Design & Learning-Centric Analytics

Proceedings of the 6th International Conference on Designs for Learning

23-25 May 2018 Bergen, Norway

Editors

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SLATE

Centre for the Science of Learning & Technology

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Publication date:
2018

ISBN: 978-82-8088-416-9

Published by:
Centre for the Science of Learning & Technology (SLATE)
University of Bergen, Norway

Citation for published version (APA):

Guribye, F., Åkerfeldt, A., Bergdal, N., Cerratto-Pargam, T., Selander, S. & Wasson, B. (Eds.) (2018). Proceedings of the 6th International Conference on Designs for Learning. (1 ed.). SLATE Report 2018-1.

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The Designs for Learning journal, www.designsforlearning.nu is an academic international journal, which is published by Stockholm University, Sweden, University of Bergen, Norway, University of Aalborg, Denmark, and University of Greenland, Greenland.

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FORWORD

We are pleased to present the proceedings from the 6th International Designs for Learning Conference – DfL 2018. This year the conference is taking place in Bergen, Norway hosted by SLATE, the Centre for the Science of Learning and Technology, 23-25th of May 2018. The Designs for Learning conference addresses issues related to designs for learning, technology enhanced learning, design-based research, multimodal knowledge representations, embodied interaction, on-line learning environments, and learning ecologies.

This year we also invited submissions for a special conference thread that focuses on the design of learning environments and the implications of design for learning-centric analytics. This thread addresses issues such as: how the design of learning environments can take into consideration the opportunities for including learning-centric analytics as part of the learning and teaching process; how the design of learning environments influence what kind of data and information that are captured for learning-centric analytics; how data can be derived and harvested from learning environments; how we can include a critical and qualitatively sound interpretation of data from such environments; and how information from learning-centric analytics can be visualized.

As in the previous conference in Copenhagen in 2016, the format for the submissions included both full papers and short papers. This year, however, we have made adjustments to further heighten the academic standard of the full papers and strengthen the ties between the conference and the Designs for Learning Journal. Therefore, the accepted full papers will appear in the journal after an additional round of reviews. At the same time we want the conference to be a gathering-point for the Designs for Learning community and have thus included the option of submitting short papers that can be either work-in-progress or shorter accounts of research studies. In the conference proceedings you will find the short papers in their full length and abstracts of the accepted full papers, workshops, symposia, keynotes and doctoral consortium. The proceedings are published online in the Bergen Open Research Archive (BORA) and are available as open access, with a unique handle and an International Standard Book Number (ISBN).

The full papers accepted for the conference revolve around a broad range of research subjects and practices within the conference theme. These include methodological questions such as design-based research, presentations of educational designs such as online learning and discussions of learning analytics, learning design, engagement and motivation, classroom technologies, MOOCs and literacy, to mention a few. The short papers cover and discuss educational designs such as SPOCs (small private online course), VET (Vocational and Education and Training) and seminar design. The short papers also cover and discuss didactical aspects such as how the use of technologies impacts the composing process of music in education, how to design for code sharing in a Data Science course, and how to engage students in dialogical interactions.

A total of 34 contributions were submitted to the conference: 17 full papers, 5 short papers, 6 proposals for workshops/symposia and 6 doctoral consortium proposals. After a double-blind peer-review of the full papers and short papers, each paper receiving two reviews, 11 full papers and 5 short papers were accepted. Five workshops/symposia proposals and all six doctoral proposals were also accepted. The program committee gave the authors of the rejected full papers the opportunity to resubmit their contribution as short paper for the conference. Only one paper was finally submitted and accepted in this category. Overall, the program committee was impressed by the high quality of the contributions.

At the conference 10 full papers, 4 short papers, 5 workshops/symposia and 5 doctoral research projects will be presented. In addition, we have two keynote speakers: *Associate professor Alexandra Weilenmann*, University of Gothenburg, Department of Applied IT, and Senior Research Fellow *María Jesús Rodríguez Triana*, Tallinn University, School of Digital Technologies and Centre for Educational Technology. We also have an invited speaker, *Professor Richard Halverson*, School of Education, University of Wisconsin-Madison, Educational Leadership & Policy Analysis.

This year we are proud to announce that we have conference delegates from the Nordic countries as well as delegates from USA, UK, and Russia. The conference participants are affiliated with approximately twenty universities. Further, there is a rich variety of disciplines represented at the conference. We hope that this blend of participants will bring forward rich discussions addressing education, learning, and technologies and also create opportunities for new and further collaborations among the participants.

We also take the opportunity to thank the reviewers of the papers.

Program co-chairs:

Frode Guribye, University of Bergen
Anna Åkerfeldt, Stockholm University
Nina Bergdahl, Stockholm University
Teresa Cerratto-Pargman, Stockholm University
Staffan Selander, Stockholm University

KEYNOTE & INVITED TALK ABSTRACTS

Visitor-driven mobile technology use: Reflections on 10 years of studies in museums and science centers

Alexandra Weilenmann

Only a few years ago, it was common to see signs in museums prohibiting visitors to take photos while visiting. Today, we see signs announcing the hashtag to use when posting images on social media and we are encouraged to take selfies with the objects and displays. What happened?

In this talk, I will give an overview of the development and involvement of visitors' use of mobile technology, drawing upon examples from studies I have conducted together with colleagues. I will discuss how museums have moved from being places where objects are put on display for visitors to learn through looking, to being places for participation and performative engagement, and the role that visitors' own technology has had, and can have, in this development.

ALEXANDRA WEILENMANN is Associate Professor of Applied Information Technology at the University of Gothenburg, Sweden. Her research is concerned with the use of mobile communication and information technologies, focusing on how these technologies are brought into play as part of everyday activities. She has been involved in several projects investigating social media and social photography practices in museums, science centers and zoological gardens. These projects have often been conducted in collaboration with these institutions and have involved developing new methodological approaches to understanding visitor-driven technology use.

Learning Design and Analytics: Hidden affordances in the area of design for learning

María Jesús Rodríguez-Triana

The learning design field has produced representations, methodologies and computer tools to assist teachers (or designers) in the creation of pedagogically-sound learning environments. In parallel, data mining and analytics techniques have been used to extract actionable information in many research areas. In the domain of learning technologies, there has been a fast expansion of learning and teaching analytics with the aim of supporting learning and teaching practices. While separately Learning Design and Data Analytics may guide the design and deployment of educational initiatives, their alignment may increase their effectivity. This tandem offers the opportunity to contextualise teaching and learning analytics, provide pedagogically-grounded actionable feedback, and support evidence-based design for learning. This presentation will provide you with an overview of existing proposals, extracting design principles to overcome current adoption challenges.

MARÍA JESÚS RODRÍGUEZ-TRIANA received her PhD in Information and Communication Technologies from the University of Valladolid (Spain, 2014) for her thesis on learning design and learning analytics applied to computer-supported collaborative learning, receiving a PhD thesis award on educational technologies from the eMadrid programme. In 2014, she joined the REACT group at École Polytechnique Fédérale de Lausanne (EPFL, Switzerland) as a postdoctoral fellow and, since 2016, she is also a senior researcher at the Centre of Excellence in Educational Innovation at Tallinn University (Estonia).

Leading Digital Learning for All Students

Richard Halverson

Contemporary school leaders face the challenge of integrating new media learning spaces into standards-based school environments. Fortunately, there are a number of excellent examples that provide design principles to create new forms of hybrid schools. I will discuss how communities such as youth media arts collaborative, video game participatory cultures, and Wikipedia provide design models for school leaders to create accessible digital learning spaces for all learners.

RICHARD HALVERSON is a professor of Educational Leadership and Policy Analysis in the UW-Madison School of Education. His research aims to bring the research methods and practices of the Learning Sciences to the world of educational leadership and interactive media. Rich co-directs the Wisconsin Collaborative Education Research Network and the Comprehensive Assessment of Leadership for Learning project, and was a co-founder and co-director the Games + Learning + Society Research Center. He is co-author (with Allan Collins) of Rethinking Education in the Age of Technology: The Digital Revolution and Schooling in America and (with Carolyn Kelley) of Mapping Leadership: The Tasks that Matter for Improving Teaching and Learning in Schools. He co-directs two federally funded projects that guide his research. First, with Kurt Squire on the National Science Foundation funded CyberSTEM project, which develops video-games for learning and investigates how the data that results from game-play can become evidence for learning and a catalyst for social interaction. Second, with Carolyn Kelley on the Institute for Education Sciences funded Collaborative Assessment of Leadership for Learning (CALL) project to develop an on-line 360-degree formative feedback system to inform and support the work of school leaders. From 2004-2009, he directed a study funded by a National Science Foundation Early Career Award to investigate how school leaders work with teachers to create the capacity for using student achievement data to improve teaching and learning.

