

# **Enhancing Students' Learning in Construction Management Courses at PSU**

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## **Abstract**

Every teaching situation is unique in terms of learning and teaching styles. To maximize student learning, instructors must find out what works best in a particular situation. Academic instructors need to seek and choose the best teaching methods to communicate and deliver the course content to their students. Moreover, instructors should always be engaged in a continuous search for ways in which to further enhance the learning skills of students by increasing their retention rate in attainment of better learning outcomes. In this study, experimental action research was implemented using Edger Dale's Cone of Experience and was employed in a partially flipped class for two engineering management courses for four academic semesters at Prince Sultan University College of Engineering. Edger Dale's Cone of Experience was employed to positively motivate student learning in an engineering course at PSU. The results show that the students positively accepted the partially flipped class, confirming that the partially flipped class enhanced their knowledge retention.

## **Keywords**

Action Research, Partial Flipped Class, Reflection, Learning, Learning Pyramid.

## **1. Introduction**

Many instructors exercise their personal reflections on teaching; that is, they look at what has worked and not worked in the classroom and think about how best to alter their teaching strategies to enhance learning (Hole and McEntee, 1999). Action Research is a method of finding out what works best in one's own classroom so that an instructor can improve students' learning (Fraenkel & Wallen, 2006). Active learning requires students to do more than just listen. Bonwell and Eison suggested that learners can work collaboratively, discuss materials, take part in cooperative learning, or produce short written exercises (Bonwell and Eison, 1991). They must read, write, discuss, or be engaged in solving problems. Within this context, it is proposed that approaches promoting active learning be defined as instructional activities that involve students in doing things and thinking about what they are doing (Bonwell and Eison, 1991). Active Learning is anything the students learn apart from passively listening to the instructor's lecture (Bonwell and Eison, 1991). Active learning is a process in which students engage in their learning activities, such as reading, writing, discussing, or problem-solving. Different learning activities lead to different learning effects.

In line with the KSA 2030 vision, academics at Prince Sultan University are engaged in an almost continuous search for ways in which to develop and further enhance the learning and teaching skills for both students and instructors to attain quality education and learning outcomes. As a reflection, it was noticed that the students do not have enough well-defined learning skills. The students are passive—they rely on understanding the general content in the class, but they do nothing further. Therefore, the intention is to help the students improve their learning skills to enable them to positively learn how to learn.

Academic instructors have a commitment to helping the students learn, develop, and grow. Yet sometimes the teaching process does not always work as well as the instructor would hope. The students may regularly attend the lectures, and they may show interest on the course, yet they tend to neither read nor discuss the topics enough, and thus their retention and progression rates may not increase.

Also, in noticing the limited retention and the lack of scheduled post-lecture reading outside of class, it was discovered that the students maintain their academic achievement mainly by relying on studying before tests and examinations, learning only under the pressure of the examination. Therefore, it is intended that the students should understand that they need to take some of the responsibility for acquiring and learning new knowledge, which is expected in their university work; the students, then, are required to enhance their knowledge retention in the learning process.

The students are encouraged to increase their retention rates by reading and conducting group discussions, rather than just relying on traditional class lectures. Such interactions are considered as a learning skill. During the teaching and learning process, the students were at all times being informed of the knowledge retention rates shown in the Cone of Experience, or the Learning Pyramid, which is adapted from Edgar Dale (see Figure 1).

