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Designing for Student-Centered Hybrid Learning Environments: A Framework for Programming Languages Course Design

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1 Introduction

Hybrid learning environments are a means of delivering instructional content in that online educational materials and opportunities for interaction were combined with traditional classroom methods. Hybrid learning environments give students the opportunity to work in an environment enriched with digital learning tools, and to support student-based learning approach. Student-based learning approach promotes engagement to make students active learners via various ways such as interactivity, feedback, etc. Researchers identified feedback as an activity for promoting effective online learning and more so creating the environment for teacher-student teaching and learning interaction [1]. Besides, some instructional strategies, like gamification and flipping the classroom, have an important role in supporting active learning. In well-designed gamified environments, students tend to dedicate more meaningful interactions with the learning process, as their efforts are promptly and effectively recognized [2]. Students, in flipped classrooms, are transformed from passive listeners into active learners [3].

In this study, we aim to propose a useful course design framework for undergraduate programming languages in hybrid learning environments.

2 Methods and Processes

We followed the Kemp Instructional Design Model [4] to design the course, as explained in the following. First, we defined the instructional problems. Second, we worked on the learning styles and needs of both students and teachers by utilizing

questionnaires. The study used a questionnaire to elicit information from Bachelor level engineering students and from teachers. In all, 372 students sampled from 19 European countries participated in the data collection; whereas, 47 teachers from five European countries participated. Results from the questionnaire analysis showcased the major benefit of online programming language classes was the variety of learning materials, for both teachers and students. Whereas, the major challenge was providing not enough feedback. They preferred simulations, video tutorials, and external resources as the educational elements that support lessons. Furthermore, teachers also stated they would mostly like to employ gamification, flipped classroom, and project-based learning activities in their classes. We also analyzed the existing course plans from five European countries. According to the course plan analysis, we have identified the weekly topics, learning objectives, and the related pedagogical approaches.

Third, based on the data from the questionnaires and the course plan analysis, we made content analysis to determine the instructional objectives. Then, we sequenced the content, determined the instructional strategies, and designed the messages, by utilizing the content analysis. As a result of these steps, we developed a course plan template (see Fig. 1).

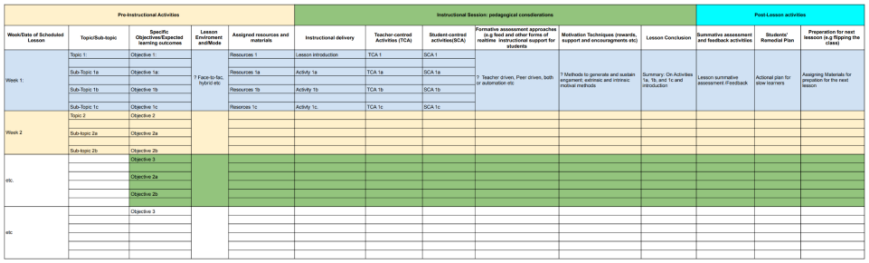

Fig. 1. The course plan template.

The template has features especially in terms of instructional strategy issues which are closely related to student-based learning approach such as feedback, gamification, and flipping the classroom. In this framework, conscious efforts are made to put the teacher as a facilitator and active student learning. This framework clusters the dimensions of the pedagogical competence of the teacher into three main dimensions:

- **Pre-Instructional Activities**: Topic and/or subtopics, specific objectives, the environment for the learning, and resources/material for the lesson.
- **Instructional Sessions**: The lesson delivery, specific teacher roles, formative assessment, motivation techniques, and lesson conclusion.
- **Post-Instructional Activities**: Summative assessment, remedial plan for students, and preparing students for the next lesson.

The other subsequent steps of the Kemp Model have not been completed yet. Therefore, the future works for us to deliver the course using this course template and evaluate it.

3 Results and Conclusion

As a result, we developed a course plan template and a course design. The course design was developed for undergraduate programming languages in hybrid learning environments. The template has features especially in terms of instructional strategy issues which are closely related to student-based learning approach such as feedback, gamification, and flipping the classroom. Based on the insights throughout the design and development process of the course plan template, we discussed implications in terms of hybrid learning environments and programming languages courses.

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