CASE STUDY: THE JOURNEY TO EXPERIENTIAL LEARNING IN PASSIVE DESIGN

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INTRODUCTION

There are many sources advising teachers to adopt innovative learning methods to improve students' capability in relation to critical thinking, creativity, depth of learning, etc. [1-4]. However, there are many reasons why such a transition can be difficult. These include the teacher's belief in the extensive lecturing approach as it reflects their own successful experience [3], lack of training to support new methods [1], and lack of time and resources to implement such an extensive change [3, 5].

There are a number of innovative learning methods advocated, e.g. experiential learning [6], collaborative learning [3, 7], backward design process [2], problem based earning [2, 7], flipped learning [5, 8], gamification [9] and others. There are also several technological approaches suggested to support these learning methods e.g. audience response systems [8], videos [5, 8], digital simulation [7] and e-learning platforms with features such as forums [7].

Selecting the appropriate approach for the specific cohort and topic is a challenge. This paper describes how this challenge was approached in relation to transforming learning of Passive Design at Post Graduate level in the Welsh School of Architecture. The topic had previously been delivered in a traditional lecture-based format with lectures recorded for distance learners.

SCOPING PARAMETERS

The most important aspect to consider is the student cohort. In this case, there are two cohorts: local students and distance learners. Due to scheduling, some of the distance learners take the module later in the year. Across both cohorts, there is a high proportion of international students for whom English is not the primary language. Within the distance learner cohort, there is a very high proportion of part-time students with the associated limitations on study time availability and quality [10]. The students have a range of academic backgrounds (e.g. Architecture, Landscape Architecture, Engineering, Interior Design). Architecture students have been found to learn more readily from visual and active approaches rather than verbal or reflective approaches [11].

The scheduled delivery time (five sessions, each of four hours), available teaching space and facilities are also considered as scoping parameters.

SELECTION OF APPROPRIATE LEARNING METHOD

When considering a departure from traditional lecturing as a teaching method, there are a bewildering number of options to take, all with literature indicating their success in at least one scenario. A selection of these were indicated in the introduction. Information on these options were gathered from academic and grey literature [12-14] and conference presentations as well as discussions with colleagues.

From this a list of broad categories was created and those which had potential for inclusion were highlighted (bold):

- **Lecturing**
- **Reflective learning**
- **Experiential learning**
- Workplace learning
- **Group work**
    - **Problem / Case based learning**
    - **Peer teaching**

Experiential learning was selected as the main strategy because of its reputation for encouraging deeper learning [6] and because it could incorporate other learning methods. This is illustrated in Figure 1.

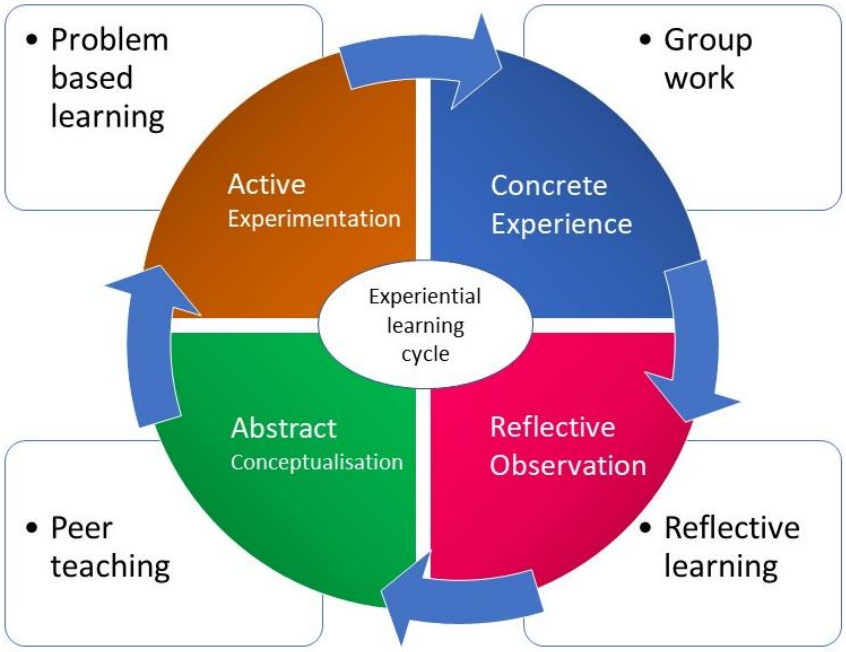

Figure 1. Illustration of Experiential Learning Stages and relationship to other innovative learning methods

APPLICATION OF EXPERIENTIAL LEARNING TO PASSIVE DESIGN MODULE

Appropriate learning opportunities were designed for each of the Experiential Learning stages.

