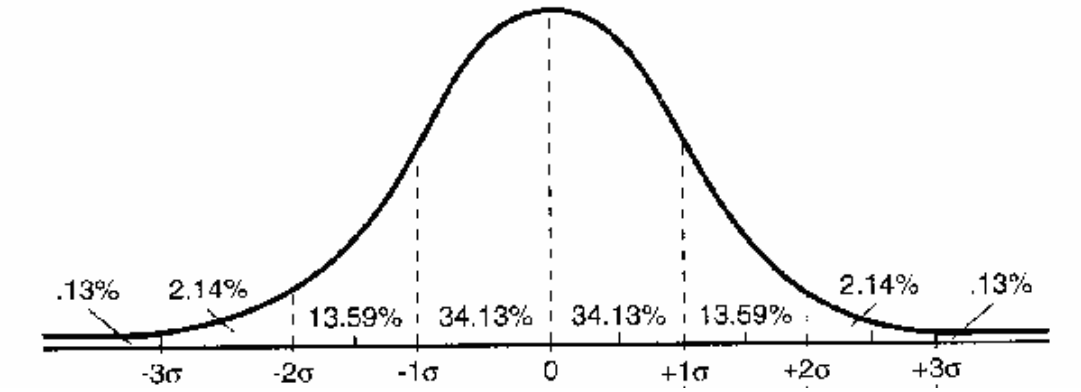

Figure 5: Percentage of Cases under Portions of the Normal Curve

2. Objectives Performance Index

"The OPI makes test results both understandable and useful for the teacher in planning effective learning strategies and activities. The OPI is an estimate of the number of items that a student would be expected to answer correctly if there had been 100 similar items for that objective....The OPI scale runs from 0 for total lack of mastery to 100 for complete mastery. For CBT Achievement tests, OPI scores between 0 and 49 are regarded as the non-Mastery level. Scores between 50 and 74 are regarded as indications of partial Mastery. Scores of 75 and above are regarded as the Mastery level."(CTB/McGraw-Hill, 1997)

3. AUST Grading System and Graduation Requirements

A Grade Point Average (GPA) of 2 points which is C or an average of 70% is required for students' graduation. "Students will not be allowed to graduate unless they achieve the accumulative grade point average of 2 or above even if they have passed all subjects projected for the degree they are studying for." *(AUST website: http://www.ajman.ac.ae/aust/index.htm)*

Therefore, to classify a course as "meets expectation", a minimum of 75 % of the students in this course must get a grade of C+ or above; in other words to reach the mastery level, in at least 75% of the objectives. Nevertheless, the CAP assessment program allows the department's committee to choose the achievement level for each objective according to its level of difficulty based on Bloom's Taxonomy (Anderson & Krathwohl, 2001) or any other logical and approved explanation.

The average of students' achievements in the academic program courses will be calculated and a detailed report will be provided to this program based on the following criteria:

- *Exceeds expectation:* 85% to 100% of the objectives are met
- *Meets expectation:* 75% to 85% of the objectives are met
- *Needs modification:* 65% to 74% of the objectives are met
- *Unsatisfactory:* 64% or less objectives are met

Implementation

The CAP Program was implemented as a Windows-based computer program by using Microsoft Visual FoxPro version 8 as the main programming tool and Microsoft Access 2003 as the database management system. Figure 3 shows a snapshot of the CAP program interface.

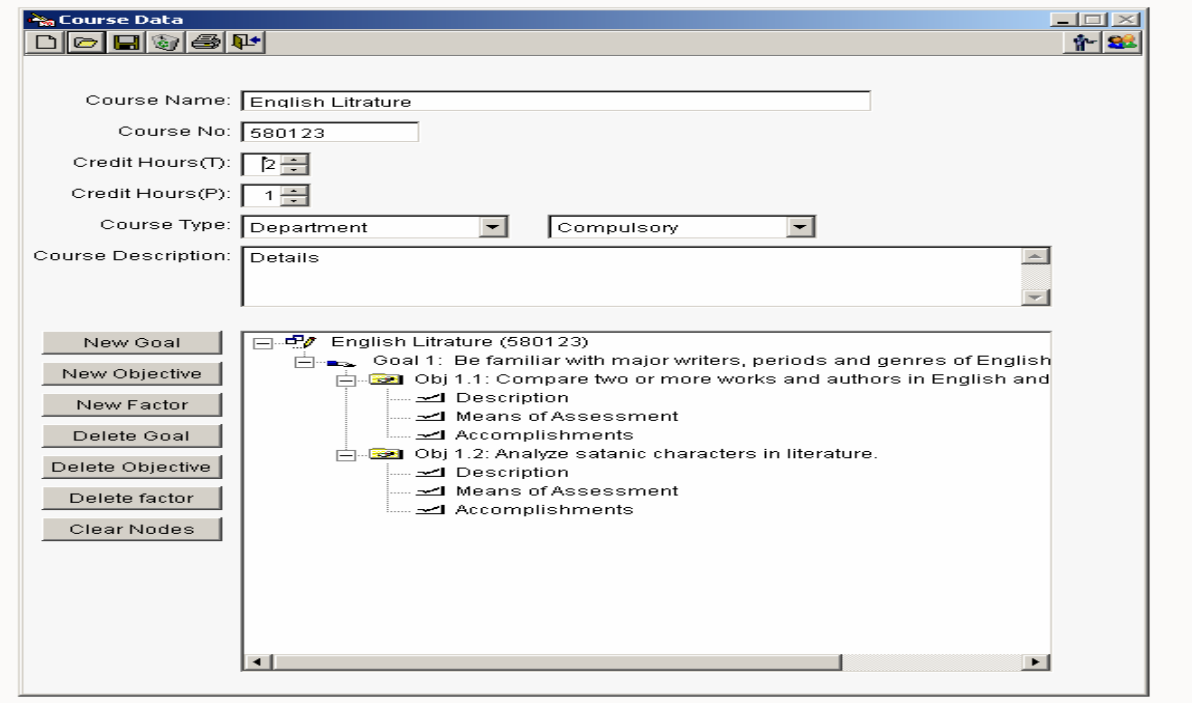

Figure 6: The Interface of the CAP Program

The program accepts the raw data which is: courses and the student database. The assessment process starts by identifying the course assessment criteria, methods/ means of assessment with the points allocated as a weight for each method/ mean, and the students' scores in each objective. The final outputs of the program are two items: a final report for the course performance and the students' performance charts in each objective.

The fundamental nature of the CAP assessment program is to integrate assessment activities that focus on the academic program's goals and objectives that align with institutional mission statement, goals and objectives. The CAP assessment program has been designed to ensure that all academic programs use the same assessment program elements, definitions of terms, database, and reporting designs. This unified approach will result in an improved institution-wide awareness of assessment and the database which will lead to an ongoing progress of program effectiveness and enhancement of student learning.

To achieve the above mentioned aims, the objective-based CAP program has been demonstrated to a group of Ajman University faculty members representing different departments, and modified according to their recommendations and suggestions. Moreover, the objective-based CAP program was tested on one of the Educational Technology Department's courses, Instructional Print and Audio Media (580111) with three credit hours (1 theory +4 practical) in the first semester 20041 and a similar course Visual Media 580123 in the second semester 20042 (1 theory +4 practical); with the same group of students and taught by the same faculty member.

