

## *Developing Language and 21st C Skills Through Problem-Based Learning*

Sophie Farag, The American University in Cairo, Egypt

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### **Abstract**

Students at the American University in Cairo are expected to be able to work on group projects and produce high quality outcomes. However, coming from a school background where rote learning is stressed, many of the students joining the Intensive English Program (IEP) at the university lack the essential problem-solving, creativity, collaboration, and communication skills that are required to perform successfully on such tasks. They also need to improve their language skills before they can take content courses at the university. A project-based course was introduced to address these needs. Throughout this course, students practised essential teamwork skills that allowed them to function successfully in a group. They began by working on short projects, such as information gap, experiential, and teambuilding activities, and activities to redesign a product for a specific need. Then students engaged in longer projects that span several weeks which focused on solving a specific problem using the process of design thinking. To develop creativity, innovative solutions were encouraged, and groups were given the freedom to choose how to organize their work and present their solution. After each project, students reflected on their performance and learning to increase self-awareness. An end-of-semester self-evaluation survey was administered, and the results showed that the activities had a significant impact on the students' confidence in approaching problem-solving tasks, and their ability to collaborate, think critically, create, reflect, and communicate in English. Samples of the activities used and the skills targeted will be presented, and the survey results will be shared.

Keywords: 21<sup>st</sup> C Skills, Problem-Based Learning, Critical Thinking, University Students, Language Learning

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## **Introduction**

The American University in Cairo sets very high expectations for its students. It requires that students have high English proficiency as it is an English medium university. Students are also expected to possess the skills that will allow them to perform successfully in group work. First year courses often include a number of group projects that require students to work together to produce the required outcome, and professors take it for granted that students already have the skills necessary to complete these tasks.

Students in the Intensive English Program (IEP) of the University have weak language skills, and attend five hours of class per day and work on academic reading, writing, listening and speaking skills. The majority of the students come from schools that stress rote learning and have very little focus on critical thinking skills. These students often lack the 21<sup>st</sup> century skills of teamwork, communication, critical thinking, problem solving, and creativity.

To help these students gain the necessary 21<sup>st</sup> century skills and to perform well on their subsequent courses, the IEP launched a problem-based learning (PBL) course, one of five courses offered in the IEP. The PBL course builds on the language skills covered in the other IEP courses, and it focuses on integrated language skills (reading, writing, listening, and speaking), presentation skills, 21<sup>st</sup> century skills (teamwork, communication, critical thinking, problem solving, and creativity), and reflective skills. The learning outcomes for this course include working collaboratively with others, communicating effectively, taking responsibility for completing tasks, creating group goals and strategies to complete tasks, reaching consensus in decision making, solving problems, managing time, reflecting on and evaluating learning and performance, and setting goals for progress. These are in addition to integrating the language skills covered in the other four IEP courses.

The problem-solving course aims to achieve the learning outcomes through a series of short and long projects. This paper will describe the activities used and the skills targeted through the assigned projects, and will present the results of a student survey assessing the activities and skills gained.

## **Short Projects**

The first four weeks of this 14-week course are dedicated to practicing the skills required to complete the longer projects later in the semester. Below are some sample short projects:

### *Teambuilding:*

The first type of short project is teambuilding activities that develop the skills of collaboration, communication, and reflection which are essential to successful group work. To complete these activities, students must work as a team to communicate, share ideas, and reach consensus to complete the challenge in the time provided.

- One example of a teambuilding activity is the Tallest Tower, where students work in groups to create a tower using basic supplies, such as paper, tape, and straws. The goal is build the tallest freestanding tower. They have a time limit, and this pushes the participants to work together and collaborate quickly to complete the task.
- Another team building activity is Newspaper Fashion Show where students are given some basic supplies, including newspapers, tape and scissors and are tasked with

creating an item of clothing out of newspaper that will be modeled by a team member. They work together to decide on the design and to create the item. When presenting the design to the class, a team member serves as the commentator and explains the details of the design being modeled.

- During the first week of class, a group campus scavenger hunt can help students break the ice while discovering the landmarks on campus. Teams are given the task of answering a set of questions related to different places on campus. The group works together to respond to as many questions as they can in the allotted time.
- A collaboration challenge that can be adapted to online delivery or socially distanced face-to-face settings is solving a mystery. Each team member is given a set of clues to be shared with their team as the solution can only be reached after considering all the clues. Collectively the team members share the clues orally and work out the solution to the mystery. Teams then present their findings to the class in the form of a news bulletin.