DOCTORAL CONSORTIUM ABSTRACTS

Environmental monitoring and the use of sensor generated data in Environmental education

Karin Ekman
Department of Applied Information Technology, University of Gothenburg, Sweden

Abstract

My thesis is addressing the growing expectations of citizen's understanding and active participation in the debates of complex sustainability challenges by taking a closer look at the increased use of digital technology in environmental education. A way to make other actors more engaged in knowledge production and in taking the action needed for socio-scientific challenges could be to let students participate in ICT-supported Citizen Science activities.

I will look closer on the design and implementation of learning activities that will use digital environmental sensors and have visualisations of the collected data. My research questions are addressing how teachers reason about using digital visual representations in environmental education, and how the use of digital sensors can engage students, teachers and other actors in socio-scientific issues.

I am following an Internet of things project that develops smaller portable and internet connected environmental sensors to measure air quality. The sensors are to be used by city officials monitoring air quality, and by citizens and school classes in a Citizen Science inspired manner. The collected data will be visualised. I am using an ethnographic approach, with interviews and participant observations as the main data collecting methods. Video recordings will provide the closer look that is needed to understand the different ways of actions and interactions in the design process.

Since submitting this text, I have recently interviewed teachers, talking about how they use digital tools in their teaching and what aspects to consider when using digital tools in Environmental education. They were also encouraged to express their views on how to use digital sensor connected to an existing Citizen Science initiative in environmental education.

Understandings of Design in Design-Based Research

Peter Gundersen
Aalborg University, Denmark

Abstract

The project addresses the growing trend of trying to implement design methods in other disciplines by focusing on the field of educational research, and more specifically Design-based research (DBR). The initial focus was on conducting so-called design experiments in order to engineer innovative educational environments and simultaneously conduct experimental studies of those innovations. The approach has seen a steady rise in interest since the beginning of the millennium and has evolved from being primarily an American phenomenon to being picked up by educational researchers in Germany, Singapore and the Nordic countries to name a few.

I look into the questions of how this research approach is connected to design. What is designerly about it? What happens when educational researchers adopt designerly ways of working? What are the challenges and what are the potentials?

The empirical material stems from interviews with and observations of researchers within the field framed by literature reviews concentrating on four key characteristics of DBR: the intervention, the collaboration with practitioners, the iterative approach and the generation of design principles.

Digital Games in Education
Exploring Teachers´ Practices and Challenges From Play to Co-Design

Melinda Mathe
Aalborg University, Denmark

Abstract

Digital games have the potential to support increased student motivation and engagement, but their use is not yet a widespread practice in education. Meta-research indicates that empirical evidence in the area is predominantly quantitative with an emphasis on researcher-led, stand-alone experiments. However, recent studies have also cautioned that games cannot be viewed as stand-alone solutions to education and the discourse in the field should pay more attention to the critical role of the teachers. Moreover, the field of digital games is characterized by distinct design approaches which may present different educational opportunities and challenges. While well-balanced educational games can provide a great learning environment, teachers and learners may find themselves in the hand of game developers. Using non-serious games for learning can provide immersive and interactive experiences, but they require extensive expertise and gaming literacy from teachers. The question arises how teachers can navigate the complex digital game landscape, select and integrate games in their classrooms and handle challenges on the way.

In this qualitative multiple-case study we use activity theory to investigate game-based learning practices and challenges of eight K-12 grade teachers in Swedish schools who have integrated digital games in their classrooms. Semi-structured interviews with the participants were conducted during 2018 spring. The findings provide an insight into the teachers´ work and discuss their role as co-designers of the gaming and learning environment as well as the demands this puts on them.

Project-based Data Science Learning of non-STEM Students

Ilya Musabirov
National Research University Higher School of Economics, St. Petersburg, Russia

Abstract

Contemporary university education landscape, pressured to become flipped and online, struggles to reconcile the metric-centred view of students with the educational science and educational psychology theoretical frameworks. Finding the optimal point in this trade-off requires the ability not only to infuse theoretical models of motivation and self-regulation with learning behaviour data, but also to switch from variable-centred to people-centred perspective of learning analytics, and, finally, use affordances provided by this perspective to improve tools for learning designers, instructors, and students. In this paper, I discuss some steps towards these goals on all three levels in the context of a blended undergraduate minor in Data Science for non-STEM students.

"Learning through Construction's" influence on IT Students' Identity formation

Justyna Szynkiewicz
Centre for Excellent IT Education (ExcIted), UiT - The Arctic University of Norway

Abstract

In recent years, there has been significant investment in the incorporation of innovative practices into higher education curriculum. Although there are studies that have provided some insights into IT students' identity development, we need to get a better understanding of how it can be influenced by innovative group learning practices.

The purpose of this research is to provide a better understanding of how university students' IT-identity is shaped through innovative learning during IT courses. This work aims to be a thematic qualitative study with overtones of grounded theory. The analysis will be built on 30 in-depth interviews among students from two study programs; GameLab at NORD University and Customer Driven Project at the Norwegian University of Science and Technology.

It will be an inductive study looking at the process of IT-identity formation in the context of Learning through Construction at University. Research will be data-driven and inductive codes and memos will be created based on the interviews. Concepts will be driven from the data not imposed by literature, nevertheless literature will be used to enhance analysis and to compare and contrast findings of the study.

The research methodology in this study belongs to the domain of exploratory research design. Principles of grounded theory will be used to investigate the process of IT-identity development.

LONG PAPER ABSTRACTS

Challenges in designing personalised learning paths in SPOCs

Anne Kristine Petersen[1] & Peter Gundersen[1,2]
[1]University College Absalon, Denmark
[2]Aalborg University, Denmark

Abstract

The paper explores the challenges of designing personalised learning paths in SPOCs (Small Private Online Courses). It opens with a discussion on different approaches to tailoring teaching to individual needs and moves on to introduce a SPOC that was developed for Continuing Professional Development (CPD) for primary and lower-secondary teachers in Denmark. The SPOC, which performs adaptation using a recommendation system, allows for students to create a personalised learning path on the basis of three components: a learner profile, a content model and an adaptation model. Using the three components as a starting point, the SPOC is analysed in order to identify differences between the intended design (what the SPOC set out to do), the implemented design (how the SPOC is used by its users) and the attained design (the outcome of the SPOC). The analysis draws on data from a series of semi-structured interviews with SPOC students and their lecturers. It is found that the implemented design deviates from the intended design in several respects, most notably in relation to how the personalised learning paths are created and how decisions as to curriculum contents are made. Moreover, it is suggested that differences between the intended design and the implemented design are rooted in differences in the learning perspectives of the students, the lecturers and the educational designers of the SPOC, and it is concluded that further research in adaptive learning designs for online platforms such as MOOCs and SPOCs is needed to minimise the gap between intended designs and implemented designs in order to create a more personalised learning experience for the students involved.

Keywords: personalised learning, SPOCs, curriculum design, adaptation

Enabling 'Ba' by Using the Photovoice Technique to Realize Expansive Learning: A Case of ICT4D Research

Farzana Akther[1] & Lone Dirckinck-Holmfeld[2]
[1]University of Southern Denmark, Denmark
[2]Aalborg University, Denmark

Abstract

After nearly two decades of discussion on ICT for development (ICT4D), it seems that researchers have still not reached a deep understanding of how to lead and allocate ICT for sustainable rural community development. The introduction and implementation of ICT not only depends on technological issues but also on social and institutional factors. To respond to these challenges, in this article we describe our way of engaging with a case of ICT4D research conducted in collaboration with the Community Empowerment Program (CEP) of the non-government organization (NGO) Bangladesh Rural Advancement Committee (BRAC). The project brings the expansive learning approach to bear in a developing country context, with the aim of achieving ICT capacity building in the broadest sense. In this present article, we are looking closer at one intervention within this research, the digital-literacy workshops for a sample of field facilitators of CEP using 'photovoice' techniques. The study employ a qualitative approach based on Engeström's expansive learning framework and Nonaka & Takeuchie's knowledge creation theory. We apply Engeström's expansive learning framework for the ICT intervention on the ground level, showing which intermediary actions and tools can be used in order to create active learning spaces for the field facilitators of the community development program, and we elicit how the photovoice technique can be an effective intermediary tool for expansive learning. To reach this conclusion, Nonaka and Takeuchi's knowledge-creation framework serves as a lens for examining the dynamic nature of the knowledge conversion context and its influence on the progression of knowledge.

Keywords: expansive learning, photovoice technique, rural community development, intermediary tools, ICT4D

The Three Spaces Model for Online CPD

- a model for designing assignments for online courses in Continuing Professional Development

Anne Kristine Petersen, Malene Erkmann & Pernille Lomholt Christensen
University College Absalon, Denmark

Abstract

The paper explores the challenges of designing assignments for online learning environments and looks into the use of models as analytic thinking tools for course designers. The paper opens with a discussion on challenges central to designing assignments for online learning environments in higher education. Subsequently, two widely used models for course design, Salmon's five-stage-model (2002; 2003) and Ryan & Ryan's TARL model (2013), are explored with the aim of evaluating their usefulness in Continuing Professional Development (CPD) for teachers and pre-school teachers, a context which has received relatively little attention in terms of research on course design. A number of assignments that have been used in online CPD courses for (pre-)school teachers are analysed with the aim of identifying design patterns, i.e. examples of how recurring pedagogical problems can be solved and, finally, a new model that can support CPD course designers in designing assignments, the Three Spaces Model For Online CPD, is presented and discussed.

