

Designing web lectures - Bridging design theory and educational practice through an inductive approach

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Abstract: - This paper explores the potential of an inductive approach to bridging IS design theory and the educational context where the design is to be implemented. The findings indicate three major advantages of deriving an emergent design concept that is rooted in actual design practice. Firstly, this approach generates design concepts that are likely to be situated in existing technological infrastructure. Secondly, it introduces a bottom up focus on multimedia production issues, where lean production is put at the centre. Thirdly, and finally, a natural consequence of an inductive approach is that system design practice becomes evolutionary rather than revolutionary.

Key-Words: - distance learning, web lectures, design concept, streaming video, learning management systems

1 Introduction

There is a growing interest in how multimedia technologies could inform design for competence development and scholastic learning. The existing body of research in this area is however dominated by evaluation studies of more or less innovative prototypes and pilots, and the focus is more often on the learner, learning outcomes and organisational effects rather than on the design process itself. see for instance [1, 2, 3, and 4].

In an influential paper from 2002, Markus, Majchrzak and Gasser [5] present a model for IS design theory (based on the work of Walls [6]), where a design framework should be firmly rooted in a kernel theory that guides the elicitation of requirements, consequently transformed into principles for design and development. Examples of work that use this (or similar) approaches to multimedia design for learning and competence development are Harrington & Oliver [7], Hung & Chen [8], and Hardless [9].

Applying the approach suggested by Markus et al. [5] is likely to generate design frameworks (i.e. theories) that are theoretically sound. Still, a central problem is to bridge a generic design theory with the specific contexts where theory is to be applied in actual design practice. Hardless [9] suggest that design concepts could be instrumental to that effect.

“Design concepts served the role as an intermediate conceptualisation between design theory and concrete prototype. A design concept is here a collection of general ideas and principles for a type of CDS [Competence development system]. In other words, a definition of a particular type of learning intervention abstracted beyond

specific instances or realisations based on the design concept.” [9]

Hence, design concepts are to be derived from, and evaluated against the design framework (see fig 1.). Such a deductive approach to the creation of design concepts is subsequently fairly insensitive to the specificities of contexts and practices. Instead, appreciation of practice becomes the centre of attention when the design concept informs the design of a particular system.

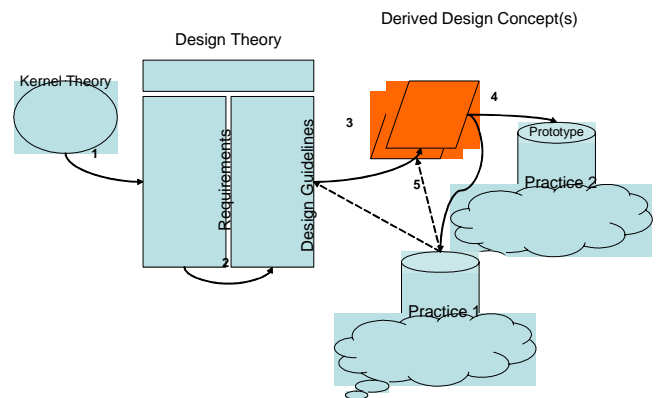


Fig. 1. Deductive approach to design concepts.

1. Kernel theory generates requirements for the phenomenon design is intended to support and develop. (2) Requirements are transformed into design guidelines. (3) Design concepts are derived from the design theory. (4) Design concepts are realised into prototypes and systems in various practices. (5) System evaluation feeds back to design concepts and design theory.

In many educational settings multimedia is widely utilised in various design practices often driven without support of design theories. Under such circumstances,

we argue that introduction of design theory could benefit from an approach that starts with an understanding of existing practice.

In this paper we propose an inductive approach where a design concept originates from an in-depth analysis of patterns and similarities of existing designs in a given practice. The case organisation of this paper had, at the time of the study, worked for one year with streaming video as a media for delivering web lectures. The aim of the action research project is to extract an emergent design concept for web lectures that is both rooted in practice and informed by existing design theories of educational multimedia. The aim of this paper is to present and discuss the inductive approach to creation of design concepts.

The findings imply that the main three major strengths of an inductive approach are

- Design concepts become better rooted in existing technological infrastructure
- Design concepts are more sensitive to existing means for lean production
- Cultivation and evolution of existing practice is likely to reduce the risk of system rejection (that is sometimes a problem relating to more revolutionary approaches)

Furthermore Design concepts (both derived from theory and emerged from practice) are argued to be an optimal level of abstraction for communicating techno-pedagogical ideas within and across educational institutions.

