DESIGNING PROCESS-ORIENTED GUIDED-INQUIRY ACTIVITIES: A NEW INNOVATION FOR MARKETING CLASSES

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In this study, a student-centered learning style is introduced to the marketing discipline. Process Oriented-Guided Inquiry Learning, or POGIL, has been used extensively by the organic science courses schools across the nation. The POGIL technique is student-focused and engages the student aurally, visually, and tacitly, making it practical for all learning styles. Students become active, rather than passive learners. This innovative teaching method has reduced absenteeism, motivated students to be active learners, and increased student performance in our classes. This study is the first POGIL study to be conducted in marketing, or any other social science discipline.

Introduction

This study introduces the Process-Oriented Guided Inquiry Learning method, or POGIL, as a new student-centered teaching style to the marketing discipline. POGIL was created under a grant from the National Science Foundation (NSF) in order to develop pedagogy and curriculum materials to help faculty move from lecturing to more student-centered teaching strategies (Hanson 2006). According to the NSF, traditional teaching methods in higher education were no longer meeting students’ needs; therefore, new educational and reform initiatives were introduced. Focus on changing the curriculum and course content, utilization of computer based multimedia technology for instruction, and promoting more student involvement in class were some of the initiatives introduced by the NSF. According to Hanson (2006), POGIL was the innovation which proved most effective in the science disciplines and is explained as follows:

In a POGIL classroom students work in learning teams on specially designed activities that promote mastery of discipline content and the development of skills in the processes of learning, thinking, problem solving, communication, teamwork, management, and assessment. The POGIL classroom environment is appropriate for faculty who want to engage students in learning and help students develop the skills they need to be successful in courses, college, and careers. In this environment, students take on greater responsibility for their education; they learn to rely on thinking skills rather than memorization; they improve performance skills while learning subject content; and they develop positive relationships with other students and faculty (p. v).

In a POGIL classroom, the student is guided by the professor rather than instructed. “In this sense, the instructor acts as a coach and has four roles to play: leader, monitor/assessor, facilitator, and evaluator” (Hanson 2006, p. 27).

Background of Innovation

Understanding the best learning methods with the best teaching practices has evolved from teacher-centered to student-centered. In the later, we find an evolution from lecture, to case study, to discovery learning to experiential learning, then to problem-based and inquiry learning, and finally to constructivist instructional techniques (Kirschner, Sweller, and Clark 2006). All of these teaching techniques require the student to learn with little or no guidance from the instructor. The foundational concepts of such learning techniques ride on the assumption that (i) students’ learning experience is more effective when they must construct their own solutions and (ii) using real-world experience, or the procedures of the discipline, is the best way to understand the discipline. Extensive

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work completed by Kirschner and colleagues (2006) on pedagogical approaches found that students learn best when direct instructional support is provided.

Learning occurs in a structured manner, with information first entering the working, or short-term, memory. Assuming the information in working memory is processed quickly, the information is stored in the long-term memory where it can be retrieved and utilized when needed (for more details, see, e.g., Ericsson and Kintsch 1995; Anderson 1996; Glaser 1987). In fact, thinking and emotions are dependant on and influenced by long-term memory. This is important to consider when considering instructional design. Presenting too much information or requiring too much processing from the students can overload the working memory, thereby limiting the transfer of information into long-term memory, and reducing the learning effect (Tuovinen and Sweller 1999). Working memory is further burdened when problem-solving activities are required, utilizing little or no guidance, are undertaken. This, according to proponents of minimal guidance, is the very reason why discovery, problem-based, inquiry, and constructivist pedagogical techniques do not work (e.g., Kischner, Sweller, and Clark 2006; Roblyer 1996; Perkins 1991).

