TOWARDS THE INTEGRATION OF TEACHING AND LEARNING PROCESSES

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Abstract

A model and a prototype support tool that treat teaching and learning as an integrated process have been developed using Total Quality Management (TQM) and Competency Based (CB) principles. Evidence shows that the proposed model works better on long semesters than during short summer terms. Implementation indicates that the model requires significant commitment to quality on the part of the faculty. Topical Module Evaluations force professors to plan ahead all material related to a class topic; thus, modularizing handouts and providing a sense of clear direction for the student.

1. Introduction

Higher education at large is facing the big challenge of improving teaching and learning efficiency with less and less resources. In response, institutions have embarked in a variety of quality improvement efforts. Most efforts have concentrated on effecting curricular changes and on improving teaching and learning as separate processes.

There is hesitation from the academic community towards using quality concepts to improve higher education performance. Faculty participation varies from institution to institution, from department to department, and even within departments. Instructors express resistance towards using quality language and tools because it would allow students to have an active involvement in classroom management. Tracking course effectiveness, as a way to improve teaching and learning, is not emphasized in the traditional higher education culture. This culture gives greater importance to research when evaluating a professor's performance. The existence of tenure has been singled out as one of the major reasons why teaching is not given its right value. However, the discussion about tenure is nothing else but a good excuse to make no change and maintain the status quo. Despite of this, various researchers and institutions have recognized and supported efforts to effect change. Some of these efforts include those by Bellamy and McNeill (1994), Chickering and Potter (1994), Chizmar (1994), Gilbert et al. (1993), Gupta (1994), and McNeill and Bellamy (1995). These works have addressed delivery methods, students as customers, management of teaching and learning, and teaching and learning evaluation methods. These efforts, with the exception of Chizmar's (1994), analyze teaching and learning independently.

Recent efforts from individual faculty members, as well as initiatives from the National Science Foundation (NSF), the Accreditation Board for Engineering and Technology (ABET), and other private organizations are beginning to effect some changes in the academic culture. However, it has become evident that the teaching and learning processes need to be modeled as one process in order to optimize the product created from them: knowledge and the ability of life long learning. In other words, it is now imperative to address teaching and learning simultaneously to take advantage of the results obtained by various independent researchers.

A model and a prototype tool that treat teaching and learning as an integrated process have been developed using TQM and CB approach to assist instructors in classroom learning management. The model is intended to enable and facilitate the analysis of the teaching and learning process so that professors have a framework to improve course efficiency. Significant lessons have been learned from partial implementations of the model and the prototype tool.

2. Model Overview

The teaching and learning process model was developed utilizing concepts from Gupta (1994), Chizmar (1994), Gilbert et al. (1993), Bellamy and McNeill (1994), and McNeill and Bellamy (1995). The model (Figure 1) utilizes the systems approach to represent teaching and learning as a single process composed of activities in which instructors and students participate actively in the creation of knowledge. This model follows the recommendations of Gupta (1994) and Gilbert et al. (1993), and it expands the concepts to integrate teaching and learning and include students in class management. The model only addresses improvement of the teaching and learning process in classroom activities. There are other factors that affect the process but are not addressed by it. Those other factors include faculty development, reward system, promotion and tenure, motivation, individual abilities, culture, and mind sets.

The model focuses on the process of a single course. Flowcharts define the activities that take place during the planning, evaluation of learning outcomes, and evaluation of teaching effectiveness processes. For instance, Figure 2 portrays the Course Planning Process. When necessary, activities are further described using sub-process flowcharts. The prototype support tool consists of applications and templates that will assist instructors and students to accomplish the required tasks. The model is composed of four major elements: inputs, outputs, constraints, tools and methods.

3. Model Inputs

The inputs to the model include instructors, students, other human resources, facilities and equipment, and learning objectives. The class instructor(s) and the students are also considered owners of the process.

One of the roles of instructors is to facilitate the students' achievement as defined in the learning objectives. The roles of the students include 1) to prepare for the class, 2) to participate in class activities, 3) to perform a self-evaluation of their educational state, and 4) to provide feedback. Students have to provide feedback on their understanding of the material presented in class or assigned for research, on teacher's and class effectiveness, and on problems and suggestions related to facilities and equipment.

