

New approaches to personalised learning through digital interactive textbooks

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0.1 Introduction

In today's teaching, MOOCs are becoming more and more popular. However, MOOCs are mainly centered on the learner's or student's perspective, often sidelining teachers from the equation. Students independently "learn" without teachers having the opportunity to intervene or monitor their progress. This renders MOOCs often impractical in conventional classroom settings.

0.2 Research Questions

The following research questions try to tackle the problem both from a conceptual standpoint as well as a practical one.

- Compared with a MOOC - what are the main distinguishing features? Which aspects - compared to a MOOC - can be covered better or worse with a platform that puts the teacher-student relationship at the centre?
- What innovative and adaptive application scenarios result from the use of a completely digital textbook?
- What methods can be used to individualize the learning paths of the digital textbook for learners?

0.3 Methodology

For the pilot application, a combination of a qualitative and quantitative study shall be conducted. The participants receive access to a prototype, which is then being used in actual classes. Feedback from both the teachers and students are used to improve the prototype for the next test group – where it is then applied again. An initial batch of schools has already received access to the prototype, focusing on two key chapters of the Austrian math curriculum for grade 5.

To ensure a balanced representation, the selection process for the qualitative survey avoids overemphasizing any specific school forms or types. Criteria such as urban/rural disparity, private/public status, and IT affinity guide the selection process.

0.4 Related Work

To answer the first research question, e.g. the following literature is relevant. A full list can be found in the accepted short paper for the ISSEP 2024.

- Atiaja, L., Guerrero-Proenza, R.S.: The moocs: origin, characterization, principal problems and challenges in higher education. *Journal of E-Learning and Knowledge Society* 12, 65–76 (02 2016).
- Ebner, M., Schön, S., Braun, C.: More Than a MOOC—Seven Learning and Teaching Scenarios to Use MOOCs in Higher Education and Beyond, pp. 75–87 (01 2020).
- Sands, P., Yadav, A.: Self-regulation for high school learners in a mooc computer science course. In: *Proceedings of the 51st ACM technical symposium on computer science education*. pp. 845–851 (2020)
- Tian, Y., Sun, Y., Zhang, L., Qi, W., et al.: Research on mooc teaching mode in higher education based on deep learning. *Computational intelligence and neuro-science 2022* (2022)

To answer research question two and three, one has to gain an overview of a wide range of topics. For me especially relevant is the theory of cognitive tutors as this allows true interactivity. The following papers go into this direction:

- Alevan, V., McLaren, B. M., Sewall, J., van Velsen, M., Popescu, O., Demi, S., Koedinger, K. R. (2016). Example-tracing tutors: Intelligent tutor development for non-programmers. *International Journal of Artificial Intelligence in Education*, 26(1), 224-269.
- Alevan, V. (2010). Rule-based cognitive modeling for intelligent tutoring systems. In R. Nkambou, J. Bourdeau, & R. Mizoguchi (Eds.), *Advances in intelligent tutoring systems* (pp. 33-62). Berlin: Springer.

0.5 Results So Far

- Multiple use case scenarios have been integrated into the platform, with active involvement from teachers throughout the implementation process.
- A short paper regarding a theoretical overview of these scenarios has been submitted and accepted to the ISSEP 2024.
- A first round of schools have tested the platform in May and June 2024 to gain some experience for the larger study in October / November 2024. The questionnaire for the upcoming study is being created during Summer.

0.6 Open Questions

- Discussion regarding methodology for the next studies in classrooms
- Discussion of integration concept of the cognitive tutor
- Discussion of interactivity possibilities