The next section of the paper outlines the research approach that was used in order to extract a design concept for web lectures. This is followed by a section that presents existing design theories for educational multimedia. Subsequently the empirical results of the study is presented and discussed. The paper ends with conclusions and thoughts on further research

2 Research approach

The inductive approach for extracting a design concept for web lectures basically followed a three step process (fig. 2.). Firstly a selection of 5 courses that used multimedia lectures were analyzed with respect to three different perspectives (Lecture narrative, Interface and Interaction, and Learning context). Secondly the students of the selected courses were presented to a questionnaire aiming at surveying their perceptions and attitudes towards multimedia in education in general and web lectures in particular. Finally, the design elements, extracted through the first step of the research process, were reviewed with existing design frameworks as an analytical lens.

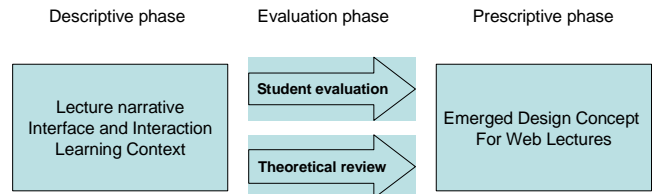


Fig. 2. Overview of the research process

2.1 Collection of design elements

The web lectures were analyzed from three complementing perspectives that together would describe techno-pedagogical design elements that constituted candidates for an abstracted design concept. The selection of design elements were conducted on both quantitative grounds (i.e. frequently occurring design elements were included), and also on qualitative grounds (i.e. pedagogically interesting design elements were

Inspection with respect to (1) Lecture narrative included aspects such as lecture length, dramaturgy, video clipping and rhetorical structure. (2) Interface and Interaction focused on teacher student interaction, and screen design. The (3) Learning Context emphasizes how the web lecture are integrated in the instructional design of the courses.

2.1 Student evaluation

An online questionnaire was emailed to all students in the courses that were included in the study (n = 33). The survey was centered around the following two themes:

- Student attitudes towards technology supported education in general, and web lectures in particular
- User behavior in terms of how web lectures were integrated into educational practice.

The design elements were then filtered through the design frameworks of Hung and Chen [8] and Harrington & Oliver [7] which are outlined in the following section

3 Theory

3.1 Design frameworks for multimedia and learning

According to Herrington and Oliver [7] instructional multimedia can and should use situated learning as an approach to design. They summarize the characteristics of situated learning for design of multimedia in a framework with three equally fundamental elements: the learner, the implementation and the multimedia program, see figure 3.

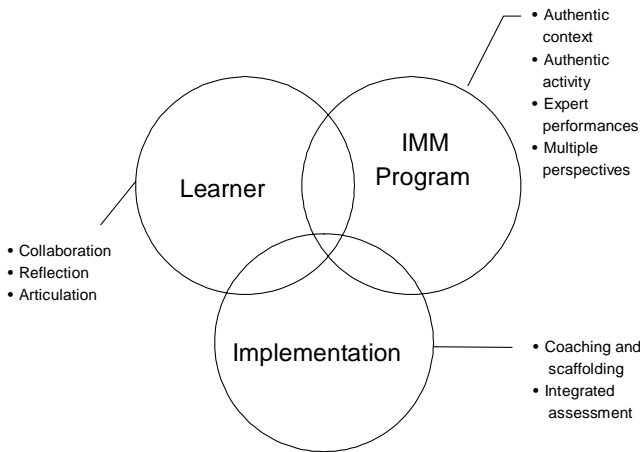


Fig. 3: Constitutive elements of situated learning in interactive multimedia

Designing the role of the multimedia program involves authentic context, authentic activity, expert performance and multiple perspectives. Authentic context refers to the use of multimedia to, not only provide suitable examples from the real world, but also provide purpose and motivation for the program and a sustained and complex learning environment that can be explored at length. Authentic activity points to the fact that the environment should encourage students to find and solve problems and not gives the students too many hints and suggestions. Expert performance relates to the use of multimedia to present experts performing skills and multiple perspectives is illustrating issues from different perspective and make it possible for the student to assume different roles and explore the material in a non linear fashion.