In fact, students in courses utilizing problem-based instructional design tend to score lower on standardized measures of basic discipline knowledge as compared to counterparts receiving traditional instruction (see Albanese and Mitchell 1993; Norman and Schmidt 1992). PBL is self-directed; students are presented with a problem to solve before the needed information is presented. As noted by McMaster University, a forerunner in PBL, the problem drives the learning and “before students learn some knowledge they are given a problem” (http://www.chemeng.mcmaster.ca/pbl/PBL.HTM). The lack of sufficient knowledge to solve the given problem contributes to the processing/cognitive overload of working memory (Schmidt, Loyens, van Gog, and Paas 2007). In an attempt to improve the effectiveness of minimal guided techniques, such as PBL, Simons and Klein (2007) looked at scaffolding, or supportive guides, which provide students assistance in the facilitation of knowledge and understanding (see also Schmidt et al. 2007; Hmelo-Silver et al. 2007). In their study, students provided with scaffolds (hints, additional websites, etc.), compared to those who were not provided scaffolds, performed significantly better on problem-solving tasks. The concept of structured, heavily guided instruction has been an effective means of instructional design (see Moreno 2004; Klahr and Nigam 2004; Chall 2000). Thus, it may be said that guided-inquiry learning overcomes the effect of the previously discussed teaching techniques.

How can academia engage students, while still providing the amount of information available through traditional, lecture type courses? According to findings in the Chemistry literature (see, e.g., Kischner and Sweller 1999), the POGIL technique may be a solution. The POGIL technique is student-focused and engages the student usually, visually, and tacitly, making it practical for all learning styles. It utilizes the content of traditional teaching, while engaging the student and encouraging them to become active, rather than passive, learners. As will be shown, POGIL appears to incorporate the advantages of, and overcome the limitations of, other instructional techniques, such as problem-based learning (PBL).

**What Is POGIL?**

As previously mentioned, the NSF introduced Process-Oriented Guided Inquiry Learning (POGIL) into the organic and chemistry classrooms. This method was developed to improve the students’ successfullness in the hard sciences. The objective was to move away from the teacher-centered classrooms to student-centered environments. The activities in POGIL are based on the Learning Cycle Approach (e.g., Abraham 2005; Lawson et al. 1989), which consist of three learning structures: exploration, term introduction, and application. In the exploration phase, students are presented with information in the form of a model, slides, audio, video, etc. Students are guided, by a progression of carefully designed questions, to the content-knowledge expected in the course. Moreover, students are guided to recognizing any trends that the information may contain (higher-order learning; see Bloom 1956). The next phase is term introduction. The guided questions then build on the concepts just explored, introducing the term only after the concept has been developed. This method is in contrast with standard textbook procedures, which introduce terms and definitions first, followed by examples that aid in the understanding of the term. The final stage of the Learning Cycle is referred to as the application. Students are once again guided to utilize the foundational knowledge by constructing their own understanding of the concept.

There are two foundational elements of POGIL. The first is that during the exploration phase, students must be presented with adequate and suitable information. This will ensure a proper foundation from which to build knowledge and understanding. Secondly, the guided questions must be composed and arranged in such a way that all students arrive at the correct conclusions and the development of process-oriented skills is encouraged. The goal of this instructional design is: (i) to develop content mastery, and (ii) to develop process-oriented skills.
such as problem solving, critical and analytical thinking, and oral and written communication.

In a POGIL environment, small groups of three to four persons are assigned individual roles: manager, reflector/technician, recorder, and presenter. Each role comes with its own set of responsibilities, which are noted in Table 1. The instructor assumes the role of facilitator, acting as a guide to the groups working. In this role, the instructor works his/her way among the student groups ensuring an understanding and following of the process. Questions are answered indirectly by guiding the students through the steps to reach a consensus on their own. Group work consists of specifically designed activities that introduce students to the materials and guide them through the learning process set by the instructor.

Research in the science literature, specifically organic chemistry, backs up the effectiveness of the POGIL method of instruction. Students experiencing a POGIL approach reported significantly higher gains in their own process skills compared with those students whose classes were taught in a lecture format (Spencer 2001). Unfortunately, only the hard sciences are using the POGIL approach at this time and research in other disciplines is limited.

It is important to note that POGIL is not PBL – the necessary information is provided to students in the POGIL method and does not overload the cognitive processing of working memory, as found in the PBL method. The goal of effective instructional design is to guide learners so that they learn to utilize the information in ways that are consistent with the learning objectives, thereby storing the information in long-term memory (Kirschner et al. 2006). POGIL appears to accomplish this goal, while still engaging the students and limiting the traditional, lecture format.