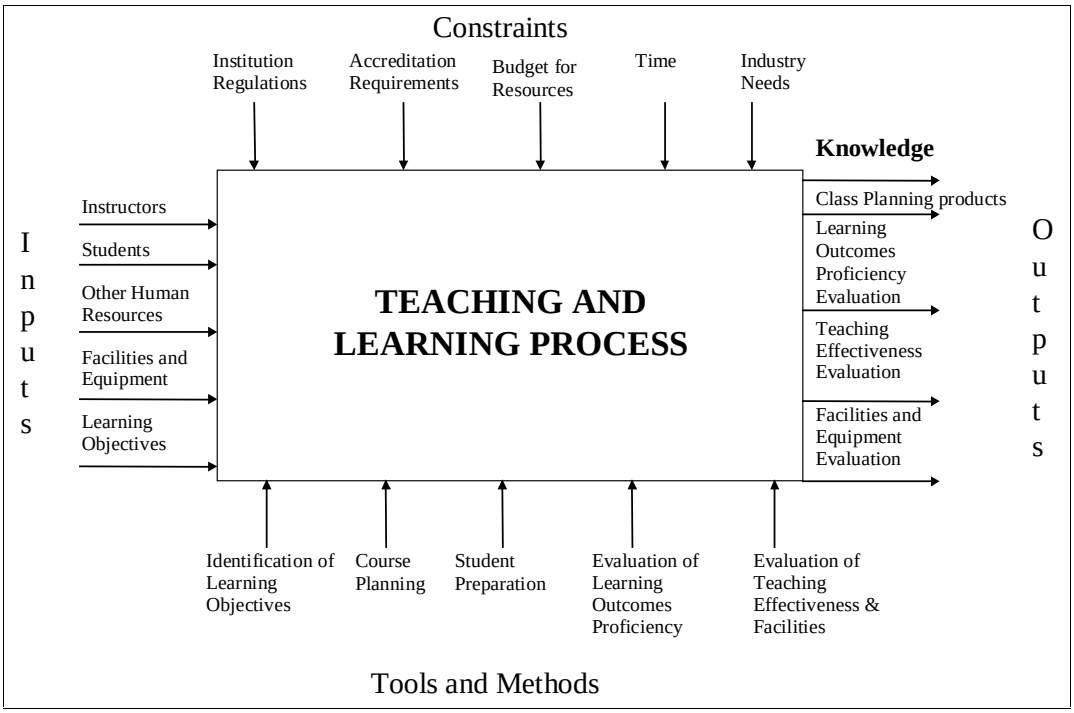

Figure 1: The Teaching and Learning Process Model

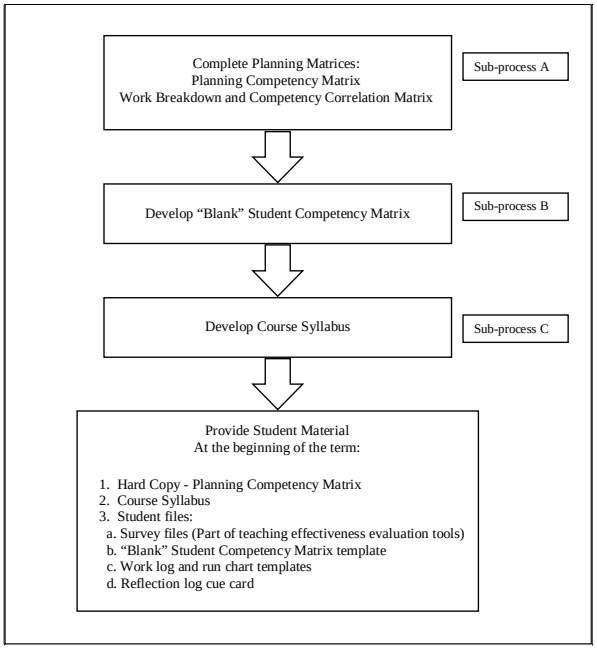

Figure 2: Course Planning Process

Although a secondary input, facilities influence the learning process (Gupta (1994); Gilbert et al. (1993)). Hence, they should be considered during course planning and be evaluated; the administrative support system has an important role on this aspect. Facilities include the classrooms where the classes are delivered, laboratories, etc. as well as the environment in those places (Gupta, 1994). They also include equipment needed such as computers, audio/visual, and lab equipment. Nonetheless, a professor should understand that preparation and enthusiasm are key to teaching; the equipment merely supports it.