Designing for the role of the learner involves collaboration, reflection and articulation. Collaboration in interactive multimedia needs to be designed to engage higher-order thinking so the collaboration between learners requires them to predict and hypothesize, and then suggest a solution. Along the same line is reflection upon a broad base of knowledge supposed to be encouraged. The environment should also ensure that the learners work and discuss in groups, present their findings in order for them to articulate, negotiate and defend their knowledge.

The implementation of the program needs to enable the teacher to be a coach and to take a more supportive scaffolding role. It also needs to have an integrated assessment wich does not nesserarly have to be done by conventional methods such as examination and essays, but can be in the form of statistics of the learners path through multimedia programs, diagnosis or reflection and self-assessment.

Hung and Chen's [8] design framework identifies four principles of learning (from a situated learning and Vygotskian view) and derives from these design considerations for e-learning: Situatedness,

Commonality, Interdependency and Infrastructure (as cited in Hardless [9]). See the below figure:

Principles of situated cognition and Vygotskian thought	Design considerations for e-learning
<p>Situatedness</p> <ul style="list-style-type: none"> Learning is embedded in rich cultural and social contexts - acquiring both implicit and explicit knowledge. Learning is reflective and meta cognitive, internalizing from social to the individual. 	<ul style="list-style-type: none"> E-learning environments should be Internet or web based so that with such a common networked platform, learners can access the learning environment in their embedded and situated contexts - anywhere and anytime. E-learning environments should be portable as far as possible so that they can be used in the context. E-learning environments can focus on tasks and projects, thus enabling learning through doing and reflection-in-action. E-learning environments can focus on depth over breadth, thus enabling learners to analyze communicative 'speech acts'.
<p>Commonality</p> <ul style="list-style-type: none"> Learning is an identity formation or act of membership. Learning is a social act/construction mediated between social beings through language, signs, genres and tools. 	<ul style="list-style-type: none"> E-learning environments should create a situation where there is continual interest and interaction through the tools (e.g. mind-tools) embedded in the environment. E-learning environments should capitalize the social communicative and collaborative dimensions allowing mediated discourse.

	<ul style="list-style-type: none"> E-learning environments should have scaffolding structures which contain the genres and common expressions used by the community.
<p>Interdependency</p> <ul style="list-style-type: none"> Learning is socially distributed between persons and tools. Learning is demand driven - dependent on engagement in practice. 	<ul style="list-style-type: none"> E-learning environments should create interdependencies between individuals where novices need more capable peers capitalizing on the zone of proximal development. E-learning environments should be designed to capitalize on the diverse expertise in the community. E-learning environments should be made personalized to the learner with tasks and projects as embedded in the meaningful activity context. E-learning environments can track the learner's history, profile, and progress and tailor personalized strategies and content.
<p>Infrastructure</p> <ul style="list-style-type: none"> Learning is facilitated by an activity - driven by appropriate mechanisms and accountability structures. 	<ul style="list-style-type: none"> E-learning environments should have structures and mechanisms set up to facilitate the activity (project) processes where learners' are engaged in. E-learning environments have the potential to radically alter traditional rules and processes that were constrained by locality and time.

Fig 4: Learning principles and design considerations (Hung and Chen [8]).

4 The case

The case organization is a small Scandinavian university college with approximately 10000 students and 500 staff

members. The study was conducted at the department of Economics and Informatics and was focused on courses in the field of systems development, digital media, and programming. The courses

4.1 DisCo

The DisCo system is based on a set of modules that the teacher chooses from. The modules are divided into three categories, Information, Material and Communication. In the Information category the modules are Students (a list if the registered students automatically generated from the student registration data base), Course description (the official curriculum automatically created from a data base), Teachers (a list of teachers involved in the course) and Schedule (a schedule automatically generated from the official schedule data base). The Material category contains the modules files (where teacher can upload course related files) and links (a list of links created by the teachers). The communication category consists of Debate forum (a threaded debate forum for discussion between students and teachers), E-mail (makes it possible for teachers to send e-mail to students and vice versa), E-mail with archive (same as E-mail but the correspondence is saved), Hand in – teacher controlled (the teacher creates groups of student so one group hands in one file), Hand in – student controlled (same as previous but the students themselves defines the group) and Hand in (the students can upload files individually). When a teacher creates a course on DisCo she chooses from the above modules or selects “standard course” and a course with the modules Course description, Students, Teachers, Files, Links, Hand in and Debate board is created.