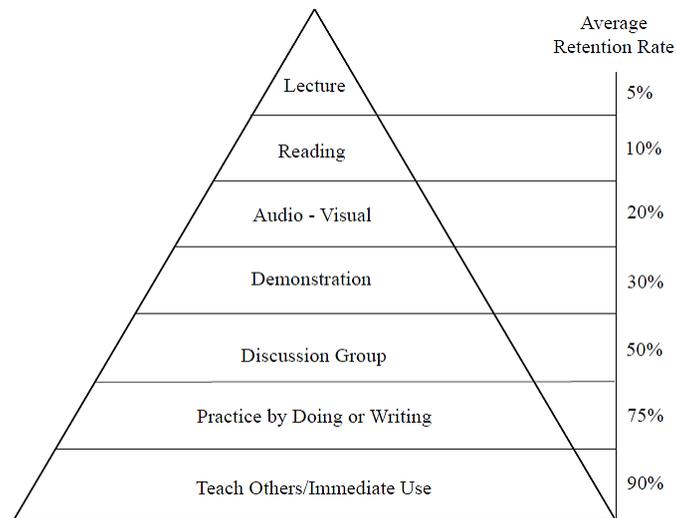


Figure 1. The Cone of Experience or the Learning Pyramid

The cone charts the average information retention rate for various methods of teaching. The further you progress down the cone, the greater the learning and the more information that is likely to be retained. It also suggests that when choosing an instructional method, it is important to remember that involving students in the process strengthens knowledge retention (Davis & Summers, 2014). The cone reveals that “action-learning” techniques result in up to 90% retention. People learn best when they use perceptual learning styles (Diamond, 1989). According to Dale (1969), instructors should design instructional activities that build upon more real-life

experiences. Dale's Cone of Experience is a tool to help instructors make decisions about learning and teaching activities. The percentages learners approximately retain are summarized as follows:

- 5% of what they learn when they've learned from lecture.
- 10% of what they learn when they've learned from reading.
- 20% of what they learn from audiovisual.
- 30% of what they learn when they see a demonstration.
- 50% of what they learn when engaged in a group discussion.
- 75% of what they learn when they practice what they learned.
- 90% of what they learn when they teach someone.

### **1.1 Dale's Cone of Experience**

Dale's Cone of Experience is a model that incorporates several theories related to instructional design and learning processes. Edgar Dale theorized that learners retain more information by what they "do" as opposed to what is "heard", "read" or "observed". This research led to the development of the Cone of Experience. This "learning by doing" has become known as "experiential learning" or "action learning".

According to Dale's research, the least effective method at the top involves learning from information presented through verbal symbols, i.e. listening to spoken words. The most effective methods at the bottom involve direct, purposeful learning experiences, such as field experience. The cone charts the average retention rates for various methods of teaching. The further you progress down the cone, the greater the learning and the more information that is likely to be retained. Dale's Cone of Experience is a tool to help instructors make decisions about resources and activities. The instructor should ask himself the following (Davis & Summers, 2014):

- What kind of learning experience do you want to enhance in the classroom?
- How does this instructional resource enhance the information supplied by the textbook?
- Where will the student's experience with this instructional resource fit on the cone?
- What senses and how many can students use to learn this instructional material?

In this research, a partially flipped class learning approach is selected and exercised for enhancing the retention rate, where, students work alone with the available resources which provide introductions to the topic. This provokes initial questions, the instructor facilitates discussion, partially breaking from the traditional classroom lectures and homework of the course facilitates active learning and understanding. Moreover, the flipped classroom approach provides the implementation of a student-centred and active learning environment. This approach was implemented in two Construction Management courses.

## **2. Methodology**

Dillon (1988) has stated that no other event better signifies learning than a question arising to the mind. Therefore, to design the experiential activity, the instructor should address the following concerns:

- Where will the students' experience with this instructional resource fit on the cone? How far is it removed from real life?
- What kind of learning experience will this provide in the classroom?
- How does this instructional resource enhance the information supplied by the textbook?

This research is conducted to enhance the student's retention via reading and engagement in a class discussion without reliance on traditional lectures. This experimental action research is done to enhance the teaching and learning process of the students by trying to answer the following questions:

- How can the students acquire more knowledge inside and outside the lecture?
- What is the best method to enhance the students' knowledge retention rates?

The study was conducted using the following steps:

- Exercising a partially flipped class
- A survey

This research does not concentrate on the wrongdoing of the students, nor does it concentrate on the culture, resources, or universities' academic programs; rather, it focuses on a way of teaching and learning that provides better retention outcomes in non-experiential-based engineering management courses at PSU.

## **2.1 Exercising a Partial Flipped Class**

The arrangement is done by implementing a partially flipped class, which involves delivering the course using traditional lecturing combined with assignments that involve pre-class reading and class discussion. It is normal to prepare classes no more than two hours prior to the traditional lecture class, whereas the flipped class does require careful preparation several days in advance. To make this approach work, consistency and organization are very important.

Reading assignments are to be given before the next lecture, for which the students will present, discuss, and answer class questions. The quality of their discussion is qualitatively assessed, and if the students need more explanation, further clarification will be given to them. Also, during this teaching and learning process, the students were at all times aware that course specifications were to be always referred to. Thus, they were made aware of the knowledge retention rates and their ability to enhance their retention rates, as well as how such rates fit into the Learning Pyramid in Figure 1.

