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TEACH AND SUPPORT LEARNING PRACTICES AT THE UNIVERSITY LEVEL

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Abstract— The paper provides an advice and case study examples to support a student-centred approach for the design and planning of the learning and teaching practices. Learning activities need to align with their assessment, the learning outcomes of the course/program, and the students' needs at their stage of learning. When planning learning activities, the types of activities the students need to engage in to demonstrate the intended learning outcome/s play a vital role in the learning process. The activities should provide experiences that will enable students to engage, practice and gain feedback on specific outcome/s. Additionally, the time assigned to the activities should be taken into consideration. Strategies need to be built in to check on understanding and to reflect on learning. Finally, regular reviews and updates to the modes of delivery and pedagogical methods are to be conducted to ensure the continuity of the successful learning approach.

Keywords—Learning, case study, teaching, assessments, module leader.

I. INTRODUCTION

Following the development in the technology and learning platforms in recent decades, the learning and teaching practices have taken a giant leap forward, moving from the analogue world and face-to-face education in simple classroom setups to the digital world where fully integrated active learning approaches and student-centred practices accompanied with a variety of interactive learning environments are being produced with ever greater doses of realism (Erazo et al., 2015). The successful implementation of an effective learning environment for civil engineering modules requires implementing different learning environments that can support different students' learning styles such as mixing both formal and informal learning setups to attain learning goals (McNamara, 2012). Student-centred approaches ensure learners participation is maximized using student-led approaches and ensuring students are active learners. Such approaches can be achieved by implementing certain forms of instructions such as giving students opportunities to lead learning activities, participate more actively in discussions, design their own learning projects, explore topics that interest them, and

generally contribute to the design of their own course of study (Glossary of Education Reform, 2014).

At the university or college level, it is very important for the module leader to work with a team of experienced professors and lecturers to ensure the proper implementation and delivery of the Program through a series of semester-based lectures and practical examples appropriate to the field of study. Such work may include module design and preparation, study plans development and follow-up, assessment design, implementing effective teaching and learning procedures, assessing students work and providing appropriate and constructive feedback, mentoring new joining colleagues, supervising senior students, participating in the different college committees, assisting in administrative college work, and pursuing research activities.

The paper provides case study examples and recommendations to support the design and planning of the learning and teaching practices. In particular, the paper supports the student-centred approach in teaching and learning. The recommendations are based on the experience of a group of module leaders at the College of Engineering at the Applied Science University (Bahrain) in partnership with London South Bank University in the United Kingdom. The paper covers three main topics: design and plan learning activities (Part II), teach and support learning (Part III), and Assess and give Feedback (Part IV).

II. DESIGN AND PLAN LEARNING ACTIVITIES

Much of the creativity and power in teaching lies in the design of the curriculum, the choice of texts and ideas which become the focus of study, the planning of experiences for students, and the means by which achievement is assessed. It can be understood that the power of good teacher-student interactions is multiplied many times by the good course design (Toohey, 1999). At the university, Module leader needs to develop and design different modules from inception to delivery following a clear and constructive alignment of the design process (Biggs & Tang, 2015). The first step in the course design should be the thorough review of the course specifications and the intended learning outcomes provided in the validation document developed as part of the partnership with the reference University. Module leaders are required to work on developing the module study



guides following a standard template provided by the university. This involved organizing the indicative content and developing the lesson plans to ensure the proper flow of the learning process in a sequential manner easy to be followed by students and allowing them to achieve the best learning outcomes. The sequence of the lesson plans starts by providing the students clear objectives of the module, good background and foundational knowledge and concepts, moving into the theoretical part of the design and then coupling it with practical examples and tutorials.

Case Studies

For example, in the design of the civil engineering module “Reinforced Concrete Design Module to Euro Code” module leader can start by clearly presenting the aims of the module and justifying the need for proper and safe design of buildings and infrastructure. Then, the module leader presents the different Codes of Practice to implement the safe design process and introduce the students to the particular Code of Practice that will be followed in the module. The implementation of the “design process” learning starts by introducing the basics and moving on lecture by lecture to a more complicated design case. Each design stage is accompanied by design examples and tutorials to ease the learning process. The Module leader should provide the students with a clear summary of the design procedure at the end of each design stage to ensure all students are coping well with the subject. This strategy has led to a higher engagement of the students in the learning process which was clear from the consistent attendance and participation of students. In this case study, the students indicated that the “summary of the design procedure” was the best part, it was like a “recipe” that can be easily followed. The assessment scheme for all modules was done according to the validation documents with a balanced approach between coursework and tests, and considering both formative and summative assessments. Internal and external moderation was performed for all module components. The design of the lesson plans and assessments and how they relate to the intended learning outcomes received excellent feedback from the external examiners who indicated that the lesson plans may serve as a prototype for future applications.