As noted, the POGIL method has been successful as a teaching technique in Organic Chemistry, where often only one correct answer usually exists. The authors of the current study wanted to see if this instructional method would be superior to traditional lecture styles of instruction in a social science course, specifically a professional sales marketing class, where there might be several “correct” answers. For more information on the specifics of POGIL, interested readers are directed to the

<table>
<thead>
<tr>
<th>Table 1</th>
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<tbody>
<tr>
<td>POGIL Group Roles</td>
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</table>

<table>
<thead>
<tr>
<th>Roles</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manager</strong></td>
<td>• Keep everyone on task</td>
</tr>
<tr>
<td></td>
<td>• Ensure everyone is participating</td>
</tr>
<tr>
<td></td>
<td>• Interact with instructor as needed</td>
</tr>
<tr>
<td><strong>Reflector/Technician</strong></td>
<td>• Comment on group behavior to the manager in an effort to make needed adjustments/improvements</td>
</tr>
<tr>
<td></td>
<td>• May be called upon to report on group dynamics (to instructor or class)</td>
</tr>
<tr>
<td></td>
<td>• Performs all technical operations for the group, including the computer, slides, calculator, etc.</td>
</tr>
<tr>
<td><strong>Recorder</strong></td>
<td>• Records names and roles of group members at the beginning of each class</td>
</tr>
<tr>
<td></td>
<td>• Responsible for turning in log indicating:</td>
</tr>
<tr>
<td></td>
<td>• One item group understood from the day</td>
</tr>
<tr>
<td></td>
<td>• One item that the group still has questions on</td>
</tr>
<tr>
<td></td>
<td>• Responsible for turning in group answers</td>
</tr>
<tr>
<td><strong>Presenter</strong></td>
<td>• Presents group’s information to the class when called upon by the instructor</td>
</tr>
</tbody>
</table>

(This role is often combined with that of the Reflector or Manager)
POGIL Project website (www.pogil.org) and various published materials (e.g., Hanson 2006; Moog et al. 2008; Hanson and Apple 2004). The description of the POGIL process is based on the findings of the NSF, the science materials available and the observations of the authors.

The Current Study

In order to assess if the POGIL technique was superior to the standard lecture-style classroom environment, two sections (A and B) of a Professional Selling course taught by one of the authors were used. Section A, comprised of 22 students, was taught at 8:00 AM in the traditional lecture style. Section B, comprised of 25 students, was taught at 10:00 AM in the POGIL format. Both sections met three days per week for 50 minutes each. Treatment groups were arbitrarily assigned for the semester. Future studies will include a reversal of the treatments; POGIL in Section A and lecture in Section B. Both researchers attended a one-day seminar hosted by the POGIL Project, who introduced the concepts of POGIL and worked one-on-one with activity development.

Students self-selected class section at the time of registration. There was no indication of treatment group at the time of registration. Prerequisites for the course included the academic ranking of junior or senior and a minimum grade of “C” in the Principles of Marketing Course. The course was a requirement or highly suggested elective for those students in Logistics, Fashion Merchandising, Fashion Design, Sports Marketing, and Marketing students with a sales and sales management emphasis. The course was an elective for the other disciplines represented in the sections included Marketing, Management, Accounting, Retail Management, Construction Management, Hospitality, and General Studies. All students had the same prerequisites prior to entering the course. Other than these prerequisites, no other measures of academic equivalence were considered.

Students were told of the study during the first day of class and were allowed to opt-in or -out of the study. If a student opted-out of the study, his/her data were not considered in the analysis. To opt-in, students were asked to sign a consent form. All students in each section opted to be active in the study. The section instructor was also the researcher and conducted all grading. While it is impossible to control for all possible research bias, even unintentional, the researchers attempted to reduce research bias in the grading process. Student work was mixed together when graded. Only after grading were the names then separated into sections by the graduate assistant.

Since this was the first time this method had been implemented by the authors, only one specific module was selected for further analysis. Module 4 was the introduction of the consumer buying process, which included basic communication and the Multi-Attribute Model. Specifically, how can the salesperson assist the prospect during the buying process? The learning objectives of the module included: (i) for students to demonstrate an understanding of the salesperson’s role in the buying process; (ii) the ability to categorize various types of buying decisions; and (iii) for students to utilize the Multi-Attribute Model to make a purchase decision.

