

# Facilitating Social Learning in Engineering Education in i-CATS University College: A Case Study

**Woan Wen Tan**

**Siti Syafinah Ahmad Hassan**

**Fabian Halley Pata Alban Dattu**

*i-CATS University College, Jalan Stampin Timur, Kuching, Sarawak, Malaysia*

## Abstract

*Teaching electrical engineering subjects in higher education can be challenging for most engineering faculty educators, as it contains a high level of abstraction by nature. Hence, the objective of this paper is to carry out short-term experimental studies of the students in their first year of the diploma electrical engineering (power) programme at i-CATS University College using social learning strategies. The results show the implementation of the methodology applied is very effective in helping the students learn better, as their both international and external engineering theory assessments have improved significantly.*

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## INTRODUCTION

Learning is an inevitable part of our development as we go through life, and it is required for survival in a constantly evolving world. Because learning is a multidimensional process, several psychological theories have been created to explain how it is that and why it is so.

This initially started with behaviorism, followed by cognitive psychology, which jointly inspired the social learning theory of psychologist Albert Bandura. This is one of the most well-known theories about learning and development, and it is still widely applied in many areas around the world. So as to perceive how this has affected the past, present, and future, we must first understand the theory, including its strengths and weaknesses, which should highlight the theory's limits. How does Bandura's theory impact engineering education, especially at higher learning institutions? Let's take electrical engineering as our study here.

Electrical engineering is often regarded as one of the most challenging majors since students must deal with a substantial amount of abstract theory. This major equips the student with advanced mathematics and physics courses, and to be successful in this profession, one needs analytical thinking, critical thinking, creative thinking, and problem-solving abilities. But what makes electrical engineering truly hard is the high level of abstraction. This implies that humans cannot see and readily comprehend electricity, such as electricity flowing through wires and magnetic fields in machine windings. Hence, one needs to learn these things on a theoretical level before applying them to their work.

## **BANDURA'S PROCESSES INVOLVED IN OBSERVATIONAL LEARNING AND MODELLING PROCESS**

According to Albert Bandura, modelling or learning is made up of four mediational processes or conditions that must be satisfied.

### **A. Attention**

To imitate behaviour, the learner needs to focus their attention to the model and observe it closely enough in order to develop cognitive processes. Anything that diverts our attention will have a negative impact on our learning and work quality. The more intriguing or distinctive the model or setting, for example, the more thoroughly the learner will concentrate on the lesson, which explains why we are far more inclined to give learning our undivided attention.

### **B. Retention**

Following observation of the behaviour, storing and recalling the information is a critical aspect in learning. However, we must know that the information retention can be influenced by a variety of factors. Therefore, it is necessary to watch a behaviour regularly and perhaps implement it ourselves.

### **C. Reproduction**

To be able to imitate a behaviour, we have to first be able to execute and perform it. Even if we wished to, we must acknowledge that we cannot physically or mentally mimic every behaviour. Our awareness of our own limitations determines whether or not we attempt to copy anything. Once we've paid attention to the model and recalled the information, it is time to put what we have learned into practice. Practice of the learnt behaviour leads to growth and development.

### **D. Motivation**

Behavioral perspectives on learning encourage self-management, which enables students to take charge of their own learning. Students educated using based on behavioral approaches rarely generalized their learning to other contexts. If students participated in the behaviour modification methods, this would enhance generalization.

### **E. Cognitive Behaviour Modification**

For observational learning to be effective, the learner themselves must be motivated or have the desire to imitate the behaviour that has been modelled. Reinforcement and punishment are essential motivators as it acts like a catalyst for drive and enthusiasm. Observing other people's experiences of reinforcement or punishment may be just as beneficial as experiencing these motivators. If the perceived benefits surpass the perceived drawbacks (if any), the observer is more inclined to mimic the behaviour. However, if the observer does not consider the vicarious reinforcement to be significant enough, they will not mimic the behaviour.

## **Strengths of Bandura's Social Learning Theory**

- Bandura's theory is versatile when it comes to discussing a person's behaviour and learning. A behavioural shift can be triggered by an environmental change.
- Learning may occur in a variety of forms, which include through observation and immediate, as well as hands-on experiences.
- Bandura's theory has been used in a variety of situations and has consistently demonstrated substantial links between social learning principles and behaviour.

## **Limitations of Bandura's Social Learning Theory**

- Bandura's theory does not take responsibility into consideration; it states that how a person acts is determined mostly by context rather than how they absorb information.
- Bandura's theory disregards developmental stages. These phases of growth are common regardless of the environment.
- Furthermore, when there is no role model, Bandura's theory does not take into consideration the behaviour.