After each teambuilding activity, the instructor leads a debriefing discussion about the activity to help students become aware of the strategies they used to complete the task. Students are then assigned a short reflection consisting of four short questions which introduces them to the concept of reflection.

#### *Divergent Thinking:*

Another type of short project focuses on divergent thinking activities that promote creativity, problem-solving, and reflection. These activities encourage students to brainstorm for new ideas and to build on the ideas of their peers to come up with creative solutions to a problem.

To introduce the skill of divergent thinking, students are asked to bring an unusual item from home. In groups of 3-4, they think of new uses for each of these items, other than the use the item is intended for. Items that generate multiple ideas include paperclips, a toothpick, and a paper cup.

To practice the skill of divergent thinking, students are assigned the task of designing a product for a specific user, taking into consideration their specific needs.

- To design a chair, students are introduced to the idea that chairs come in many different shapes and forms, and they must challenge the assumption that a chair must have four legs and a back. Once free from limitations, they are required to design a chair for different users: a toddler, an elderly man, a teenager, etc. Their task is to consider the size, height, safety requirements, stability, etc., and to design a chair that meets the needs of their user. They create a prototype in the form of a sketch or a digital drawing.
- To design a car, students are shown images of different types of cars, including less conventional models that have sliding doors, two or three wheels, two-seater, etc. They are then asked to design a car for a specific user: a parent with a toddler, a person who uses a wheelchair, an elderly couple, etc. They consider the safety issues, comfort level, ease of getting in and out of the car, space in the boot, etc., and sketch their design.

The teams present their designs to their class mates and explain their rationale for including the different features. This is followed by a class discussion on the strategies followed, what went well, and points to work on in future. Students are then assigned a written reflection on the process and are encouraged to set a goal to work on in future group activities.

## **Long Projects**

Once the students have gained some experience in working in groups, they are assigned longer projects that span several weeks. In the IEP PBL course, students are assigned two long projects, each lasting four weeks. These projects are based on the design thinking process and focus on solving a specific problem. They follow five stages:

1. Empathize: In this stage, students learn as much as they can about the problem they are trying to solve. They conduct background research on the problem and interview their users to learn more about their perspectives.
2. Define: Students analyze the results of their interviews and define the main needs and problem(s) to solve.
3. Ideate: Students brainstorm for innovative solutions to the problem.
4. Prototype: Groups create an initial prototype of their solution.
5. Test: Groups test their prototype with another group of users to get feedback. They incorporate this feedback and revise their prototype.

The last stage of the project is to deliver a group presentation on the process followed. Students also write an individual reflection on the experience, outlining points to work on in future projects.

### *Sample topics used for longer projects:*

Redesign a study space: This topic is accessible to students as they have experience with different study areas. Each group chooses a different space to redesign: classroom, study space at home, student lounge, etc. They follow the stages of design thinking to come up with a prototype that addresses the problem identified by their users.

- Design a tiny house:  
After reading about tiny houses and watching a variety of videos on the topic, students learn that tiny houses require great creativity as each item in the house must have multiple uses in order to use the small space efficiently. Each team focuses on a different type of tiny house: dorm room, mobile house, downtown apartment, etc. They get creative in addressing the specific needs of their user and come up with prototypes that are tailored to the individuals they interviewed.
- Solve a problem faced by university students:  
Teams interview other university students to learn about problems that these students face. Then, the team decides on the problem they will focus on. They do research on the topic, gather information, and follow the design thinking stages to come up with creative solutions. Examples of such topics include redesigning the campus to make it more user friendly for visually impaired students, creating origami style paper cups and straws to reduce single-use plastic, and designing an app to help students discover their talents.

Other topics used for projects include designing a toy for a specific age group, designing a startup, and redesigning a product or service.

### Results of student feedback

A student self-evaluation survey was administered at the end of the semester to get the students' feedback on the skills learned and the activities they participated in. Students responded to each question on a five-point Likert scale, ranging from strongly agree to strongly disagree. The students' feedback was very positive, with most responses in the Strongly Agree and Agree categories.

See table 1 for the questions related to the skills learned and distribution of responses across the categories. The survey was completed by 22 respondents.