Section A was taught in the traditional lecture format over three class sessions. The lecture style involved the professor speaking the entire time about a set of slides provided by the textbook publishers; students were provided a subset of the slides on the course website prior to class and took notes during the class. The lecture consisted of 30 slides, which covered business communication processes, how business consumers make purchase decisions, and a demonstration of how to work a multi-attribute problem. The problem worked out in the lecture class was the same problem presented to the POGIL class in Section B. At the end of each session, students were told which pages to read in the text as follow-up to the class lecture.

Section B received no lecture from the professor. The module was taught over three class sessions. Upon entering the classes each day, students were placed into their groups of three to four individuals, assigned one of the roles noted in Table 1, and presented with a team folder. Students had practiced the roles in a previous exercise involving the syllabus; roles were rotated each class session. The folders each contained a model (set of slides, figures, tables, charts, etc.), instructions for the group manager, a sheet for the recorder to record the group’s answers to the carefully designed guided questions, a reflector sheet for the reflector to analyze the group’s progress, and a worksheet for each member in the group to retain. The worksheets contained the same questions as the recorders sheet. At the end of each worksheet was the reading assignment and additional questions to be worked on individually. These questions were not graded or collected; they were for individuals to further their understanding of the materials discussed in class. Slides and models utilized in Section B were a subset of what was presented to Section A.

At the start of each class period, each group was presented with their team folder. The first part of the module contained six slides (tables and diagrams) and introduced the basics of communication in the sales environment, to include communication cross-culturally and the role of space and physical contact. Part two of the module, which was presented during the next class session, contained five slides and introduced the
Table 2
Module 4 Quiz Results

<table>
<thead>
<tr>
<th>Class Format</th>
<th>Students Completing Quiz</th>
<th>Students Absent</th>
<th>Quiz Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>17</td>
<td>5</td>
<td>48.24%</td>
</tr>
<tr>
<td>POGIL</td>
<td>24</td>
<td>1</td>
<td>62.92%</td>
</tr>
</tbody>
</table>

Table 3
Module 4 Quiz Results by Question

<table>
<thead>
<tr>
<th>Class Format</th>
<th>N</th>
<th>Quiz Question #1</th>
<th>Correct/ Partial Credit</th>
<th>Incorrect/ Not Answered</th>
<th>Quiz Question #2</th>
<th>Correct/ Partial Credit</th>
<th>Incorrect/ Not Answered</th>
<th>Quiz Question #3</th>
<th>Correct/ Partial Credit</th>
<th>Incorrect/ Not Answered</th>
<th>Quiz Question #4</th>
<th>Correct/ Partial Credit</th>
<th>Incorrect/ Not Answered</th>
<th>Quiz Question #5</th>
<th>Correct/ Partial Credit</th>
<th>Incorrect/ Not Answered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>17</td>
<td>10 (58.8%)</td>
<td>7 (41.2%)</td>
<td>3 (17.6%)</td>
<td>14 (82.4%)</td>
<td>8 (47.1%)</td>
<td>9 (52.9%)</td>
<td>9 (58.9%)</td>
<td>8 (47.1%)</td>
<td>13 (76.4%)</td>
<td>4 (17.6%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POGIL</td>
<td>24</td>
<td>18 (75%)</td>
<td>6 (25%)</td>
<td>10 (41.7%)</td>
<td>14 (58.3%)</td>
<td>16 (66.7%)</td>
<td>8 (33.3%)</td>
<td>10 (41.7%)</td>
<td>14 (58.3%)</td>
<td>22 (91.7%)</td>
<td>2 (8.3%)</td>
<td></td>
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</tr>
</tbody>
</table>

various buying decisions encountered in the business-to-business market, to include how business purchase decisions differ from consumer purchase decisions. The final part of Module 4, which was taught at the following class session, was comprised of four slides and two tables of the Multi-Attribute Model. The presented information provided the foundation for how to utilize the Multi-Attribute Model to make purchase decisions and how a salesperson might utilize the information to assist in the purchase of his/her offerings. Due to space constraints, copies of the information provided to each of the sections, including copies of the contents of the POGIL team folders, are not presented in this manuscript. Interested readers are encouraged to review all materials at http://pogil.bbred.org.

