



Title: Putting Constructive Alignment to Work: A Hands-on Experience with a First-Year Programming Course

Keywords: Course development, Peer learning, Student engagement and motivation

Presentation format: Presentation

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Abstract

This abstract discusses our experience with using Constructive Alignment (CA) for developing a Programming course for first-year Computer Science and Engineering students over a three-year period.

Background and purpose:

The project seeks to provide a better alignment between different course activities, including lectures, lab sessions and home assignments, maximizing the fulfillment of learning objectives. To this end, we investigate different activities that allow students engage in interaction with each other and leverage elements of active learning [2] to achieve the course objectives. The approach enables teachers receive early feedback on possible issues with the course and intervene in a timely manner. The pedagogical idea is based on the theory of Constructive Alignment [1,3], which provides a principled way of aligning the learning outcomes, teaching and learning activities, and formal examination.

A primer on CA:

In essence, constructivism states that the best way of creating knowledge is by means of activities that students engage in, rather than by rigid knowledge transfer from teacher to student. The teacher's role is seen as a facilitator that contributes to the teaching activities creating an environment that enables students engage in deep learning. To this end, CA provides an aligned system of instruction, a web of consistency, where students are entrapped to engage in appropriate learning activities. By putting the student activities on the spotlight, the teacher has to be clear about the learning objectives, which drive teaching and learning activities, as well as feedback and assessment methods.

Work done:

The main goal of this project is to apply the theory of constructive alignment at the letter, providing a student-oriented learning environment and increasing the qualitative and quantitative indicators of the course. To this end, we set out to achieve the following goals:

- Enhance students' experience by introducing elements of active learning
- Help teachers to identify possible issues and get feedback early on
- Improve the alignment of course activities towards the fulfillment of learning objectives
- Increase cooperation between students and train their presentation skills
- Make the learning experience more productive, interactive and fun
- Increase the course quality by improving on quantitative and quantitative indicators

We have applied the theory of CA to a first-year undergraduate course for three consecutive years. The following activities and factors have played a key role in making the programming course successful: (a) student motivation and enthusiasm; (b) anonymous online quizzes to monitor progress; (c) training of problem solving skills; (d) quick recaps at the lecture's start; (e) alignment of labs with graded assignments; (f) enforcement of work-in-group and presentations, and (g) care on threshold concepts.

Results/observations/lessons learned:

The analysis of student evaluations and examination results reveals that CA produces excellent results. 92% of the students evaluated the course as good and excellent, while 70% of the students managed to complete the course after the first examination. We asked specific questions about the proposed changes and activities and they were highly appreciated by over 85% of the students. Students felt enthusiastic about all course activities. This can be best described with students' own words:

- "The teaching was very interactive and easy to follow and keep up with. Everything was explained at a level fit for both beginners and people with some experience. It was by far the most fun and fulfilling course I've ever had."

- "The "we love programming" approach is really inspiring. Very good to have one lecture and repeat it next time."

- "The Kahoot questionnaires were quite a nice start of the wednesday lectures as well as a fun way to test the progress. "

Take-home message:

CA is an excellent framework to successful teaching.

References:

[1] Biggs, J., Tang, C.: Teaching for quality learning at university (society for research into higher education) (2007)

[2] Gibbs, G.: Using assessment strategically to change the way students learn. Assessment matters in higher education (1999)

[3] Weurlander, M.: Designing a course for meaningful learning. A step by step guide. (2006)