4.2 The recording studio

The recording studio is equipped with a Sony DV camera, a professional microphone, a document camera and a computer with Windows XP. The software used for creating web lectures is usually the freeware Microsoft Producer, but the movie editing program that comes with the operating system, Movie Maker, is also used by some of the more computer experienced teachers. The background wall is draped with a light blue curtain to give the films a calm background. The lighting is the standard fluorescent tubes, but with papers taped in front of them to dim and even the light in the studio and to reduce reflexes in e.g. teachers' glasses.

4.2 Microsoft producer

MS producer was chosen as the tool for creating and publishing the streamed lectures. With MS producer it is possible to capture audio, video and activities on the screen. It also supports Microsoft PowerPoint-slides and html documents. When creating a web lecture with MS

producer the teacher can choose to narrate PowerPoint-slides, record audio and video files, take screen dumps or capture screen activities while recording speech. This is all saved in the current project where it is also possible to import PowerPoint-slides, pictures, html document or audio and video created with another program. Then the teacher drags the different media to a time line where they are either displayed in parallel or in sequence.

When the media is arranged in the time line one or more presentation templates are selected. The template rule where the different medias are displayed and adds a table of contents e.g. the table of contents to the left with PowerPoint-slides displayed to the right while audio is played through the beginning of the lecture and then a video with sound is shown where the PowerPoint-slides was presented earlier, and during the entire lecture a html document is shown at the bottom with a list of links.

4.3 Design Elements of Web lectures

Interface and Interaction

The teachers at UTU commonly use the above mentioned infrastructure to create web lectures, although the choice of template differs. In figure 5 the teacher/s are visible in the top left corner with the table of contents beneath. To the right the slides for the lecture are shown. In figure 6 the slides and the table on contents is the only things shown while the teacher is talking about the topics on the slides. Figure 7 is video only with a table of contents and figure 8 is an example of a web conferencing videostream.

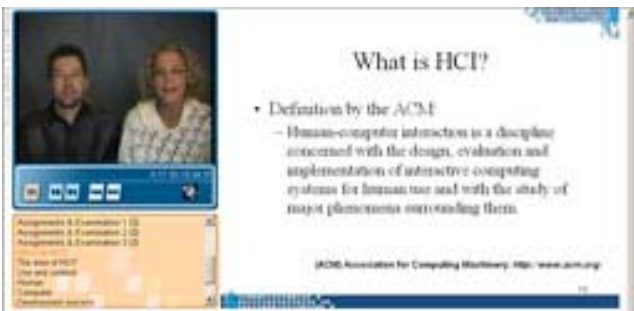


Fig. 5: Video and slides with a TOC



Fig. 6: Sound and slides with a TOC

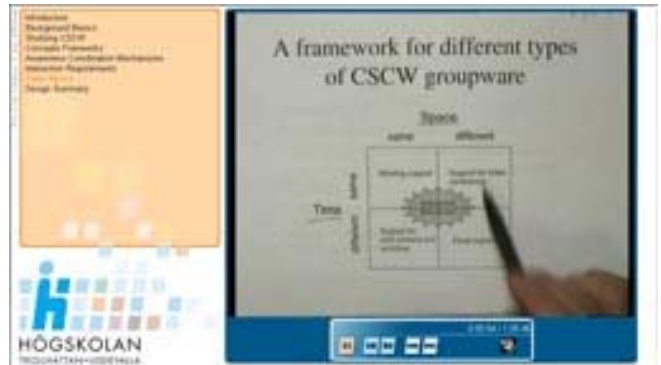


Fig. 7: Video with a TOC (document camera in this example)



Fig. 8: Video recording of a lecture

What template to choose is driven by the characteristics of the lecture. A lecture where the teacher e.g. demonstrates how different microphones work by talking straight at them or away from them uses the video only template. A lecture that more or less is a talk about what is on the slides uses the sound and slide template and the video and slide template is typically used for an introduction where it is relevant that the teachers are visible to give the students a face behind the voice and to create a personal atmosphere. One problem with MS producer's templates is that there is no template that can be used for combining both slides and video in a lecture. I.e. if we look at figure 4 it would be preferable for a lecture using both video and slides that when the video part of the lecture (often screen captures, e.g. how changes in XHTML code looks in a web browser or how a program works) appeared it would appear in the same spot as the slides previously where in. Some teachers simply switched template and consequently the layout when showing video while others took the time to create their own (the template are determined by CSS) but with less features as in the default ones such as skip 10 seconds ahead.