A Module leader while at another University has worked with a team of designers to introduce math classes appropriate to the fields of study with practical examples. This has led to the development of 6 classes that took into consideration the level of learning outcomes required for the pursued degree and the diverse learning communities. Another area that has been considered in the development of classes was to accommodate a combination of on-line and on-campus learning. The lecturer should be keen to adopt an interactive approach in his classes (Olive, 2013). The Module leader at the college of engineering (ASU), has

designed 7 modules from inception to delivery taking into consideration constructive alignment in the design process (Biggs and Tang, 2015). The development of the modules included a review of the study guides provided in the validation documents (Partnership with London South Bank University) and re-organizing the study guides and lesson plans to make the learning process flow in a sequential manner to achieve the best learning outcomes for the students. Another area that has been considered in the development of the classes is to provide the students with the theoretical concepts needed for the design coupled with practical examples. This has led to a higher participation and engagement of the students in the learning process.

COVID 19 has forced on us the on-line learning process. Module leaders have taken this into consideration in the design of the modules with professional videos recorded to ensure that the practical components are covered appropriately. For example, in the design of the Surveying module, the Module leader has suggested to record videos to show the complete setup of the equipment used in Surveying such as Levels and Total Stations. The Module leader also worked with professional surveyors to collect raw data for the students’ projects. The Module leaders were praised by their students on the practical experience they have gained.

Another example is the graduation projects. Module leaders have introduced different new topics into the design for the students in diverse areas in civil Engineering taking into consideration the practical aspects of each project and recent developments in the topics considered. The graduation projects covered three main area in Civil Engineering; Structural Analysis and Design, Hydrology and Hydraulics, and Geotechnical Engineering to provide a wider list of projects to our students that meet their interest.

III. TEACH AND SUPPORT LEARNING

The formula for successful teaching of the engineering modules involves three elements: (1) bringing students into the research enterprise; (2) giving them hands-on field experience; and (3) breaking down disciplinary boundaries (Healey & Healey, 2019). This embedding of active learning in the teaching practices helps students think outside the box and provides them with the relevant expertise to deal with problems and create solutions under distinct set of conditions and parameters rather than classically sitting in classrooms listening to teachers, memorizing pre-packaged assignments, and spitting out answers. Module leaders need to implement effective and interactive learning procedures based on a flipped classroom setting that support the blended and technology enhanced learning. This can be done particularly for the modules that need a higher level of knowledge and when knowledge from different subjects has to be integrated. This includes the creation of material and PowerPoint



presentations to supplement the proposed readings and focus on the important concepts of the subject, the use of tablets and virtual white boards, the use of breakout rooms and private chat rooms to support small group learning, the use of polls and quiz-based games on learning platforms such as the “KAHOOT” mobile application to encourage students’ participation and learning.

When students leave the class, Module leaders want them to have the foundational knowledge to ground their ideas in practice and the inspiration to let go of constraints about what they think is possible. This technological-innovative approach should be embodied in the pairing of class instruction and assignments. The view that technology can promote creativity and learning is shared by educators across many countries (Cachia & Ferrari, 2010). For example, when instructing students on hydraulic engineering, the module leader combines direct instruction of modelling techniques with “recommendation exercises” in which students are asked to provide suggestions on how these models could be applied for particular applications such as flood assessment and mitigation (Scott, Leritz, & Mumford, 2004b). The Module leader needs to dedicate a portion of the lecture to covering the important concepts and the remaining part of the lecture allows for questions that invoke critical thinking. They can use interactive power point presentations to capture well the students’ attention, record all lectures and produce videos for the practical components to make the material easily and readily accessible by students.

Furthermore, module leaders can provide postings of helpful videos and additional reading material to the students to increase their skillsets and to prepare them well for the competitive job market (Scott, Leritz, & Mumford, 2004a). This technology-enhanced learning for a relatively small number of studies supported the creativity in the students who showed high performance rates and reduced failure rates. The effect of this approach was also measured by the quality of submitted assignments which included innovative techniques to collect, analyse and present data results. This quality of the students’ work received positive feedback from internal and external moderators. Furthermore, this active learning approach resulted in the graduation of the first cohort of engineers who are able to successfully pursue their professional and academic career and can compete and excel at the tasks they are supposed to handle. This was indicated by the positive feedback about our students’ levels received from employers in prominent engineering companies.