Similar results were obtained with the two courses. However, slight improvements have been noticed in the second course (580123**).** The explanation for this improvement was due to the time that the courses were offered. The first course being offered in the (580111) during the first semesters of the entire study plan; hence the students are still new to the teaching/ learning environment at AUST. Hatcher and others (1992) have explained this by predicting that satisfaction with the university experience is linked to students' performance, (figures 7a & 7b).

Table 1a

Instructional Print and Audio Media – First Semester

Grades	obj_1	obj_2	obj_3	obj_4	obj_5	obj_6	obj_7	obj_8
A+	0%	0%	0%	10%	10%	10%	10%	0%
A	10%	10%	10%	0%	10%	10%	10%	10%
B+	0%	0%	0%	0%	0%	10%	10%	0%
B	20%	10%	50%	40%	50%	40%	40%	20%
C+	0%	0%	0%	0%	0%	0%	0%	10%
C	60%	70%	30%	30%	10%	10%	10%	50%
D+	0%	0%	0%	0%	0%	10%	10%	10%
D	10%	10%	10%	20%	20%	10%	10%	0%
F	0%	0%	0%	0%	0%	0%	0%	0%

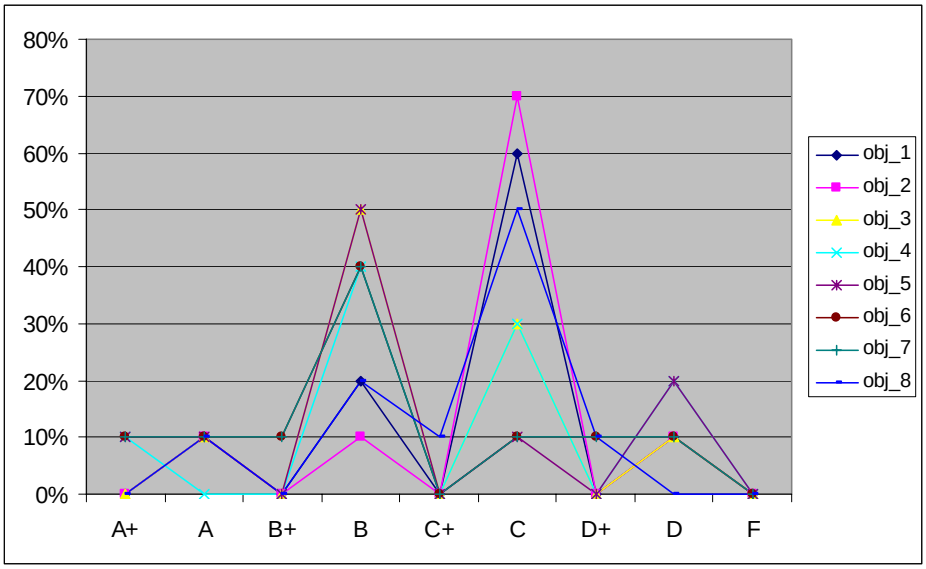

Figure 7a: Overall results of 580111: Instructional Print & Audio Media

Table 1b

Instructional Visual Media – Second Semester

Grades	obj_1	obj_2	obj_3	obj_4	obj_5	obj_6	obj_7	obj_8
A+	0%	0%	0%	0%	0%	0%	0%	0%
A	10%	10%	10%	10%	20%	20%	20%	10%
B+	0%	0%	50%	30%	40%	40%	40%	20%
B	20%	10%	0%	10%	10%	10%	10%	0%
C+	60%	70%	30%	30%	10%	10%	10%	60%
C	0%	0%	0%	0%	0%	0%	0%	0%
D+	0%	0%	0%	0%	0%	10%	10%	10%
D	10%	10%	10%	20%	20%	10%	10%	0%
F	0%	0%	0%	0%	0%	0%	0%	0%

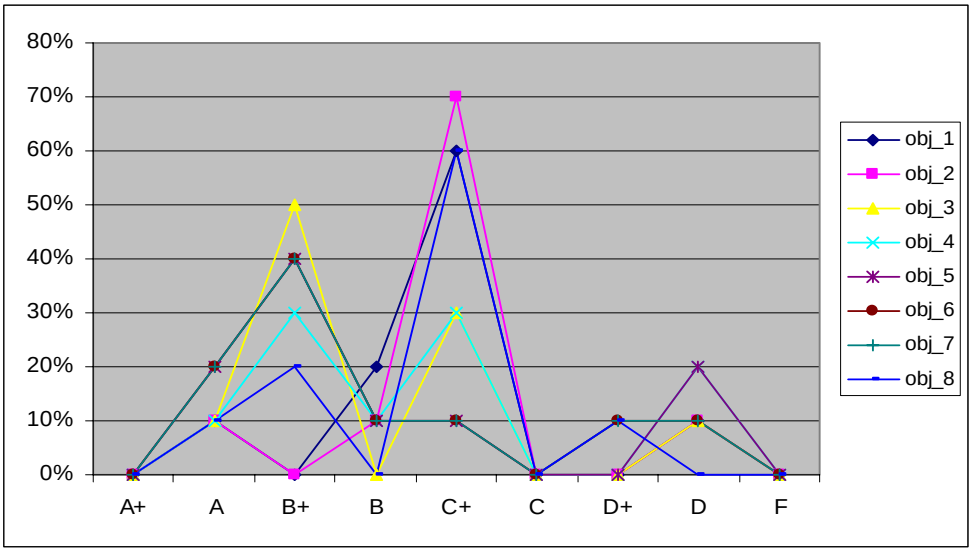

Figure 7b: Overall results of 580123: Instructional Visual Media

Based on the fact that, the major intention in creating and implementing an assessment instrument is to eliminate, or at least limit, the factors that might have an undesirable effect on its validity, and the interpretation of the assessments' outcomes has to be based on the extent to which such factors can be controlled. For this reason, and in support of the continuous corrective/improvement of the assessment program, the Objective-Based Course Assessment Program has been used for the last three years, to assess one course each semester. Results of individual courses are listed below:

Table 2

Objective-Based Course Assessment Program

S	Course Name	Semester	No of Students	Final Result
1	Instructional Print and Audio Media	2nd 2004	10	Meets Expectations
2	Instructional Visual Media	2nd 2004	10	Meets Expectations
3	Computer Based Training	1st 2005	34	Meets Expectations
4	Introduction to Distance Education	1st 2005	15	Needs Improvement
5	Practicum	1st 2006	6	Exceeds Expectations
6	Training Strategies	1st 2007	20	Meets Expectations

The above trial testing, provided a continuous and concrete feedback about the assessment program. Results were channeled back into the program development for accuracy.

Timing, Findings and Improvements:

1. Timing

Since no institution or department has the resources or time to continually assess all possible aspects of each academic program, it is rational to begin or focus the department's assessment efforts on the Programs' core courses. Two courses per semester will be selected for assessment, four courses each year, one from each academic level of the study program (1st 2nd, 3rd & 4th). So by the end of assessment of all the core courses, the department will be ready for the accreditation and review process.

