

# CAFE: an automatic and on-line learning system to guide freshmen towards the meeting of Higher Education requirements

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At the University of Liège, in Belgium, where the open access to Higher Education is usually the rule, various initiatives are taken in order to ease the transition between Secondary School and Higher Education as no background might be expected from students. In Computer Science Education, many first year students enter the program with excitement (typically, due to a biased vision of the Computer Science) but without being clearly aware of the real expectations. During the last decade, Assessment for Learning (AfL) strategies (e.g., Sambel et al., 2013, Wiliam, 2011) have been proposed as an efficient way to guide and engage freshmen towards the meeting of Higher Education requirements.

This communication focuses on an original AfL based automatic and on-line learning system, called “CAFE”, implemented in the context of the Computer Programming Introduction course addressed to first year students. In a nutshell, the system proposes all over the semester multiple programming challenges. It leads the students to work, on a regular basis, on problems with increasing difficulties and cumulative expected learning outcomes, “ensuring that summative assessment has a positive impact on learning” (Nicol, 2009). CAFE also allows students for three submissions for each challenge, thus closing the feedback loop (Boud, 2000). In addition, for each submission, CAFE provides a high quality and automatic feedback that is parametrized according to the literature in order to maximize the likelihood of student self regulation. In particular, this feedback is

- individual (Brookhart, 2008), thus customized;
- focused on the task, not the learner (Narciss et Hut, 2004);
- written, unbiased, objective, via computer (Kluger et De Nisi, 1996);
- immediately sent to the student, preventing the student from being bogged down or frustrated (Knoblauch et Brannon, 1981).

Finally, CAFE brings valuable and longitudinal information to the Educational Team by profiling each student and by estimating the overall understanding of the course.

CAFE has been used during Academic Year 2017-2018, with a population of 72 students. Some key aspects of the system have been evaluated in two ways. First, data has been collected empirically and allows for assessing CAFE in terms of usage and students success rate: submission rate per challenge, correlation between challenges and additional evaluation (mid-term, final exam), etc. Second, additional

objective (via CAFE and the blackboard course session) and subjective data allows for investigating the levels of cognitive engagement and actual self-regulation behaviors following the introduction of CAFE.