Concrete Experience

The first stage of Experiential learning (Concrete Experience) was facilitated by designing activities to allow groups of students to explore key themes of passive design:

- Passive solar heating
- Natural ventilation
- Vegetative cooling.

A fourth activity – the "Bundle-Up! Game" developed by Mark DeKay [15] was also used. Images of the natural ventilation investigation are presented in Figure 2.

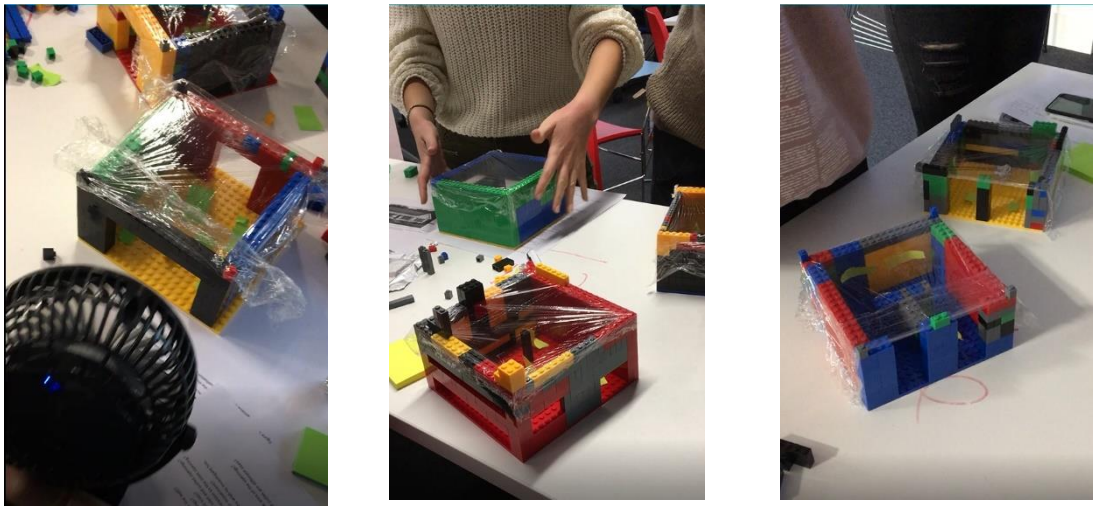

Figure 2. Images showing natural ventilation investigation being carried out

Reflective Observation

In the second phase (reflective observation), students were aided in reflection by being posed questions in two formats.

- Initially questions were posed in the activity brief (during "concrete experience") to guide the students investigation activities.
- Additionally, for each theme, a quiz has been developed.

The quiz questions are posed to all the students. However, it has been recognized that some students find it difficult to ask or respond to questions publicly due to modesty or concern about loss of face [16]. However, it is important to encourage these students to participate, as otherwise it is very difficult for the teacher to gauge student understanding and to present information in a different way if there is a misunderstanding. To enable all students to participate, an audience response system (PollEV) was adopted; this allows students to respond on a mobile device using the local wifi connection. Audience response systems can facilitate a wide range of question types including multiple choice, open ended, ranking or even selecting an image. Some students prefer to respond verbally which is welcome and enables further discussion. Figure 3 shows an illustration of a multiple choice question being presented to the students, followed by an explanation.

