INTERACTIVE AND ITERATIVE ASSESSMENT:
A CASE FOR ENHANCED STUDENT LEARNING

DEBASHISH BANERJEE*; N. LEROY KAUFFMAN**

* Associate Professor
Accounting, Finance, Information Systems & Economics
College of Business
Western Carolina University
Cullowhee, NC 28723, USA

** Associate Professor
Accounting, Finance, Information Systems & Economics
College of Business
Western Carolina University
Cullowhee, NC 28723, USA

ABSTRACT

This is a Case study of how an interactive and iterative assessment process improved the performance of students in a course. The chosen course was project intensive and as per requirements students did projects involving developing functional and deployable database applications. The course projects were developed from a semi-structured problem definition of a hypothetical business situation. Students created data models and process models for this business situation. Once the students had satisfactory workable models, they implemented both the data model, and the process model to create an application that solved the semi-structured business problem. The students demonstrated their work at each pre-determined check point, and if their work was not satisfactory, they were provided suggestions to improve their work, and they went back and incorporated the suggestions – thus improving the quality of the product. The process continued till the product was deemed satisfactory in the eyes of the professor. Incorporating the suggestions and being able to visualize the improvement in the project output seemed to significantly enhance the learning process of the students. In a mid-term evaluation by a third party, students reported that they felt they were learning better.

KEYWORDS: Frequent feedback, interactive assessment, iterative assessment, learning.

1. INTRODUCTION

Thanks to some excellent research in recent decades, we know a great deal about how learning happens and about how little of it happens in a lecture context (McKeachie, et al., 1993;
Bransford, Brown and Cocking, 2000). “As fascinating as professors think students should be with an hour of material like:

```sql
CREATE OR REPLACE PROCEDURE CreditLoop AS
    V_StudentID   students.IF%TYPE;
    V_Vredits     students.current_credits%TYPE;
    CURSOR c_Students IS
        SELECT ID
        FROM STUDENTS;
BEGIN
    OPEN c_Students;
    LOOP
        Fetch C_Students INTO v_StudentID;
        V_credits := CountCredits(v_StudentIF);
        INSERT INTO temp_table (num_col, char_col)
            VALUES (v_StudentID, "Credits = " || TO_CHAR(v_Credits));
        EXIT WHEN c_Student%NotFound;
    END LOOP;
    CLOSE c_Students;
END CreditLoop;
```

There’s no mistaking the dazed stupor that falls over classrooms after even just a few minutes of it” (adapted from Felder & Brent, 2003). The lecture seems not to be an effective way to engage students in learning. A much more efficient and effective method to engage students in their own learning is by doing, learning by doing. The only way to learn a skill is by practicing that skill: try something, seeing how well or poorly it works, reflecting on how to do it differently, then trying it again and seeing if it works better (Felder and Brent, 2003).

In a blog piece written by Sherri Kruger on 10/10/2010, she uses the following example to illustrate a point:

If you read all the books, blogs and articles on ice skating you would likely think it's pretty easy, and it is ... in theory. But strap on some skates and step on the ice for the very first time and my bets are that you'd be sitting on the ice a whole lot more than you'd be gracefully gliding around on it. It boils down to the old saying that practice makes perfect.

Kruger (2010) further enumerates several visible benefits of learning by doing:

1. You gain a better understanding of what it actually means to do the activity
2. You’ll know if you actually like the activity or not.
3. You know what you can tweak.
4. You get a deeper understanding of the subject.
5. Learning by doing promotes critical thinking.

If we consider the purpose of our classroom instruction to be understanding a body of knowledge, Harvard (2012) suggests that the process of assessment needs to be more than an endpoint evaluation of knowledge. If assessment is to facilitate the learning process, it needs to
be much more than simply an end-of-unit examination. One does not have to look far to see examples where the learning model is an iterative process of instruction, assessment, instruction, assessment, etc. Consider an athletic team. The team tries various plays, assesses their success and makes modifications. Or a dance team where the instructor provides direction, the students try their hand, or feet, at it, the instructor assess performance and provides further direction which is subsequently assessed until the final product is a beautifully choreographed dance piece.

This model of instruction accompanied by feedback can readily be applied to the university classroom. In the teaching for understanding framework, this is called “ongoing assessment” (Harvard, 2012). The ongoing assessment website from Harvard (2012) lists the following steps in the process:

1. Tie assessments to the central Understanding Goals for students,
2. Set clear criteria for what students do in each performance so they will know what constitutes successful work,
3. Use assessments as teaching tools, and
4. Give students feedback frequently for most performances telling them how to improve next time.

The following case study demonstrates the application of both the learning by doing paradigm and the ongoing assessment model. Many undergraduate curricula for Computer Information Systems (CIS) majors are sequential. The curricula are often made up of several different topics/functional areas placed into a variety of courses. The last course in the sequence is often considered to be a capstone course whose objective is to integrate major learning points and tools from previous courses. As a capstone course, this course may also serve as an assessment point for the degree program. This is a difficult task given the variety of topical areas taught in the other courses in the sequence. The capstone course in this study focuses primarily on assessing student knowledge of system development.

