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# Making video tutorials in the classroom – tacit knowledge on display

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**Abstract.** The paper presents the first experiences of teaching design of video tutorials in a ninth semester engineering cause titled "Learning and technology". YouTube's popularity and easy to use programs for video production makes video tutorials a promising educational tool. Students tend to use video tutorial on their own initiative as supplement to curriculum literature or just for fun. The extensive use of simple video tutorials in both formal and informal settings makes it relevant to study in the classroom from a design angle.

The students developed simplistic and creative tutorials. They reflected on the design processes and how to compose efficient tutorials. Additionally, tacit knowledge were displayed visually due to interactions and system behavior. This tacit knowledge on display is one of the greatest potentials of video tutorials.

**Keywords:** Design processes, Tacit knowledge, Video tutorials

## 1 Introduction

What are the challenges and potentials of developing video tutorials in the classroom? The paper reports on the first experiences of teaching ninth semester engineering students design of video tutorials as part of a course in Learning and Technology. The students were from two educational programs: "Welfare technology" and "Learning and experience technology". The course covered learning theories and design of educational technology. As part of the course, the students analyzed and developed their own video tutorials in the field of health, learning and experience technology. Health technology covered applications for rehabilitation and of tracking health information. Learning technology covered e.g. tools to introduce programming and different digital devices. Experience technology were e.g. museums apps.

YouTube's rapid growth in popularity and easy to use programs for video production makes video tutorials a promising alternative to paper tutorials [10]. Students tend to

use video tutorial on their own initiative as supplementary tutorials for new and hard topics [11]. They also see video tutorials just for leisure. The extensive use of video tutorials in both formal and informal settings makes it relevant to study in the classroom from a design angle [4].

The learning approach was inspired by communities of practice and constructionist learning ideas [3; 4; 8]. In communities of practice students work actively together on common projects supported by experts [3]. The constructionistic approach comprises development and exploration of concrete systems in this case video tutorials while the students in parallel are developing internal cognitive learning processes [8]. The learning process is design based, experimental and experience oriented. The idea was for students to read about learning theory and in parallel develop tutorials in small groups.

## 2 Method

The students were required to develop short (maximum 5 minutes) instruction videos in the field of educational technology or health technology in pairs or groups of three. They were to develop storyboards as part of the preparation for the video production. The students developed tutorials using Flash Back Recorder, Camtasia Studio or similar to record screen, sound and webcam. The tools also had editing and sharing functions.

The students were to develop two versions of their tutorial and perform user testing in between in order to promote user centered design processes. Status meetings on the design process were conducted during classes. The student also received lectures on learning theory e.g. tacit knowledge [6], persuasive design[2] and evolutionary learning models[1; 9].

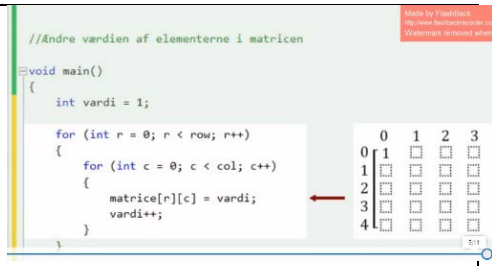
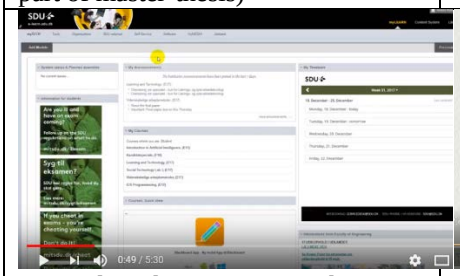
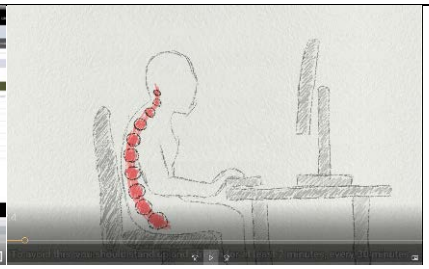
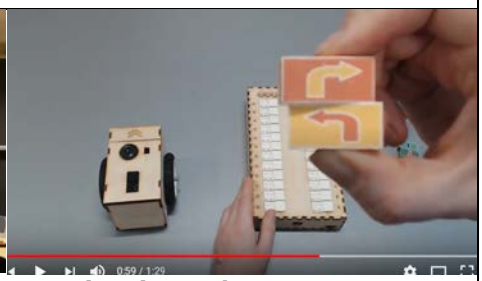
The research method was inspired by action research, supporting a reflective and iterative research process involving both researches and students in a community of practice. The process consisted of iterations of planning, action and fact-finding about the result of the action [5]. Empirical data were the students' tutorials and written assignments, curriculum, observations and a questionnaire.

## 3 Results

In the following, examples of students' tutorials are described. The students developed diverse tutorials in the field of educational technology and health technology, see Table 1. The tutorials were either screen recordings or web-cam recordings.