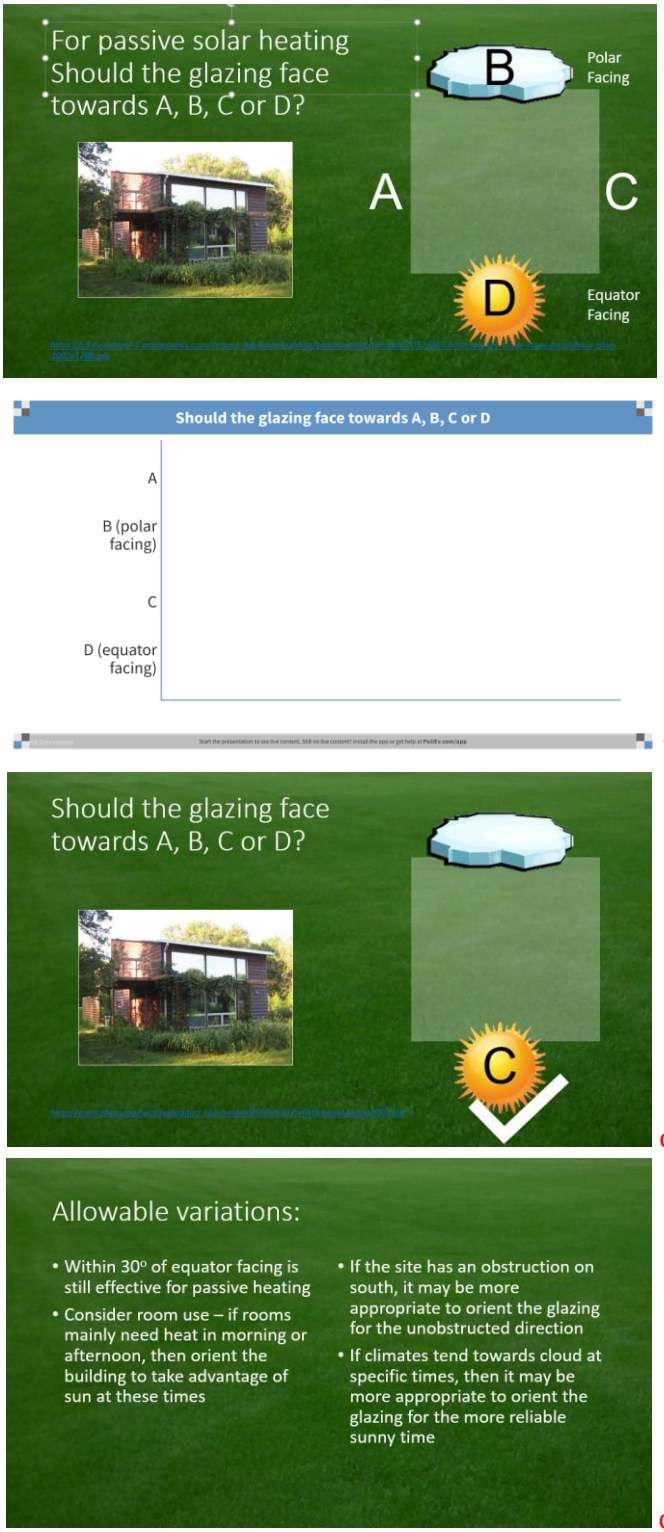

Figure 3. Quiz presented in collaboration with audience response system:
a – presents the question, b – shows the responses, c – shows the correct response, d - provides additional information for discussion

Abstract Conceptualisation

The third stage (abstract conceptualization) occurs when students make sense of the experience so far and draw conclusions. Two opportunities for this are given to the students.

Firstly, each student group is asked to present their findings from the activity. This has the potential to incorporate peer teaching, particularly if a member of the group is struggling to grasp the concept. The presentations are recorded and made available on the Virtual Learning Environment (VLE) and are also a resource for any student who was not available to participate in the activity.

Secondly, the summative assessment for the module asks each student to consider one passive design strategy in detail with the aim of explaining:

- What need does the passive design strategy respond to?
- How would it be applied?
- How would it perform?