The students are always made aware of course outcomes and the students were well informed on the available teaching and learning methods. A reading assignment on the topic of construction contracts was assigned for the next class. It was planned to have the students read a few pages prior to the coming lesson to introduce them to the new topic.

The session involves an introductory lecture on the concepts of a specific topic as scheduled in the course specification. The students are then assigned to read and further study the concepts of these topics beforehand so that they are ready to discuss it in class. Therefore, instead of spending the whole lecture time on lecturing, the class time focuses on discussion of the concepts. A textbook presentation is also exercised. Moreover, students explore conceptual questions usually assigned during or at the end of the previous lecture and prior to the next class.

The students were incentivized in three ways:

1. By intentionally making each class very modular, with specific instructions on which book sections to read or skip, which sections to browse, and which sections to focus on for a thorough understanding.
2. By asking questions that are conceptual in nature.
3. By encouraging the student to ask questions

The process is performed with the use of the available technology, including electronic Learning Management System (LMS) technology, which is considered a useful tool in this process.

## **2.2 The survey**

At mid-term, a questionnaire was exercised in which the students were asked to give their opinion on partially flipped class learning methods, pre-class reading, and class discussions. The questionnaire was exercised in one course, with eight students in each group. For the first question, all the students indicated their preference to split the class and utilize the interactive methods rather than employ the traditional lecture-focused class. The questionnaire was introduced to two engineering management courses over four different academic semesters, where the number of students per semester varied from 8 to 30 students. Four questions were asked, as follows:

Question I - I believe that reading the lecture prior to the class and the class discussion helped me understand the material better.

Question II - I believe that by using a partially flipped class, I achieved learning outcomes more effectively than with traditional teaching.

Question III - Having the split between in-class lecture, visual media presentations, and discussion helped me understand the material better.

Question IV - I would like to have more courses taught using partially flipped class in non-experiential-based courses.

The survey employed a 5-point Likert scale:

- Scale 1 – Strongly Disagree
- Scale 2 – Disagree
- Scale 3 – Neither Agree or Disagree
- Scale 4 – Agree
- Scale 5 – Strongly Agree

The questions were designed to measure the attitude toward class activities. The study included 78 respondents from four different academic semesters; all respondents had been taught by the same instructor.

### **3. Results**

The first survey question asked “I believe that reading the lecture prior the class helped me understand and discuss the material better”; the results strongly indicated that 88% believed it to be a true statement, of which 35% of the respondents selected agree and 53% selected strongly agree. Figure 2 below gives an illustration of the options chosen by the respondents. This response strongly indicates students’ support for experiential learning in the classroom.

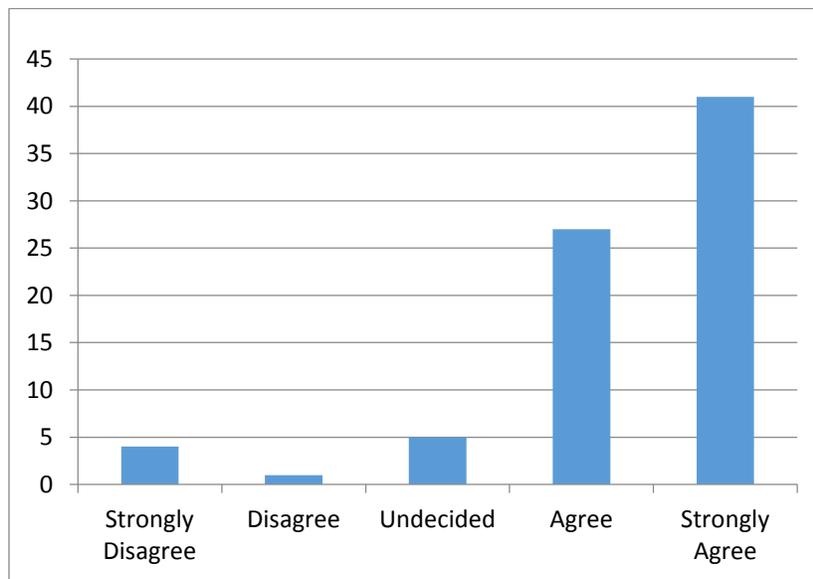


Figure 2. Responses to Question 1

For the second question, 88% believed that that reading the lecture prior to the class helped facilitate understanding and discussion of the material. Figure 3 below gives an illustration of the option chosen by the respondents. Of those that agreed, 47% of the respondents selected agree and 41% selected strongly agree. The remaining commented that they would “rather read after the class lecture, rather than before, to understand what they are reading based on what was comprehended in class”.