In the lecture treatment (Section A), no assessment of understanding was conducted at the end of each class session. For the POGIL treatment (Section B), group performance on each part of Module 4 was assessed. Each group turned in a set of answers to the guided questions. These were graded and the groups each received a total grade for Module 4, comprised of each part of the module. This allowed for the instructor to evaluate cooperative learning skills within each group of Section B. In areas where the group’s answers were incorrect, the instructor provided guidance in the next class to correct any misunderstandings. The groups then discussed their incorrect answers until the entire group determined the content was understood.

Upon completion of Module 4, it was necessary for students to individually display knowledge and comprehension, as well as provide evidence of application, analysis, synthesis, and evaluating/critical thinking abilities (Bloom 1956) for each learning outcome. In order to assess the desired outcomes, each student was given a short quiz on the class session following the completion of Module 4. Students understood that a quiz on the module would be given at the next meeting. The quiz contained five short-answer questions and was closed-book. The quiz was worth five points and counted toward the student’s final grade in the course. Answers to the quiz where based on the content found in the information provided to the students in both sections (slides, tables, diagrams) and in the textbook reading assigned to both sections. The quiz was graded by the instructor, who is also one of the researchers in this project. The quiz questions are available at http://pogil.bbred.org.

Results of the Innovation

Of the 22 students enrolled in the lecture treatment section of Professional Selling, five (5) were absent on the day of the quiz. The average quiz grade for the 17 students who completed the quiz was 48.24%. In contrast, 25 students in the POGIL treatment section completed the quiz, with only one (1) student being absent, resulting in a class average of 62.92%. As noted in Table 2, students in the POGIL classroom displayed better attendance and a far better command of the information as assessed by the quiz. As noted in Table 3, students in the POGIL treatment performed better on each question of the quiz, except for question four. The first three questions assessed students’ knowledge of in-
formation discussed during the class or activity. Information for question four came from the assigned readings that students were asked to do outside of class. Question number five assessed the student’s ability to apply the knowledge gained. The results in this study were similar to those found in the Organic Chemistry POGIL studies (see Hanson and Wolfskill 2000; Stony Brook Press Release 2003).

The results for Module 4 may appear drastic. However, throughout the course, students in Section B appeared to be more successful. For example, Module 1 (syllabus review) resulted in a quiz score of 90% for Section A, compared to 97% for Section B. Another module consisted of both classes watching specific videos from U-Tube related to overcoming prospect objections, followed by a lecture or POGIL activity on the topic. The average quiz grade for this module was higher for Section B (96%) than for Section A (68%). The comprehensive final exam utilized in both sections was newly created and its validity as an accurate measure of course performance was still being tested. The final exam proved more difficult than either researcher realized. That being said, the final exam scores for both sections were very close; Section A averaged 67.7% and Section B averaged 69.7%.

The instructor of both sections enforced a very stringent attendance policy; every absence after the third resulted in the loss of a letter grade. Therefore, it is difficult to conclude if attendance for Module 4 was due to the POGIL treatment or the course policy. It is important to note that Module 4 occurred very early in the semester prior to the time when students concern themselves with limits on absenteeism. The overall absentee rate for the entire course in both sections is very close. Section A had an average absenteeism rate of 2.10 days, compared to 2.06 days for Section B. Overall, approximately 10% of the students in Section A (lecture treatment) had perfect attendance, compared to 12.5% of the students in Section B (POGIL treatment).

One unintended result occurred during another module. A few students from the POGIL section were absent for a part of a module, as were some students in the lecture section. What occurred at the next class meeting was not expected by the researchers. The absent students from the POGIL section turned in the assigned activity completed in class by their peers. The students formed their own group outside of class, networked with other classmates for the materials needed, made their own copies and packet, worked together to answer the questions and completed the activity without any additional guidance from the instructor. The students took their own initiative to complete this task, and completed the activity correctly. While the module slides were available on the class website for the lecture group (Section A), it is unknown if those students absent from the lecture section made any attempts to gather the missed information or discuss the topic with their peers. None of the students contacted the instructor for details of what was missed.

Conclusions and Discussion

It may be important to note that the POGIL technique has been successfully utilized in a variety of high school and university Chemistry courses, including Organic, General, and Biological Chemistry. Since the current study is the only known examination of this technique in a non-science course, comparisons to other social science contexts cannot be made. The authors contend that differences between Chemistry and Marketing exist; however, the initial results of this technique’s use in marketing courses prove promising.

