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Integrating Experiential Learning into the Curriculum

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ABSTRACT

CONTEXT

An activity was developed to integrate experiential learning into the curriculum of a transport course through a site visit. Students were required to apply design principles taught in the classroom to a real-world example. The activity was developed to inject some enthusiasm for the subject, and to provide an exercise to apply the concepts learnt. The selected site involved walking routes to two bus stops located at the university campus. This site was selected to make it easier for the students to practice in a familiar setting. The activity allowed students to apply the newly taught concepts learned in class by observing and interacting with their surroundings.

PURPOSE

The primary goal was to create an experiential learning experience for students by developing an activity that used real-world settings for Civil Engineering students studying transportation planning. The secondary goal was to teach students how to conduct site visits. As graduate transportation engineers, they will be required to undertake site visits to identify issues and suggest feasible solutions. The activity gave students a chance to learn these skills in preparation for their future career.

APPROACH

The site visit was in total for one hour and taken during one of the scheduled lecture hours. As a group, the students followed the typical walking routes to two bus stops located on campus. As they walked the different paths, students were required to make observations. They were tasked with making 2-3 recommendations for improving public transport users' walking route using the CPTED principles. The instructor provided feedback on-site.

OUTCOMES

Students were given an assignment, in which part of it was to carry out the same exercise as the activity for their selected project site. Marks for the assignment shows that the overall distribution is higher for the Environmental Design/CPTED component in comparison to the other section with equal marks. In a survey, students also stated that the activity was helpful in their learning.

CONCLUSIONS

The activity was developed to show the students an example of the type of work they may receive as graduate engineers. Most graduates are required to do site visits to gather evidence and make recommendations. For the activity, they were required to engage with their surroundings to derive feasible design recommendations.

KEYWORDS

Experiential learning, student focused learning, UN SDG 11, transportation engineering, undergraduate outcomes

Introduction

Course material and supporting teaching activities aim to ensure students are prepared for the profession. Instructors often need to weigh between course materials and class exercises/tutorials to determine which will be more beneficial for students to achieve the learning outcomes of a module. The restructure of a curriculum provides an opportune time for an in-depth reflective teaching exercise. In 2023, a new final year elective was developed for Civil Engineering students interested to specialize in transportation planning and road safety. A higher proportion of teaching hours were allocated to transportation planning in comparison previous years. This provided an opportunity for the instructor to create new course materials and teaching activities suited to prepare the final year Civil Engineering students for the year ahead and into their new roles as graduate engineers.

The complex situations in which an engineer is required to make decisions cannot be properly replicated in classroom activities. At the same time, graduate engineers are expected by employers to quickly learn new skills to ensure financial benefit for the company. One of the basic tasks undertaken by transportation engineers, in particular those in their early career, is to conduct site visits. The purpose of site visits is to collect data and critically examine the environmental to identify: (a) the problem, (b) constraints and (c) possible solutions. A poorly undertaken site visit can cause a number of issues, such as problems unidentified, incorrect data collected and equally worse, a poor recommendation by the engineer. Needless to say, career progressions can be greatly hindered if a transportation engineer cannot expertly identify the problems and constraints on site.

Experiential learning is critical for engineering students, as it is dictated by the demands of the profession (Baldwin & Rosier, 2017). The purpose of the activity is two-folds. Firstly, it was developed to meet graduate attribute requirements of preparing students for the profession. Secondly, it was developed to create enthusiasm for the specialisation.

The activity has been shared with university colleagues through means of an award (Change One Challenge by University of Auckland). The instructor has continued the activity in 2024 for the same course and student feedback has confirmed that it was one they enjoyed and learned from.

Literature Review

Transportation engineering sits in a unique position in Civil Engineering discipline, given that for an infrastructure to be efficient and attractive, it needs to meet people's needs. There are numerous examples of research on different aspects of transportation, all focused on ensuring user needs are met by design of the transport infrastructure. This is particularly true for public transportation. Personal security is a major issue for safe passage to public transport stations and can effect rider's decision on time of travel, destination, which mode they will select to reach the station (known as first mile trip) etc. Crime Prevention Through Environmental Design (CPTED) provides four design principles to reduce the likelihood of crime in urban areas. CPTED principles have been adopted widely to improve the urban areas surrounding public transport terminals (Kerr et al., 2015). The activity developed for experiential learning is based on the CPTED principles.

