

Chapter 3

Flipped Learning With Peer Reviews in the Introductory CS Course

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ABSTRACT

Today, university pedagogues in Finland are keen on applying flipped learning techniques to improve education and learning outcomes. In accordance, assessment moves to a more formative and flipped direction as well. Flipped learning implies assessment to be continuous, yet controversially, resources in education are decreasing. The dilemma can be partly solved by increasing self-, peer-, and automatic assessment, and in addition, the exploitation of learning analytics. Tampere University has addressed these pedagogical demands and challenges in computer science courses by developing a learning management system called WETO. This supports flipped learning techniques in a resource-wise way by enhancing assessment with new peer-review options, self reflection, and negotiations. This chapter highlights the proven and functional practices of formative assessment based on an introductory computer science course supported by WETO. It discusses further development needs and opportunities of learning management systems from this viewpoint.

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1 INTRODUCTION

Generation Z will face a new flexible working life requiring so-called 21st century skills. The skills comprise thinking, working, and living skills, and digital fluency and digital literacy as all-encompassing tools and enablers. Moravec (2013) itemizes *thinking skills* as creativity, innovativeness, co-operation, motivation, and quick combinations of new ideas; *working skills* as digital literacy, exploitation of free and open learning resources, horizontal knowledge networks, and socially constructed understanding; and *living skills* as continuous updates of one's knowledge, that is, lifelong learning, but, on the other hand, a relaxed attitude towards failures and resilience. As the requirements for future working skills change, education should adapt and ensure, that also *digital-literacy skills* of the generation Z are adequate.

Training students adequately for future working life necessitates also the evaluation and development of teaching methods. The methods should, for example, employ exercises that in addition to digital skills emphasize co-creation, collaboration, transparency, and sharing results. In consequence, new innovative digital pedagogy and learning management systems need to be developed.

Learning management systems (LMSs) have progressed from simple pdf document and course grade repositories into ones promoting social interactions and collaborative problem solving among participants. In addition to formal learning resources, students exploit extensively online materials such as videos, games, virtual worlds, and free online MOOCs, which further foster informal learning that blend with formal education (Gros and García-Peñalvo, 2016).

Flipped learning and assessment exemplify such methods that prepare students for the 21st century, and for the requirements of a new flexible working life. Flipped learning (FL) and flipped classroom (FC) are trends with a promise of improved and intensified learning. This paper describes the steps towards flipped learning in one introductory computer science course arranged at Tampere University, and examines the assessment practices enabled by a self-developed LMS, WETO, in particular. The main questions we address in this paper are:

RQ1: What are the means to increase formative assessment in the introductory computer science course with plenty of exercises that are difficult to assess automatically?

RQ2: How are the teaching arrangements, and the applied self- and peer-review practice in particular, perceived among the course participants?

RQ3: What is the current level of support for self- and peer-reviews in the selected LMS?

The paper is organized as follows: Section 2 contains a review of current discourse about flipped learning, Section 3 describes the research context of this study, Section 4 introduces the results, and Section 5 discusses the results, validity considerations, and the future ideas to improve the approach.

2 A PEDAGOGICAL RATIONALE FOR FLIPPED LEARNING

Current society extends flexibility and increases uncertainty, which requires of young people self-regulation skills and identity work as specified by self-determination theory (SDT) (Ryan and Deci, 2000; Deci, 1971; Deci and Ryan, 2010). SDT consists of autonomy, relatedness, and felt competence that largely determine the self-confidence of a worker of the 21st century. Supposedly, competence increases naturally by deepening substance knowledge.

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