Keywords: online learning, continuing professional development, design patterns, course design, assignment design

Collaborative Learning Online - A Case Study

Elsebeth Korsgaard Sorensen
Aalborg University, Denmark

Abstract

The paper reports on findings from the use of a VLE-pilot designed from a perspective of collaborative learning. More specifically, it scrutinizes what ways this environment proves to be supportive for collaboration and interaction amongst theology learners distributed in time and space. Moreover, the author question if the result can be ascribed the VLE design or rather the collaborative instruction process that was enhanced and supported by the teacher. Finally, the author touches upon which features are significant for design and delivery of CSCL.

Keywords: distributed collaborative learning, distance learning, interaction, project work, collaboration, design, CSCL online, digital communication technology

Designs for Learning: Focus on Special Needs

Designs for digitalised Literacy Education in a Swedish Lower Primary School

Karin Forsling
Department of Pedagogical Studies, Karlstad University, Sweden

Abstract

The aim of this paper is to contribute knowledge about challenges to literacy development in a digitalised learning environment, with focus on *pupils in need of special support.* The paper is based on a section of my doctoral thesis, titled *Bridging gaps in a digital learning landscape* (Forsling, 2017), centring on how digital learning environments and situations were designed and orchestrated in a Swedish lower primary school with the aim to provide all pupils, including children in need of special support, with optimal opportunities for literacy development.

The theoretical framework is grounded in *design-oriented theory*, with emphasis on how design and *orchestration* make affordances for *learning* and *meaning-making*. The ethnographically inspired study is based on observations and interviews at one school in Sweden. Six teachers, one special needs teacher and one literacy-developer participated in the study. The design-oriented concepts of design and orchestration were used to analyse the data.

The results show that the teachers' intentions with their designs for learning were focused on *children in need of special support*. From a special education perspective, this is a *relational and democratic approach* - an intention to *close gaps.* Nevertheless, the results manifest a parallelism where two special education perspectives appeared side by side with a gap between them. On one hand, the teachers´ relational perspective, and on the other hand, the special need teachers´ *compensatory perspective*.

Another result indicates that the unequal allocation of digital tools led to teachers' frustration and displayed the school´s inadequate fulfilment of its mandate to provide equal education: on the one hand, there was a difference between the preschool-class and the lower primary classes, and on the other, a failure to compensate for differences between pupils' home circumstances and the preschool-class.

Keywords: special needs education, design-oriented theory, digital tools, digital literacy, relational perspective, communicative competences, design, orchestration

Emergence of Visual Literacy through Enactments by Visual Analytics and Students

Ulrika Bodén & Linnéa Stenliden
Linköping University, Sweden

Abstract

This paper aims to explore how visual literacy emerges when visual analytics and students enact in social science secondary classrooms. Interacting with visual technology likely demands new forms of literacy as various dimensions of complexity emerge in such learning activities, where reading become a way to impose order and relevance on what is displayed. However, there is a lack of research how these visual processes emerge. By applying a socio-material semiotic approach, the interactions between teachers, students and a visual analytics application are followed. The paper clarifies what might strengthen or weaken the socio-material relations at work in emerging visual literacy. This design-based study was conducted in five classes in three secondary schools in Sweden, with 97 students. The visual analytics application introduced was Statistics eXplorer. Each class were followed two to three lessons by a video recording program that captured both the students and the actions at the computer screen. The socio-material analyses show that the enactments between the visual analytics and the students were both strengthened and weakened by different social as well as material forces. The actions were directed by visual properties as movement, highlighting and color. Connecting to the students these often produced a quick vision or a locked vision. The paper argues for close didactic alignment and deeper knowledge of how the visual interface attracts human (students') attention and how students' visual literacy ablilites may emerge in that relation.

Keywords: visual literacy, visual analytics, K12 students, socio-material relations, social science education, didactic design

The dinosaur that lost its head: A contribution to a framework using Learning Analytics in Learning Design

Rene B Christiansen, Karsten Gynther & Rasmus Jørnø
University College Absalon, Denmark

Abstract

This paper presents a catalogue of research findings regarding how participants act within the Massive Open Online Course (MOOC) format based on a learning analytics approach. We show that learning analytics is a meaningful tool for teachers to improve the robustness of their learning designs. Using learning analytics, we show that the teacher/designer is able to gain knowledge about his or her intended, implemented and attained learning design, how MOOC participants act according to these and how students are able to develop 'study-efficiency' when participating in the MOOC. The learning analytics approach makes it possible to follow certain MOOC students and their study behaviours (e.g. the participants who pass the MOOC by earning enough achievement badges) as well as examine the role of the moderator in MOOCs, showing that scaffolding plays a central role in studying and learning processes in educational formats like that of an MOOC.

Keywords: MOOCs, Massive Open Online Courses, data-saturated, learning analytics, learning design, educational design research, LMS

Teachers' Learning Design Practice for Students as Learning Designers

Karin Tweddell Levinsen & Birgitte Holm Sørensen
Aalborg University, Denmark

Abstract

This paper contributes with elements of an emerging learning design methodology and takes as its starting point the theory of Students as Learning Designers, which was developed by Sørensen and Levinsen and based on more than a decade of research-and-development projects in Danish primary schools (first to 10th grade). The research focussed on information and communication technology (ICT) within the Scandinavian tradition of Problem Oriented Project Pedagogy (POPP), Problem Based Learning (PBL) and students' production. In recent years, the projects that provide the theory's grounding have focussed specifically on learning designs that constitute students as learning designers of digital productions (both multimodal and coded productions). This includes learning designs that contribute to students' empowerment, involvement and autonomy within the teacher-designed frameworks that simultaneously scaffold students' subject-related inquiry, agency, reflection and learning. Research have documented that this approach constitutes arenas that support students' deep learning and mastery of both transdisciplinary and subject matter, along with acquisition of digital literacy and 21st-century competencies. As this theory and its operationalization in practice have proven useful, it makes sense to move from researching the WHY of students as learning designers to look into HOW, that is the methodology of teachers practising learning design. For this purpose, we use the lens of the concepts metaphor and metonymy and interaction design theory to explore our empirical studies and previous findings and identify aspects of learning-design practice that teachers can apply as methods when creating learning designs aimed at students as learning designers.

Keywords: learning design, students as learning designers, design methodology, design for learning model, teacher agency, student agency

Designing for Engagement

A Teacher-Researcher Collaboration to Facilitate Student Engagement in Technology-Enhanced Learning

Nina Bergdahl, Uno Fors & Ola Knutsson
Department of Computer and Systems Sciences (DSV), Stockholm University, Sweden

Abstract

Student engagement is significantly related to both retention and learning outcome. Hence, teachers need to take into account how their practices affect student engagement. Applying Design-Based Research (DBR), the purpose of this study was to approach influences of student engagement and explore how teachers and researchers collaboratively could develop learning activities with learning technologies (LTs) to facilitate for this this. The intervention included an online assessment application, a virtual learning environment (VLE) and an additional tablet for the teacher. The teacher constantly carried the tablet around and used it to access the students' shared workspace. The intervention was implemented in two classes in an upper secondary school. Classroom observations and intervention evaluations were analysed.

Analysis of the intervention indicates that the teachers and researchers collaboratively could design interventions that facilitated student engagement. The LTs enabled insight in students' knowledge and learning process and opened for new possibilities to engage for students and a change in teacher practices. When conditions for learning changed as a result of implementation of LTs, both student interaction and teacher practises changed. However, it was not observed that the teacher would sustain the design without support. While this might reflect many underlying reasons, it also implies that educational goals and visions need to be consistent and communicated to practitioners, otherwise teachers will not have the guidance needed to advance or evaluate their professional development.

Keywords: *student engagement, design for engagement, learning technologies*

Modes of Teacher Participation in the Digitalisation of School

Bertil Ipsen, Jonas Dreyøe, Andreas Lindenskov Tamborg, Benjamin Allsopp,
Lone Dirckinck-Holmfeld & Morten Misfeldt
Aalborg University, Denmark

Abstract

Previous research has emphasized the importance and potentials relating to actively involving teachers in the design and implementation of educational technologies in schools (Lochner, Conrad & Graham, 2015; Underwood & Stiller, 2014). Only a few studies however have devoted attention to developing methodologies for engaging teachers in the appropriation of digital technologies, which is highly needed as many educational sectors currently witness increased digitalisation (Johnsons, Adams, Becker & Hall, 2014). Drawing on experiences from two large-scale research projects building on participatory approaches, this paper investigates and discusses two approaches to involving teachers in the design and implementation of digital learning platforms. We examine how and to what extent Participatory Data Design (Jensen et al., 2017) and future workshops (Jungk & Müllert, 1984) can help cultivate communities of practice (Wenger, 1998; Wenger, McDermott & Snyder, 2002). Ultimately, we use examples to argue how and to what extent these methods both play a role in developing and maintaining a community of practice.