Most of the lectures are only used a couple of times, after which the teacher makes a new updated streamed

lecture. These lectures are not worked up to the extent that everything is perfect, instead shorter pauses and smaller slips of the tongue are corrected on the fly and do not result in a re-recording of the passage. Some lectures though, are of the character that they do not need constant updating and can therefore be reused to a larger extent. These are more worked up and in some cases where the teachers are knowledgeable in other tools that can be used to produce web lectures (such Adobe Premier and Macromedia Flash), they can be very professionally done. An example of this could be a lecture created with Macromedia Flash where the teacher is, after an introducing text with the name of the course and a jingle, welcoming the students to the course. Then the background changes to a slide with the course outline with the teacher still in front but not blocking the text. After that the teachers fading out and a program is being demonstrated while the teacher comments without any unwanted pauses or colloquial expression.

Contrary to this some lectures are held via ISDN video conferencing as a real time lecture (where students can interact with the teacher) and at the same time being recorded. The lecture is later made available "as is" for the students who where not able to attend the web lecture or the ones who for what ever reason wants to see lecture again.

4.3.1 Lecture narrative

The majority of the web lectures have the same disposition and structure that the campus based lectures have. We see though examples entering new elements in the web lectures. One lecturer put in interviews with initiated colleagues. The length of the lectures are the same if we look at how many slides that are being used and what is being said on each slide. Although if we look at the time of each lecture, the normal three times 45 minutes lecture ends up being around an hour, give and take 15 minutes. This have the result that the students themselves need to pause if they are not to sit for an hour straight while receiving concentrated information. There where though examples of teachers breaking down the lectures in shorter 10 to 15 minutes modules.

4.3.2 Learning context

With the lecture, the PowerPoint presentation or a PDF document with the lecture notes are usually published on DisCo so the students can prepare themselves before the web lecture or at least use them to write their own notes on. In addition to the lectures some courses have Teacher On-line (TOL) sessions where the teacher is available for questions, either via e-mail or a groupware program called Marratec. During this session the teacher answers questions about a task that has been given to them or other things unclear to the students. Some use the web

lecture as a teaser or topic for a mandatory discussion in the debate board where the students are to participate actively with at least 3 entries, but in general the debate boards are rarely used.

Although most of the lectures are streamed and must be seen at a computer with relative high speed connection, some web lectures where downloadable, and one teacher made the sound from the lecture available since some of the students attending the course had trouble watching the web lectures on a Macintosh computer. Since the teacher did not have any video or demonstration in these web lectures a printout of the slides with sound worked fine according to these students. The possibility to take part of the lecture even more freely without having to use a computer with Internet made it very appreciated, even if this only where in the latter part of the course.

4.4 Student evaluation

Of the respondents 40% are female and 60% are male. 93% of the students more or less used the Internet 14 hours a week or more. 37 % of the students where between the ages of 18-25 and another 37% between 25-35, the rest where in the ages between 35-45.

4.4.1 User behaviour

When asked the question if they often utilize the functions pause, fast forward and fast backward, 57 % totally agreed, 24 % agreed in part and the rest had no opinion. 63% agreed totally or in part when asked the question "I watch the entire lectures more than once" whereas 15% disagreed in part or totally and the rest was of no opinion. When asked if they watched parts of the lecture more than once 90% agreed in part or totally and 10% disagreed in part. 70% of the students took notes during the lecture while 18% did not, 9% where of no opinion. 48% felt that it was a disadvantage not being able to ask the teacher questions during the lectures, 21% did not see that as problematic and 31% did not have an opinion.

"The interaction with the teacher does without a doubt suffer, mail or even chat can only compensate some of the possibility to ask questions immediately, so a lot of the time saved from not having to travel is lost because of the time consuming task of understanding the material yourself"

4.4.2 Student attitudes

70% of the students felt it to be very important that they could choose when to watch a lecture 15% thought is was important and 15% felt it not to be of importance. 94% of the students where more or less satisfied with the course as a whole and a 100% where more or less satisfied with the web lectures. 57% of the students preferred distance education to traditional education,

24% did not and 15% did not have a point of view on this.

