Teaching Culturally and Linguistically Diverse International Students in Open and/or Online Learning Environments: A Research Symposium

Games, Planes, and Other Useful Distractions: Teaching Online Diverse International Students

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Abstract

The global pandemic triggered a rapid shift to online delivery of courses, and necessitated a re-evaluation of which in-class, active learning activities can be effectively migrated to the online environment without losing their original pedagogical purpose. In particular, team-based interactions or interactions involving physical objects posed a set of instructional design challenges online. Context of this presentation are online teaching experiences from a large, second-year engineering class with a culturally diversified student body. A key part are weekly studio sessions, which focus on a set of hands-on exercises, providing students with opportunities to bridge general concepts/theories and their practical applications in the context of each team-based project. It describes a ground-roots approach of faculty incorporating learning activities that help students develop teamwork, collaboration, communication, etc. skills. Additional aims are also to help students to lower cultural anxieties, develop interpersonal connections, and a sense of belonging.

Keywords: engineering education; active learning; hands-on activities; collaborative development; global cultural diversity.

Introduction

The global pandemic triggered a rapid shift to online delivery of courses and necessitated a re-evaluation of which in-class, active learning activities can be effectively migrated to the online environment without losing their original pedagogical purpose. In particular, team-based interactions or interactions involving physical objects posed a set of instructional design challenges online.

This presentation shares the online teaching experiences from a second-year engineering class, that focuses on a semester-long, team-based student design project. In support of project-related activities, students are introduced to general concepts of globalization, product development, and entrepreneurship through lectures that are supplemented by weekly studio sessions, which focus on a set of hands-on exercises. The intent of the sessions is to provide students with opportunities to bridge general concepts/theories and their practical applications in the context of each team-based project.

The student body in this large (200+ students), undergraduate class at the University of Windsor, is usually very diverse, with typically over 50% of the students being international. The student teams are built by the instructor to maintain cultural and linguistic diversity within smaller project groups. The course was also offered to students in Poland and Saudi Arabia in a shortened format. The comparison with those experiences will also be highlighted to understand of needs of international students in online environments.

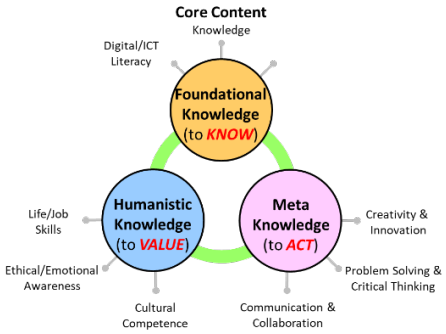
Background

Traditional engineering education concentrates on developing students' foundational knowledge, and only recently, started paying attention to development of meta-skills (e.g., creative and communication skills), but still poorly connects these two areas with humanistic knowledge (see Figure 1). The 21st Century Skills movement (Kereluik et al., 2014) also emphasizes the need to develop skills particularly relevant to the following themes of:

- Global awareness
- Financial, economic, business and entrepreneurial literacy
- Civic literacy
- Health literacy
- Environmental literacy, etc.

Figure 1

Summary of 21st Century Learning Networks



The issue most undergraduate engineering programs face is that they over-deliver in terms of technical preparation of students in their hard-core skills, and systematically under-deliver in developing their so-called soft skills, which are essential for the future job success of the engineering graduates (NAE, 2008). As a result, there is relatively little space left in the curriculum to offer students opportunities to develop such skills.

There are two key challenges that willing instructors usually face when developing elements of a hands-on, active learning curriculum that can be offered to budding engineers, and is intentionally, not exclusively, skewed towards further development of their technical skills, but also intends to expand both their humanistic and meta-knowledge. These are constraints related to cost and available class time. The guiding principle here is to keep things simple, and rely on the use of common objects as necessary supplies (e.g., paper, aluminum foil). The length of class activities should not exceed 30 minutes of its core, but time has to be allocated for providing clear instructions and post-activity debriefs.

Methods

Methods used in developing the hands-on activities are an eclectic mix of approaches, drawing from a rich collection of interdisciplinary efforts to develop engaging active learning activities at variety of levels.

- **Fast prototyping** is a basic tenet of the Design Thinking (DT) approach. It intentionally relies on the use of artifact prototypes made of common, inexpensive materials (such as used in the office or kitchen), which also simplifies and (usefully) limits the scope of planned activities. The DT approach also invites and encourages failure as an opportunity for learning, although for this to happen, a built-in forced reflection mechanism, such as a team oral debrief or written reports, is necessary. A good example for such an activity is making a paper airplane (also dubbed 'origami engineering'), where all students are provided with the sketched plan for an award-winning airplane, 'Suzanne' (Collins, 2013), and after folding their planes out of a plain sheet of paper, they have to fly them and record the flight results. Building and testing these simple paper planes (see Figs. 2 and 3), constructed by each student from the same building plan, offers a great gateway for discussions on a number of topics, such as aerodynamics, statistics, or quality.