Keywords: learning design, students as learning designers, design methodology, design for learning model, teacher agency, student agency

SHORT PAPERS

Ghosts in the MOOC?

The Concept of the Implied Student as a Thinking Tool in Educational Design Research: A Contribution

Rene Christiansen, Bettina Buch, Anne Kristine Petersen & Randi Skovbjerg Sørensen
University College Absalon, Denmark

Abstract

This short paper explores the potentiality and strength of the concept of the implied student as a design thinking tool in relation to educational design research and more specifically in relation to a new educational format: a MOOC. The paper argues that the concept of the implied student can function as a means to understand decision-making in educational design processes, and the concept should thus be considered by educational design researchers designing educational formats such as MOOCs.

Keywords: MOOCs, educational design research, learning, teaching, implied student, thinking tool

Introduction, context, method and research question

In 2020, a national education reform requires that all teachers in the Danish primary and lower-secondary school system hold a formal exam in the subjects they teach or, alternatively, hold a positive validation of non-formal and informal learning. This has brought forward an acute need for educational design concepts that are flexible in relation to the teachers' work situations and concepts that are based on the fact that the teachers already have a pool of professional and didactic skills gained throughout years of teacher work.

The MOOCs in our institution are designed as so-called SPOCs, i.e. small private online courses (Fox 2013), offering a formal subject program for teachers already teaching in the Danish primary and lower-secondary school (Christiansen & Rosenlund 2016, Gynther 2015). In the slipstream of the development of this design framework and the ongoing work with SPOCs at University College Absalon, several "*side discussions*" have surfaced. One of these side discussions deals with the student, the actual living subject, who has to work and study *within* a given design framework, thus leading us to the aim and research question of this short paper:

In which ways can the concept of the implied student serve as an analytic thinking tool for uncovering conceptions of teaching and learning "hidden" within a MOOC design framework, and in which ways does this inform us about the educational design process?"

Below, we will point out examples of how the concept of the implied student can function as an analytic tool for understanding a design. We close this short paper by pointing out specific examples of how the concept of the implied student can be used as an analytic thinking tool for the educational designer. In other words, how the concept *implied student* may help reveal or at least potentially draw attention to implicit conceptions – or "ghosts" – in the educational design.

MOOCs and online learning

The SPOC designed for primary and lower-secondary school teachers mentioned above is a blended MOOC that draws on principles from various MOOC formats as well as other models for e-learning. The emergence of blended formats highlights the need for a more balanced understanding of how MOOC designers subscribe to various ideas of learning, teaching, participation, content production and collaboration. A SPOC is a crossing between a MOOC and an online course that is small rather than massive and private rather than open (Baggaley 2014). The SPOC format is, in other words, one of several subgenres derived from the Massive Open Online Course (Buch, Christiansen, Hansen, Petersen & Sørensen 2018, Bayne & Ross 2013, Petersen & Gundersen 2016).

The implied student in educational design

In this part, we will argue that the concept of the implied student can function as a tool for understanding decision-making for educational designers and, thus, plays the role of an integrated and conscious - or sometimes unconscious - part of an educational design process when designing educational formats such as MOOCs or SPOCs.

It is essential that the MOOC designer has an idea of the addressee, the MOOC participant or student, in mind when designing. However, knowing the complexity of MOOCs and the potential variety in backgrounds and skills of its participants, communicating appropriately to each of the participants is to say the least (one of) the tricky part(s) of designing a MOOC. Even if the MOOC designer only speaks of neutral beliefs and aims to have a picture of a standard student as her/his addressee, still, according to Bakhtin (1986), all sorts of implicit assumptions of the addressee's background is likely to be crucial to the interaction. Bakhtin moves this argument even further stating that these points about spoken language count for written and read language as well (Bakhtin 1986:69).

The Danish professor of Science Education Lars Ulriksen (2009) puts forward the term *the implied student*. Ulriksen's (ibid. p.522) and he specifies that:

> [T]he implied student could be understood as *the study practice, the attitudes, interpretations and behaviour of the student, that is presupposed by the way the study is organised, the mode of teaching and assessment, by the teachers and in the relations between the students, enabling the students to actualise the study in a meaningful way.* It is presupposed that students can act in and with this structure, and it provides the students with specific possibilities for acting in the study. (Ulriksen 2009:522; italics in original)

Thus, the implied student is understood as dual: The term both comprises the implicit (and tacit) expectations to the student implied in the design of a given study as well as the actions (and reactions) of the students interacting with the structure. Yet, the term is not only about the expectations of the teachers and the behaviour of the students, it also entails the necessity of the students acquiring the so-called "hidden curriculum" (Christiansen 2011, Ulriksen 2009), a term referring to Jackson (1968), which covers all the aspects - invisible or transparent, spoken or silent - that any student may need to be aware of and adjust to (such as social relations and compliance to school rules) to be able to succeed (with)in the school system.

We define a thinking tool as "a research-based and systematic tool, yet, it is not normative in relation to practice in the sense of specific rules or descriptive to a certain practice" (Staunæs &

Bjerg 2016, our translation). We use the term *thinking tool* when proposing the concept of the implied student. A thinking tool - sometimes also referred to as a *problem-solving tool* - is an instrument, a concept, often a model or a principle that can help a process of reflection to be more systematic and effective. The concept of the implied student *within* an educational design can serve as a thinking tool for the designers. Having pointed out the potential of using the concept of the implied student as a thinking tool for analyzing educational design proposals, we move on to a more concrete level showing parts of a few educational designs and pointing out how the student can be found "hidden" in the design.

Examples of education designs containing ideas of teaching and learning within the design

Entering the MOOC (SPOC) for the teacher training program, the various subjects are listed: English, music, Danish, science and so on. As a MOOC student you then enter the digital milieu of the subject to study. In our study, we have read through all the content of the various subjects and in the end focused on the tasks being offered to the student. By examining the patterns of intended student behaviour in the various MOOCs (*how students are supposed to carry out the offered tasks*), a series of categories can be listed after analyzing the various tasks being offered in the subject of study:

I: The idea of the collaborative student and peer-learning (inside-MOOC activities)
A well-functioned collaborative environment in which it takes peers to solve the assignments, e.g. "*Write an essay-like text containing your reflections on your own teaching. Upload this on the MOOC-platform. Comment on two or more of the texts uploaded from your fellow students*".
Within this task lies an understanding of collaborative learning (peer-learning) and the value of peer response rather than teacher feedback.

II: Making sure curriculum is learned and understood (inside-MOOC activities)
These assignments highlight the quality of student learning in the MOOC, often in the form of direct questions which can be found in the learning resources in the MOOCs (most often texts) and sometimes expanding the questions in a more action-based manner, e.g. "*how do you understand x*", "*how can x be used in teaching in 4th grade*" and so on. The assignments address the MOOC students as learning *within* the MOOC and finishing the part *within* the MOOC, thus, the MOOC being a "safe environment" for student reflection and student learning controlled and evaluated by the organization and the professionals within it.

III: Teaching and learning in real-life situations (outside-MOOC activities)
This approach focuses on the value of assignments carried out in classrooms - or in real-life situations outside school - involving students. When working with a specific part of the subject in the MOOC in the form of reading texts, watching videos and answering questions, students are furthermore asked to teach the part they are studying to their pupils, film the situation, upload it to the MOOC platform and describe the situation. It is a formula of *reading, watching, writing, reflecting and doing*. Also in these situations peer-feedback is often a part of the task.

IV: The student as the explorative learner (both in-and-outside-of-the-MOOC activities)
These assignments are characterized in the form of a basis/additum approach: The basis being the online learning resources in the MOOC and the additum is the students "being sent out" to the library or the internet to include other resources and then answer questions using the collective pool of resources. These tasks focus on the students' explorative skills and learning processes as activities that cannot - and should not - be controlled by the teacher.

Conclusion

In this paper, we have offered the concept of the implied student as a way of analyzing the motivations and understandings of teaching and learning in educational designs. This approach is unorthodox and premature to carry out more deep conclusions. The development of educational thinking tools that can serve as solid helpers of understanding the ideas of teaching and learning within educational designs is still in its very early stage. More work is needed on the development of tools that can help reveal the issues of what takes place when teachers and students design learning environments.

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How Does Technology Impact the Composition Processes when Secondary School Pupils Compose on iPad?

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Abstract

Based on a micro-ethnographic study where eight-grade pupils composed on iPad, this paper questions how technology impacts the composition processes. In line with a design theoretical perspective, technology is regarded as a package of semiotic resources in an artifact that is socially contextualized. The narrative analysis reveals that the technology has impact on the pupil's perspectives, competence requirements and priorities, linked to multimodality offered by the technology and musical structures made dominant in the technology. This study shows that the relations between the pupils and technology both shape and reshape how the technology is put into use.

