Adapting Problem-Based Learning For The First-Year Experience

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Abstract
The United Arab Emirates University has implemented a unique adaptation of Problem-Based Learning (PBL) to meet the short, medium and long-term interdisciplinary developmental needs of Middle Eastern first-year university students (Learner Training, Thinking Skills, Application of Knowledge, Information Literacy, and Communication). This paper highlights the process of adapting PBL to the first-year context and presents findings demonstrating its positive impact.

INTRODUCTION
Universities throughout the Middle East have set up special programs designed to meet the unique needs of the first-year student, ranging from independent seminars to full-scale preparatory years. Most often these programs focus on academic remediation in the areas of English language, mathematics, and ICT. A focus on academic skills in these areas is important; however, programs that limit their emphasis to basic skills and knowledge often do little to motivate the student or provide them with the full range of tools needed to be successful in university and beyond. Student-centered opportunities to develop skills, knowledge and dispositions aimed at becoming life-long learners are more likely to motivate and engage. Problem-Based Learning (PBL) is one innovative methodology that shows great promise as a means for promoting acquisition of these skills, knowledge and dispositions. In most higher education institutions, the primary focus of PBL is on the discovery and application of content knowledge in a single discipline (Jonassen, 2000; Knowlton, 2003). In first-year programs, the PBL methodology provides a unique opportunity to focus more on the process of learning.

In this paper we highlight an adaptation of the PBL approach to the first-year experience that promotes the development and assessment of a set of interdisciplinary lifelong learning competencies: Learner Training, Thinking Skills, Application of Knowledge, Information Literacy, and Communication. The power of this approach as a means of meeting the short, medium, and long-term educational needs of Arab students is demonstrated through presentation of data collected during the initial semester of implementation of PBL in UGRU, the first-year developmental program of the United Arab Emirates University. These findings provide evidence that the PBL experience in a first-year program can motivate and engage students to a greater degree than traditional lecture-based courses. Participation in the PBL experience also enables student to make a variety of connections often missing from traditional courses: connections between subjects (mathematics-ICT-English-Study Skills), connections to the real world, connections between participants (community of
learners), and connections to the knowledge, skills and dispositions that will be needed for success in university and beyond.

**PROBLEM-BASED LEARNING**

The potential for incorporating Problem-Based Learning into formal education systems has been described as “a method [that] may change the nature of education” (Hung, et al, 2003). With PBL, students do much more than learn a body of knowledge to be regurgitated on an exam. As Ward and Lee (2002) point out, in PBL

Students need to recognize what information is needed, have the knowledge and skill necessary to acquire this information, and the ability to use that knowledge appropriately to solve the problems they face (p. 17).

Problem-Based Learning was a term coined by Howard Barrows at McMaster University, Canada, in the 1960s. Involved in medical education, Barrows realized that doctors needed more than a body of knowledge - they needed the ability to draw on that knowledge as necessary and apply it to solving problems with which they were faced in their clinical practices. What is more, they needed to be able to extend their knowledge throughout their careers. In today’s information rich society, this need is even more pressing for graduates of all fields. For students to be successful in the twenty first century they need to be lifelong learners. Helping them to develop the skills necessary to become lifelong learners requires an approach like PBL.

Unlike a traditional project, which is usually designed to consolidate knowledge and demonstrate the relevance of what has already been taught, PBL is inductive in that it begins with the presentation of a real world scenario. This scenario provides the context and motivation for learning. The following process forms the basis of PBL methodology (based on Barrows, 1992):

- Small groups of students are presented with a real-world, ‘messy’ open-ended problem;
- The group analyzes the problem to establish what they know, what they need to know and how they can find out;
- The workload is distributed fairly and efficiently among the group;
- Individuals carry out their assigned task outside of the classroom;
- Individuals share their new knowledge with the group and apply it to the problem;
- The group re-conceptualizes the problem in the light of new knowledge and comes up with potential solutions;
- Solutions are communicated to a wider audience and justified in an authentic performance-based assessment situation.