2. Findings

The findings will be presented in one or more of the following approaches: narrative, tabular, or graphics. The result will be based upon the following rating categories, as shown in figure 5:

- *Exceeds Expectations*

  Reserved for those whose achievements substantially exceed acceptable performance; all objectives and job requirements are met and the end result is outstanding.
- *Meets Expectations*

  A term applied to those whose achievements meet all objectives and job requirements; competent in all responsibilities of the position; and require minimal direction.
- *Needs Improvement*

  Reserved for those whose objectives and job requirements are not fully achieved; and require substantial direction.
- *Unsatisfactory*

  A term applied to those who fail to achieve objectives and job requirements; requiring continuous direction. Overall performance is unacceptable.

3. Implications/Recommendations

Discuss the findings' implications and suggest recommendations for improvement plans. These recommendations should be supported by data; it often is supported from findings which involve

one student or more learning objective; they are also supported by best practice in professional literature.

4. Improvement Plan

Assessment data collected at the academic program level will form the most essential component used for Program's quality assessment and improvement. The improvement plan includes:

- ***Assessment Findings:*** A brief description of program assessment findings.
- ***Justifications****:* A brief explanation of reasons and rational for the improvement plan.
- ***Objective****:* Listing of the desired objectives of the improvement plan.
- ***Actions****:* Listing of main activities needed to achieve the identified objectives of the plan.
- ***Responsibility****:* Responsibility for carrying out the plan.
- ***Duration****:* Time needed to conduct the plan (beginning and ending times)
- ***Budget****:* Budget and resources needed, if any.
- ***Wrap-up****:* Explores end of plan consequences and if objectives were sufficiently met

Recommendations

Objective - based assessment has been a valuable and an integral part of programmatic development. It has the capability to positively influence students and faculty members in academic programs throughout the campus. Through the mentioned program, faculty will acquire useful information about student learning that may support existing educational practices or demonstrate any necessary changes. It also encourages collaborative and team faculty work to develop strategies that match with the department's educational missions, goals, and objectives. This is considered to be essential in order for the assessment program to be successful.

At the Department of Educational Technology at AUST, the objective-based course assessment program has demonstrated the capacity of presenting systematic attention to how a program has performed in relation to what was intended. Since reliable assessment programs often take years to reach perfection and to be able to generate the exact type of results expected, we recommend that AUST adopt this system. However, in this case, certain modifications must be tailored to suit AUST's needs. Such modifications may include feeding in information about AUST University, Colleges, Programs and Courses; these will need to be updated regularly. Moreover, this template like Objective-Based Course Assessment Program can be easily adopted and applied in any program at any higher educational institution.

ACKNOWLEDGEMENTS

The author thanks Mr. Shubair Abed Al Kareem, the programmer of the *Objective-Based Course Assessment Program* and assures that without his significant and continuous contributions, the achievements described in this paper would not have been possible.

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Besides lecturing at the graduate and undergraduate level and leading various student services activities, she worked with students individually and supervised graduate and undergraduate students' teaching training and research. She also developed an *Objective-Based Course Assessment Program*, to facilitate the Department's curriculum development, and to help in creating an environment where students and faculty can get pleasure from their work and be dynamic.

Editor's Note: This is a complex study that adapts a variety of quality practices used in industry to an education al setting.

Model for 'Total Quality' of the Open and Distance Education System

Manoj Killedar

India

Abstract

Web is a globally distributed and often highly personalized asynchronous distribution media, for cost-effective delivery of multimedia information and services. Web will have a very strong impact on almost every aspect of how we learn. The best rewards from this technological revolution can be harnessed only when it is perfectly blended with the managerial revolution: 'Total Quality Management' and 'Just in Time'.

This research paper evaluates an application of 'Total Quality Management (TQM)' and 'Just in Time (JIT)' principles along with web based systems and procedures to an 'Open and Distance Education System (ODES)' of India. After providing necessary background information about these relatively new concepts, this paper presents a model for 'Total Quality' and 'ODES' for India. It reviews application of the TQM model to the development of engineering graduate degree programmes. Each 'Quality Parameter' of this TQM model is listed along with a brief review of how programme design tries to confirm it by prevention of errors.

Keywords: open education, distance education, online education, elearning, knowledge granules, total quality management, just in time, quality feedback

Introduction

Distance learning is one of the most dramatic technology-based recent changes that occur in education. Communication technology enables students to receive instruction despite geographic and time separation, conditions that make traditional classroom learning impossible.

Distance Education is a method of instruction that utilizes different communication technologies to provide information and facilitate or enhance self-learning by students at different places. Distance education enable students and teachers to interact with each other by means of computers, man-made satellites, telephones, radios, broadcast television, or other technologies.

Distance education is also called distance learning. While distance learning can refer to either formal or informal learning experiences, distance education refers specifically to formal instruction conducted at a distance by a teacher who plans, guides, coordinates and evaluates the learning process. As new communications technologies become more efficient and more widely available, increasing numbers of elementary schools, secondary schools, universities, and businesses offer distance education programs.

Nearly every country in the world uses distance education. More than 20 countries in the world have national open universities in which all instruction is provided by distance education. This method of education is especially valuable in developing countries. By reaching a large number of students with relatively few teachers, it provides a cost-effective way to make limited academic resources available in such countries. Many businesses use distance education programs to train employees or to help them update skills or knowledge. Employees may take such programs in the workplace or at home in their spare time [6].

Brief History

Distance education initially used the postal system to open educational opportunities to people who wanted to learn but were not able to attend conventional schools. People who most benefited from such correspondence education included those with physical disabilities, women who were not allowed to enroll in men-only educational institutions, people who had jobs during normal school hours, and those who lived in remote regions where schools did not exist.

Invention of radio in the 1920s and television in the 1940s were important milestones in distance education. Educators used these new tools to broadcast educational programs to millions of students, thus extending learning opportunities beyond the walls of conventional teaching institutions.

The development of teleconferencing technologies in the 1980s and 1990s, coupled with already well developed telephone networks, made it possible for teachers to talk with, hear, and see their students in real time—that is, with no delays in the transmissions—even if they were located across the country or around the world.

Distance education increasingly uses combinations of communications technologies to enhance the ability of teachers and students to interact and communicate with each other. Distance education also makes use of the World Wide Web, where teachers and students communicate interactively via text, pictures, audio, and occasionally video. A conferencing method known as 'one-way video / two-way audio' uses television pictures that are transmitted to sites where people can reply with an audio link. Television pictures can also be simultaneously transmitted in two directions, so that teachers and students in one place can see and hear teachers and students in other places. This is called video-conferencing [6].

Media Strategy

Each communication medium has certain advantages over the other. The most effective distance education employs several media tso that students can harness benefits and strengths of each one. G**eographic and time separation** of the student and the teacher is a fundamental characteristic of distance education.

Multimedia instruction with web, video systems, or television may be used to connect the local classroom to students at a distance. Satellite, compressed video, and fiber-optic systems are increasingly used for same-time, different-place education. This approach is called **synchronous** distance learning. Students can also learn at different times and in different places. This approach is called **asynchronous** distance learning.

Distance education programs require teams of media producers, teaching specialists, subject matter experts, and instructional designers to design effective teaching strategies and communication media. Other specialists plan and facilitate interaction and communications with students. Such programs are expensive to produce so that distance education courses are usually designed for relatively large audiences and a wide geographic area.