Keywords: primary mode, secondary sign system, composing process, musical structure, smart instruments, music literacy

Introduction

Music didactics communities setting the tone at grassroots level in Norway, show enthusiasm for iPad technology (Musikk i skolen, 2014; Senter for IKT i utdanningen, 2016; Skjørten, 2018). iPad technology is, nevertheless, under-researched in the context of music education. A review of literature concerning research on children's composing with digital technology is focused on children's own procedural choices and contextualization of their composition, as well as technology as a learning resource (Dyndahl, 2002; Folkestad, 1996; Mellor, 2008; Olsson, 2014).

In this paper the design theoretical perspective developed by Selander and Kress, in which meaning-making is regarded as transformation of semiotic resources into new meaningful representations, is applied (Selander & Kress, 2015, p. 97). In this context, iPad technology is considered as a package of semiotic resources. A design theoretical understanding of the concept *affordance* emphasizes socially contextualized relations between objects and users (p. 37). From the perspective of teaching and learning, it is important to know how this technology affects pupils' work. The question asked is "How does technology impact the composition processes when pupils compose on iPad?"

Research Methods

This presentation is part of a comprehensive research project in progress, focusing on pupils composing on iPad. The empirical material for the project is generated through a microethnographic study (Postholm, 2010, s.48-49), were the pupils composed regularly on iPad for nearly three months. The study involved 80 eight-grade pupils, two teachers, one assistant teacher and the researcher in an assistant role in the teaching sessions. Data was generated through observation of teaching sessions, pupils' work products and many conversations with all participants. The study was explorative, meaning that the research questions, focusing on knowledge production and technology impact, were developed in the encounter with the research field.

The research participants are anonymized, and the study is approved by NSD.

The material for this particular paper is generated through four of the teaching sessions, where the task was to compose freely in Garageband. Garageband provides multitrack audio and midi recording, and editing and mixing tools. Software instruments can be played directly in the visual interface of the touchscreen. The *smart* instruments provide different kinds of resources for generating musical structures depending on how they are configured and activated.

Through sorting, reduction and argumentation (Rennstam & Wästerfoss, 2015), the analysis has led to illustrative narratives and discussions presented in this paper.

Narratives

In this section the stories about the composing processes of Nils, Eirik and Esra are told.

Nils wanted to make a rap. He experienced the vocal track's dominant position in the music, and decided to record this at first, but was dissatisfied with his result. It was difficult for Nils to get the uncompromising smartdrums to fit the rhythm of the vocal track. He received tips on changing the order of work, but he chose to repeat the first procedure. On the third attempt, Nils's drum track was created before he started rapping, and he finally got the two tracks to fit. Nils' main challenge seemed to be about understanding *how* the relation *between* foreground and background of music is important in the composing process.

Eirik designed a single piano motif over two bars at first. The motif provides a calm, commuting motion back and forth over a minor third. Also the chords that were added reinforced the minor key feeling.

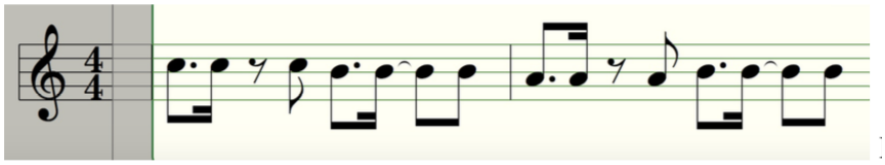

Figure 1: Eirik's melody motif

Eirik did not *play* the motif. He *drew* it in the midi roll. Then Eirik copied the motif to different tracks, to have different instruments play the same motif.

The composing process was characterized by constant shifting back and forth *between* the music as primary mode and the music's secondary sign systems. He designed, clipped, glued and moved elements in the visual interface, while controlling the auditive expression of the music through listening. He processed musical structures visually and beyond the time dimension, although music as primary mode per definition is operated audibly within the time dimension. Eirik's multimodal shift between modes meant that he varied between different perspectives on the music. His composition process was characterized by construction, critical considerations and control. Eirik said it was challenging to make the music accurate enough, and he never considered the job to be completely finished. He always looked for more details to grind.

Esra's composition is characterised by the "piano riff" over 4 bars containing a chord pattern with the chords Am, Gm and G. She *played* and recorded the chord pattern, but was not entirely satisfied with the rhythmic precision. She tried correcting it by using quantization on eighth-notes. The result of quantization was that a highly syncopated rhythm occurred:

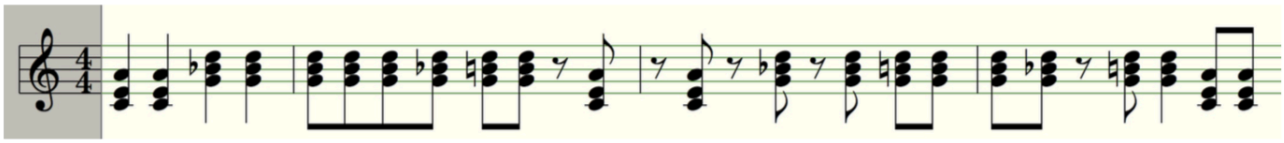

Figure 2: Esra's Pianoriff

She was unhappy with this solution. She remade the piano-recording with a smoother rhythm, and added bass and drums. Nevertheless, she ended up deleting the newest piano track, while keeping the syncopated one. It seems she had discovered how exciting it was, especially related to the bass and drums.

In Esra's case, a dialectic sequence is spelled out with several theses and antitheses between technology and Esra. While technology's embedded resources could be enabled to censor the pupil's suggestions and propose changes, the pupil herself chose or opted for the technology's contribution. After a while, Esra interpreted the technology's contribution as meaningful, and the contribution became a prompt for further composing.

Nils, Eirik and Esra approached their composition task in different ways, and they met the challenges of the technological device in different ways. With the short narrative constructions, I have spotted the key challenges: Understanding of the relationship between the music's foreground or background. Musical construction between modes. Dialectics between individuals and technology.

Music is Created in a Network of Vertical and Horizontal Structures

Folkestad (1996) suggests describing composition strategies as horizontal or vertical. He found that most pupils worked horizontally. Dyndahl (2002) points out that Folkestad's conclusion depends on the technological tool used. Mellor (2008), who used a different tool, concluded that most pupils used a vertical strategy. Regarding the pupils' composing with Garageband on iPad, the combination of horizontal and vertical focus seems to be the most prominent. Technology seems to accentuate the need for vertical and horizontal axes to fit together. To Nils, both the difficulties and the solution were related to this need.

It is quite common, and can be recognized in sheet music notation as well, that music has such structures. However, these structures are not necessarily the focus of the musician or composer in all practice, and the structures often have a dynamic and changeable character. Garageband technology, however, lift these structures to the center of activity and attention. All musical resources used and processed are physically placed in such a network structure in Garageband's editing tools, where the network is also visualized with visible horizontal and vertical lines crossing each other. Most "smart" resources in Garageband are also linked to the metronome's uncompromising control over all coordinates in the horizontal axis. This leads to structural coercion. The only way the pupil can escape is by opting out of metronome-based smart instruments, thus disqualifying large parts of the current technology.

The fact that these structures are so prominent seems to have an effect, where traditional notions, such as considering drums and bass to be fundamental in the musical context, are reinforced and made principles. Based on this, the technology can be judged to be musically conforming and culture-bearing, and perhaps even oppressive. It provides guidance for what is and what is not allowed. On the other hand the effects of the stringent structures is that music as cultural modality, is interpreted, deconstructed and opened up for sign making production as well as consumption. Considering such a two-sided interpretation of the impact of technology, it is relevant to look at design and redesign as linked to both stability and change (Selander & Kress, 2015, p. 23).

Music is Created in the Technology's Multimodal Interface

Transduction refers to the transmission of meaning between modes (Selander & Kress, 2015, p. 30). Transduction between music as the primary mode and the secondary sign system of music is emphasized in Garageband. The secondary sign systems that are used in Garageband consist of visual symbols and verbal terms that refer to certain and relatively constant musical elements and structures that are analytically identified and established. The purpose of the secondary sign system's visual representation is not the creation of visual art expression, but refers to musical meaning content that is defined from parts of the music as primary mode. Meaning in the secondary sign system is then at a meta level in relation to meaning in the primary mode, and can contribute to a distant perspective on the music structures. At the same time, transduction carries

the possibility of changes of meaning because meaning is necessarily formed on the chosen modality's premises.

Music is Created in the Relationship Between Technology and Pupil

Olsson (2014, p. 79) writes about how digital technology has gained an integrated embedded position in the music subject. The smart instruments embedding of musical knowledge implies that technology moves the limits of what are available musical resources in relation to the pupils' prior knowledge in the subject. By adding to the instrument itself the capacity to build and physically perform musical structures such as chords, and patterns based on specified musical concepts, the limit for the respective tasks of the instrument and the pupil is moved.

