A PRODUCTION WORKFLOW FOR SITUATING EXAMPLES OF KNOWLEDGE IN VIDEO LECTURES
HOW TO SECURE THE REUSABILITY OF KNOWLEDGE

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Summary

Producing quality films that can replace lectures is a resource consuming activity. It also requires a different pedagogy than what is used in the classroom.

We have developed and evaluated a workflow for mass production of filmed examples of knowledge. We implemented the workflow in a university course and then we evaluated to what extent the results satisfied six quality criteria.

The results showed that the workflow: 1) enabled the student to identify the problem situation, 2) supported learning during the film production, and 3) was economically feasible. However: 4) the lack of clear presentations of theories in the films did not motivate their reuse, 5) the lack of restrictions on creativity made the students lose their focus, and 6) the lack of constraints on the format often made it difficult to follow the reasoning in the films. We made three general conclusions:

1. There were strong indications that educational films can be mass produced within tight economical constraints by making the film production a part of the course curriculum.
2. Students need strict guidelines when designing the dialogues.
3. The role of the teacher has to be more active in the workflow to secure the quality of the films

Background

Even though most students in Sweden have financial aid from the government they are forced to work to make ends meet. Students have less time for school as their outside activities such as work and other obligations increases. Students cannot attend all lectures or chooses to attend online courses at a higher degree since it fits their schedules better (Wettergren, et al. 2008) During the last two years we have been experimenting with filming lectures and seminars at Stockholm University with the goal of allowing students to gain the knowledge required to pass a course and at the same time allowing them to study at their own convenience and pace. Three major problems have been encountered: (1) It is difficult to design the presentation of knowledge in order to make it reusable outside the class room, (2) Producing quality films is very resource/time consuming, (3) The pedagogy in a film must be different than the pedagogy in a lecture room in order to motivate students.
After eight years of experimenting with students creating situated examples of theories we found a solution to problem one above. We verified that knowledge can be made more reusable by reformulating the curricula into short questions and answers related to examples. We also found that this work could be done as assignments by the students while they were studying the knowledge. The situating of knowledge into stored examples makes it reusable for other students outside the classroom. (Kjellin, Stenfors 2003 & 2004; Kjellin 2005). Problem 2 and 3 as described above are dealt with in this paper. In the research iteration described in this paper we will show results from experiments with mass production of films that contain the exemplified knowledge from the course curricula. The films are based on variations of student’s storytelling of dramatized theories. We have been well aware of problems related to stories as carriers of knowledge as described in (Thody et al. 1997), where it is stressed that storytelling is restricted to a metaphorical description of knowledge. We believe we have solved problems related to this by combining storytelling with formal interpretations of the theories and thus the stories or examples are only used as illustrations of the presented theoretical content.

Purpose
The purpose of this paper is to develop a workflow including a format for mass production of filmed examples of knowledge allowing for reuse, thus making our courses available to students who cannot attend lectures and seminars.

Methodology
A workflow for film production can be designed in a large number ways and it is difficult to determine which way is the best. An analogy to this is that when one is building a bridge across a river one can never say beforehand which type of bridge is better than another, since the complexity of possibilities are endless, and two entirely different bridges can be just as good. We therefore decided to use an iterated type of design that can be classified as a mix of action research, design science, and an iterative prototyping. This was carried out using the following process:

![Figure 1 Research process](image)

Lessons learned from previous iterations
One year of informal filming experiments resulted in the following experiences:
1. The students scripts of knowledge tended to be superficial and not focused on the theory it should exemplify and explain
2. Students were often very creative in ways that were not beneficial for the purpose of the course, i.e. to secure that the students would learn how to apply a set of theories and models.
3. Students often presented descriptions on a level of abstraction that made it difficult for other students to follow their line of reasoning.

The above “lessons learned” made us realize that it was necessary to formalize the workflow in a new way. The results of the “lessons learned” inspired us change the requirements for the redesign of the previous workflow. In addition we drew inspiration from Bonk (2004) which describes how examples can be designed in Web-based distance education, and from Freeman (2005) who adds a set of requirements for producing good reusable stories for educational purposes.

New requirements – this iteration

The new requirements were derived from analyzing the problems we had with the previous workflow and outside sources as described above. The new requirements were:

1. **Enabling individual identification.** All theories must be situated in examples where the individual student can identify the relevance of the example. This is necessary for the students to be able to explain complex theories to each other in a motivating way.

2. **Continuous active learning.** The students should be motivated to stimulate each other into an active learning at each step of the workflow. They should be learning while producing knowledge.

3. **Economically feasible.** It should not be necessary to invest in additional expertise to produce the films, but this should be done within a normal course budget, given the needed technology is available. The initial quality check of the knowledge could therefore be done as peer reviewing.

4. **Motivating reusability.** The films that came out as the end product of the workflow should be tested and it should be verified that they were reusable.

5. **Restricted creativity.** The students should not be allowed to engage in any creativity that was not aimed at exemplifying the theoretical essence of the topic they had been assigned.

6. **Format of recording.** In order for the filming to be as professional as possible, the students had to design their dialogues to follow a set template of how their conversations should flow when presenting their message in the studio.