Distance education is much more **flexible and student centered** in approach. By allowing students to learn in more convenient locations, and often at more convenient times, distance education opens educational opportunity to previously un-reached learners. It also enables students to extend the period of their education from a limited number of schooling years to a **lifelong learning** process. It changes power and authority relationships between teachers and students and often encourages more equal and open communication than occurs in traditional educational settings. Because distance education enables institutions to reach students all over the

world, students gain increased opportunities to experience other cultures as they enrich their educational experience.

Interactive instruction is possible because the technologies give the student access to databases, information sources, instructional expertise, and contact with instructors and other students in real-time and interactive ways. For example, individual students can use their computers to interact and share information with other students or individuals. In interactive virtual classrooms, students can participate and interact with teachers from remote place. An instructor can organize the learning activities of individual students who collaborate with other students, with the teacher, and with multimedia technology available locally or via the Internet. Distance learning encourages collaboration without time and location barriers.

The practice of distance education has dramatically changed since the early 1990s. Educators are using technology to increase the distant student's access to the local classroom, to improve access of all students to resources, and to make the experience of the remote student comparable to that of the local student. Recent innovations in hardware, software, and Internet technologies have made **web-based distance education** systems more available, easier to use, and less costly. But, any new technology is not a panacea. It also has trade-offs [4, 6].

Essential Attributes

Open and Distance Education Systems (ODES) have six essential attributes:

1. The teacher and the student are separated from each other by geographic distance.
2. Two-way communication between student and teacher is possible through a limited number of face-to-face contact sessions, interactive media, and assignments.
3. ODES systems use different media such as print, audio, video, CDs, multimedia, computers, and the World Wide Web.
4. ODES systems are learner-centered. Active students participation is ensured through practical activities, project or field work, discussion forums, other interactive communications, and Self-Test Centers.
5. Self-Learning is emphasized; traditional lectures are increasingly replaced by interactive multimedia.
6. ODES has accepted an industrial form of education and treats education as an industry.

Industry Model for Education

Distance education systems provide 'Quality Education' simultaneously to large numbers of students having a wide variety of interests and background. Naturally, this system has to explore many new effective methods of imparting clear information, using various media and technologies. But, more important than just a better communication, it also has to establish and manage a virtual environment, which nurtures and facilitates **'learning'** that is, developing understanding about information, by allowing all distance students to actively **'interact'** with each other, irrespective of their place and time. Only then, the real task of making learning possible can be achieved. Hence, the great challenge before this system is to consistently manage this huge, still personalized human system and environment, for better learning with cost-effectiveness. This challenge demands that this system is viewed as a **'Service Industry'**, which provides 'Quality Educational Services' to students at a distance [1].

Knowledge Granules

Recent paradigm shift, towards object oriented software development, allows easy reuse, maintenance and constant up-gradation of smallest 'knowledge' objects, which may be called as 'Knowledge Granules'. Web based object oriented 'Knowledge Management System' will allow easy use of these highly standardized, still personalized 'Knowledge Granules', providing unprecedented flexibility and interactivity, without any geographic distance or time barriers. Development of such system will be a reality in foreseeable future of next 15-20 years. Surely, this development will be the most spectacular turning point, for the 'Open and Distance Education', which perhaps elevates **'Total Quality'** of its educational services, even better than the best from the conventional education system.

Due to this, to earn appropriate certifications, students may able to select even content which they want to learn, at place and time convenient to them. This virtual learning environment will allow them to actively interact as and when they want, with other fellow students and even teachers at other institutions. With large number of simultaneous students at any given point of time, this asynchronous learning environment will retain all benefits of synchronous group learning. Precise feedback about their learning will be just click away and thus, will be available any time any where. This virtual environment automatically localizes itself to the cultural and language background of the student. In fact, it will be complete virtual learning environment, providing best learning experience to students, without any geographic distance or time barrier.

With this scenario, it is estimated that **'Knowledge Creation, Dissemination and Preservation'** may not remain privileged and restricted functions of the universities, but business corporations will also play very strong, fruitful and competitive role for this function as a **'Knowledge Service Industry'**. With globalization of education, education systems of only those nations will survive which acknowledge this future trend and provides necessary statutory proactive support, to nurture the development and growth of this futuristic education system. Surely, this will be the beginning of new era in student centered quality education, where ultimate flexibility about almost all important features, is available to all students.

A comprehensive and systematic way of approaching and analyzing these future trends, on the broadest and most fundamental level, are now required. This can be provided by viewing the **educational process as a production process** – which uses various resources to convert inputs into outputs. Specific issues can then be discussed systematically in terms of:

- **Efficiency** of resources utilized
- **Effectiveness** of the quality of the output produced

Furthermore, once having described the education as production process, it can then be analyze systematically in regards to efficiency, effectiveness and quality, in light of the principles and concepts of **'Total Quality Management (TQM)'**, an integrated, internally consistent philosophy of management and leadership.

Most academicians often misperceived the mere mention of 'an education as production process' as the image of academic factories in which servile students are forced through a production line of subjects. This response is mostly due to political and reactive nature of the present university administration system, which is modeled on an assorted array of outdated concepts and philosophies. In an efficiency and quality conscious environment, paradigms and approaches, which were once considered adequate and are maintained because of tradition, inertia, ignorance or convenience, simply cannot be allowed to continue [5].

Customers of Education System

Universities are complex organizations with variety of customers making demands unparalleled in society. But, then who are customers of the university? Prospective customers of the university include:

- **Students**, as they receive education services from the university
- **Affiliated colleges or study centers**, as they receive various support services from the university
- **Society at large**, as it receives the product of university, that is, student with added knowledge and skills.

The student is at center of education system and thus, is the major focus of the educational process. Although the definition of the customer need not be reduced to single alternative and in fact is the combination of all alternatives, the student clearly should be placed at the forefront of this definition [1, 5].

Products of Education System

Once customer is defined, the next logical question is what is the product of an education system? Answer to this question may be explored with following different views:

- Student may be viewed as a customer who buys a product of an education system, that is, an academic programme, in expectation of some type of life benefit.
- The student himself is the product of an education system after being transformed by the educational process from a 'raw' material into a person with added knowledge and skills. With this view, the buyer is society; directly in terms of the employer and indirectly as a funding agency.

Although, these two products of an education system are apparently different, product from the first view, that is an academic programme, is nothing but encapsulation of the educational process mentioned in the second view [5].

Total Quality

'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. As it is the perception by the customers, in addition to conformance with pre-established quality standards, it may also include additional parameters like cost-effectiveness, conformance to time schedule, after sale service etc. Quality thus cannot be defined by the supplier himself, but should always be defined by the customers. Then only quality ratings carry meaning and retain validity [1].

Total Quality Management (TQM)

Total quality management (TQM) is not a technique; it is a broad management approach or methodology, dealing with processes and attitudes. TQM places quality as the primary objective for the organization, as opposed to the traditional management objective of maximizing production and subsequently controlling costs. Although, TQM was initially developed for the manufacturing environment, it can be equally applicable to any environment, which involves inputs and outputs, such as knowledge service industry like universities.