The technology's embedding of knowledge thus becomes a two-edged sword for the pupils. The technology's embedded knowledge was a scaffolding support when the pupils used the smart instruments to put together meaningful accompaniments, while the same embedded knowledge formed the basis for Nils experienced procedural coercion, for the musical counter-proposal Esra got back from technology and for Eirik's systematic shift between perspectives. While technology in some ways simplifies the task, new and different prerequisites are also required.

Music Literacy As a Prerequisite – Analytical or Intuitive?

In this context, it becomes relevant to define what kind of music literacy is required by this technology. Different definitions of music literacy (Blix, 2012; Lancy, 1994; Levinson, 1990) have emphasized analytical respective more intuitive forms of access to music in very different ways. The music literacy required for composing in Garageband can be defined as the understanding of, and the ability to adequate practical musical use of verbalised musical theoretical concepts.

The three narratives have made visible how technology has an impact in the composing process, concerning perspectives, priorities and competence requirements, associated with the use of different sign modes and musical structures in the composition processes. This study has shown that the relations between the pupils and technology both shape and reshape how the technology is put into use.

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STEPRE – Model: Facilitating knowledge development in student groups in Higher Education

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Abstract

In this paper we present a phase model describing a way to structure knowledge development in student groups in higher education. The model (STEPRE) is based on research conducted by the first author on multidisciplinary groups in knowledge intensive organizations. The focus was on how group members with different expertise developed new knowledge and ideas. Results showed that the knowledge processes went through phases and that active participation and dialogue between the different perspectives was crucial in order to achieve new ideas. These findings were transferred to a context with cross faculty student groups and the STEPRE model was developed and tested in seminars. The research is placed within a sociocultural perspective on knowledge development and we emphasise the importance of engaging in dialogues with peers and the content for promoting student learning, socialization, individualization, and self-assessment in light of Dewey's concept of experience and Bakthin's concepts of dialogue and polyphony.

Keywords: knowledge development, higher education, experience, dialogue, sociocultural

Introduction

In this paper we present a model describing a way to structure Knowledge development in multidisciplinary groups of students at seminars in higher education. The model (STEPRE) consists of different steps/phases: Start, Theory, Examples, Polyphony, Reflection, and Evaluating.

The STEPRE model is a prescriptive model generated from findings on research conducted by the Ness on how knowledge development was stimulated through dialogue in multidisciplinary groups in knowledge intensive organizations (Ness, 2017; Ness & Riese, 2015; Ness & Søreide, 2014).

Diverse groups of students need better pedagogical facilitation

Since the early nineties, the number of students enrolling in higher education has increased drastically. In the case of Norway, the number of students enrolled at Universities has risen from 6 983 students in 1997 to 82 193 in 2017 (NSD, 2018). As a result, student groups have become more diverse, encompassing students with different cultural and socio-economic backgrounds (Biggs & Tang, 2011). However, this diversity is not simply a challenge that needs to be overcome, but also an opportunity to promote dialogue between a wide range of perspectives. The aim of the STEPRE-model is to utilize this diversity in the student groups by creating situations where the students can engage in dialogue with each other and the material, and thus, support the students' development into a field of study.

Theoretical framework: Sociocultural approach to knowledge development

The research is positioned within a sociocultural perspective, and builds, in particular on the concepts, dialogue and polyphony from Bakhtin, and experience from Dewey. Bakhtin's perception of polyphony refers to the process where many voices interact together and acknowledges the tension between voices this interaction might lead to. To Bakhtin this implies that participants in a dialogue must have an open mind to others as it is in the tension between different voices knowledge and meaning are created.

According to Dewey, new experiences are made through an interpretative interaction process between the individual and its environment. Dewey (1934/1980) claims that experience can "grow" into imagination, that "growth" is the connection between experience and imagination.

Multidisciplinary working groups in organizations

We now present the first study of three groups in an organizational context. One of the groups was based at the Innovation Department in the International Oil- and Gas Company, Statoil, another group worked with strategy in Statoil, and the last group was based in a Norwegian Research Institute. Table 1 (Ness, 2016) describes the groups.

Table 1: *Groups that participated in research* (Ness, 2016, pp. 39-40)

Group name	Formal group task/aim	Group composition
Strategy group Oil and gas company	Strategy development Their aim was to develop a business case with cost-efficient solutions and with a competitive instinct	Core group: 3 male members from different parts of the organization with different experiences and competences, including legal and on/offshore logistics and engineering Group meetings were supplemented with 3-10 members with specific knowledge
Innovation group Oil and gas company	Idea/innovation development Their aim was to develop radical ideas based on needs and challenges across the organization	Core group: 5 males and 1 female researchers with different expertise and competences, including engineering, business, geophysics, cyber technology In some meetings the group was supplemented with 3-7 members with specific knowledge
Research group Research Institute	Their aim was to develop innovative research projects and write applications for external funding	3 males and 1 female researchers with different expertise and competences

Ness (2016) investigated the social interactions, communication, and relational processes specific for the three workgroups. The research was qualitative in nature and an ethnographic research design was chosen as it was necessary to experience the social life of the groups studied over longer periods of time.

One of the main findings was that group members developed new knowledge and ideas through six phases (Ness & Søreide, 2014).

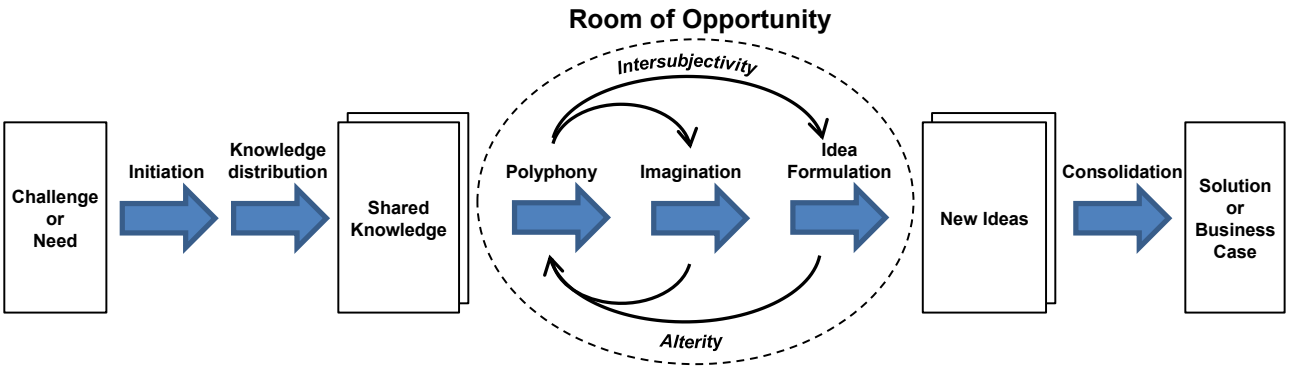


Figure 1. Model, "The Room of Opportunity" (Ness & Søreide, 2014, p. 557)

The process started with a challenge or need. Then the process went through initiation and knowledge distribution, where group members shared knowledge on the task at hand. The process ended with a solution or business case after a consolidation of a concrete idea, in the two last phases, when the group members formulated and then consolidated their concrete ideas. It was thus crucial that they could learn from each other in order to develop new ideas and knowledge.

Further, the creativity peaked in the three middle phases. In this part of the process the group members began to discuss and challenge new ideas. This was done in a circular movement in which group members moved back and forth between the different identified phases in the discussions. In these discussions they explored different ideas and scenarios, and in this way could stretch the limits for what was possible to imagine at the time.

Consequently, these phases could be seen as a separate "room", characterized by many voices that built on different views and perspectives in dialogue. Ness refers to this the "Room of Opportunity" (Ness & Søreide, 2014).

In sum, developing innovative ideas was about bringing together different perspectives and letting group members dialogue with each other when co-constructing ideas (Ness and Riese, 2015).

Transferring findings to a similar context: student groups in Higher Education

How multidisciplinary group members in the organizations developed new knowledge has similarities with how students coming from different faculties and departments develop knowledge – thus, the first author transferred the findings from the organizational context to the Higher Education context and developed a prescriptive model (STEPRE). The model was applied in two courses, one methods and one on learning theories, at the University of Bergen to see how it could be used for structuring learning activities at seminars in higher education. Both in the organization working groups and in the student groups the aim was to learn together and develop new knowledge. This required active participation and an open dialogue among the learners.

The STEPRE-model is a way to stimulate dialogue by structuring academic seminars a certain way, through phases, starting with preparing the students for the main dialogical learning activity in the middle phases, and after this activity, then to sum up and evaluate the learning process.

The STEPRE model:

Co-construction of knowledge among multidisciplinary student groups in Higher Education

The STEPRE-model, see figure 2, shows how to structure knowledge development by guiding the student activity. This is visualized in six phases with the colours red and yellow indicating the phases where the students are most active and engaged in dialogues while processing the academic content.