Active Experimentation

The final stage of experiential learning (active experimentation) takes place in a related project module utilising problem based learning. The project module requires students to relate occupant requirements throughout the year in a specific climate to appropriate passive strategies which may not operate in a complementary fashion. The students have to:

- prioritise the needs of the occupants,
- considering appropriate ways of integrating the passive design strategies into the building design,
- evaluate the effectiveness of the strategy (including the sensitivity of the building response to variants on the design),
- refine the design to optimize occupant comfort throughout the year.

This activity fully proves the students capability to conceive, apply, analyse and evaluate – all of which are considered evidence of deeper learning in Blooms Taxonomy [17].

LOGISTICS OF APPLYING EXPERIENTIAL LEARNING TO PASSIVE DESIGN MODULE

Although there are many classifications of learning styles, the overall message is that different people have different learning preferences. For this reason, “lectures” were still required; however, there is a wealth of literature over decades, indicating that student concentration reduces after approximately fifteen minutes of passive learning [18, 19].

Since contact time was required for interactive activities, it was decided that a series of short (less than fifteen minute) lecture podcasts would be pre-recorded. Students would be asked to review the recordings or accompanying written notes before the interactive sessions in a “flipped-learning” approach.

The key ambitions in preparing the visual materials were:

- create concise presentations which would communicate key points within the passive concentration period
- show examples of the passive design strategies being applied in relevant climates
- provide high quality visuals to satisfy the high visual standards of modern students, particularly those involved in architecture.

After completing the recordings, it was found that the lecture material had been reduced to four hours and twenty minutes for the entire module.

The combination of the flipped-learning approach with short recordings or written notes gave the following advantages to the students:

- choice of format for preparation (short recorded presentations or written notes)
- all pre-recorded materials are available from the start of the module. This gives students a choice of when and where to prepare for the interactive session and to balance their overall workload from week to week.
- ability to break up the recordings to fit into their own schedule as there is no requirement to watch all the preparatory materials for a session in one sitting. This allows the students to take natural breaks and recover their concentration
- allows students whose first language is not English to deal with any language issues in a non-pressurised environment. In traditional lectures, students can find it difficult to look up words they are not familiar with without losing track of the topic and are often reluctant to ask for clarification of words.

Practitioners are invited to give guest lectures in the contact sessions. These presentations are also recorded and made available on the VLE.

Distance Learners

During the module transformation, it was important to remember the requirements of distance learners. As they are not available to participate in activities during contact sessions, briefs were adapted to enable these students to carry out their own version of the activities.
The VLE contains a forum to enable all students to communicate amongst themselves and with the module leader (although students make limited use of it). Students are also able to contact the module leader directly via e-mail and this communication method is used more frequently. Responses to individual student questions are then announced to all students using the forum as it is considered likely that more than one student will benefit from the clarification.

REFLECTION ON IMPACT OF THE MODULE TRANSFORMATION

Students were asked for their views on the module transformation. Students could respond to questions verbally or using the audience response system. The main findings were:

- Students showed a strong preference for short pre-recorded lectures over long lectures and over written notes
- appropriate amount of time available for quizzes, discussion, guest lectures
- even more learning activities were wanted, although this could not be provided without increasing the overall time allocated to the module
- all learning activities were found to be valuable

Students also provided the following comments in their module evaluation feedback:

- “I loved how in-depth each short video was and liked the fact that all material had been uploaded for viewing weeks before the module had begun” (Distance Learner)
- “I really enjoyed the module and found it a lot easier to digest the shorter presentations … than the longer lectures in other modules” (Distance Learner)
- “A number of activities helped us to understand the reason of the strategies” (Local Student)
- “Interactive class sessions. Reading first, applying later in class was helpful and fun to learn the principles” (Local Student)

CONCLUDING REMARKS

Transforming the passive design module to an experiential learning approach has been a significant investment of time. However, it has been possible to spread the process over three academic years. This involved trialling different activities and developing the short pre-recorded presentations. As with any module, the development is never considered as "finished" - further developments are still being implemented (eg creating new activities, revising pre-recorded lectures). However, the framework for the module is now established.

The Experiential Learning approach to the module has been delivered in the last two academic years. There has been good attendance at activity sessions, and students appear to derive significant benefit from them. To have the phrase "fun to learn" addressed to the module by a participating student is considered as a significant compliment.

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