Learning objectives define specific topics for the learning outcomes that must be achieved. The learning outcomes are the specific skills that the instructor wants the students to have at the end of the semester (McNeill and Bellamy, 1995). For example, one of the learning outcomes of an Applied Industrial Systems Simulation class may be simulation data analysis. To achieve this learning outcome, the instructor may establish as specific objectives the mastery of input data analysis, verification and validation, and output analysis. These learning outcomes are determined at the time the course content is defined.

4. Model Constraints

This model is constrained by the institution regulation, accreditation requirements, budget, time, and industry requirements.

Institution regulations affect the process because they sometimes determine whether something can be done or not. These regulations include grading policies, number of students per section, dates for submission of grades, course evaluations, and final exam policies. Obviously, these regulation and policies vary from institution to institution.

The State Board of Education and other organizations such as a State Board of Regents approve university academic programs. Professional programs are also accredited or approved by the appropriate professional association in the field. The professional association that approves engineering and technology programs is ABET. Accreditation influences the content of a curriculum because compliance determines whether a program is approved or not.

As in the case of any other enterprise, schools are limited by budgets allocated to each part of the institution. Limited budgets affect the type of facilities and the type and amount of equipment available. Also, they impact the availability of other resources such as teaching assistants.

The amount of information to be covered depends on curriculum requirements; however, the academic term has a fixed duration. Therefore, time also has an impact in the process.

The growing number of partnerships between industry and higher education institutions has force schools to give more consideration to industry requirements for graduates entering the work force. Industry has expressed concern about specific deficiencies that affect worker's performance and for which industry has been taking remedial action resulting in an increase in training costs. It is essential to consider industry needs as a constraint because they will influence which learning outcomes are established.

5. Model Tools and Methods

A way to ensure that objectives are met and transformed into learning outcomes is to develop a tractable structure. This is accomplished by developing a competency matrix. The competency

matrix provides a way to document how the learning objectives translate into instruction methods. The Planning Competency Matrix was developed using McNeill and Bellamy's (1995) competency matrix, but it was modified to include additional planning elements. An additional dimension was added to the competency matrix by introducing instruction methods, minimum required performance for each competency category, frequency of surveys, and grading policy. The matrix has a dual purpose. It illustrates the cognitive/affective performance achieved in each of the categories, and it documents where the work to support that claim is located.

For the Planning Competency Matrix, the instructor must define the required educational states for the students. These states are defined in terms of the affective and cognitive domains. The affective domain deals with interests, attitudes and values; the three degrees to be considered are Receiving (R), Responding (P), and Valuing (V). The cognitive domain deals with the development of intellectual abilities and includes six levels: Knowledge (K), Comprehension (C), Application (A), Analysis (N), Synthesis (S), and Evaluation (E).

Students prepare for classes using different techniques. Those techniques vary from student to student and from course to course. This model proposes that the instructor provide study aids such as additional exercises or reference material that would help the student achieve the learning outcomes.

The model utilizes Competency Based Evaluation to assess student's proficiency of the learning outcomes. This evaluation system was selected because it has the characteristics that Chizmar (1994) and Gilbert et al. (1993) identified as necessary for the continuous improvement of teaching and learning. Some of the evaluation tools and methods presented by McNeill and Bellamy (1995) were modified and new tools were introduced in order to facilitate the evaluation activities and insert objective measures of performance of the required competency categories.

The levels of proficiency that will be evaluated for the cognitive domain are knowledge, comprehension, analysis, synthesis, and evaluation. For the affective domain, receiving, responding, and valuing are the degrees of internalization which will be evaluated. The process consists of the student's self-evaluation and documentation of his/her educational state and the instructor's evaluation of the student's work, review of that documentation to verify the student's claim, assistance of the student in case of difficulties, and assignment of the student's grade. The instructor's review of the generated student documentation should also uncover problems early on and allow corrective action.

Evaluating teaching effectiveness is a very complex process not only because of the various factors that affect it directly (teaching style, learning styles, concepts being delivered), but also because the true results can only be seen in the long term. The methodology developed for this model relies on the works of Gilbert et al. (1993).

