Work in Progress - Comparing the results of Reflective Thinking Interventions at IIT and Uppsala University

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Abstract - A common problem in higher education is the question of whether or not students are obtaining the skills they need to solve problems in the real world. At the Illinois Institute of Technology (IIT), an attempt to address this problem has led to the concept of Reflective Judgment, defined by Patricia M. King and Karen Strohm Kitchener (1994) as the ability to make good decisions about ill-structured problems, or problems that do not have a single right answer. At IIT, a written measure of Reflective Thinking has been developed using questions included in Reflections assignments. At Uppsala University, a similar interest in the question of how students learn has led educators to experiment with the use of Reflections assignments in their courses as a means of stimulating deeper learning. Comparing IIT’s scoring of student Reflections for Reflective Thinking to Uppsala’s interest in ill-structured problem solving and use of Reflections as an enhancement of the student learning process, it is clear that while these two universities have in common the use of Reflections and the goal of helping students develop advanced problem solving skills, they are taking two fairly distinct approaches. What is not clear is whether one approach is more effective than the other approach at enhancing students’ problem solving skills.

Index Terms – Reflections, Ill-Structured Problem Solving, Open-Ended Problems, Reflective Thinking.

INTRODUCTION

Many educators agree that one of the most important goals of higher education is to prepare students for the real world, but it is often difficult to determine whether or not this goal is actually being attained. It has been noted that the kinds of problems with which we typically provide college students are close-ended or well-structured [1]; they have single right answers, and they can be defined with a high degree of certainty and completeness. This is not the type of problem that students are likely to encounter in their professional and personal lives, as many problems in the real world are open-ended or ill-structured; they do not have a single right answer, they are difficult to define, and they involve many uncertainties. It has been argued that providing nothing but well-structured problems is unlikely to lead to development of the kind of professional competencies that we would like our students to have [1].

This paper will compare the approaches that educators at IIT and Uppsala University have taken to address this “gap” between the kinds of problems students solve in the classroom and the kinds of problems they will face in the real world.

ILLINOIS INSTITUTE OF TECHNOLOGY (IIT)

At IIT, all undergraduate students are required to enroll in at least two three-credit Interprofessional Projects Program (IPRO) courses before they graduate. A principle aim of this program is to enable students to develop professional skills through the experience of working with students from other majors to solve a problem that exists in the real world.

The concern about advanced thinking and problem solving skills has led several IPRO instructors to implement the use of Reflections assignments in their courses. Reflections are individually completed, written assignments, typically completed twice in one 16-week semester. Each Reflection includes 6-10 open-ended questions about the functioning of the team, management of the project, the student’s individual role on the team, and the student’s understanding of and ideas about the real-world problem on which the team is working.

Of these open-ended questions, at least one question on each Reflection is specifically intended to measure Reflective Thinking skills, previously defined by King and Kitchener [2] as Reflective Judgment, or the ability to develop good solutions to problems that do not have a single, clear right answer. Student responses are scored on a 3-point scale representing the three levels of Reflective Thinking. As defined by King & Kitchener, these levels are pre-reflective thinking (1), quasi-reflective thinking (2), and reflective thinking (3).

King and Kitchener conducted extensive research in this area [over 20,000 interviews] and concluded that undergraduate college students typically think at the pre-reflective level, and less commonly at the quasi-reflective level. They noted that truly advanced, reflective thinking is typically observed only in very advanced graduate-level or post-doctoral students [2].

Results gathered from IIT students have been both consistent and inconsistent with King and Kitchener’s findings. Like King and Kitchener, instructors at IIT have...
observed a great deal of pre-reflective thinking. However, the average Reflective Thinking score has increased somewhat over the past few semesters to reflect a greater frequency of quasi-reflective thinking than what King and Kitchener observed. During the Spring 2007 semester, there was an average Reflective Thinking level of 1.62 on a 3-point scale, suggesting that the average was between the pre-reflective (1) and quasi-reflective (2) levels. During the Fall 2007 semester, there was an overall average Reflective Thinking level of 1.97, suggesting that the average was very close to the quasi-reflective level (2). However, this sample is potentially biased by including large numbers of service learning and business planning student teams in the pilot.