As the concept of PBL has spread beyond medical faculties, numerous studies have illustrated its potential to engage students and improve learning. PBL has been shown to help students take more responsibility for their learning (Lieux, 1996), improve cognitive skills (Chrispeel and Martin, 1998), become more motivated (McKinnon, 1999), develop valuable social skills (Lieux, 1996), and learn more about themselves (Evensen, Salisbury-Glennon & Glenn, 2001). Important in PBL is that learners have ownership, that the learning is anchored to a larger task and that learners are
challenged (MacKinnon, 1999). This process has been applied in many educational settings, and appears to be extremely appropriate for engaging students within foundational level programs in the Arab world.

THE CONTEXT - UGRU
The United Arab Emirates University (UAU) is a public institution with an enrollment of approximately 16,000 students. The University General Requirements Unit (UGRU) is the foundation level program within the university. UGRU consists of over 350 instructors and nearly 6,000 students. The average percentages of female and male students in the fall intake over the past 5 years have been 76% and 24%, respectively. The vast majority, nearly 90%, are first-generation university students (Bielenberg, 2005). First generation students are defined as those whose parents have had no college or university experience. The majority of UGRU students enter with limited academic abilities in mathematics and ICT. The difficulties that may arise from this are compounded by the fact that student exposure to and abilities in academic English, the language they will need for most of their academic studies at UAEU, are also quite limited.

UGRU is a developmental program that aims to foster active, life-long learners able to tackle challenging, cross-disciplinary problems. Its mission is to equip students with the relevant knowledge and skills needed to function as a competent member of the university and society. As such, the UGRU curriculum focuses on both the process and the product of learning in order to develop students with a mastery of the subject-specific core competencies who can also create, use and communicate knowledge. In fall 2003 a set of Curriculum Competencies were adopted within UGRU. The five competencies are: learner training, thinking skills, application of knowledge, information literacy, and communication. During spring 2004 specific teaching and learning objectives related to the UGRU Curriculum Competencies were woven into the Mathematics, English, ICT and Arabic course documents. While these objectives existed on paper, classroom observations and discussion with instructors indicated that their implementation in the classroom, and opportunities to develop and assess them, was limited. In response, UGRU sought to identify an engaging means for students to develop the curriculum competencies, and a tool to assess competency levels. PBL fit its needs. UGRU’s unique adaptation of this approach is presented in the next section.

THE UGRU PBL EXPERIENCE
The UGRU PBL initiative began in spring 2004 when instructors from all subject areas were invited to contribute ideas on how to better engage students on Wednesdays, a day of high absenteeism and unengaged learning. Ideas included subject specific project weeks, service learning projects, guest speakers, and an extended tutorial system. The common theme was a project element. Discussions took place in various forums as to the shape of the new vision for Wednesday and after considerable online research the recommendation was made to introduce a Problem-Based Learning component to the UGRU Curriculum. In fall 2004, a team of volunteer teachers from all subject areas (English, Mathematics, ICT) was brought together and began work on developing scenarios, materials and assessment tools. The initial PBL experience was piloted in spring 2005 with three sections of female students. Improvements were made in the wording of the problems and the facilitator (instructor) guidelines, and the experience was fully implemented in fall 2005. This
original initiative has come to be known as PBL2. A second level of the PBL experience was developed in fall 2005 and fully implemented in spring 2006. Known in UGRU as PBL1, this form of the PBL experience has adaptations in terms of language requirements and is intended for students who are placed into the first level of UGRU English during their first semester of UGRU. By spring 2006, both PBL1 and PBL2 were fully implemented.

In its present form, the PBL experience in UGRU takes place over the period of one semester for both PBL1 and PBL2. In each level, small groups of students (4-5 per group) select and work through a real world problem, applying knowledge and skills gained in other UGRU courses. During the problem solving process a facilitator coaches groups on the metacognitive skills of setting goals, recording and monitoring action, reflecting on performance, and assessing progress. The final product includes two recommendations with relevant justification and support in the form of a poster or leaflet. The groups also present their recommendations to the class, usually in the form of a PowerPoint presentation. The key to the whole process is an authentic, engaging real-world problem.