Principles of TQM may be summarized as follows:

1. There is a goal of **'Continuous Improvement'** against achieving some static level of quality. It is about approaching excellence in an incremental way. Quality is a continuous ongoing process. Quality is responsibility and mission of all. Hence all employees should be continuously trained and motivate to consistently achieve better and better quality. Even **'Commitment of Top Management'** should be visible and clear to all.
2. Instead of reactive and person dependent system, TQM is a **'Proactive Systematic Approach'**. This means 'prevention and immediate detection of errors and problems at root source' is preferred over of 'correction for problems after its occurrence'. Responsibility for quality takes place at the source. This feature demands 'Quality Design' rather than inspection of quality after poor design.
3. TQM attempts to **expose problems** rather than hide or burry them. 'Just in Time (JIT)' concept described in next section will elaborate more on this. TQM identifies and addresses **causes of problems**, not effects.
4. TQM creates, encourages and nurtures **simplicity**, instead of bureaucratic approach of adding controls. It attempts to identify and eliminate non-value-added activities thus naturally motivating people to use quality procedures.

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, as time and resources are wasted by allowing defective products to get produced. Thus, longer it takes to identify problem, more will be the cost incurred to correct it.

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 [5].

Just In Time (JIT)

'Just in Time (JIT)' is the philosophy which systematically enforces 'Continuous Improvement' by continual reduction of non-value-added inventory stocks to lower and then further lower levels. Inventory stocks allow production process to continue even when some problem occurs. In a way, inventory stocks act like a buffers to hide any problem that may occur. But, with JIT, there are no buffers to hide problems and thus, occurrence of problem can shut down the entire production process. Thus, JIT philosophy helps organization to **prominently expose problems** and thus, bring a clear focus on removal of it at source, by eliminating the cause, rather than effects, of problem.

With JIT, it is believed that the root causes of most problems are due to faulty production process design. Hence, with JIT, nothing is taken for granted, everything is subject to analysis. Each activity is identified as either 'Value-Added' or 'Non-Value-Added'. The reduction of 'Non-Value-Added' activities is achieved mainly through increasing manufacturing flexibility and improved quality.

Simplification of the production process is another key concept in JIT. Reusing existing components in design of new products keeps variety of required components at minimum level and thus, enhances cost-effectiveness and simplicity of the production process.

JIT is an extremely powerful tool to identify where improvements should be made. It helps you to identify cause (not the effect) of problem and its elimination. Failures and exceptions are treated as opportunities to improve the system. In fact, JIT initiates failures due to problems to expose

them. It is a system of trouble-shooting, within a culture of constant analysis and improvement. It is clear, as an attitude and approach, JIT and TQM are perfectly complimentary to each other, to expose and correct problems at source, so as to avoid wasting resources on production of defective products [5].

TQM/JIT and ODES

TQM/JIT demands highly focused attention directly on those activities which are responsible for 'Quality Costs'. Here, **'Quality Costs' are defined as any cost incurred, because something is not done right at first time**. They are not the cost associated with the 'Quality Department' or 'Quality Function'. Enormous productivity enhancement can be made as a result of exploring and eliminating non-value added or waste activities, which exist because things were not done right at the first time. In fact, quality is highly profitable only due to this.

TQM/JIT demands continuous improvement in definition of quality itself. Thus, attention is focused on 'Quality Costs', that is, on those activities which are responsible for problems and hence have potential for improvement, resulting in great cost reduction. Accurate and reliable measurement of 'Quality Costs' is the most important requirement for this improvement process. With TQM/JIT, output of any organization can be described as below:

Output = Value-Added Activities + Non-Value-Added Activities

Hence, to maximize the output and efficiency, organization must continuously explore ways to reduce and finally eliminate 'Non-Value-Added Activities'. It can be done only when every thing is subject to analysis and examination. Most of 'Non-Value-Added Activities' are often the result of 'faulty or inefficient design', previously taken for granted. System design evaluation from this perspective allows improvements or changes, so as to reduce and finally eliminate 'Non-Value-Added Activities'. The result is more efficient design which improves productivity and reduces costs.

Well known quality expert like 'Dr J M Juran' estimates that about 85% of the problems with a product are designed into the product. Hence, one can not expect significant quality improvement in 'Open and Distance Education System (ODES)', unless inefficiency and ineffectiveness are removed from the design, delivery and assessment of courses and subjects.

Focus on simplification is the fundamental concept in TQM/JIT. Products and processes are designed around existing families of standardized multi purpose components of minimum variety. Mass education system like ODES can not be achieved, without the development of standardized modules, which have a recognized exchange value at inter university level. Along with the cost reduction, flexibility can be significantly increased with this modular approach.

TQM/JIT continuously pushes the exposure of problems back, towards the starting point of the process, until initiation point is reached which is prevention. Every problem has a cause and every cause is preventable. Obviously, sooner the problem is detected, sooner it can be addressed [5].

Electronics Engineering Diploma Programmes

Since 1992, 'Yashwantrao Chavan Maharashtra Open University (YCMOU)' has been offering 'Electronics Engineering Diploma Programmes (EEDP)'. This was the first technical programme offered through the distance mode in India. Naturally, it was quite hard for the people to place faith in their academic quality and thus till 1996, student enrolment was hovering at 100-200 students every year.

An ‘experiment kit’ was developed with a view to allow the student to perform many different electronics experiments at his convenient place and time. Programme implementation effectiveness was substantially improved with the introduction of various managerial innovations. Over a period of time, the curriculum was totally revamped to ensure relevance to today’s industry and student needs. These changes initiated explosive growth in student enrolment from just about 150 students in 1996, to cumulative 9120 students in 2004. **These changes also improved the drop-out rate from an initial 40% to the present 25%**.

This is the first technical academic programme in India, offered with web based ELearning support, which substantially improves access, flexibility and effectiveness. With this kind of web-based support, it is believed that, this programme will set the standards of academic excellence, along with effective programme implementation systems. Recently, YCMOU also completes systematic and critical evaluation of these programmes.

Graduate Degree Programmes

With rich and long experience of technical programmes in distance mode, YCMOU decides to launch ‘Graduate Degree Programmes’ in electronics and mechanical engineering. Right from the design concept stage, concepts and principles of TQM and JIT explained above were applied in development of these academic programmes, so as to offer better ‘Total Quality’ of learning experience. This research paper aims to provide brief account of these efforts and share some YCMOU experiences about its effect on the ‘Total Quality’ of learning experience.

While designing these academic programmes, following facts were taken into consideration:

- Rather than coming to **learn**, most undergraduate students are coming to be **taught**. In contrast to this, postgraduate students are much more mature and accept far more responsibility for their own learning [5].
- Rather than degree driven approach, a **subject driven system design** approach utilizing standardized, multi-purpose **smaller** subjects/modules, can only provide flexibility, standardization and simplicity in design. Each certificate, diploma and degree is constructed with appropriate combination of these subjects [5].
- Coherent learning experience is best achieved by the development of **well designed degree plans** with carefully thought out options, which allows for flexibility and some freedom of choice on the part of students [5]. Highly modular structure with ‘Multiple Entry and Exit Points’ provides better flexibility with horizontal and vertical mobility.
- Web is a globally distributed, still highly personalized asynchronous distribution medium, for delivering multimedia information and services. Hence, it can offer rich personalized learning experience, as per the student’s preference for place and time. Relatively inexpensive infrastructure is required for the web, which is getting cheaper every year [2].