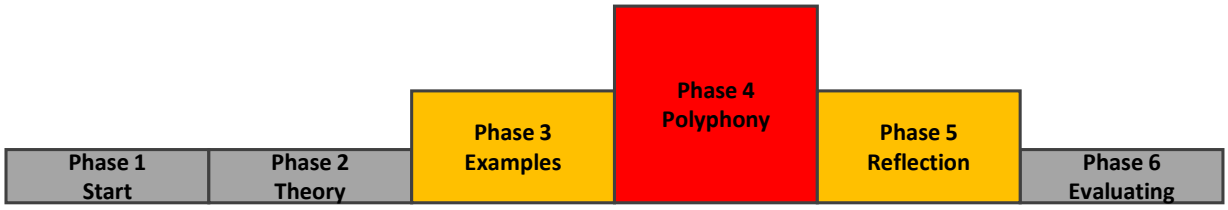
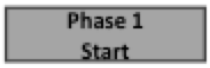


Figure 2: The Six phases of the STEPRE-model

Phase 1: Start – introduction and overview given by teacher

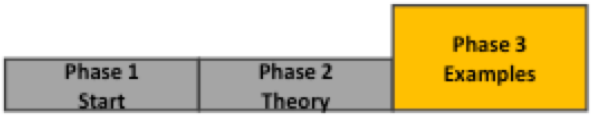


In the Start phase the teacher informed students about the work structure and the aim of the seminar. An important part of this first phase is to inform the students about the intention behind the activities. At the seminars the students came from different institutes and faculties. This ensured diverse perspectives in the groups.

Phase 2: Theoretical input – guided of teacher

*In th*e second phase, the focus is on theoretical input. For instance at seminars in qualitative methods, this could be giving a short lecture on how to analyse texts from recommended literature. At this point the teacher acted as the expert and the more knowledgeable (in accordance with Vygotsky´s proximate zone of development). In this phase the aim is to help the students to build knowledge to use when they, in the fourth phase, engage in dialogues and further knowledge development.

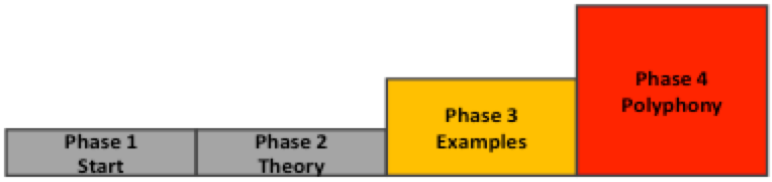
Phase 3: Examples - guided by teacher



The third phase focuses on empirical examples to help the students see the practical implications of the theory that enables a deeper understanding. For instance, this could be to present analyses and categorizations from a real research design so that the students gained some basic understanding. Ness's experiences from the organization groups

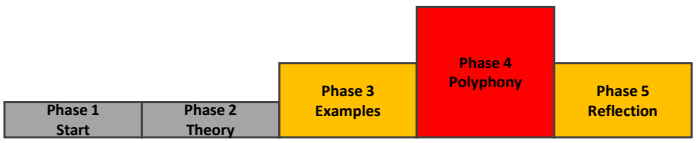
was that it was important to ensure that every member possessed a certain level of knowledge in order to get productive discussions. Similarly, in the student groups, it was clear that going through both theory and examples helped students to get both a more common level of knowledge, as well as deeper knowledge. Using the STEPRE model, thus made it easier for these students to participate and engage in the dialogues since they now had been given a short introduction to the topic. through theory and examples.

Phase 4: Polyphony – stimulating dialogues in student groups



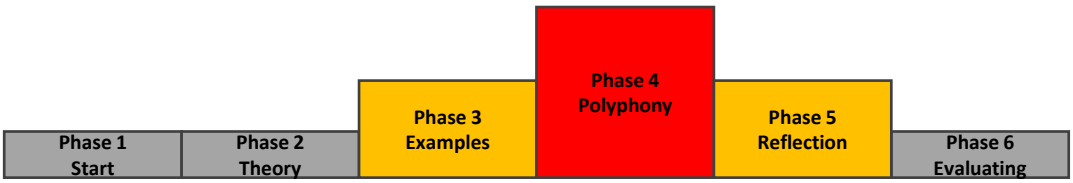
In the fourth Polyphony phase, the students are introduced to a practical activity which requires participation with the aim to stimulate dialogues and explorative discussions to enhance learning. Such student discussions can be facilitated in different ways, from technological tools such as SRS systems like Clickers or Flinga to more traditional questions. The aim is to create an arena for dialogue and exploration of perspectives. An example of an activity tested by the first author was "the Dialogue game". The students were placed in small groups, and given cards with different arguments generated from the previous theoretical input. Each student had to agree or disagree and to explain to the others in the group what they thought. In this way different parts of the course literature were covered and discussed by the students. The given arguments must be formulated in ways that will bring out differences and encourage the students to have open dialogues in stead of yes/no questions which do not lead to discussions and exploration of different perspectives. In this way the diversity in the groups came to the surface and the students had to position themselves and discuss the dialogue game's claims from different perspectives. The students expressed that they often found it challenging to meet other ways of seeing something. Then it was important to keep an openness towards each other's views and listen and respect each other in a true dialogical mindset. The intention of this phase is for the students to be active and engage in dialogue, and in this way achieve a deeper understanding, based on how they were confronted with different perspectives from their peers. In addition, the purpose is also to expose the students to difference and to other's perspectives and thoughts, and to encourage them to be open for these views.

Phase 5: Reflection – students achieve a meta perspective



After the students have gone through the Polyphony phase with an emphasis on active participation and explicit co-construction of knowledge, the focus of the Reflection phase is reflecting on how the new knowledge that they have gained can be used. The students discussed in groups how they had developed a new understanding and how they imagined it could be used in their own work. The purpose is to both to promote awareness of the various perspectives possible on the topic and to reflect on on their own learning process.

Phase 6: Evaluation – Students give feedback



In the last phase, Evaluating, the students give feedback on the main activity and evaluate their own learning outcome. What was useful – were there still questions to be answered which not had been covered at the seminar. This is important information to the teacher for the further development of the course.

Reflections on the STEPRE model on knowledge development

In the STEPRE model the students used the presented theory and examples from the first phases and made use of it in the main dialogical activities in the Polyphony phase. Bakhtin's concept of dialogic polyphony highlights how knowledge and ideas are created in the tension between different voices (Morson & Emerson, 1990) acknowledging each other. Both in the large ethnographic study at the organizations and in the student groups at the University course, imagination and knowledge development was stimulated by the tension between the diverse perspectives, as well as the dynamics between the group members and students. By engaging in dialogue the students shared experiences. By engage in dialogues, the student shared experiences and in this way, they could get a broader perspective on the topics based on the experiences of others (Dewey 1997).

Student involvement with each other and the material, as facilitated through the STEPRE-model, is important for three major reasons: 1) the students need to make their own experiences that can enhance their understanding of the subject; 2) the students need to voice their own perspectives and be challenged by each other's perspectives to become educated in a way that also promotes socialization and subjectification; and 3) the students need to test out their knowledge through discussions in order to receive feedback on their understanding and improve their ability to self-assess. The way they co-constructed knowledge was through dialogue and exploring various perspectives. These perspectives were brought forward by open questions.

In summary, in this paper we have presented and reflected on the STEPRE-model for structuring learning activities at seminars in higher education.

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Designing for Code Sharing in a Data Science Course for non-STEM students

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Abstract

Based on a micro-ethnographic study where eight-grade pupils composed on iPad, this paper questions how technology impacts the composition processes. In line with a design theoretical perspective, technology is regarded as a package of semiotic resources in an artifact that is socially contextualized. The narrative analysis reveals that the technology has impact on the pupil's perspectives, competence requirements and priorities, linked to multimodality offered by the technology and musical structures made dominant in the technology. This study shows that the relations between the pupils and technology both shape and reshape how the technology is put into use.

Keywords: primary mode, secondary sign system, composing process, musical structure, smart instruments, music literacy

1. Introduction

In this paper, we describe a design of a collaboration tool for code and report sharing. The tool is aimed at supporting and enhancing the cooperation and communication of non-STEM students of an undergraduate minor programme in Data Science (DSM).

This work originated from attempts to provide a toolkit to non-STEM students that study Data Science, a compelling and technically sophisticated subject. The students emanate from various non- STEM backgrounds, from Asian Studies to Sociology and Economics undergraduate programmes.

During the second term of the programme, students are assigned to project groups so that the teams would be as diverse as possible in terms of grades and educational programmes to improve cross-programme student communication so that the access to the advice network and knowledge sharing became easier for underrepresented students from Humanities.

The course uses a Virtual Learning Environment (VLE) built around three components: Rstudio integrated development environment (see Fig. 1) for R language (R Core Team, 2017), Q&A platform (Biostars), and custom software modules.

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Traditional version control systems and tools (e.g. Git) are designed for professional users. We developed a code-sharing system which is integrated into the VLE and does not require additional training.

