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Development report
Educational Science and Technology
University of Twente

www.academion.nl
info@academion.nl

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Introduction

On 27 and 28 March, the master's programme Educational Science and Technology at the University of Twente was assessed by an independent peer review panel as part of the cluster Educational Sciences. During the site visit, a development dialogue was carried out in the form of three thematic sessions. This resulted in lively discussions amongst lecturers, students, programme management and the panel about future developments in the EST programme. This development report is based on these sessions and discussions about the themes within the panel.

Theme 1. High tech in the EST programme

Introduction

The programme's working definition of high tech is: 'innovative and emerging technologies that offer new affordances to educators and learners'. Examples are robots, virtual reality systems, sensors, intelligent systems, simulators and online labs. Different forms of high tech play a role in the EST curriculum.
The programme currently explores the following questions:

- Is the range of offered technologies adequate to provide a picture of innovative and emerging technologies for the future EST alumni that will work at schools and industry?
- Do the current levels of knowledge (application and development) needed adequately address the needs of future EST alumni that will work at schools and industry?
- Is the balance between educational sciences and educational technology adequately achieved in the EST programme?
- Should we introduce a course dedicated to technology specifically?

Discussion outcomes and recommendations by the panel

- Graduates from the EST programme need soft skills: they should be able to understand IT-people, explain to them what they want and ask intelligent questions. They need to make the bridge between the purely educational thinkers and the software engineers. Even though they do not have to code themselves, educational scientists need some idea of computational thinking. This may be acquired by taking a basic programming course or a broad course on computational thinking. It does not matter which programming language they learn, they just have to get familiar with the thinking behind it.
- Another way to get familiar with the bridge function is to stimulate students to work on multidisciplinary projects together with students from 'hard tech' disciplines. This could for instance be done in final projects that aim at design-based research, or in an elective course, or in hackathons. The BMS lab and the design lab offer great opportunities for such projects.

Theme 2. Life-long learning

Introduction

The university and the programme see opportunities to offer life-long learning options, and alumni are interested to stay connected. The university's ambition is to make life-long learning a fully-fledged primary process activity throughout the UT. The EST-programme is now searching for direction. Challenges are: high diversity in needs & motivation of lifelong learners, work pressure of lecturers and the need to make the activities cost-effective. Questions that arise are:

- What to prioritize?
- What other opportunities and risks are there?
- What is a good point of departure?

Discussion outcomes and recommendations by the panel

- Educational professionals want to stay ahead of developments, remain connected to the research and to each other. Even the academic conversation, the systematic way of tackling a problem, the different angle may help outsiders.
- The primary target group are alumni, but it can be broadened. Activities for professionals may directly or indirectly lead to more influx in the EST-programme.
- At this stage, the 'how' of life-long learning is more important than the 'what'. Design, test and develop a model that works for all topics and then upscale.
- Start with alumni, not only as consumers of life-long learning, but also as sources of knowledge and experience. Build sustainable structural collaborations between alumni and the programme. Use Comma, which has a great network and is very active. This has the potential for win-win situations. Using alumni as guest lecturers may be inspirational, feed the programme with fresh ideas and authentic assignments, and offer students an extra connection to the professional field. They may also alleviate work pressure for staff. On the other hand it will be interesting for these experienced professionals to participate in education and research as a form of life-long learning.
- The 'trending topics' course may provide an opportunity to build a community and to earn some extra money. Just as this course is interesting for students, it may as well be of value for professionals from outside the programme, for instance through micro-credentials. In the same manner, presentation of final projects may be an interesting option for professionals to stay connected to the field, and for the programme to build a community.
- Again: start with alumni. Do a small survey to consult them about their interests, both in terms of topics and in terms of forms of participation. Stimulate them to come up with ideas.
- Put together a small team to set up the initiative. Reduce team members' workload.

Theme 3. Digital testing

Introduction

The University of Twente has already introduced challenge-based learning in its bachelor programmes. It now has the intention to make this a core value in its master programmes as well. This will mean more teaching practices centred on real-life complex issues, that are interdisciplinary in nature and involve multiple stakeholders. This provides a different context for assessment of achievement and growth. An important issue in this respect is data mining, not only about the end product of a project, but also about the process, which is equally important. Some questions the programme has to come to terms with are:

- How to balance process and end product?
- How about transparency?
- How to assess student independency (use of hints)?
- How to account for error recovery?
- How important is working speed?
- How about validity?
- How about attributed value of process data for summative assessment?

Discussion outcomes and recommendations by the panel

- There are clear hazards in the mining of process data for formative assessment purposes. For instance, students may loose their spontaneity and behave differently. They may practice beforehand and the process assessed may be artificial. Or they may be deterred altogether. It should always be possible for students to make mistakes and learn from them, without being punished. From a formative perspective it therefore seems doubtful to collect process data for formative assessment. On the other hand, the mining of process data may provide interesting information to improve instruction.
- Process mining may be suitable for formative assessment as long as the indicators are well-chosen. You need to measure individual contributions to group tasks, in order to start a conversation about co-creation. 'How are we doing. How can we improve?' If the indicators are good, it is no problem that students anticipate. This means that they are learning. If you take challenge-based learning seriously, it is inevitable to measure the incremental learning process in one way or another.
- Students say that in case of process mining they would want full transparency. What is recorded and measured? What will happen with the recording?
- A suggestion: use scaffolding and eventually make the system give automatized feedback without intervention by the lecturer. This will make students feel more at ease.
- Perhaps give students logging data – individual or group data, whether or not in combination with log data from other groups. Visualise these data in a dashboard. It will stimulate reflection by the students, which is priceless.
- Conclusion: process mining is useful for summative purposes and inseparable from challenge-based learning, but should not be used for summative assessment.