## **Types of Social Learning in Engineering Classroom**

As lecturers, we will encounter a wide range of students with a range of learning styles in the classroom. Learning to balance our teaching approaches will be critical to our students' success. Social learning, in particular, has limitless applications in the classroom. It all depends on how we, as the lecturers, deliver the content to the end users in order for them to absorb knowledge effectively. Here are some typical examples everyone can adopt:

### **A. Role-Playing**

Role-playing is an approach that works well with others, whether one-on-one or in groups. For example, assign one of the students to be a group leader by taking turns in each of them, and have them act it out in front of the class. Another option is to play a role-playing game in which one person is the instructor and the other is the student.

### **B. Exercises**

Make a list of exercises for a specific topic that they are currently studying. It can be completed as homework or in class. The students are expected to work together to work out the solutions and then explain them to the rest of the class during the next lesson. Not only that, the exercises can be used as study materials to improve their comprehension on the subject matter.

### **C. Brainstorming**

Brainstorming, mind mapping, and systems diagrams are all methods for generating and organising students' thinking on a topic by generating a large number of ideas. It is great to work on it in a classroom as a group by appointing one student as the drawer, while

the rest of the class works through the material and suggests ideas. Not only is this a positive part of learning in groups, but it can also take shape as a simple list, an outline, or a mind map. The more ideas are generated among the group, the higher the quality of the desired outcome, and this enhances their level of understanding of their learning. As we know, engineering subjects are all interlinked and interconnected with one another, which does not act as a silo. That explains why there is a prerequisite for high-level subjects to get through it.

#### **D. Presentation**

Presentation skills are one of the most critical skill sets for students in higher education institutions. Students are highly encouraged to use systematic methods to make their presentations smoothly in the classroom. This will help them improve their presentation skills. The primary reason that presentation skills are emphasized in higher education is to help students establish professionalism in the classroom. In this age of fast-changing technology, students can improve their presentation skills by using high-tech tools. This will help them present information in a more professional way.

### **SOCIAL LEARNING CASE STUDIES AT i-CATS UNIVERSITY COLLEGE**

As per i-CATS University College norms for the Diploma of Electrical Power Engineering programme, the students have quizzes, mid-term examinations, and assignments before undergoing a final exam. The number of students enrolled in DEP3013 Electrical Circuit Theory 2 and DEP3024 Electrical Machines and Drives are taken into account, each having five and four students, respectively. These subjects integrate multiple subject areas, as the former requires knowledge of fundamental power electronics, control theory, and electromechanical, whereas the latter requires a basic understanding of electricity and electronics, but they all require a mathematical background without struggle throughout the course of study. During the first two weeks of class, which commenced on August 29th, 2022, we observed that not all students are capable of coping well with the subjects because of various factors, especially due to their academic background and their learning attitude. To improve their performance, we conducted a short-term experiment as part of social learning.

Before we start conducting a short-term experiment which was held on the Week 3 and Week 4 as part of social learning in the classroom, we put them into heterogeneous grouping. This is because we believe that the students of different grasping power levels combined can be much more efficient compared to homogenous grouping, especially when the class is small. As a result, the student(s) who performed better academically can also assist the student who requires extra assistance and work on something different.

#### **Case Study 1**

Students are all in one heterogeneous group. After the completion of each subject, we gave another different set of exercises to them and had them work in collaboration and come up with the working solutions themselves. We repeated this procedure for both subjects. Then, the students in the group have to perform either role-playing or presentation activities in the classroom.

## **Case Study 2**

In order to improve their performance in assessments or enhance their understanding level of a particular subject topic, we discussed and came up with an idea to have the students do a brainstorming activity to give them a bigger picture of how that particular subject is interlinked to the prerequisite subject they are studying currently. From here, we learned that learning should not be merely based on bottom-up but could also be top-down, just like the pyramid shape.

### **RESULTS**

The results of these case studies involve a total of 9 students, and we are sure that the methods we used helped our students learn because we can see that their performance has improved substantially through the social learning aspects of both internal and external technical assessment.

### **CONCLUSION**

In conclusion, we can conclude from the above points that Bandura's social learning theory is one of the most influential theories of learning and development in our education system because it helps us learn more about how our students learn. This theory states that people can learn new information and behaviours by watching other people. This type of learning can be used to explain a wide variety of behaviours. One of the main points to take away is that it is crucial for educators to be flexible enough to know that certain strategies do not work if they are not used appropriately. It should also be emphasized that what works well for certain students may not work for others, no matter how much positive reinforcement or punishment is applied. Bandura's theory teaches us that observation is crucial in molding our students' knowledge, behaviour and attitudes. Hence, as an educator ourselves should be a good role model for them at all time.

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