Table 1 presents an adaptation of the Dimensions of Effective Teaching proposed by Gilbert et al. (1993). In-class evaluations, versus end of semester evaluations, are intended to assist instructors in achieving continuous improvement, not to judge or criticize; therefore, these evaluations must be self-managed by each professor. As it can be seen from Table 1, students would evaluate a professor as a whole, not only on the knowledge of the material being delivered, but also on the role modeling of the professor. Motivation is mostly achieved by inspiration. Rigor, rapport, listening, commitment, and networking are dimensions that project a professor as a professional beyond the classroom. These dimensions are rarely surveyed on end of semester evaluations; furthermore, they get little recognition from a professor's peers. Still, they tend to be the most important dimensions for students.

The process for a professor covers survey planning, offering, summary and analysis, feedback, and improvement implementation. Two surveys were developed to assist professors in the evaluation of teaching effectiveness, the Module Evaluation and the Instructor Evaluation. These surveys were computerized, using Visual Basic (VB), with the intention of facilitating data collection and analysis. The Visual Basic (VB) application will generate the survey-planning file, which would be provided to the students, so they can complete the surveys. Students will run the survey application to complete the required survey on the date the professor designates.

Dimension	**Criteria**
Organization	Preparation for classroom presentations and a detailed course syllabus and planning matrices. Pace of instruction[1] Use of, and kinds of tests, and visual aids
Rigor	New levels of excellence
Responsiveness	Willingness to help students learn both inside and outside the classroom. Quick evaluation of student work, including both positive and negative reinforcement. Feedback on students' feedback[1]
Aesthetics/ Tangibles	Classroom facilities and equipment (taking responsibility to assure that they are functioning properly). Materials developed for class delivery and students use (handouts, slides, etc. error free)
Rapport	Informal discussions used to get to know students as individuals. Motivation of students. Respect and concern for students
Enjoyment	Be interesting by being more than academic drones, have fun
Subject-Mastery	Depth of knowledge. Able to relate content to other subjects
self-improvement	Modifying instructor's classroom behavior based on students' constructive criticism
Communication	Clarity in written, oral, and physical presentation
Passion	Interesting, animated, voice tone and projection
Listening	Leading without dominating
Relevance	Relevance of material to ideas and values of society and to the students experience and to [1]contribution towards achieving learning outcomes
Commitment	A lifetime commitment to classroom excellence
Networking	On and off campus alliances

Table 1: Criteria to Evaluate Teaching Effectiveness (Adapted from Gilbert et al. (1993))

The Module Evaluation and the Instructor Evaluation surveys were developed to collect data to assess the Organization (which includes planning), Responsiveness, Aesthetics/Tangibles, Rapport, Subject Mastery, self-improvement, Communication, Passion, Listening, and Relevance teaching dimensions. Instructors will perform a self-assessment of the rigor, enjoyment, commitment, and networking dimensions since those are very subjective areas. Since taking responsibility for classroom facilities and equipment is one of the criteria under the Aesthetics/Tangibles dimension, students' feedback on facilities and equipment will be collected through the surveys. Instructors will provide that information to administrative and support personnel for action using the Facilities and Equipment Report. Feedback is required on all school facilities and equipment used in the learning process, i.e. computer, labs, library, etc.

A VB application and Excel templates were created to assist instructors in summarizing the surveys. Instructors will follow a sub-process flowchart to tally the results. The VB application will generate the file that will contain the survey tally and the file that will contain the students' comments. The tally file will be used to generate the survey summary tables, frequency distributions, and charts. After summarizing the surveys, the instructor will evaluate the dimensions of effective teaching. The ratings for each question will serve as an indicator of which areas need improvement. Questions for which the average rating is Fair or below will be the ones in which the instructor will work on first. If there are no questions rated Fair or below, those rated good will be approached in a priority order to be assigned by the instructor. The instructor will make adjustments to the elements that show room for improvement and monitor the effect of the changes the next time the survey is offered.

6. Model Outputs

The main output of the teaching and learning process is Knowledge. Knowledge acquired by the student. Knowledge to be used in subsequent classes and that forms the foundation for the body of knowledge the student is expected to have by the time s/he graduates. Knowledge acquired by the professor as to how well s/he is doing his/her job. In addition to knowledge, there is a set of tangible outputs that are the products of the planning and evaluation activities that take place in the process.