“For practical reasons, I work fulltime and live on the country side, I prefer distance education. I don’t really have any experience of any other kind of education so I have no pedagogical preferences either way.”

4.4.3 Pro and cons

54% did not feel that it was of importance that the lecturer was visible as a video stream during the lecture, 18% felt it was important and 28% had no opinion. 82% thought that their Internet connection was sufficient for taking part of the web lectures.

“It is a negative thing that the streamed lectures are locked to Internet Explorer. This is not an anti-Microsoft statement but merely a platform independency statement.”

4.5 Implications for web lectures from theory

Authentic context (Herrington and Oliver 1995) in a web lecture denotes that multimedia should be used only when it contributes to the lecture, not just because it is possible, e.g. give an impression of the speaker or helping disabled to take part of the content (Nielsen 2000). Multimedia should also be used to, if possible, provide real examples e.g. use video to bring student a richer material when learning about observational research methods (Torgerson et. al. 2003). Authentic activity for a web lecture could for instance be to present several multimedia clips without hinting the students which are relevant. An example of involving expert performance and multiple perspectives in web lectures would be a teacher recording screen activity while recording speech during searches on different search engines. These would be compared to each other and the student could then go to the different search engines and search themselves.

Moving on to the role of the learner the web lecture needs to provide for and encourage collaboration, reflection and articulation. A chat system on connection to the video [12, 13] would enable students to collaborate during lectures they watch simultaneously and the possibility to annotate a web lecture [14] that encouraged discussion would make it possible to collaborate over time and also make the students articulate and reflect upon knowledge gained.

The debate board and chat could also be utilized by the teacher to take a coaching and scaffolding role by being active, enthusiastic and supportive in the ongoing discussions [7]. This would also create a commonality [8]. Assessments usually take place at the end of a course and maybe at some points during the course, but an assessment of the web lecture could be in a summative way where it is pointed out to the students what areas and topics he or she should have gained

knowledge on and they would be encouraged to reflect on the lecture. A quick questionnaire could also be a way of assessing whether the main points of the lecture was understood. Analyzing web logs could be a way to evaluate the web lecture for the teacher and find out if some part of the lecture was frequently skipped or re-viewed giving implications for improvements.

The mere name web lecture indicates that it is made accessible through common networks, but it is important to consider platform independency and not assume that everybody uses Internet Explorer on a Windows system even if it is the dominating combination. With the increasing growth and development of mobile technology web lectures it is desirable to adapt the web lecture to be viewed in a relevant environment through mobile technology [15] and in this way enact the situatedness recommended by Hung and Chen [8].

5 Proposal: An emergent design concept for web lectures

To summarize the lesson learned from the descriptive and evaluative phases outlined above we propose a (tentative) synthesis of a web lecture design concept. Input to this from existing practice is, as described earlier, mainly about production issues and overall structure of web lectures as learning interventions. Input from theory adds important focus on lecture content and social and collaborative aspects of educational practice and learning.

As stated by Hardless [9] a design concept is a collection of ideas and principles that guides the design of a specific type of learning intervention. There are of course many possible narratives for presenting such a design concept, and given the nature of web lectures we choose to outline the design concept as a series of guidelines that are intended to cover the full spectrum of possible scenarios and contexts in which web lectures may occur.

5.1 Overall structure

Producing the lectures in smaller modules does not only make it easier to update for the teacher, but it could ease the process of enlightening issues and questions from different perspectives and enables the students to explore the material in a non linear way [7]. This is further strengthened from our study where almost all the students claimed to watch parts of lectures more than once. Not having to start the entire lecture and skip forward to or even worse, have to wait several minutes before, the material of interest appears. Most topics in higher education demands constant updating and revision. This gives rise to a need for lean production where the current

practice and infrastructure is taken into consideration and being adopted.

5.2 Lecture content

Making the lectures even more flexible than merely asynchronous where ever there is a computer with a fast Internet connection is also a result from our study. Some students did not have the platform (Internet Explorer preferably on a Windows XP operating system) the web lectures where designed for. Since the lectures where streamed the students did not have the possibility to download them and watch them on another computer without Internet connection. In some cases it could be sufficient with just the sound file from the lecture.