Engineering modules require students’ thinking outside the box to be able to deal with problems and solutions under distinct set of conditions and parameters. Module leaders have implemented a dynamic interactive approach in the classroom, particularly for the modules at the higher level where knowledge from different subjects has to be integrated. They dedicate a portion of the lecture to covering the important concepts and the remaining part of the lecture

is dedicated to questions that invoke critical thinking. For example, in the Engineering System Design module, they can break students into rooms where they discuss all the elements in a system design starting from the planning phase all the way to the full design phase and they report back on their findings to realize the complexity of an engineering project and the involvement of the stakeholders including planners, designers, governmental agencies, environmental compliance personnel, finance people, etc. This approach takes into consideration the different levels of learning, encourages teamwork and integrates the learning outcomes from several modules that the students have been exposed to. During this process, the module leader can instruct students to conduct relevant research to gain full understanding of the components of the system, the project brief, feasibility studies and alternatives, risk analysis and so on. Students have always indicated that this was the most exciting and enjoyable part of the learning process where they start thinking like professionals and not only as students. Importantly, they used the knowledge gained in the classroom to successfully apply it to practical projects in two of the modules studied.

Another approach that can be adopted in the classroom is referred to “from theory to practice”. This approach is implemented in three geotechnical engineering modules where the students are given different situations from those covered in the classroom and are asked to identify solutions based on the applicable concepts. Feedback from the students through e-mails and in the classroom has shown that the students have benefited greatly from this approach and have applied their gained practical skills in their graduation projects.

In the graduation projects, several topics can be introduced to provide the students with a wide selection of topics/projects that are of interest to them). These projects can help the students to integrate the knowledge from other modules that they have taken including foundation engineering, structural analysis and design, drainage and hydrology, and so on. The jury members were impressed by the project levels and the students’ confidence during the discussions. Also, the students have made serious contacts with geotechnical engineering firms and governmental agencies to obtain data for their projects and to seek professional practice. In addition, these projects have helped the module leader professional development to keep up to date with the recent developments in the topics of the students’ graduation projects.

In addition to the above items, module leaders need to use PowerPoint presentations, recordings of all lectures, production of videos for the practical components, and provide postings of additional reading material to the students to increase their skillsets and to prepare them well for the competitive job market (Bereczki & Karpati, 2021).



IV. ASSESS AND GIVE FEEDBACK

The consistent assessment of students' performance is a critical component in the learning process (Pellegrino, 2014). Assessments should be properly conceived, designed, and implemented to attain the learning goals (Kaestle, 2013). One approach towards designing an assessment is to build a balanced system based on the three interconnected elements of the assessment triangle: observation, interpretation, and cognition (Linn, 2013). Rubrics and model answers are designed to be coherent with the assessment triangle. This approach allows to "Know What the students Know" (Pellegrino, 2014). The design of the assessments shall be based on both informal and formal levels through formative and summative assessment schemes. Assessments should be Provided continuously during the semester to maximize the students' chances of improving their performance rather than only attaching high stakes to the outcomes of the final test which has proved to have a negative influence on teaching and learning (Kaestle, 2013). Concise oral feedback during the sessions as well as clear and detailed written feedback on the university's learning platform (MOODLE) shall be provided directly after every assessment to ensure the students are fully aware of their mistakes or misunderstandings and to guide them on how to properly progress and improve in future assessments.

To ensure the design of a fair marking scheme, all features that need to be presented in the students' submissions and how they are weighted should be clearly identified at the beginning. The module leader should differentiate between "which matters most and which matters least or not at all". For example, if the evidence about a student's knowledge of the laws of motion is that a student is able to analyse a physical problem by clearly identifying the forces acting on all the bodies, the evidence in the assessment would be drawing a free body diagram including all the known and unknown forces properly labelled and in the correct direction. This results in a fair and objective marking system allowing the assessment of students' levels and differentiating clearly between them. This approach has proven to provide a positive influence on attaining the learning objectives measured by good and well-distributed overall students' marks and module averages.

V. CONCLUSIONS

The paper provides a general advice and case studies on how teaching and learning activities should be designed and planned. Learning activities need to be in alignment with the assessment, the learning outcomes for the course/program, and the students' needs at their stage in the learning.

A variety of pedagogical methods needs to be implemented to accommodate different learning styles. Those pedagogical methods need to be innovative and shall be evaluated regularly and adjusted as needed to maximize learners' participation and engagement.

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