Implementation of new workflow

Here we will just describe the steps in general in order to focus on the most important parts of the work-flow:

1. Teachers will divide the course curriculum into a set of theories or topics. Each student group must design a presentation of examples of theoretical content in the topics assigned to the group.

2. Each group develops examples of the theoretical content that is situated as a story or as questions and answers in a debate or similar dramatizing. This is done in a set of seminars. The examples are designed for being filmed.

3. The groups evaluate and refine their presentations in seminars where each group teaches other groups the theoretical content they have transformed into examples.

4. Finally the examples from each group are filmed in a studio, where there is also a filmed debate concerning the theoretical content of the examples.
The empirical studies
We evaluated the results from our experiments out of three perspectives. First we asked 65 students about their opinion of the workflow. They answered questions like: 1) Would you like more courses to be like this one?, 2) Do you want to see the examples filmed by the other groups?, 3) What is your opinion of the theoretical content in the films? etc.. Altogether 12 questions were used to give a picture of the workflow and the reusability of the films. We then went on to evaluating the technical and pedagogical design of the workflow and format of the films using interviews with three expert colleagues in the field of distance education. Finally we asked students that had not participated in the course to react to films done by other students and asked questions like: 1) Did you understand the theoretical content of the films?, 2) Would you like to make a similar assignment in the next course you are taking?, and so on.

Summaries of results
The evaluation enabled us to make conclusions concerning the extent to which the requirements had been satisfied:

1. **Enabling individual identification.** Most stories and examples were experienced as engaging and entertaining and allowed the students to experience the feeling of the problem and the solution in the example.
2. **Continuous active learning.** A majority of students claimed they had learned very much from participating in the seminars. Overwhelmingly positive results.
3. **Economically feasible.** This requirement was satisfied
4. **Motivating reusability.** This requirement was only satisfied for a minority of examples (4 groups out of 10) which is concluded as a failure for the workflow and format. The dialogue was not clear and explicit enough and contained too many metaphorical insinuations.
5. **Restricted creativity.** This requirement was not satisfied. Five of the ten groups got carried away by the creative task they were working with which made them lose their focus on the most essential and significant aspects of the theory they were to exemplify. The most outstanding weakness was that the students did not focus the dialogue of the films on the most significant parts of the theoretical content.
6. **Format of recording.** This requirement was only completely satisfied by three of our ten groups. The dialogues of the films were sometimes difficult to follow. Students tended to engage in extensive dialogues that were not well suited for the film format. There was generally a lack of structured meta-discussions that explicitly told the viewer “the moral” of the story.

Conclusions
In the beginning of this paper we stated that the first question was already answered so we would address two remaining two questions, 2) the economical feasibility of video recording of this kind, and 3) the needed pedagogy to make video work as a tool for gaining knowledge.

With regards to the economical feasibility we found that the proposed framework presents a solution that works. Designing and making the films was completely integrated in the works done by the students. This work required no extra resources apart from the technical equipment. Incorporating the video recording and editing into the assignments takes away a huge workload from the teachers and it offers the students a chance to revisit and edit the
material as they see fit, thus learning the material again while making the production better and clearer.

Examining the pedagogical approach we consider the presented approach as a failure with clear indications that much more work is needed on designing constraints on reusability and excessive creativity, and on the format of the final recording. The previous constraints should be improved by incorporating more checks, balances and teacher involvement in the planning and storyboard phases of each group's work in order to ensure that the dialogue in the films is focused on the essence of the assigned topic and the meta-discussions. This should help in creating reusable videos, restrict some of the creativity that overshadowed the students, and secure a dialogue format suitable for films.

The drawback with the workflow was that it did not secure high quality student presentations. To secure the quality, the teacher needs to be much stricter when monitoring the theoretical content of the students' work during the course. This could be done in a number of checkpoints, where students would be supported in designing a dialogue that must be entirely focused on exemplifying a theory in a way that makes the theory the essence of the story. Such types of checkpoints are common in university courses. The teacher would also have to work as a film director in the filming phase, with a strict control of how each little part of each dialogue should be filmed to have the desired effect on the future viewers of the film. To what extent the resources for such additional work for the teacher could be done without threatening the economical feasibility of the workflow, as described above in point 2, will be checked in the next iteration of the research.

To sum up the three conclusions from the presented experiments:

1. There were strong indications that educational films can be mass produced within tight economical constraints by making the film production a part of the course curriculum.
2. There was only a small minority of students who managed to create reusable and pedagogical dialogues in the films which indicated that the reusability and pedagogical value of the films will not be acceptable unless students have more constraints on what is an acceptable dialogue in the films.
3. The role of the teacher has to be more active in the workflow to secure the quality of the filmed results.

The new constraints, referred to above in point 2 and 3, will be investigated in the next experiment that has already been started. In this new experiment we will implement the changes as was described in the conclusions above.

Critical reflections
The complexity of the work indicates that there may be a lot of success factors that were not covered. We do however advocate our action research design approach, since we feel that more traditional approaches would be too time consuming. The advantage with the approach is that we were able to discover what was missing without having to go very deep in formal evaluations. Now we can proceed with designing new constraints on the dialogue in students' assignments.

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