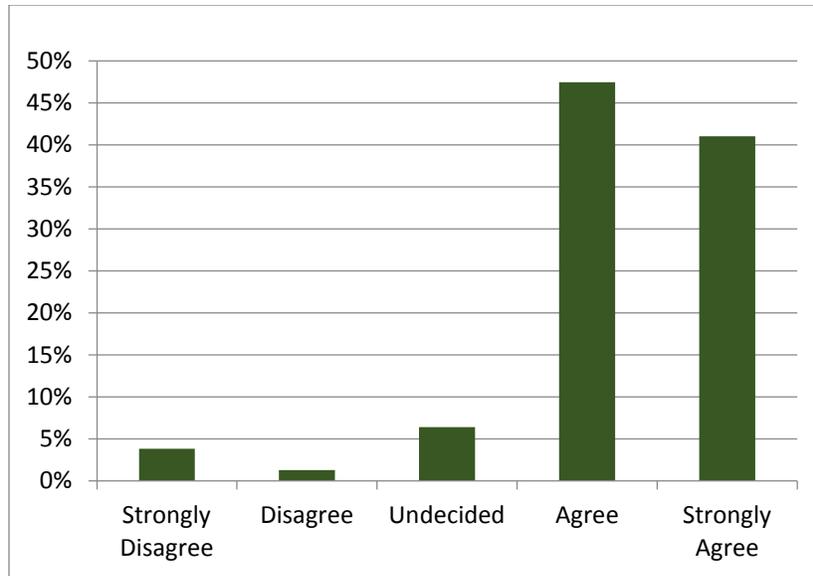


Figure 3. Responses to Question 2

The third survey question: “Having the split between in-class lecture and visual media presentations and discussion helped me understand the material better”.

In general, the respondents believed that this learning activity positively impacted learning in the course. However, there was a slight shift in the response, with 33% selecting agreed and 51% selecting strongly agreed (Figure 4).

Some of the students pointed out that “The pre-class reading and discussions are most valuable because I understand and interact more quickly in class”.

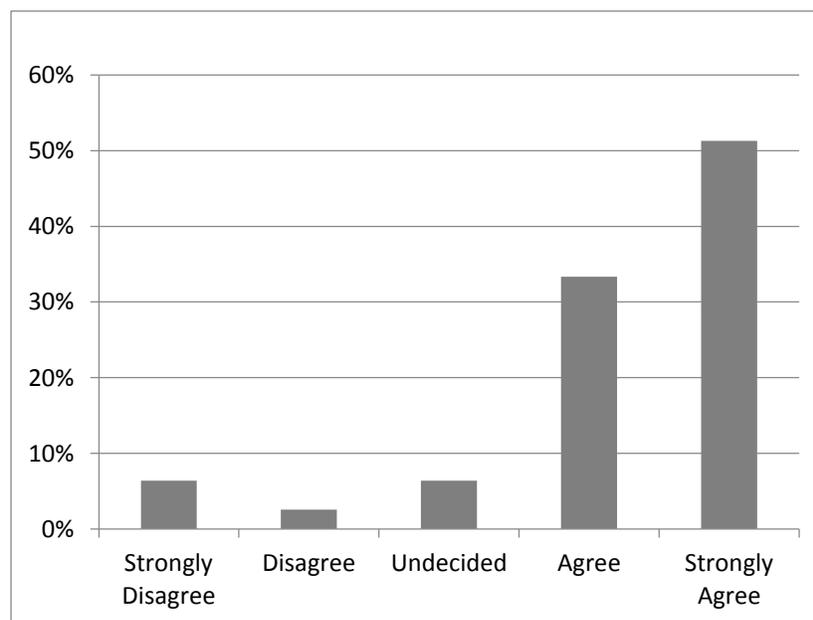


Figure 4. Responses to Question 3

Question IV – “I would like to have more courses taught using partially flipped classes”.