Model for ‘Total Quality’

Clear definition of the ‘Total Quality’ in measurable terms is extremely important as no quality improvement is possible without its unambiguous measurement. Hence, quality should be expressed in clearly measurable parameters with appropriate importance. Not all features of quality have equal importance. Weight-age or importance assigned to each quality parameter can vary as per organization mission and goal or even as per the type of customer. Quality is defined not by the organization itself, but rather by the customers. Hence easily accessible quality feedback systems are essential to sustain quality drive, with which, customers of the organization

can define quality. It is clear that definition of the quality will be dynamically changing with the changing perceptions of customers, which is in conformance with 'Continuous Improvement', an important principle of the TQM/JIT philosophy.

Thus, Quality parameters should be logically grouped together at different levels with appropriate importance. Proposed hierarchical tree of quality parameters for the 'Total Quality' of 'Open and Distance Education System' is as follows:

1. **Total Quality**
    - **a. Academic Quality (50%)**
        - **i. Academic Human Resource Quality (30%)**
            1. Well Qualified and Experienced (20%)
            2. Self-Motivated and Properly Trained (20%)
            3. With good Knowledge (30%)
            4. With good Communication Skills (30%)
        - **ii. Teaching Learning Process Quality (20%)**
            1. Regular, Enjoyable and Flexible (20%)
            2. With Peer Group Interaction (20%)
            3. Effective, Efficient, Quick and Interactive (20%)
            4. Proper and Judicious Media Mix (20%)
            5. Use of Modern Interactive Multimedia Learning Tools (20%)
        - **iii. Learning Material Quality (20%)**
            1. Clear and simple Language (20%)
            2. Distance education Pedagogy (20%)
            3. Logical Presentation (30%)
            4. Generating Curiosity, Hence Engaging (20%)
            5. Well Illustrated (10%)
        - **iv. Curriculum and Syllabus Quality (15%)**
            1. Clear, Accurate, Up to date and Optimum (15%)
            2. Realistic Programme Calendar Design (15%)
            3. Communication, Self-Learning, Managerial and IT Skills (15%)
            4. Real Life Context, Relevance and Equivalence (25%)
            5. Modular and Flexible with Multiple Entry and Exit Points (30%)
        - **v. Academic Infrastructure Quality (15%)**
            1. Library and Learning Resource Centre (40%)
            2. Laboratories (60%)
    - **b. Student Services Quality (20%)**
        - **i. Services Quality (60 %)**
            1. Programme Information Quality (10%)
            2. Pre and Post Admission Counseling Quality (10%)
            3. Learning Material Distribution Quality (20%)
            4. Counseling Session Quality (20%)
            5. Learning Feedback Quality (20%)
            6. Evaluation Quality (20%)
        - **ii. Infrastructure Quality (40%)**
            1. Basic Infrastructure Quality (30%)
            2. Computing Infrastructure Quality (30%)
            3. Communication Infrastructure Quality (30%)
            4. Audio Video Infrastructure Quality (10%)
    - **c. Management Quality (15%)**
        - i. Clear Quality Policy visible to all (10%)
        - ii. Continuous Ongoing Quality Training for All (20%)
        - iii. Accessible quality feedback systems for customers (20%)
        - iv. Proactive Systematic Approach (15%)
        - v. Simple and Preventive System (15%)
        - vi. Accountability with Error Correction (20%)

d. Time Quality (10%)
- i. Right at First Time (20%)
- ii. Right at Every Time (20%)
- iii. Speed of Response to Query/Feedback received (30%)
- iv. Time Efficiency of systems and processes (30%)

e. Cost Quality (5%)
- i. More Value for customers (40%)
- ii. Less Cost for customers and organization (60%)

TQM Model and Degree Programmes

This section briefly review the application of TQM model discussed in earlier section, to the development of engineering graduate degree programmes. In a table below, first column list the 'Quality Parameter' as per this TQM model and second column briefly review how programme design tries to confirm with it by prevention of errors.

TQM Model Quality Parameter	Corresponding Programme Design Features
1. Total Quality (100 %)	
a. Academic Quality (50 %)	
i. Academic Human Resource Quality (30 %)	
(1) Well Qualified and Experienced (20%)	**1.** University approves appointment of any academic staff at each study center or for development of virtual classroom modules, in accordance with well defined qualification and experience norms.
(2) Self-Motivated and Properly Trained (20%)	**1.** Working as an academic staff for the university, at each study center or for development of virtual classroom modules or 'Online Counseling', is voluntary extra activity, which is normally not possible without self-motivation. **2.** University provides honorarium, comparable with the best in India, for attracting motivated best experts. **3.** University regularly provides training to academic staff at each study center.
(3) With good Knowledge (30%) **(4)** With good Communication Skills (30%)	**1.** University appoints only excellent teachers, well known for their good knowledge and communication abilities, for the development of virtual classroom modules and 'Online Counseling'. **2.** University allows students to change study center during each course admission, if they were not satisfied with the quality of academic services from the study center. Due to this open competition, in order to retain enrolled students, each study center have to employ services of only excellent teachers, well known for their good knowledge and communication abilities. **3.** University provides honorarium, comparable with the best in India, for attracting best of available talent.
ii. Teaching Learning Process Quality (20 %)	

TQM Model Quality Parameter	Corresponding Programme Design Features
(1) Regular, Enjoyable and Flexible (20%)	**1.** Detail time schedule for regular face to face teaching at each study center is clearly communicated to all. **2.** University promotes activity based exploratory style of teaching-learning process, which offers enjoyable learning. **3.** In case student is not able to attend regular face to face teaching at the allotted study center, 'Virtual Classroom Modules' and 'Online Counseling' on web, offers him extra flexibility, for ensuring regular teaching-learning process. **4.** Compare to conventional education system in India, about 30% contact hours are provided for these programmes, which are far more than the established 'Open University' norms for other academic programmes.
(2) With Peer Group Interaction (20%)	**1.** Small batch size of 30 students ensures effective peer group interaction during regular face to face teaching at each study center. **2.** 'Online Counseling' on web also offers excellent peer group interaction opportunity, without any geographic place and time separation problems.
(3) Effective, Efficient, Quick and Interactive (20%)	**1.** Distance education pedagogy is used in the development of virtual classroom modules. During textbook selection process for adoption, it is also an important factor for consideration. Conformance to distance education pedagogy with multimedia approach ensures effective, efficient, quick and interactive learning experience. **2.** University offers continuous evaluation for the subject, immediately after counseling for it, in the last week of the same month. This immediate monthly continuous evaluation pattern dramatically improves effectiveness of teaching-learning process.
(4) Proper and Judicious Media Mix (20%)	**1.** Although, almost all possible media can be use in 'Virtual Classroom Modules', only proper and judicious media mix is used, which is appropriate with the content type and its requirement.
(5) Use of Modern Interactive Multimedia Learning Tools (20%)	**1.** For effective teaching-learning process, these programmes use minimum variety of modern interactive multimedia learning web-tools like: • 'Virtual Classroom Modules' on web and CD • 'Online Discussion Forum' on web • 'Online Self-Test Center' on web
iii. Learning Material Quality (20 %)	
(1) Clear and simple Language (20%)	**1.** Only clear and simple language, appropriate with target group of students, is used in all virtual classroom modules. During textbook selection process for adoption, it is an important factor for consideration. **2.** University allows use of local language for explanation, during face-to-face teaching at each study center.
(2) Distance education Pedagogy (20%)	**1.** Distance education pedagogy is used in the development of virtual classroom modules. During textbook selection process for adoption, it is an important factor for consideration.
(3) Logical Presentation (30%)	**1.** Logical presentation is ensured with well designed templates for the development of virtual classroom modules. During textbook selection process for adoption, it is an important factor for consideration.
(4) Generating Curiosity, Hence Engaging (20%)	**1.** Learning material should able to generate curiosity. Then only students are motivated to learn and explore new knowledge. This is ensured with well designed templates for the development of virtual classroom modules. During textbook selection process for adoption, it is an important factor for consideration.