It is also important to note that Reflective Thinking scores varied within individual students from one specific Reflective Thinking question to another, at different times in the semester for the same students and across different members of a student team. The observed results are likely dependent on the type of question asked, the timing of the reflection in the semester, the type of problem assigned to the team and the mix of students within a specific team.

**UPPSALA UNIVERSITY**

At Uppsala University, Reflections are not used for the purpose of directly measuring Reflective Thinking, but for the more general goal of stimulating deeper learning through the process of reflecting on a lecture or mini-seminar [3].

Arnold Pears of Uppsala University has previously described his attempts to facilitate deeper learning through the use of Reflections assignments in two information technology courses [3]. These Reflections were completed continually throughout the semester rather than at predetermined times like the Reflections at IIT, and were focused on the content of the lecture material, as opposed to Reflections at IIT which are focused on the problem context within which learning is occurring.

A content analysis of these Reflections by Pears revealed that there were generally three types of students in these courses: 1) those who met the requirements of the assignment but did not appear to engage in significant reflection, indicated by few edits and revisions to the Reflection throughout the semester; 2) those who clearly put a great deal of time and effort into their Reflections, indicated by many edits and revisions throughout the semester and by drawing connections between different aspects of the course material; and, 3) those who used the Reflections to direct questions and comments to the lecturer rather than using them as a personal learning tool.

These three categories of student learners may be analogous to the three levels of Reflective Thinking. A pre-reflective thinker would be likely to misunderstand the purpose of the Reflections and use them only as a medium for communication with the instructor. A quasi-reflective thinker would be likely to understand the requirements, but to fail to engage in truly significant reflection on what he or she had learned. A reflective thinker would be most likely to use the assignment to organize his or her thoughts about the material and to synthesize information to draw meaningful connections between seemingly unrelated topics.

Mats Daniels, also of Uppsala University, has specifically noted the special problems presented by Open Ended Group Projects (OEGPs), noting that solving an ill-structured or open-ended problem requires different skill sets than solving a well-structured problem [4]. Although Daniels is not using Reflections in exactly the same way as they are being used in the IPRO Program at IIT, or in the same way that Arnold Pears has used them in his courses at Uppsala, he does note the importance of scaffolding for guiding student learning in an OEGP, and describes his use of Reflections to help provide such scaffolding.

In this case, students reflect on a lecture or on issues that arise during work on the project, and this information is used to help the instructor identify areas where there are individual needs for scaffolding or development. Reflections at IIT provide similar information for many instructors about team functioning, progress of work on the project, and both novel ideas and misconceptions that students have about the nature of the problem they are working on and the potential solutions that can be applied to that problem.

**SYNTHESIS AND CONCLUSIONS**

Although our two universities have in common our interest in deep learning and advanced problem-solving skills and our use of Reflections with our students, our methods and specific goals are somewhat different.

At IIT, while our ultimate goal is to stimulate higher levels of Reflective Thinking in our students, we have long been focused on the short-term goal of developing a feasible, valid, reliable method of measuring Reflective Thinking. At Uppsala, while the interest in helping students develop advanced problem solving skills is equally strong, the focus on developing these skills does not include a concern with producing a quantifiable measure of the extent to which students have attained them. Textual analyses of student Reflections focus on identifying natural patterns of student responses or on identifying areas for student development and potential needs for scaffolding, rather than assigning students to pre-defined categories of Reflective Thinking.

**NEXT STEPS**

A more detailed comparison of the response categories identified by Pears [3] and the levels of Reflective Thinking used at IIT [5] may reveal that the two methods already lead to very similar conclusions about undergraduate students’ problem-solving skills, i.e. the number of students assigned to Pears’ category 1 may be similar to the number of IIT students assigned to the level of pre-reflective thinking, and so on for the other two categories or levels.

In terms of comparing the efficacy of these different approaches to developing advanced problem solving skills, it may be useful to apply one of the two above described categorization strategies to the responses of
students from both universities at the beginning and end of an academic term in which Reflection exercises are used, and compare any changes in the students’ scores.

REFERENCES