Overall, the innovation presented in this study does show a decrease in absenteeism and an increase in student performance. As shown in the results of Table 2, using guided inquiry materials to deliver course content increased the student’s average on the module quiz by almost 15 per cent. Additionally, only one student was absent from the POGIL section, as opposed to five students in the lecture class, on the day the quiz was given. Students knew when the quiz would be administered; it was announced in class and was listed on the course syllabus.

One interesting artifact of this study, which was not expected, was that students in the POGIL section appeared to take full responsibility for their learning. From past experience, students in the Professional Selling courses have always displayed passive learning. Most would not read the text and many did not purchase the text. Additionally, late assignments were not accepted by the instructor in past or present courses; therefore, the instructor did not expect the students to “make-up” any missed work. Students from the lecture section who were absent from class made no attempt to contact the instructor. In contrast, students who were absent from the POGIL section took responsibility for their learning by gathering the data and completing all tasks for the activity. Thus, not only were the students engaged in their learning, they were motivated to be active, not passive, learners. This finding may be due to the group structure imposed by the POGIL technique forging a sense of social responsibility or relationship. The relationship building and sense of identity is also present in other teaching styles such as PBL (see O’Kelly and Gibson 2005).

It is reasonable to ask if the improvements in performance and knowledge base examined in the POGIL
treatment were due to the structure of the activity or the cooperative learning brought about by the groups themselves. None of the module activities were completed at an individual level; therefore, we cannot speak to this research question. Our future research will include a course module completed by individuals to examine the effect that cooperative learning may have on overall performance. The core focus of the assessment for this study has been on the knowledge and application of course content. The researchers did not examine the higher level of learning proposed by the POGIL technique, that of developing process-oriented skills such as problem solving, critical and analytical thinking, and oral and written communication. Again, future research will examine the process-oriented skills gained between the two treatment groups.

There is no disagreement that it is important to examine student performance in the classroom; it may be just as important to measure student motivation and preference for a teaching technique. Approximately two-thirds of the way through the course, students in the POGIL treatment (Section B) were asked two questions:

1. Would you like to see some lecture added to the current course structure?

2. Would you like to see the format changed to ALL lecture?

Student responses demonstrated overwhelming support for the POGIL technique. In all, 24 students were present for the survey. The survey was conducted within each group, with students answering either “yes” or “no” to each question. In response to question 1, eight students (one-third) stated they would like to see some lecture added to the course; two-thirds of the students answered “no” to this question. The response to the second question was very clear, students unanimously answered “no” to changing the format to all lecture. Therefore, the remainder of the course was taught in POGIL format. One group even added the comment, “We like the group activities. We feel this helps us learn.” No other comments were written by any other groups. These questions were not presented to the lecture treatment (Section A).

While our study only examines an upper-level marketing course (Professional Selling), studies in the sciences have shown that the POGIL technique is appropriate for both lower- and upper-level courses. Additionally, this teaching technique appropriately adapts to each student’s learning style, allowing for a more cohesive learning environment. This technique could work well for any course, and may work best for instructors who already incorporate class activities into their classroom. The courses utilized in this study were small in size; however, the POGIL technique has been successfully utilized in large science courses (for more details see POGIL Project website, www.pogil.org.)

The POGIL process requires a lot of work and preparation from the instructor at the onset; however, once the guided inquiry materials are created and validated, the workload becomes minimal. The long-term benefits of the POGIL technique to the instructor include less preparation time, consistency between sections, and the ability to monitor each student’s progress. In the lecture style section, the authors were able to monitor each group by reviewing their answers to the guided inquiry worksheets. If groups or the class as a whole missed any portion of the module, the instructor was quickly able to provide proper guidance by writing a message to the group, contacting the group through email, or briefly discussing the concern during the next class period. This ability to monitor student progress prior to the formal assessment may be the greatest benefit of this teaching innovation.

References


O’Kelly, Jackie and J. Paul Gibson (2005), PBL: Year One Analysis—Interpretation and Validation, PBL International Conference, PBL In Context—Bridging work and Education, Finland, June 9th – 11th.


POGIL Project Website: Retrieved on September 14, 2008 http://www.pogil.org/.