DESCRIPTION OF THE PROCESS

This study comes from a capstone course in a Computer Information Systems (CIS) major. The major consists of a highly structured series of seven courses in CIS, namely three parallel pairs of courses and a capstone course. The discipline faculty determined that the capstone course should have students develop functional application using Microsoft ACCESS and be project intensive. The course projects were developed from a semi-structured problem definition of a hypothetical business situation. Students created data models and process models to create applications that solved business problems in the given context. They then followed an iterative process of validating the models against each other at different stages of model development. Once the students had satisfactory workable models, they implemented both the data model, and the process model to create an application to solve the semi-structured business problem. This approach gave them the opportunity to see how things came together in system development projects. The approach also served as a knowledge refresher and assessed the ability of students to synthesize what they had learned in previous courses (viz., Systems Analysis and Database Design courses) and to apply their understanding in a hands-on environment.
It has been the experience of our program that groups of students go through the program nearly as a cohort. Students tend to take the same course at the same time as they move through the major CIS courses. As a result, a core group of students often takes shape with little change in membership over time. Often the core group of students is made up of tightly knit subgroups based upon social and other norms. The norms of these subgroups may manifest themselves in a variety of behaviors over time, some of them being quite disruptive. One such group several years ago became so disruptive that the teaching/learning experience for both the professor and the students were seriously challenged. This generally created an environment of total apathy for both professor and students.

As that this group approached the capstone course, the professor, with the goal of improving the overall instructional experience, began to consider how the classroom environment could be modified for both the students and the instructor and decided to do whatever it took to change the attitude and behavior of these students. On the first day of class, several things relevant to the way the course would be conducted were shared with the class. Students were told that there would be no exams and that the entire course grade would be based on projects. The students would do the first two of three projects individually and the third project would be in two person groups. The students were told that if they followed through with this proposed course model, there would be no C’s or D’s in the class. Each student would have to perform at her/his highest level and demonstrate their projects to the professor individually or as a group, as appropriate. Most importantly, students were told that the projects would not be deemed complete until the professor was convinced that they performed at a satisfactory level. The objective was for the students to learn and be able to do the things they would need to do as IT professionals.

The class began and within one week the first project was assigned. Several intermediate checkpoints were established for the project. Students were required to make an appointment with the professor within three days of the due date to demonstrate what had been accomplished. The professor took notes during the demonstration session and awarded an ‘OK’ if satisfactory progress had been made. Otherwise, the professor provided feedback to the students, in writing, and the students were required to modify the project based on the feedback. The students would resubmit their projects within a very short period of time and again demonstrate the project until the professor was fully satisfied with the students’ project. Thus, everyone in the class got a good grade because the final work had achieved good quality. As the semester progressed, the projects became incrementally more challenging and the same iterative development process continued. While most students got their ‘OK’ in the first round of each project evaluation, there were a few who had to come back with modifications more than once. Interestingly, it was often not the same students who came back multiple times across the projects. Using this iterative approach, the project and the evaluation process did not simply stop with a few comments from the professor and a project grade. Most importantly, the students had to incorporate the changes suggested by the professor and they were able to see how the project outcome changed as a result of incorporating the suggested modifications.
RESULTS

Incorporating the suggestions and being able to visualize the improvement in the project output seemed to significantly enhance the learning process of the students. This approach made everyone, the students and professor, a part of the learning process. In a mid-term evaluation by an independent third party evaluator, the students reported that they felt that they were learning better. Although this instructional variation was not based on an a priori design, research supports the fact that learning by doing and interactive teaching, assessment and feedback is helpful for higher quality student learning.

The class GPA of this group of students at the end of the course was 3.54, compared to 2.36 and 2.54 respectively, in the two preceding semester of this course. The average of two earlier semesters’ scores for the Student Assessment of Instruction (SAI) item “Stimulated my thinking and gave me new insights” was 3.7 compared to 4.13 for the semester in which this iterative feedback model was used. Also, two earlier semester averages for the SAI item “overall teaching effectiveness” was 3.73 compared to 4.13 for the semester where the iterative feedback model was used. Thus, there were significant improvement in both student self-assessment of teaching effectiveness and student self-reported assessment of their own learning.

DISCUSSION

To make the iterative feedback process work, the professor had to commit an enormous amount of time to review projects and watch demonstrations, sometimes more than once for a student. At times it seemed as if the projects dragged on for too long and the students failed to gain closure as quickly as the professor desired. To better understand the time commitment for the professor, consider that for each of the three projects assigned, there were three or four checkpoints where the projects were evaluated, twenty students in the class working individually on the first two projects and ten two-person teams for the final project, four or five students coming back three or more times, and each session with a student taking an average of 30 to 45 minutes. A simple calculation reveals that a total of about 110 hours were spent on direct professor-student interaction to accommodate only the iterative assessment process during this semester. This is in addition to the class meetings and preparation time. In the end, it all seemed to pay off. Enrollment in the course was small (20 students) which played an important part in being able to handle the iterative process. In order to conduct a course in this manner, two important things that need to be considered are: (i) the professor must be willing to adopt this process and be available for extended periods of time and (ii) small class size helps manage the workload.

This teaching approach is better suited to courses where a significant part of the course grade is dependent on projects, either individual or group. Another important element is the nature of the course. The easier it is to visualize the effect of a suggested program change (as in the hands-on nature of system development projects in CIS), the more suited is the course for this teaching approach. A CIS System Development project course therefore, is a good candidate for the model. However, this methodology could be extended to any course, or portion of a course, where an iterative process of feedback, modification to incorporate suggestions in the feedback,
and re-evaluation of the assignment is carried on until the quality of the work turned in reaches a satisfactory level.

REFERENCES


McKeachie, W.J., P.R. Pintrich, Y-G Lin, D.A. Smith, and R. Sharma (1990), Teaching and Learning in the College Classroom: A Review of the Research Literature, 2nd ed., University of Michigan, Ann Arbor, MI.