This course helped me to ...	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
improve my ability to collaborate and work in teams.	68.2%	22.7%	4.5%	4.5%	
	Combined 90.9%				
look at problems from different perspectives.	68.2%	22.7%	4.5%	4.5%	
	Combined 90.9%				
break down problems into manageable steps in order to find a solution	68.2%	18.2%	9.1%	4.5%	
	Combined 86.4%				
develop my ability to come up with creative ideas using divergent thinking.	72.7%	18.2%	9.1%		
	Combined 90.9%				
develop my ability to reflect on my performance.	63.6%	31.8%	4.5%		
	Combined 95.4%				
develop my ability to communicate in English.	59.1%	22.7%	13.6%	4.5%	
	Combined 81.8%				
develop my critical thinking and problem-solving skills overall.	63.6%	18.2%	9.1%	9.1%	
	Combined 81.8%				

Table 1: Survey questions related to the skills learned and distribution of responses

The ratings were very positive for all skills surveyed and students felt the course was effective in helping them gain these skills. The skill most highly rated was reflection and this is probably because it is a new skill that very few IEP students had been exposed to previously. The skill of communicating in English was not rated as highly as expected, and this is probably due to the fact that 95% of the students were native speakers of Arabic, so students often reverted to speaking Arabic when working in groups. This is a point to work on in future semesters to find ways to motivate students to converse in English when working together.

See table 2 for the questions related to the activities and how effective they were in developing critical thinking and problem-solving skills.

These activities were effective in developing my critical thinking and problem-solving skills:	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<b>Short projects</b>					
Information gap activities, such as the bank robbery mystery.	54.5%	27.2%	13.6%		4.5%
	Combined 81.7%				
Teambuilding activities, such as the campus scavenger hunt.	50%	27.2%	18%		4.5%
	Combined 77.2%				
Design activities, such as redesigning a chair.	59%	27.2%	9%	4.5%	
	Combined 86.2%				
<b>Longer projects</b>					
Design thinking project 1 - Design a tiny house	63.6%	22.7%	4.5%	9%	
	Combined 86.3%				
Design thinking project 2 - Redesign a product or a service	59%	27.2%	4.5%	4.5%	4.5%
	Combined 86.2%				

Table 2: Survey questions related to the effectiveness of the activities in developing critical thinking and problem solving skills

The ratings were very positive for all activities surveyed. The students particularly appreciated the design thinking activities and projects and this is probably because they require creativity and critical thinking, which the students enjoyed.

Students were also given the opportunity to write comments. In response to a question about the specific aspects of these activities that helped them learn, they mentioned teamwork, communication, time management, divergent thinking, creative thinking, creating prototypes, giving presentations, and writing reflections. Regarding specific recommendations for modifying or improving these activities, only one comment was made suggesting that an option be added to remove a member from a group if they don't do their share of the work. As with all group work, it is difficult to ensure all members contribute equally to the task and this can cause frustration for the other team members. Although there are several opportunities in the course assessment for grading individual effort, there is currently no mechanism for team members to evaluate their peers. This is an option that can be considered in the future.

### Implications for the future

Based on the results of the student feedback survey, the main area to work on is finding ways to motivate students to communicate in English during their group discussions. One possible way is to introduce an element of gamification where groups that communicate in English will receive rewards, badges, and/or bonus points. Rewarding speaking in English, as opposed to punishing the use of the L1, will hopefully motivate the students to make the effort. Another way to motivate the students could be to provide more opportunities for them to speak in front of the class and to communicate with other students and teachers. This could motivate them to practice their speaking to gain fluency so that they are more comfortable during these activities.

Another point to consider is ways to motivate all team members to participate equally in the group project. Students get frustrated when they feel that a teammate is not making an effort,

and this can negatively affect the group work experience. Introducing self and peer evaluation as a method to encourage equal participation can be considered. It is possible that if students know that their contribution will be evaluated by their team members at the end of the project, this will help clarify expectations and might motivate them to apply themselves.

## **Conclusion**

The results of the survey indicate that the students felt they benefited from the course and gained valuable skills including integrated language skills, 21<sup>st</sup> century skills, and reflective skills. They also rated highly the variety of activities they participated in and felt that they helped them gain the skills of critical thinking and problem solving. The IEP is the first course that these students encounter when joining the university and therefore is the first step in their learning. The students will continue to develop these important skills throughout their university courses. Future research could be done to assess the continued development of these skills in subsequent courses.

**Contact email:** [sophiemf@aucegypt.edu](mailto:sophiemf@aucegypt.edu)