The number of studies which have adopted experiential learning for urban planning is limited. There is support for developing experiential learning activities for complex concepts in urban planning courses. Caruso et al. (2022) developed an experiential learning activity to help students understand spatial justice in urban planning. Kotval (2003) adopted the framework of experiential learning for a practical course in urban planning. The activity was designed as part of a final year capstone project, in which students were required to engage with the community for feedback of their recommendations. Experiential Learning was adapted slightly differently by Rosier (2016), in which it was embedded into an entire undergraduate planning program. The range of activities included field trips, guest lectures, design studios and role-plays.

Experiential Learning was first introduced by David Kolb and Roger Fry (Smith, 2001) in 1975. It can be defined as "*a purposeful process of engaged, active learning in which the student constructs knowledge, skills or values by means of direct experience in authentic, real world contexts*".

The activity developed is based on a four-stage cycle which acts more like a continuous spiral. Figure 1 provides an illustration of the steps.

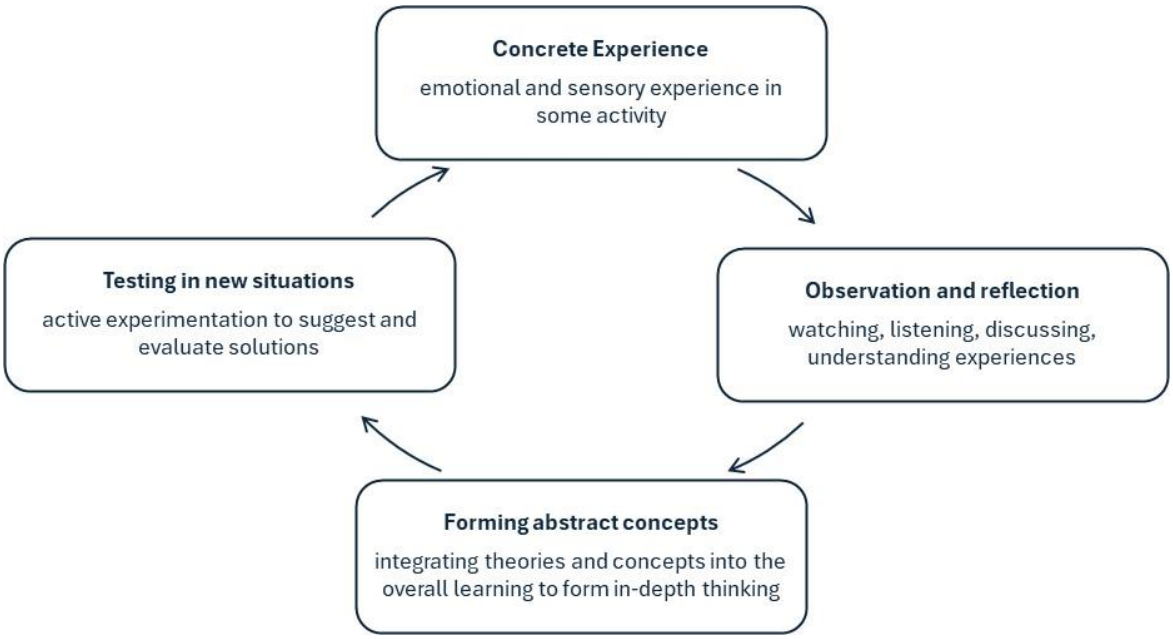

Figure 1: Four stages of experiential learning, adapted from Balwin and Rosier (2017)

The model emphasizes that learning is a process and not an outcome. The process creates a transaction between the learner and the environment by allowing the experience to be both objective and subjective (Baldwin & Rosier, 2017). Students are allow to link between theory and 'real-world' applications, thus developing a motivation to learn and be enthusiastic about the subject. This in turn assist with retention of learning, often lost through more traditional classroom exercises. In a study by Terashima et al. (2023) undergraduate urban planning students were given the task of using wheelchairs to explore and understand the barriers and problems related to design standards. By experiencing the issues first-hand, the students were able to relate to the design problems, and thereby gain greater appreciation for the issues encountered by those with physical impairment.

A common difficulty with the development of experiential learning activities is that it requires a considerable time and effort by the instructor (Parker et al., 2022). Depending on the exercise, instructors need to obtain equipment, set up partnership, ensure all health and safety checks have been fulfilled etc. For students, this effort by the instructor is often very beneficial for their learning. They not only acquire technical skills, but also professional skills which assist in their development to be ready for the profession.