The products of the instructor planning activities defined in this model are the Planning Competency Matrix (Figure 3), the Work Breakdown and Competency Correlation Matrix (Figure 4), the "Blank" Student Competency Matrix (Figure 5), and the survey planning file. Other products, for which a format was not defined and is left up to the instructor, include course syllabus, notes, and other material provided to the students.

Planning Competency Matrix — Course ref# ESI6524

(RC) = Run Chart Competency Category — Required proficiency: Before Course [X] After Course [ ]

			Delivery Method							Affective Deg.			Cognitive Level						Perf.
Learning Outcomes	Competency Categories	Comp#	L	H	C	P	SP	LR		R	P	V	K	C	A	N	S	E	MR%
1. Discrete event	Modeling	1.1	◊																60%
system simulation	Types of systems	1.2	◊																60%
(d.e.s)	Types of models	1.3	◊																60%
	Concepts in d.e.s.	1.4	◊	◊															65%
	List processing	1.5	◊	◊															65%
	Applications	1.6	◊	◊															65%
2. Simulation	Programming languages	2.1	◊																65%
software	Criteria for selection	2.2	◊																65%
3. SIMAN	Basic blocks review	3.1	◊							X			X						65%
	Intermediate b. review	3.2	◊							X			X						65%
	Advanced blocks	3.3	◊																65%
4. Random numbers	Random # generation	4.1	◊																65%
	Random variate generat.	4.2	◊																65%
	Random number testing	4.3	◊																65%
5. Simulation data	Input data analysis	5.1	◊																70%
analysis	Verification & validation	5.2					◊												70%
	Output analysis	5.3					◊												70%
6. System design	Comparing alternatives	6.1	◊	◊															65%
	Variance reduction tech	6.2	◊	◊															65%
7. Self	Timeliness **(RC)**	7.1								X									N/A
development	Attendance **(RC)**	7.2								X									N/A
	Feedback & coop. **(RC)**	7.3								X									N/A
8. Simulation	Areas of interest	8.1						◊											65%
special topics																			

Surveys	
Name	Frequency
ME	3 / term
IE	2 / term

Grading Criteria		
WT	W%	W-tot.pts
Htot.	6%	140
C1	15%	100
C2	15%	100
SP1	8%	60
SP2	8%	60
LR	8%	80
HD1	5%	25
HD2	5%	25
T	15%	100
F	15%	120
Total	100%	
EPtot.	5%	100
Total	105%	

Delivery methods: L= Lecture H= Homework C= Case Study P= Project SP= Student presentation LR= Literature review
Assessments/other graded work: Q= Quiz T= Test F= Final exam HD= Handouts created by student **EP= Extra points:** PA= Professor assigned SU= Student undertaken TC= Timeliness chart AC=Attendance chart FC=Feedback chart
Affective degree: R= Receiving P= Responding V= Valuing. **Cognitive level:** K = Knowledge C= Comprehension A = Application N= Analysis S= Synthesis E= Evaluation
Performance (Perf.): MR%= Minimum required performance in percent per competency **Surveys:** ME= Module Evaluation IE= Instructor Evaluation
Grading criteria: WT= Work/assessment type W-total pts= Total possible points per work type W%= Percentage value of total grade per work type
Grading scale (ClassG%): A >= 93 > A- >= 90 > B >= 87.5 > B- >= 80 > C >= 70 > D >= 60 > F

Figure 3: Planning Competency Matrix (Adapted from McNeill and Bellamy (1995))

WT	H1	H2	Htot.	C1	C2	SP1	SP2	LR	HD1	HD2	T	F	PA	SU	TC	AC	FC	EPtot.
W%			6.0%	15.0%	15.0%	8.0%	8.0%	8.0%	5.0%	5.0%	15.0%	15.0%						5.0%
Wtot. pts	80	60	140	100	100	60	60	80	25	25	100	120	#N/A	#N/A	25	25	50	#N/A
Comp#																		
1.1											KC							
1.2											KC							
1.3											KC							
1.4	KC										KCA	KCA						
1.5	KC										KCA	KCA						
1.6	KC										KCA	KCA						
2.1											KC							
2.2											KC							
3.1											KCA	KCA						
3.2											KCA	KCA						
3.3											KCA	KCA						
4.1											KCA	KCA						
4.2											KCA	KCA						
4.3											KCA	KCA						
5.1												KCA						
5.2						KC						KCA						
5.3						KC						KCA						
6.1		KC										KCA						
6.2		KC										KCA						
7.1	KCA	KCA		KCA	KCA	KCA	KCA	KCA	KCA	KCA	KCA	KCA	KCA	KCA	KCA			
7.2																KCA		
7.3																	KCA	
8.1							K	K										