TQM Model Quality Parameter	Corresponding Programme Design Features
(5) Well Illustrated (10%)	**1.** It is said that an image can communicate better than thousand words. Many well illustrated images, appropriate with the contents, are used in the Virtual Classroom Modules. During textbook selection process for adoption, it is an important factor for consideration.
iv. Curriculum and Syllabus Quality (15 %)	
(1) Clear, Accurate, Up to date and Optimum (15%)	**1.** Clear and precise detail syllabus is specified in a well structured format. **2.** Specified syllabus is totally based on one or more adopted textbooks. **3.** Syllabus contents are selected by experts from industries and academic institutions, considering present and future trends in research and industry. **4.** Students are expected to learn 1 credit point syllabus contents with about 30-35 hours of study. Depending upon information density and difficulty level of the adopted textbook, contents from only about 60 ± 15 pages (120 ± 30 pages for IT related course due to much lower information density) of textbook is specified for 1 credit point.
(2) Realistic Programme Calendar Design (15%)	**1.** Realistic time schedule for each important activity in total teaching-learning process is clearly specified. **2.** In case, due to unforeseen circumstances, some activities can not be completed as scheduled, time schedule for clearing its backlog is also clearly specified.
(3) Communication, Self-Learning, Managerial and IT Skills (15%)	**1.** Common courses across academic programmes, provides academic inputs regarding • **Communication Skills**: Single subject of 4 credit points • **Self-Learning Skills**: Single subject of 4 credit points • **Managerial Skills**: Three subjects, each of 4 credit points • **IT Skills**: Six subjects, each of 4 credit points
(4) Real Life Context, Relevance and Equivalence (25%)	**1.** Rather than producing students with designer level expert knowledge, these programmes aims to produce 'Power User' or 'Application Expert' of today's technology, who can think logically and creatively about the real problems encountered in a technical job, by applying basic concepts, principles and skills. **2.** Majority of technical jobs on offer do not require designer level expert knowledge. Hence, emphasis on mathematics is reduced. Syllabus contents are selected with a clear focus on present requirements of majority of other technical jobs. Syllabus of these programmes prefers subjects, which offers better employment opportunities. **3.** Syllabus contents are selected by experts from industries and academic institutions, considering present and future trends in research and industry. **4.** Syllabus of these programmes is designed for • Equivalence with other universities and • Recognition from statutory bodies.

TQM Model Quality Parameter	Corresponding Programme Design Features
(5) Modular and Flexible with Multiple Entry and Exit Points (30%)	**1.** Admission is given to each subject, rather than to these academic programmes. Round the year, online monthly admission and continuous evaluation pattern is used for each subject in these academic programmes. **2.** Contact hours for any subject starts from first day of the month and ends in twenty working days in a single month, followed by immediate online continuous evaluation during last week of the same month. **3.** Although recommended sequence of subjects for admission and pre-requisite knowledge required for each subject are clearly specified and communicated, students are allowed to take admission in any sequence to maximum any 5 subjects. **4.** Many appropriate subjects are common across these academic programmes. Relative position at the semester is same for each common subject, which enables university to use same common 'Question Bank' and 'End Exam' for these subjects across these academic programmes. **5.** The total syllabus for each semester of these academic programmes is always equally divided among 5 subjects, each of 4 credit points, with first 4 subjects are of theory type and the last one is of practical or project-work type. Contact hours for **each** subject are as follows: • 40 hours for theory type of subject • 80 hours for practical or project-work type of subject. **6.** Multiple entry points are provided with exemptions to appropriate subjects to students with variety of educational background like 10^{th} or 12^{th} standard, Engineering Diploma or Graduate Degree in Science. **7.** Multiple exit points are provided with appropriate certificate, diploma or degree, after successful completion of all the subjects, specified for the respective certificate, diploma or degree.
v. Academic Infrastructure Quality (15 %)	
(1) Library and Learning Resource Centre (40%)	**1.** University ensures access to adopted textbooks and reference books for all students, by clearly specifying required copies of **each** adopted textbook and reference book, which each study center is required to purchase before recognition, for **book-bank and library**. **2.** Virtual Classroom Modules (VCMs) requires much larger disk space and Internet bandwidth. Thus, for better cost-effectiveness and ease of offline use, university provides them also on CD, to each study center.
(2) Laboratories (60%)	**1.** Each study center is required to provide all laboratory infrastructure required to perform each specified lab activity for each practical type of subject.
b. Student Services Quality (20 %)	
i. Services Quality (60 %)	

TQM Model Quality Parameter	Corresponding Programme Design Features
(1) Programme Information Quality (10%) **(2)** Pre and Post Admission Counseling Quality (10%)	**1.** Detail programme information is organized in following 4 (Four) documents, which are available for free download in PDF format on web: ▪ **Prospectus**: Essential information for Students ▪ **Syllabus**: Academic Information for students and teachers ▪ **Study Center Manual**: Implementation details for study centers ▪ **Programme Rules**: Programme rules and procedures for all **2.** Well structured website provides anywhere, anytime, fast, easy and cost-effective access to clear programme information for everyone. **3.** Discussion forum allows anywhere, anytime, fast, easy and cost-effective interaction among students, study centers and university, regarding clarification of any doubts. After forum subscription, it offers auto email notification about any new interaction, without any junk or virus mail type of problems of email. **4.** Well classified past interaction is available for reference to all, which can be easily searched with few keywords, so that answers to most common problems are already available; hence the need for interaction itself is greatly reduced. **5.** Intelligent web applications provide step by step clear instructions with intelligent programmatic controls, which prevent student and study centers from committing common errors.
(3) Learning Material Distribution Quality (20%)	**1.** Study centers are required to purchase in advance, required copies of each specified textbook and reference book for book-bank and library. University provides multimedia learning material to all on web and CD. Hence all learning material is always available to all students, immediately after admission, without any delay. **2.** University ensures access to multimedia learning resource like (1) Virtual Classroom Modules, (2) Online Counseling and (3) Self-Test Center, by specifying minimum number of Internet and multimedia ready computers, with free Internet access at each allotted study center, to all students for 6 (six) hours for **each** subject. **3.** Multimedia learning material distribution through asynchronous media like web ensures anywhere, anytime, fast, easy and cost-effective access to all.
(4) Counseling Session Quality (20%)	**1.** University ensures minimum consistent quality of counseling sessions at each study centers, by using Virtual Classroom Modules (VCMs) from master trainer, followed by interaction with peer students and real teachers during face to face teaching at each study center. **2.** 'Online Counseling' on web also offers excellent academic support from expert teacher and peer group interaction opportunity, without any geographic place and time separation problems.
(5) Learning Feedback Quality (20%)	**1.** During only formative evaluation, as an immediate, precise and accurate feedback about learning, all questions with wrong response from the student are displayed back on the screen along with the result of the test. As correct answers are still never disclosed, it promotes exploratory style of learning. **2.** Unlimited number of attempts for 'Online Self-Tests' provides immediate, precise and accurate feedback about learning, as and when student want it.