Background and Motivation

Each year, Summative Evaluation Tool (SET) surveys are conducted to receive feedback on the course. In survey responses for a previous transport course, which the new transport elective replaced, the instructor often received a low percentage (~70) of GA for the statement "*The teacher inspired me to learn*". So, for the new elective, a key reason for developing the experiential learning activity was to induce some enthusiasm in students' learning. The primary objective was to make students' learning more interactive and exciting. The secondary objective was to create an open dialogue with students. During the activity while on-site, students were able to ask questions openly and be inquisitive.

The outside-the-classroom activity was developed to engage students with the teaching material and also to provide students with an opportunity to feel empowered with their new skills as transportation engineering students. This is one of the reasons for selecting an on-campus site. A familiar environment gave students an opportunity to assess it with new skills; thereby deepening

their understanding of the concepts and showing the students its applicability in a ‘real world’ setting.

Around six to seven years ago, it became compulsory for all lectures to be recorded at the University of Auckland. This had a significant impact on the number of students who attend in-person lectures. Upon checking the viewing data for lecture recordings, more than half of the class do not watch the lecture recordings within a week’s time. Each week the modules built on the topic taught the week before, so this is a critical issue in their learning progress *during* the semester. As such, the activity was placed strategically after the mid-semester break – a time period when most undergraduate courses see a decline in student attendance - to increase participation and break-up the routine of classroom teaching.

Experiential Learning Activity

The chapter on “Teaching, not telling” by Tormey et. al (2021) was also very useful in understanding how to focus students’ attention on complex subjects through interactive activities and was used as a source in the development of this activity. The module for the outside-classroom activity was on security of public transport riders enroute to stops/stations through the principles of CPTED. Figure 2 provides the map of the two bus stops and the walking paths at campus.

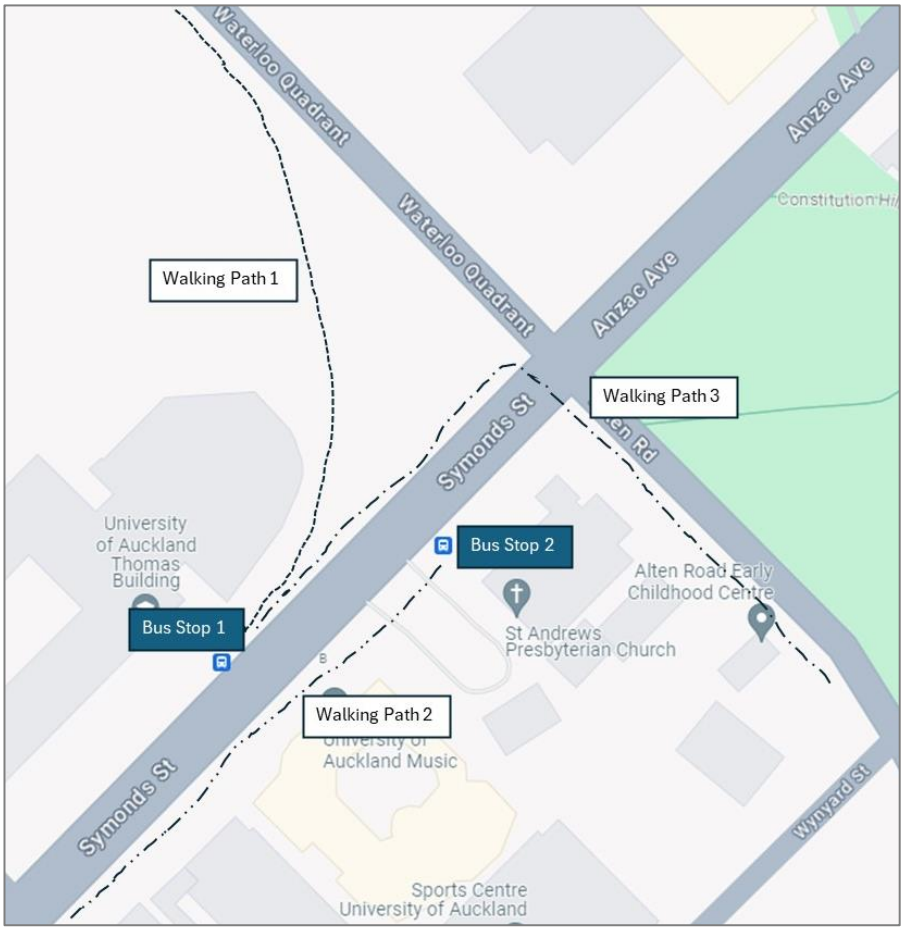

Figure 2: Map of site for experiential learning activity

Students were asked to form groups of 2/3 students and tasked with taking typical walking paths to two bus stops. As the students were observing the paths using CPTED principles, they were asked to discuss 2-3 recommendations for improving the safety of riders’ walking routes. Students had to apply critical-thinking skills to identify and analyse issues within the environment to determine the recommendations. The second part of the activity was feedback from the instructor. With each group, the feasibility of their recommendations while on-site was discussed. This type of

open communication is not always possible inside the classroom, and nonexistent for lecture recordings.