The tutorials in the first two rows in Table 1 shows traditional screen recorded video tutorials. The first row to the left shows a video recordings of a mobile app combined with power point bullets. The first row to the right shows a tutorial in Danish introducing two-dimensional arrays. The second row to the left shows a screenshot from a tutorial introducing the University of Southern Denmark's Learning Management System. The second row to the right shows a hand drawn animation.

**Table 1.** Screen dumps from tutorials develop by the students.

| | |
|---|---|
|  <br>Applikation til Fjord&Bælt - Instruktionsvideo<br>Tutorial explaining how to use an Augmented Reality Application for the Danish natural science museum "Fjord & Bælt"<br>(AR-application was developed as part of master-thesis) |  <br>Tutorial in Danish explaining two-dimensional arrays in C# |
|  <br>Tutorial explaining new students important elements of the University of Southern Denmark's Learning Management System |  <br>Tutorial explaining how to use health-device to improve back health in sedentary work situations |
|  <br>Tutorial explaining how to make gestures using Hololens before wearing the glasses |  <br>Tutorial explaining how to use interactive building blocks to program robot car's behavior. (Robot system was developed a part of a master thesis) |

The tutorials in the third row in Table 1 applied simple webcams. To the left a tutorial showing gestures for interacting with Hololenses and to the right a tutorial explaining how to program interactive building blocks developed as part of a master project.

## 4 Discussion

In the following, we discuss the learning potentials and challenges we discovered.

*Learning potential 1: Tacit knowledge on display.* Making their own tutorials facilitated deep learning for the students. For example, when they related learning theory to their designs or testing of observations. Often learning theory was a bit abstract for engineering students but the application of theory in the design processes made theory more concrete and relevant. Theory on tacit and explicit knowledge [6] gave them a language for articulated reflections on aspects of the learning processes. For example, in the project Fjord & Bælt tutorial (see table 1, first row to the left), the students linked tacit knowledge to things you do in the tutorial while recording like clicking or touching. Additionally, tacit knowledge were observed in the programming of two-dimensional arrays where the learner observed the behavior of the programing environment, which wasn't explicitly articulated.

*Learning potential 2: Creative and simplistic design of tutorials.* The tutorials in the table above shows how very diverse the tutorials were. Some students developed creative hand drawn animations (see table 1, row two to the right). Other students were creative in the way they manually zoomed in on the digital building blocks – simply by bringing blocks closer to the camera lens (see table 1, third row to the right). This supports the idea of YouTube tutorial videos being simple, rudimentary and authentic [4].

*Learning potential 3: From native tutorial consumer into reflective tutorial designers.* It became clear that the students from time to time watched tutorials and during one of the lectures, they were to present their favorite tutorial for either entertainment or study. They also read about designing tutorials [4; 10; 11]. Finally, they developed and tested their own tutorials. Potentially, this gave the students a more reflected perspective on video tutorials. They became more aware of what was easy to visualize and what to expect from an effective video tutorial e.g. recap in the beginning, appropriate pace, length and clear language. They were also exploring the difficulty of making short tutorials no longer the five minutes and deciding what was the most important content. The students were able to reflect on the tutorials they were designing and improve the second version of their tutorial based on test results. Additionally, they were applying theory in the analysis of video tutorials in general.

*Challenge 1: Video tutorials and future profession.* The Learning and experience technology students could easily relate the design of video tutorial to their future profession and some of the students were making tutorials for their master thesis projects. Whereas, some welfare technology students didn't expect video tutorial to be a part of their future profession, even though they sometimes used them as part of their study. In the future, we as teachers must stress why design of tutorials can nuance evaluation of tutorials used in e.g. rehabilitation or requirement specification of tutorials.

*Challenge 2: Diverse science cultures in the two educational programs.* In the questionnaire, the students commented on the course project. Some students from the Welfare Technology program found it meaningless to make two iterative rounds of development. They also found it difficult to relate creation of video tutorials to their future profession. Whereas, the iterative design paradigm was a natural part of Learning and

experience technology students' DNA. The Learning and experience technology students also found development of video tutorial relevant for their future profession. This might be due to the different research cultures and work practices. The Welfare technology students were used to a more positivistic approach of setting up highly structured experiments for testing hypotheses, gathering large samples of quantitative data for subsequently analysis [7]. The students from Learning and experience technology were more trained in qualitative design-based research methods and they were used to participatory iterative design methods [5]. As teachers, we were not aware of different cultures until very late in the semester, so next time we might propose two alternative semester assignments, which might fit better the diverse cultures. Additionally, we might also get the students to reflect on how they would be able to use video tutorials in their profession.

## 5 Conclusion

The paper reported on the first experiences of teaching ninth semester engineering students' design of video tutorials as part of a course titled "Learning and Technology". The challenges and potentials of developing video tutorials in the classroom are summarized below.

Regarding the potentials of teaching design of video tutorials in summary:

- Tacit knowledge on display.
- Creative and simplistic design of tutorials.
- From native tutorial consumer into reflective tutorial designers.

Regarding the challenges of teaching design of video tutorials, the most obvious was the diverse science cultures in the two educational programs. Which we plan to address in next year's teaching.

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