Figure 4: Work Breakdown and Competency Correlation Matrix

Student Competency Matrix — Course ref# ESI6524

(RC) = Run Chart Competency Category — Required proficiency: Before Course [X] After Course [ ]

			Delivery Method							Affective Deg.			Cognitive Level						Perf.
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	List processing	1.5	●	●															65%
	Applications	1.6	●	●															65%
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analysis	Verification & validation	5.2					●												70%
	Output analysis	5.3					●												70%
6. System design	Comparing alternatives	6.1	●	●															65%
	Variance reduction tech	6.2	●	●															65%
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development	Attendance **(RC)**	7.2								X									N/A
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Figure 5: “Blank” Student Competency Matrix (Adapted from McNeill and Bellamy (1995))

The products of the teaching effectiveness evaluation activities are the analyses of the Module and Instructor Evaluation Surveys that will be used to collect student feedback. They include

surveys summaries, frequency distribution tables, charts, and students' comments. The instructor will use those analyses to evaluate the dimensions of effective teaching, to plan for improvements, and to provide feedback to students on the results of the surveys and any planned changes. Each survey offering will provide the instructor with the information necessary to make adjustments and will reflect if changes brought about the desired improvement.

From the Module Evaluation, the instructor will take the students comments dealing with Facilities and equipment and will document any problems in the Facilities / Equipment Report. S/he will refer the reports to the administrative or support unit for resolution (depending on what the institution's policy is). Also, the instructor will report comments dealing with suggestions for improvements. S/he should provide prompt feedback to the students on the status of problems and/or suggestions.

7. Findings and Future Enhancements

Two implementations of the model were attempted in the summer of 1997 and spring of 1998 terms. During the Summer of 1997, implementation of the model was cumbersome because of the short duration of the term (six weeks). The instructor had to cover the class material in addition to completing the tasks the model proposes. Therefore, this attempt indicates that the model may work better on a long semester than during short class terms. Explaining the use of the portfolios was time consuming. The instructor and the students were concerned about covering all the required class material. Moreover, the instructor was concerned about not having enough time to grade assignments, review portfolios, prepare classes, and accomplish other faculty activities because of the amount of time required to review the portfolios. Also, carrying the portfolios around was very awkward for the professor because of their size and the number of students in the class.

The documentation of the students' educational state (keeping the portfolios) created a discourteous environment. Students were demanding additional points to perform the task. Although the model proposes that students be rewarded for completing the feedback surveys, it does not suggest that they receive points for documenting the achievement of a required proficiency level. Information found, on the competency based evaluation methodology, did not point out if this was an issue during other applications. On the other hand, some students either forgot to document which proficiency levels the assignments contributed to or photocopied books and notes to put in the portfolio. Mostly, the students who were keeping the portfolio were good students and felt overworked. Most of the comments provided to the instructor indicated that students thought the professor was genuinely interested and was improving.

During the spring of 1998, the instructor decided to implement only the portion of the model dealing with the evaluation of teaching effectiveness because of the previous semester difficulties and the desire to isolate the individual effects of the two processes. The professor was forced to modularize the class handouts because of the incorporation of the Module Evaluation survey offerings. The professor and the students were very satisfied with the improvement brought about by this change. In previous classes of the same instructor, weekly handouts would sometimes include more than one module; in addition, homework was assigned as the class progressed. The students and the instructor found that modularizing the handouts facilitated their work. The instructor was required to plan the assignments and include them in the handout for each module. She felt that advanced planning was a must and her work was

more organized in relation to the class assignments; therefore, it was easier. The students expressed that they had more time to review the material, complete the assignments, and ask questions when something was not clear. Therefore, their preparation for class improved.

The newness of the prototype survey applications created students' uncertainty. In general, they were willing to use the survey application but some of the features of the program discouraged many of them. For example, the Module Evaluation survey required them to input the names of the delivery methods employed to cover the material for the module being evaluated. Students expressed dissatisfaction with that requirement.