The four stage of experiential learning for the activity was applied as follows:

- **Concrete experience**: achieved by the site visit
- **Observation and reflection**: tasking students with making recommendations.
- **Forming abstract concepts**: feedback from instructor on feasibility of recommendations and discussions with the instructor.
- **Testing in new situation**: carrying out the same exercise for the Environmental Design component of the assignment.

Outcome

Students were given a public transport design assignment, in which part of it was to carry out the same exercise as the outside-the-classroom activity for their selected project site. In 2023, the assignment was out of 80 marks and had four parts. Overall, students performed very well for the Environmental Design (CPTED) part (30 marks) of the assignment in comparison to the other section (Transfers) which carries equal marks. Figure 3 shows that the overall distribution of marks is higher for the Environmental Design component in comparison to the other section with equal marks, emphasizing that students performed better. This shows some evidence of student having learnt the CPTED concepts and are able to competently apply them.

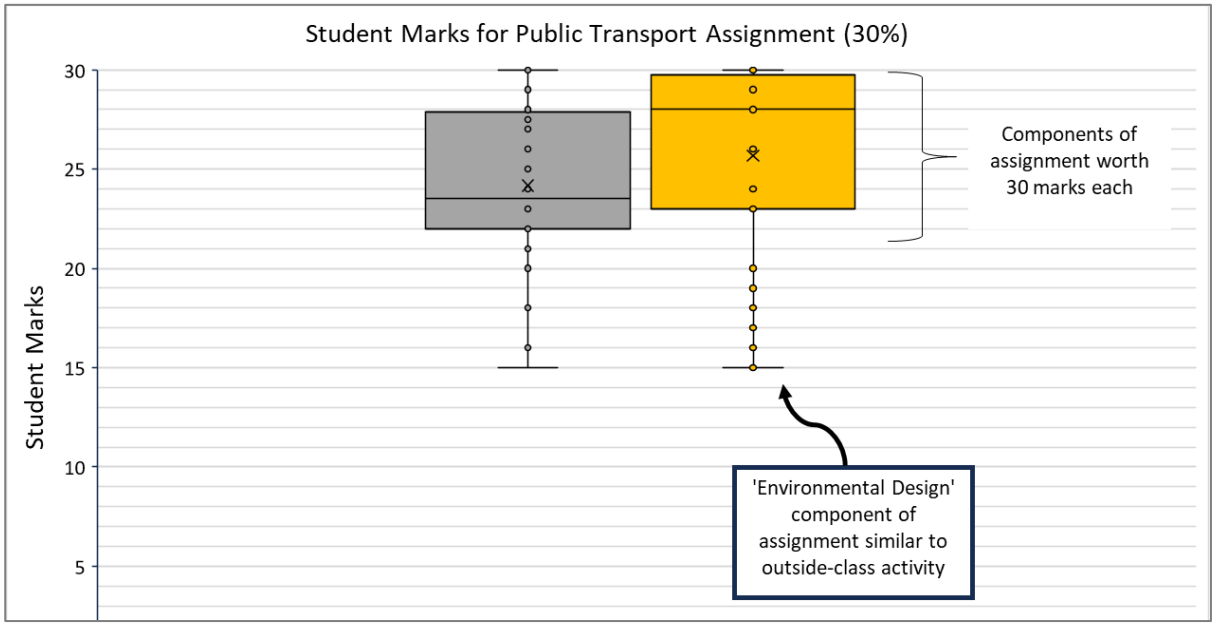

Figure 3: Comparison of assignment component marks in 2023

The same assignment was repeated in 2024. The average mark for the Environmental Design component was 86% in 2023 and 95% in 2024, both times higher than the average mark obtained for the Transfers component of the assignment, which was 80% and 93%, respectively.

Table 1: Average marks for the design assignment

Year	Transfers	Environmental Design
2023	80%	86%
2024	93%	95%

Student Feedback and Reflection

A student feedback survey on the overall course content was collected using Qualtrics, to keep the anonymity of the student's identity in 2023 and 2024. Only one student responded directly about the activity in the 2023 survey and it was a positive remark. Out of the 30 students enrolled in the 2024 class, 16 students participated in the survey. Figure 4 provides some of the comments from the survey related specifically to the activity. Overall, students provided positive feedback on the activity.