The collaborative aspect is emphasized by both Herrington and Oliver [7] and Hung and Chen [8], enabling reflection through articulation of their knowledge. Our study showed that the half of the student felt a need to be able to ask the teacher questions during the lectures. This is not doable when lectures are streamed asynchronous, but a debate board where students could ask and answer each others questions knowing that if no peer had asked the question the teacher would within a couple of days. This gives the teacher a supportive scaffolding role [7] and forces the students to articulate and reflect upon what they know and do not know and also helps build a community feeling.

6 Discussion

As a starting point for a discussion of the values of an inductive approach to the creation of design concepts it is important to stress that our argument is not about choosing between user-centered versus expert driven methods of design and development. It is merely to suggest a course of action that arrives at design concepts that are well grounded in both practice and theory. (The general process is described in figure 9). A second general reflection is that an inductive approach could have an obvious disadvantage compared to a more deductive strategy in terms of the design concept becoming too close to the practice from which it was abstracted. However, we believe that the situated components of an induced design concept are important in any context, and furthermore have its counterparts in other settings. The major advantages that have surfaced through the research process could be summarized into three interrelated aspects relating to (1) Technological infrastructure, (2) Means for production, and (3) User adoption and adaptation.

6.1 Technological infrastructure

It is evident that the existing systems, such as DisCo, Microsoft Producer, and the video conferencing software have had a very strong impact on the existing web lecture practice in the case organization. We believe that teacher and student familiarity with these environments are central aspects of a high level of diffusion with respect to web lecturing. It is therefore important that the suggested design concept respects the affordances and limitations that this infrastructure provides. We even think that the strategy should be to supplement (rather than replace) these systems, should they prove to be insufficient for future needs.

6.2 Focus on lean production

Tightly linked to the issue of existing tools is the aspect of the production practice that has evolved on top of the technical infrastructure. There seems to be great values attached to the fact that the emergent models for production has had an implicit focus on lean and scalable production. Web lecturing requires constantly ongoing design work, where new lectures have to be designed all the time. Issues relating to development of educational multimedia are seldom explored in design theories (and subsequently in design concepts derived from those theories).

6.3 Adoption and adaptation

An inductive approach is implicitly linked to a design strategy that is more focused on evolution and cultivation than on revolution of existing practice. We believe that the cultivating approach is valuable with respect to students' and teachers' adoption of technology mediated learning interventions. Together with familiar tools and lean production models, an evolutionary approach to design and re-design could contribute to a preferred organizational change. As a natural consequence, innovation of the design practice (and the overarching design concept) becomes incremental rather than radical.

6.4 Communicating techno-pedagogical ideas

Finally it is worth highlighting that discussing the project and the findings with teachers involved in design work, reveals that they appreciate the level of abstraction that a design concept offers. Educational institutions in general prove that instructional genres are very powerful ways of communicating pedagogical ideas, but when it comes to techno-pedagogical design there seem to be a lack of terminology to frame and capture these ideas on a suitable level of abstraction. Here, design concepts (derived from theory and or abstracted from practice) could play an important role for exchanging experiences between designers and teachers within and across educational institutions.

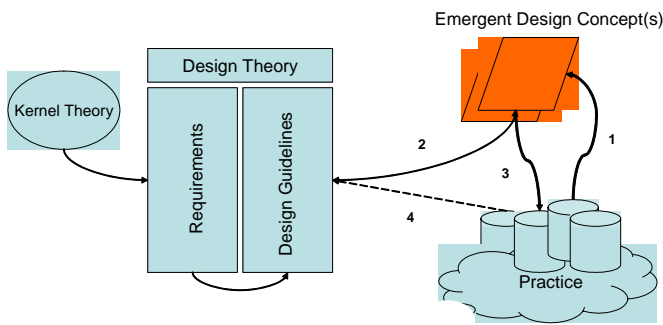


Fig. 9. Inductive approach to design concepts

(1). Existing practice and user evaluation informs the abstraction of a design concept. (2) Existing design theories inform the emergent design concept, which in turn informs theory. (3) The emergent design concepts guides design of new applications, and (4) user evaluations feeds back to theory.

7 Conclusion and Further Work

This paper advocates that an inductive approach to the creation of design concepts for educational multimedia has potential advantages to a strict deductive approach regarding user adoption, production issues and appreciation of existing technological infrastructure. The arguments are based on, and illustrated through, a pilot case where a design concept for web lectures has been abstracted from an existing design practice at a Scandinavian university college. Further work will examine the strength of this design concept through evaluation of web lectures inspired by the proposed design concept.

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