Scenarios
Problem-Based Learning problems (known as scenarios in the UGRU PBL Experience) “should be designed so that students must perform research to gather information needed for possible solutions” (Delisle, 1997). They should be developmentally appropriate, have a clear purpose, have available resources, and be curriculum based. The topics of scenarios for the UGRU PBL Experience are guided by the general themes worked on in the English program: Daily Life, Work and Business, Science and Nature, Sports and Leisure, and Nutrition and Health. Other characteristics of PBL problems are that they be current, relevant, complex, open-ended and ill-defined (Samford, 2006). These characteristics apply to the problem scenarios at both levels of the UGRU PBL Experience, although the nature of the scenarios presented to students differs. In PBL1, the students are given the choice of three student profiles and tasked with providing recommendations for two careers. They then present the two chosen careers to the facilitator with an analysis of the candidate’s strengths and weaknesses for each career and advice on action to be taken to improve prospects. Through these scenarios students see the relevance of a career search and are able to apply some of the lessons learnt to their own lives.

In PBL2 the students are presented with a choice of three real world problems that are of current relevance to their life in the UAE. To date UGRU students have tackled parking problems, infant mortality, and water resources. A scenario bank is currently being developed and includes additional topics such as campus development, traffic accidents, stock exchange, graduate employment, tourism, library facilities, and sports and leisure facilities. Three different scenarios are presented to students each semester.

Task structure
Both PBL1 and PBL2 students follow the same problem solving process as outlined in Table 1. Each session begins with students sharing information from their preparation task followed by discussions within the group. Next, individual responsibilities are allocated for the out-of-class preparation task, and each session ends with some form of self- or peer-assessment focusing primarily on the functioning
of the group. Each session comes with a clear lesson plan and set of materials for facilitators to use in order to guide students through this process.

Table 1. The UGRU Problem-Based Learning Process

<table>
<thead>
<tr>
<th>Sessions</th>
<th>By the end of this session you will have…</th>
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| **Orientation**| 1. understood what PBL is and why we will do it  
                        2. thought about good group work |
| **Session 1**  | 1. formed groups and chosen a role  
                        2. understood the task and grading  
                        3. understood a chosen scenario  
                        4. self-assessed your understanding of PBL |
| **Out of class preparation** | identified what you know and what you need to know (1C) |
| **Session 2**  | 1. shared knowledge and opinions on what you know and what you need to know.  
                        2. written research questions  
                        3. developed a search plan  
                        4. shared responsibilities  
                        5. assessed one of your group members contributions |
| **Out of class preparation** | found information and taken notes (2A). |
| **Session 3**  | 1. presented information to your group;  
                        2. brainstormed possible solutions to the problem;  
                        3. selected relevant information;  
                        4. identified gaps in information;  
                        5. made a work plan.  
                        6. assessed how well your group is working |
| **Out of class preparation** | completed work plan (3C). |
| **Session 4**  | 1. shared results of individual work;  
                        2. organized information for final product (poster/leaflet);  
                        3. agreed meeting times/responsibilities.  
                        4. assessed how well your group is working |
| **Out of class preparation** | produced draft poster/leaflet  
                          completed task sheet (4D) |
| **Session 5**  | 1. given feedback on other groups’ posters/leaflets  
                        2. planned your presentation  
                        3. assessed your peers’ products and provided them with feedback |
| **Out of class preparation** | Finalized your poster/leaflet  
                          Practised and assessed own group’s presentation. |
| **Session 6**  | 1. taken part in final presentations  
                        2. written comments on the Wednesday PBL Experience.  
                        3. self-assessed your group’s presentation  
                        4. evaluated the PBL course |
Assessment
There is no traditional examination in the UGRU PBL Experience as the students are not expected to acquire subject specific knowledge. Rather, students develop knowledge, skills and attitudes in the UGRU Curriculum Competencies that are best assessed using alternative techniques. In addition to a self- or peer-assessment task in each session, there is a standardized teacher assessment component. This consists of the following three elements:

- **Process** The problem solving process itself is central to the course and as such represents 30% of the final grade through continuous assessment. This consists of a series of individual tasks allocated by the group at the end of each session to be completed for the following session in order to allow the group to progress on schedule. The facilitator checks completion of tasks at the start of each session and awards a grade of 0 (not accomplished/does not meet minimal standards); 1 (accomplished with prompting/developing/meets basic requirements), or 2 (accomplished without prompting/exemplary/exceeds basic requirements). The average of these 6 preparation tasks is entered as 30% of the final grade. This element of the grade will clearly differentiate between those members of a group who have been fully engaged in the process and those who have failed to perform as an effective group member.

- **Product** This consists of a leaflet or poster that includes two recommendations on how to address the chosen problem, with relevant supporting details and justification, submitted to the facilitator in session 6. Facilitators use a standardized criteria sheet to award a group grade to those students who have clearly contributed. Calibration sessions are carried out with facilitators prior to session 6. The product counts for 30% of the final grade.

- **Performance** In the final session the group is required to present their recommendations and explain their decision making process. Facilitators use a standardized criteria sheet to assess group and individual performance in the presentation. This represents 40% of the final grade. Calibration sessions are carried out with facilitators prior to session 6.

Professional Development
The role of the instructor (Facilitator in PBL) is substantially different from the traditional teacher role in a content area class. Rather than serving as a “sage on the stage,” the PBL facilitator is expected to be “a guide by the side” facilitating the learning process without specifying the content to be learned (Stinson & Milter, 1996). Instead of lectures, the facilitator is asked to model various methods of problem-solving and/or ask guiding, meta-cognitive questions such as “tell me about your group’s thought process.” This is sometimes referred to as “cognitive apprenticeship” learning (Brown, Collins & Newman, 1989). This change in instructor role can be frustrating for both students and teachers, especially in the initial stages of Problem-Based Learning (Zimitat & Miflin, 2003). In response, on-going professional development has been an integral component of the UGRU PBL Experience. In our concept of professional development, the course developers work with teachers to identify issues and reflect on practice, an approach to professional development that puts instructors at the center of an examination of teaching practice. In June 2005 a
‘PBL through PBL’ experience was organized to allow future facilitators to experience the methodology that they would be using in order to discover the theory and practical implementation of PBL. This initial experience has been followed by sustained PD support whereby facilitators gather to preview the sessions before they are delivered and then meet again after each session to debrief and reflect on the lesson taught. There is also an electronic discussion board where facilitators are encouraged to share their experiences. Instructor input has led to many improvements in the UGRU PBL Experience materials and process.

EVALUATING THE UGRU PBL EXPERIENCE – INITIAL FINDINGS
The design of the UGRU PBL Experience was in many ways successful because of the active involvement of instructors in the development process. This active involvement continued during the initial piloting and implementation of PBL in UGRU. As such, both instructors and administrators where anxious to determine the degree to which their PBL initiative was successful in motivating students and developing student knowledge, skills and dispositions in the areas of the five curriculum competencies. Four key areas were assessed: Student Motivation, Development of Curriculum Competencies, Instructor Development, and Connections.

In order to assess the items listed above a combination of qualitative and quantitative data gathered through teacher focus groups, classroom observations, and student and teacher course evaluations were used. The focus groups were held on a bi-weekly basis, with each group consisting of 10 – 15 instructors. Discussions during these sessions was guided by a set of questions distributed to facilitators prior to a given PBL session and completed immediately following the session. Discussion notes were compiled and key themes identified across sessions through careful analysis of the focus group discourse.

Course evaluation forms were completed by both teachers and students at the end of the course. The student course evaluation form consisted of 19 questions covering four main categories: General Issues, Course Documents, Assessment, and Curriculum Competencies. The teacher course evaluation form paralleled the student form and also contained items in the areas of Support and Content, resulting in a total of 29 items. Responses to individual items were on a four-point Likert scale. Both evaluation forms included prompts for essay responses. The essay responses were read, key themes identified and responses coded according to these themes. Student and teacher responses were triangulate through classroom observations.