Figure 2 Pre-pandemic paper plane tests

Figure 3 Remote paper plane tests

- **Collaborative storytelling** is one of the possible activities addressing both communication and teamwork skills. Prototyping of tinfoil hats tied by a common story is an effective team-development exercise. In this activity, students work in small groups of 3 or 4, and have to use a piece of aluminum foil (e.g., tinfoil) to build a hat for themselves. The challenge is that, as a group, they have to create a common narrative that would explain the connection between them as team members. Thus, the activity involves both collaborative communication and prototype building. Another opportunity for collaborative storytelling can be explored by joint interpretation of photographic images, such as those made available by the New York Times, as a learning resource (New York Times, 2021).
- **Information cards** are a low-tech, tangible, and approachable way to introduce information and sources of inspiration as part of almost any systematic processes or activity. Cards are instantly recognizable to most participants, meaning that they can serve as shared objects between diverse groups of participants. The tangible and manifest nature of cards furthermore enables them to function as props that encourage and support actions that are visible to all participants. In engineering or business, many card decks have been developed (Roy 2019; Peters 2020) and are often in use, although they are rather expensive. One possible use of the card-based concept is to build cultural competency among the students. The Culture Game (The School of Life, 2015), for example, introduces a set of information cards showing significant artifacts from various cultures around the world to inform and open a group discussion on cultural diversity and communication. However, cards can be also developed by the students themselves. Such an assignment allows international students, in particular, to share parts of their own culture, unknown or misunderstood by others, and by doing so, to contribute meaningfully to the class content.
- **Self-made videos** turned out to be not only a great communication exercise carried out in a non-traditional (for engineers) medium, but also an excellent opportunity to engage students on an individual level. Given that most online learning platforms force students in large classes into anonymity, and thus, 'invisible' to the instructor, a simple assignment at the beginning of the class can soften that alienation. It may also be worthwhile to split such an assignment into more segments dispersed across the semester. In the first one, pre-class, students can introduce themselves and answer simple questions (e.g., about their expectations). The second one, post-class, they can be asked to reflect on their experience and revisit their initial anticipations.

Discussion of Results

The majority of hands-on activities used in class under face-to-face teaching conditions can be transformed to the distance-learning environment. Those that are impossible to adopt usually involve both group activities and handling of physical objects simultaneously. For example, one of the commonly used, and very effective team development exercises, is Marshmallow Challenge (Wujec, 2016), where a group builds a tower out of a provided bag of supplies, which include strings of spaghetti. Such an experience is impossible to duplicate when the participants are not in the same physical space. Instead, such team interaction was replaced

by multiple communication-focused exercises. Other activities, which are based on individual activities, which do not rely on space-sharing, can be relatively successfully transformed, and use an LMS system as the interaction facilitation platform.

It is worth mentioning that there was significant effort invested in preparing materials for students, such as, for example, detailed instructions or report templates. Multiple iterations were required to minimize potential students' errors in carrying out the activities that stemmed from misinterpretation of instructions. Students were also often taking shortcuts in executing the instructions to save time or required communication efforts. Erroneous situations were sometimes piling up, due to a minor initial misstep, which occasionally was taking students astray. Such trivial errors, easy to catch on the fly in face-to-face instruction, when left undetected early, lead to unchecked frustration in the end in the online teaching environment.

The course had been originally developed in 2009 as part of the renewed undergraduate engineering curriculum, and has since undergone multiple revisions and adjustments related to developments in the disciplines it covers (e.g., product design, entrepreneurship, manufacturing, and supply chains, and business). Since its original inception, the composition of the student body has also evolved, currently including about 60% of international students, many of whom moved to Canada to study. Such a diverse group requires caution and sensitivity, even though the standard language of instruction is English. The project teams are intentionally multicultural, and it is imperative to raise students' awareness of potentially sensitive issues in other cultures. Allowing international students to contribute by presenting their own cultural backgrounds facilitates cultural understanding and lowers their cultural anxiety.

Another set of issues is brought up when the content of the class is being taught outside of Canada, and even when the language of instruction is still in English, some cultural adjustments are also necessary. Providing thorough cultural background to instructors may be the key to avoiding potential misunderstandings.

Conclusion

While most of the group-based, active learning exercises can be adopted to work in the distance-learning format, it is also important to recognize that typical LMS (e.g., Blackboard or Moodle) as an interaction platform are far from perfect. In particular, many functional limitations severely constrain what can be accomplished by students using such tools. Tools that address such deficiencies do exist, but often require use of software outside the LMS.

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