Students were required to type the course number when completing the survey. They were not consistent in their inputs although the application reminded them of the format to be used when entering the data. Furthermore, students did not use the same date for a given survey offering because the instructor allowed them to turn in their answers after the due date. It delayed the summary process since the dates had to be checked. In addition, students did not follow the file naming convention the instructor asked them to use when saving their answers. It created difficulties and required extra-care and time when tabulating the answers. On the other hand, the instructor indicated that the preparation of the disks containing the support tool files was very time consuming.

Students' dissatisfaction and difficulties experienced when summarizing the surveys brought about a revision to the survey support tool programs. In the instructor's application, a planning subroutine was added to allow the creation of a survey planning file that would contain the course number in addition to the delivery method names. The instructor will generate that file at the beginning of the term and provide it to the students. In that way, the Module Evaluation survey form will be loaded with the course number and the names of the delivery methods already filled out. The Instructor Evaluation form will be loaded with the course number only since that form does not address delivery methods.

After the VB programs were changed to incorporate the enhancements, completing the surveys was easier. Still, students indicated that they were very busy with the work required for the end of the semester and studying for final exams. Only twelve percent completed the last offering. It should be noted that during this attempt to implement the methodology for the evaluation of teaching effectiveness, the instructor did not offer extra points to the students for completing the feedback surveys.

For future implementations of the model, it is necessary to take a series of steps to reduce the hurdles of using it. For first time users, the model description, support tool files, instructor's guide, and students' guide should be provided to the course instructor at least one term in advance. It would allow time for the instructor to get familiar with the tools and methods that s/he and the students will be using. In addition, instructors should be given the opportunity to attend workshops on assessment techniques as part of their career development. This will familiarize them with the Competency Based Evaluation methodology. Initially, while the faculty is getting familiar with the processes, the model should not be implemented during compressed class terms. Adjustments will be required to use the methodologies proposed by the model during those terms.

On another aspect, serious consideration should be given to the use of electronic portfolios to keep the documentation required to support students' achievement of the required proficiency levels. It would eliminate the professor's burden of carrying around up to thirty binders full of information. Also, instructors should provide the students' guide and the description of the

affective degrees of internalization and cognitive levels of learning to the students on the first day of class. They need to ask the students to prepare questions for a one or two-hour workshop session on using the evaluation methodologies and the support tool that accompanies the model. If the students familiarize themselves with the tools and methods from the beginning, it will reduce the amount of class time required to answer questions related to them. Furthermore, instructors need to discuss, with the students, the benefits to be derived from using the evaluation methodologies and stress the importance of mutual cooperation.

8. Summary and Conclusions

The integrated model of the teaching and learning process and its support tool provide a framework conducive to increasing course effectiveness. The model focuses on the activities that take place in the creation of knowledge. It uses the systems approach to analyze teaching and learning as one process and defines each one of its components. In addition, it enables the selection of methodologies to evaluate instructors' and students' performance. The competency matrix was modified and new planning and grading matrices were created for use in a Competency Based Evaluation oriented environment.

The model has tools that will contribute to making planning and assessment more efficient and to ensuring that required learning objectives were addressed. It introduces additional performance measures with the objective of monitoring process output. Students will be active participants in classroom management. They will take part in the assessment of their educational states and will be expected to cherish honor and ethical behavior since their role will be more active. Students' inputs in regards to class delivery methods and instructor's performance will be requested and adjustments will be made based on those inputs. Finally, the instructor will manage his/her classroom improvement program. S/he will evaluate teaching effectiveness using students' inputs and self-evaluations and will make adjustments in class delivery/assessment methods based on those evaluations. Evaluation methods will assist in the early detection of potential problems in students' performance and aspects that could be improved about instruction methods.

The biggest challenges are suggesting change to the traditional ways of delivering engineering courses and the time required for instructors and students to become familiar with the tools and methods proposed by the model. People are resistant to change by nature and modifying processes that they are already acquainted with may bring about skepticism. Furthermore, additional work may discourage instructors and students despite of the benefits that may be derived. The fact that they already have a lot of work under the traditional system and the idea of adding to it may bring opposition from the start. Finally, extra time is required for the activities proposed for the evaluation of learning outcomes and teaching effectiveness evaluation processes.

9. References

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