Initial Findings
Overall, the PBL initiative has been found to motivate and engage students while also providing opportunities for them to develop in most areas of the curriculum competencies. Data also indicate that students developed a number of connections that will support their learning throughout their university education and beyond.

When compared with other courses, students rate the PBL Experience as the most useful. Table 2 indicates the percent of students who found each UGRU course useful or very useful. The UGRU PBL Experience was rated substantially higher than other, more traditional, courses.
<table>
<thead>
<tr>
<th>Course</th>
<th>% who find course useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>56%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>73%</td>
</tr>
<tr>
<td>IT</td>
<td>66%</td>
</tr>
<tr>
<td>Arabic (Study Skills)</td>
<td>72%</td>
</tr>
<tr>
<td>PBL</td>
<td>92%</td>
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</tbody>
</table>

Student comments provide insight as to why they consider the experience so useful. First, students indicate that they appreciate working together on important issues relevant to their lives, and feel in charge of their own learning. As one student put it, “[PBL] makes me feel like an important person in society.” While group work contributes to the enjoyment of many students, it was also often mentioned as a demotivating factor: “Group work is very useful and enjoyable, but when I work with lazy and irresponsible students it gets boring. The most difficult part is working with other students.” In response, UGRU has provided more opportunities within the PBL course to reflect on group work and discuss ways to resolve conflict within groups. Finally, students report that participating in learning through PBL leads to increased confidence, which in turn results in more on task behavior.

Both students and teachers identified that the PBL course strongly contributed to the development of the curriculum competencies. Information literacy (learning how to access information) and Learner Training (learning to work in a group, taking responsibility for one’s work, and organizing one’s work) were rated most highly by both teachers and students, and student development in these areas was confirmed through classroom observations. And while students often found it difficult to analyze the vast amounts of information they accessed, a majority identified this challenge as a major motivating factor. In other words, when presented with challenges that had an authentic purpose, students rose to the challenge and persisted in their efforts. In many ways this is summed up in the words of one of the PBL facilitators, who wrote, “Students’ performance levels were all beyond my expectation and to be more accurate I should say way beyond my expectations.” This is one of the most positive benefits arising from implementation of PBL in our first-year developmental program. As instructors have opportunities to see students being successful, and students experience success in a challenging endeavor, beliefs from both parties about what is possible have risen. Setting high standards and providing students with the scaffolding necessary to reach those high standards is becoming more and more common in UGRU classroom practice. UGRU instructors have also moved toward more student-centered teaching in their regular courses with group work being more effectively used and 73% of facilitators indicating that they now see the positive aspects of self- and peer-assessment tools and are likely to use them in their regular content classroom.

The final area of positive impact from PBL is in terms of connections. Analysis of the comments on evaluation forms and classroom discourse indicates that PBL enables students to make connections with other learners, between subjects, to the community, to their future, and with their instructors. The connections to both short-term and long-term learning are evident in comments from students, “I am very happy about this PBL because I learned many things that will be useful in my life.” “It (PBL) was so good and this will help me in my faculty studies.”
CONCLUSION
The evidence presented above provides initial insight into the positive impact that this curricular initiative has had for Arab students in a foundation year course. The UGRU PBL Experience is a motivating tool that enables the development, application and assessment of essential knowledge, skills and dispositions necessary for learning-for-life. PBL helps connect students both as a community of learners and to the broader community. Perhaps most importantly, PBL has contributed toward the transformation of the broader learning environment, providing a student-centered approach that engages students in active learning. In order to be successful in the twenty-first century, universities must graduate students who are prepared to be lifelong learners. This challenge necessitates a pedagogical shift from transmitting a body of expected knowledge that is largely memorized to one that is predominately process oriented. In this paper we have demonstrated that PBL is one methodology that can be effectively used in first-year programs to accomplish this goal. It seems appropriate to end with the words of a student who participated in the first UGRU PBL Experience, “I enjoyed working with the group and feeling that our work is so important that we gave it most of our time and thoughts.”

REFERENCES