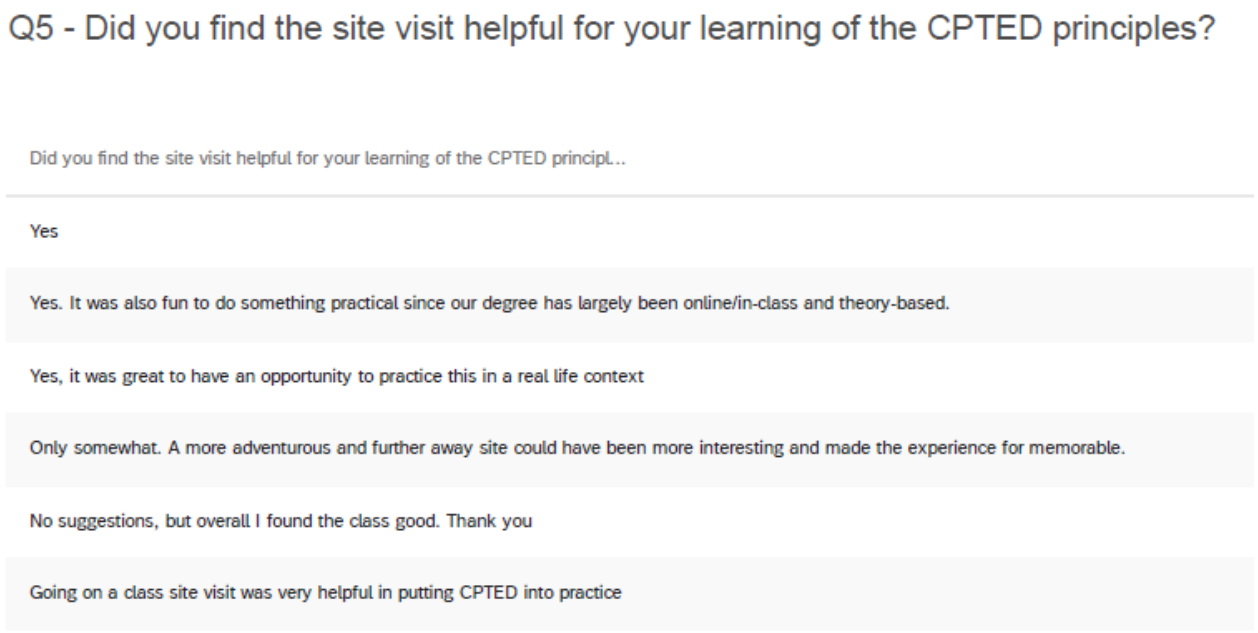

Figure 4: Student feedback in 2024 survey

In both 2023 and 2024, around 30% of the students enrolled participated in the site visit. This was expected, given the class attendance is normally around 20-30%. The activity did not increase the number of students present in-person. Majority of Civil Engineering students work in groups, especially for assignments and projects. From this, it is suspected that students who attended the outside-classroom activity shared their learnings with teammates for the assignment.

Concluding remarks

A common attribute of graduate profile in any tertiary institute is to develop critical thinking minds with the ability to seek solutions for future years. In the engineering profession, being able to think in a skilled manner within a short time period is greatly sought after. Career path progressions are dependent on how well an engineer is able to engage with the surrounding environment and determine feasible solutions, amongst other attributes.

This demand from the profession makes integrating experiential learning into the curriculum for an engineering course a key component for developing young leaders. Often, due to lack of experience by teaching staff, such activities are less common. The present study contributes by providing a simple example of integrating experiential learning into a final year Civil Engineering course. Despite the activity being simple, it was greatly enjoyed by both cohorts of students in 2023 and 2024. Evidence of performance in 2023 and 2024 provide further assurance that the outside-classroom activity assisted in students' learning of the CPTED principles. With a longer timeframe to improve the activity with changes over time, it will no doubt be a class exercise with good learning outcomes.

Health and safety regulations must be closely adhere to, as the risk of an incident occurring increases once students leave the classroom. Before the students were taken out on-site, they

were briefed on the health and safety procedures to follow and were asked to sign a consent form. Overall, using the 'real-world' setting as an example provides an opportunity for the students to develop a deeper understanding and for the instructor to have open discussions with the students.

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