

INCREASING MOTIVATION AND ENGAGEMENT IN ONLINE PROGRAMMING EDUCATION

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ABSTRACT

According to the OECD, programming is one of the essential skills in the 21st century. Following the recommendation, many Nordic countries have started to integrate programming education into their educational curricula as early as primary school. Despite that, many people still struggle to learn programming, which is indicated by, for instance, the low pass rate of introductory programming courses. Another problem is that only 17% of all students in the field of Information and Communication Technologies in the European Union are women. Such a low rate indicates that most women will not benefit from the growing demand for people with programming skills.

Research shows that smaller classes with fewer than 30 students are the most effective environment to teach programming. Part of the reason is the personalized feedback and the possibility to more easily adapt the learning path towards the needs of a smaller group. However, larger classes are required to satisfy the growing demand, yet such a programming learning environment is less effective. To adapt the learning path towards the students, their attitudes, disposition, and motivation need to be considered — non-cognitive factors driving people's behavior. The influence of these factors on learning success is well documented in other disciplines, but not well-researched in computing education yet. Additionally, addressing these factors in large classes and online contexts is also a challenge. Creating a learning platform that can adapt the learning path towards the individual student can help to address the non-cognitive factors. Adding a personalized conversational agent, also referred to as chatbot, carries a potential to increase the students' motivation and engagement, consequentially affecting their learning behaviors. Therefore, such technologies can help to make larger classes, or online courses, more effective.

The primary objective of this research is to explore, through the mixed-methods approach enabling the triangulation of data from qualitative and quantitative research, the relationship between motivation and engagement and their effects on learning programming. In particular, the aim is to assess how motivation and engagement can be strengthened by the personalization of the learning path and the usage of a conversational agent. Both components utilize the latest advances in large language models to improve the personalization and raise the quality of the conversation with the students.

After conducting a comprehensive literature review of the field, a learning platform will be designed to allow personalization of the learning path of students. Next, a conversational agent will be integrated into it to provide the students with a personalized real-time tutor. During the conversations with the students, a sentiment analysis will be conducted to understand their emotions and experiences. Utilizing large language models, the conversational agent will be able to react to the students according to their needs. This way, the conversational agent will not only be able to provide meaningful feedback to the students, but also act humanely to build a strong relationship between the conversational agent and the students. As final step, the learning platform will be used in different courses and the effectiveness will be evaluated. These studies should also focus on the effect on underrepresented groups.

The proposed approach can help to broaden computing literacy, help to decrease the gender gap in computing, and make programming education more inclusive for future generations.

Keywords: computing education, ai, personalization, programming