The purpose of the question was to measure the student response and attitude toward incorporating experiential learning into other courses. Figure 5 graphically represents student support of the inclusion of experiential activities, with 41% selecting agree and 45% selecting strongly agreed. These results were consistent with the response to Question 1.

A majority of the respondents indicated agreement or strong agreement that partially flipped classes should be used in other courses.

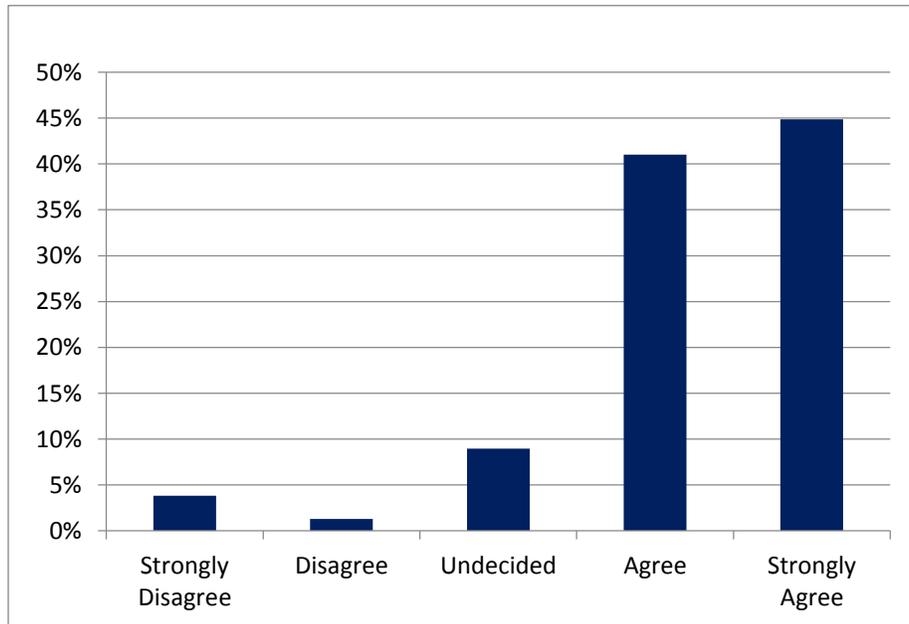


Figure 5. Responses to Question 4

In general, the students looked interested and enthusiastic to attend class and learn. Moreover, with respect to class size, the partially flipped class works more efficiently for smaller groups; therefore, partially flipped classes may require making some additional alterations to suit the relatively larger groups.

#### **4. Conclusion**

Every teaching situation is unique in terms of student skill and learning and teaching styles, as well as many other factors. To maximize student learning, the instructor must find out what teaching methods works best in a particular situation for his students. In this action research, a partially flipped class is used to enhance the students’ retention via out-of-class reading, class discussion, and in-class traditional lecture; this has worked well with the construction management student courses at PSU.

The survey indicated that the partially flipped class method has been extremely well received by the students; the survey results have confirmed this outcome. The questionnaire was exercised in two construction management courses, for four different academic semesters, in which the number of students per semester varies from 8 to 30 students per class. The students accepted and confirmed the benefits of the partially flipped class as they became more active learners in and after class, and this approach helped them to more quickly understand the course topics

and participate more in class. Most importantly, this approach worked well because the students worked together to achieve the course outcomes. Moreover, the majority of the respondents indicated agreement that partially flipped classes should be used in other courses.

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## **Biographies**

**Basel Sultan** Gained the Bachelor and Master Degrees in Civil and Structural Engineering from the United Kingdom and got his Doctorate in Construction Management from Queensland University of Technology QUT Australia. He is a fellow of the Higher Education Academy. He has over 27 years of experience in academic teaching, as well spending these years in the construction industry. Worked at Sana’a University and currently works in the Engineering Management Department at Prince Sultan University. He an author of two books and his research field is engineering management and the construction industry in the developing countries.

**Ihab Katar** He is an assistant professor in the Department of Engineering Management at Prince Sultan University, KSA, since 2014. He leads the QA of Construction Management Program (CMP) team in the last years for the national accreditation process through the “National Center for Academic Accreditation and Assessment” (NCAAA). He is certified as a fellow of the Higher Education Academy-UK (HEA) in 2015. He has several journal publications in the area of construction materials and management, as well as engineering education.