TQM Model Quality Parameter	Corresponding Programme Design Features
(6) Evaluation Quality (20%)	**1.** University uses both types, that is, formative and summative evaluation for all theory type of course. University does not provide any internal or external choice, for any question in any end exam question paper. As per the blue print for it, all questions are always compulsory and evenly distributed on whole syllabus. **2.** University develops well structured, detailed and exhaustive question bank for each course. Only about 30% simpler questions from the question bank are used for both, that is, formative and summative evaluation. Remaining 70% harder questions are always used only for summative evaluation. **3.** Least used 50% questions from question bank are only used for formative as well as summative evaluation, which ensures use of only fresh questions. **4.** Difficulty level and assigned response time duration for students are dynamically updated based on the past real usage history for each question item. **5.** Adaptive algorithm challenge high achievers and motivates low achievers by generation of • Harder question after each previous correct response and • Simpler question after each previous wrong response. **8.** University ensures longer usability of the question bank as correct answers are never disclosed to any one. **11.** University offers continuous evaluation for the subject, immediately after counseling for it, in the last week of the same month. This immediate monthly continuous evaluation pattern dramatically improves effectiveness of teaching-learning process. **12.** Just before printing, using question bank, computer generates end exam question papers as per the blue print for each subject. Hence, better accuracy and confidentiality is maintained.
ii. Infrastructure Quality (40 %)	
(1) Basic Infrastructure Quality (30%)	**1.** University ensures availability of required basic infrastructure for all students, by clearly specifying it, which each study center is required to provide before recognition.
(2) Computing Infrastructure Quality (30%)	**1.** University ensures availability of required computing infrastructure for all students, by clearly specifying it, which each study center is required to provide before recognition.
(3) Communication Infrastructure Quality (30%)	**1.** University ensures availability of required communication infrastructure for all students, by clearly specifying it, which each study center is required to provide before recognition.
(4) Audio Video Infrastructure Quality (10%)	**1.** University ensures availability of required audio-video infrastructure for all students, by clearly specifying it, which each study center is required to provide before recognition.
c. Management Quality (15 %)	
i Clear Quality Policy visible to all (10%)	**1.** Quality policy is clearly communicated on website. **2.** Model for 'Total Quality' of the open and distance education system is clearly communicated on website. **3.** Quality systems and procedures are clearly communicated on website. **4.** University ensures clear visibility for all by publishing information on website.

TQM Model Quality Parameter	Corresponding Programme Design Features
ii Continuous Ongoing Quality Training for All (20%)	**1.** Common course across academic programmes, about 'Total Quality Management (TQM)' provides relevant training regarding quality to all students. **2.** Majority of quality systems and procedures are web based. Hence, in order to enable better and effective usage, common course across academic programmes, about 'Computer Fundamentals' provides relevant activity based training regarding usage of web tools to all students. **3.** Once in each year, teachers at each study center are regularly trained with single face to face training programme organized at the university. **4.** University ensures anytime anywhere online continuous training to all, as all above training material is also made available on website for free use.
iii Accessible quality feedback systems for customers (20%)	**1.** With web based 'Total Quality' feedback system (which uses hierarchical tree of quality parameters with appropriate importance and 5-point rating system), students and experts can easily provide accurate and precise feedback about quality of each object. After the receipt of feedback, this system immediately provides current average quality ratings along with his rating for the same. **2.** University ensures accessibility to all, by using only web based 'Total Quality' feedback system.
iv Proactive Systematic Approach (15%) **v** Simple and Preventive System (15%)	**1.** University constantly explores new but appropriate managerial **and** technical innovations to develop proactive systematic systems and procedures, which are still simple and having clear focus on prevention of problems rather than on correction after its occurrence. These innovations also have clear focus on effectiveness, efficiency, maximization of value-added activities while reducing non-value-added activities. **2.** As most problems are built in design itself, nothing was taken for granted from earlier design pattern while designing these new academic programmes. University tries to push the exposure of problems back, towards the starting point of the process, until initiation point is reached which is prevention. Every problem has a cause and every cause is preventable. Obviously, sooner the problem is detected, sooner it can be addressed saving substantial quality costs. **3.** University has used highly modular programme design, which uses existing families of standardized multi purpose subjects, with many common subjects across academic programmes. **4.** University has used minimum variety of web based systems and tools, so as to maximize simplicity, efficiency and effectiveness and reduce the time required for training to minimum.
vi Accountability with Error Correction (20%)	**1.** University clearly specifies responsibility for each important function with designation either at university or at study center, which substantially improves accountability. **2.** University also clearly specifies responsibility, procedure and time schedule for any error correction.
d. Time Quality (10 %)	

TQM Model Quality Parameter	Corresponding Programme Design Features
i Right at First Time (20%) **ii** Right at Every Time (20%) **iii** Speed of Response to Query / Feedback received (30%) **iv** Time efficiency of systems and processes (30%)	**1.** Web site provides single point reference for clear programme information for students, study centers and university, with excellent speed of response for any interaction, communication or any information update. **2.** University has used minimum variety of web based systems and tools with intelligent controls to prevent any error, so as to maximize simplicity, efficiency and effectiveness and reduce the time required for training to minimum. **3.** Every system and procedure is designed for simplicity, hence naturally ensuring right at first time and then every time. **4.** Elimination of many non-value-added activities, highly modular programme design with innovative synchronization of many events with realistic time frame substantially improves time efficiency.
e. Cost Quality (5 %)	
i More Value for customers (40%) **ii** Less Cost for customers and organization (60%)	**1.** Relevant, employment oriented and up-to-date modular curriculum with multiple entry and exit point provides much more value to students, employers and society. **2.** Carefully chosen latest IT subjects, offers enhanced world wide employment opportunities. These subjects also prepare students to earn additional certifications, which are recognized by the IT industries world wide. **3.** Highly modular programme design, which uses existing families of standardized multi purpose subjects, with many common subjects at same relative position at respective semester across academic programmes, substantially reduces cost. **4.** Minimum variety of web based systems and tools with intelligent controls to prevent any error, also substantially reduces quality costs. **5.** Elimination of many non-value-added activities improves cost-effectiveness.

Conclusion

Web is a globally distributed, still highly personalized asynchronous distribution media, for cost-effective delivery of multimedia information and services. Web will have a very strong impact on almost every aspect of how we learn. But best rewards from this technological revolution can be harnessed only when it is perfectly blended with managerial revolution, that is, 'Total Quality Management' and 'Just in Time'.

'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. Hence, 'Total Quality' of the learning experience in 'Open and Distance Education System' cannot be accessed 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 is suggested, 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'.

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.

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