2. Relevant Work

Studies emphasise the importance of the social aspect of learning (Dawson, Tan, & McWilliam, 2011), namely the influence of friends on student's academic performance. Collaboration with peers im- proves satisfaction (Jung, Choi, Lim, & Leem, 2002), academic performance and retention (McDowell, Werner, Bullock, & Fernald, 2002).

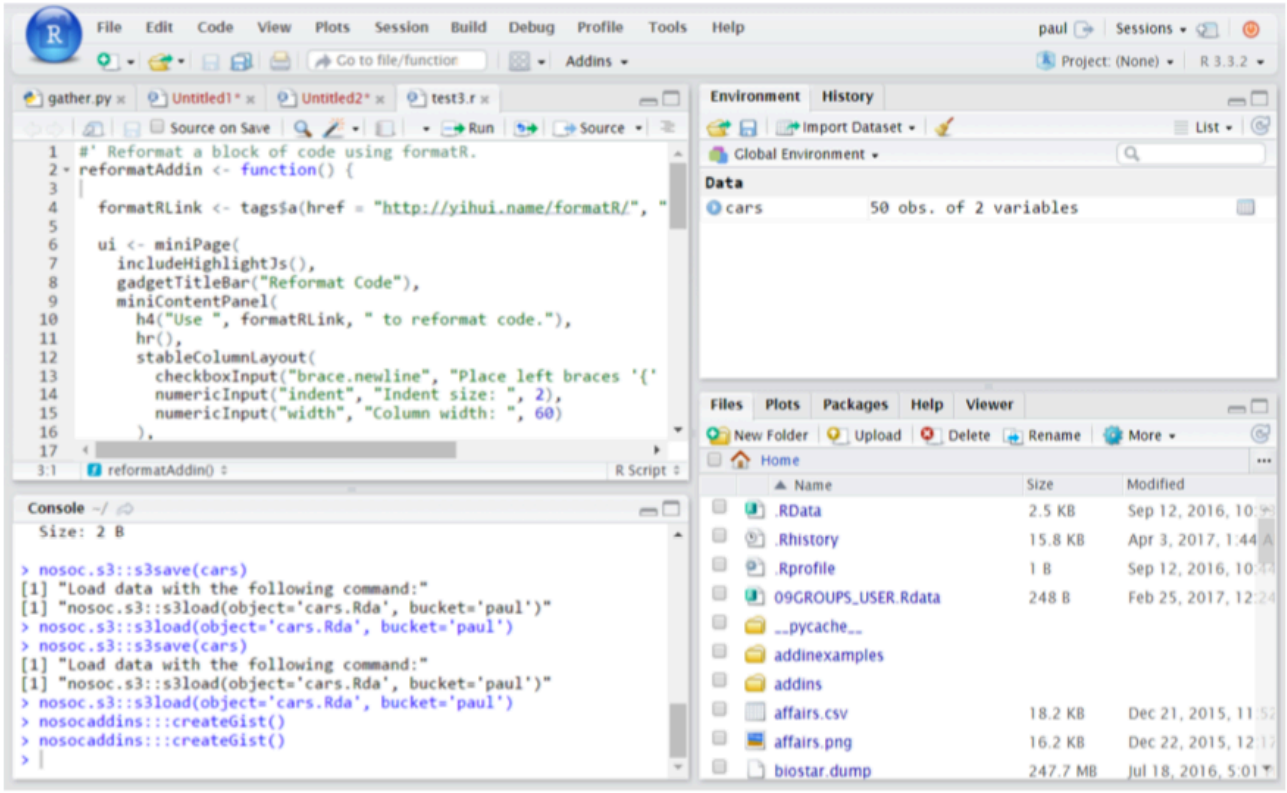


Figure 1: Rstudio user interface

To facilitate the learning process, many institutions employ a Learning Management System (LMS) (Weaver, Spratt, & Nair, 2008) with additional design efforts to support collaboration (Cavus, Uzunboylu, & Ibrahim, 2007). Zagalsky, Feliciano, Storey, Zhao, and Wang suggested using the Github.com platform for social coding in programming courses as it was initially designed for developers and encourages collaboration (Zagalsky et al., 2015).

However, e-mail and Social Media (SM) remain the most popular communication media among faculty and students (Kolowich, 2011; Moran, Seaman, & Tinti-Kane, 2011).

3. Design Framework

Following Attwell and Van Harmelen, we investigated the gap between existing usage of SM by students and faculty and institutionally introduced learning ICT tools via the lens of the Personal

Learning Environment (PLE). PLE denotes a user-centred approach, recognising learning as a personal activity and establishing a learner's role in organising their learning activities, including communication with peers and teachers. PLE aims to narrow the gap between students as consumers and teachers as producers of education-related content by treating available ICT, such as SM, as able to shape learning experiences according to students' learning goals.

We aimed to fill the gap between SM and VLE which were not connected in any way other than by student practices employing SM to exchange different types of artefacts: scripts and chunks of code, tables and graphics, written and generated reports.

We designed and implemented a code-sharing tool, analogous to GitHub's Gists service, to enable students to share programming code and reports.

To inform the design process, we utilised:

- background interviews (in the form of contextual inquiry (Beyer & Holtzblatt, 1997)) to gather data on users' needs; and
- on-site observations during early stages of the project to collect information regarding the environment in which the solution is used.

4. Requirements and Practices

Sending code via SM or email appears to be the easiest and most popular method to share code among aforementioned. However, it implies certain drawbacks:

- code formatting (e.g., indentation) often gets crooked, making the code less clear;
- SM automatically parse messages and interpret certain sequences of symbols as emojis;
- code chunks are stripped off their context and miss important information or commands that are required to run them.

The most significant drawback is the lack of integration with Rstudio and VLE.

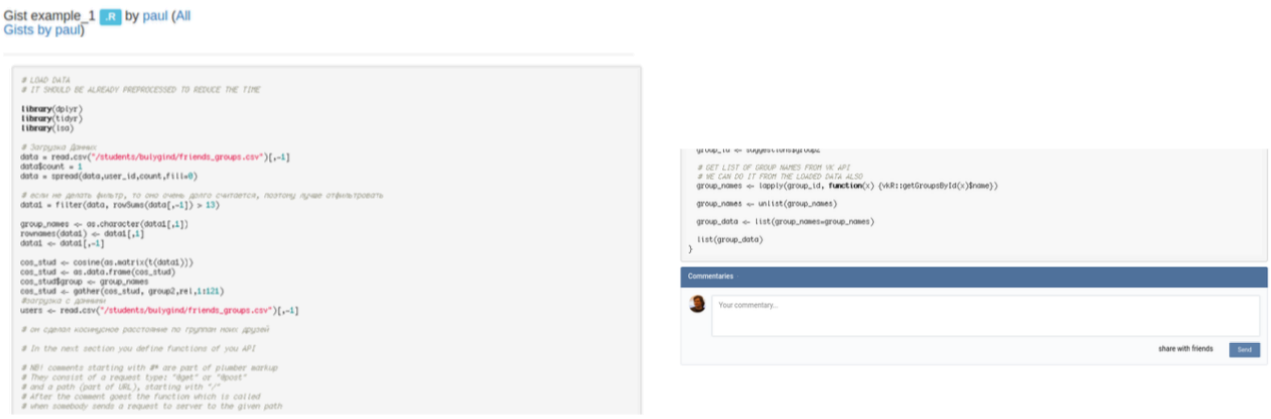
DSM students do not specialise in STEM, and teachers avoid overloading them with technical information or details. Thus, we did not employ Git or other version control systems as it implies mastering additional technical skills and tools.

5. System's Design

Based on it's similarity in purpose and design to the Gist by Github, we called the system Gist. Similar to the tool which we described in (Musabirov, Okopny, & Pozdniakov, 2016), Gist em- ploys Addins[1] functionality of Rstudio, thereby allowing for the introduction of custom functions to the Rstudio user interface.

To enable SM-related activities, we employed the VK.com widget system[2] by inserting a commentaries block. To enable sharing, we added a "Share via VK" button, hence permitting users to send a link to the Gist via VK.com to their friends or group chats.

The Gist has rather simple and minimalistic user interface (see Figure 2a). In the heading, there is a name of a code block (a Gist) and the author's name. Below is the code block and the SM commentaries plug-in (see Figure 2b). Besides code, a Gist can contain a generated report (produced with rmarkdown package) that might be submitted by the student as an assignment. Gists also can be shared with members of a project group.



(a) First UI version

(b) Social Media commentaries block

Figure 2: UI Interface and Commentaries Block

6. How Students Share Code

To determine the impact of the code sharing system on the communication between students, we analysed one cohort of first-year minor students who started their studies in 2016/2017. Out of 194 students enrolled in the course, 164 created one or more Gists and 151 viewed at least one Gist of another student.

In Table 1, we summarize the Gist usage by majors. Students from underrepresented programmes are presented under one label "Humanities."

Kendall's rank correlation for non-normal data was applied to explore how the Gist usage is connected to educational achievement and the reported number of friends on the DSM. Data on students friends was collected during the survey conducted by the Sociology of Education and Science Laboratory at HSE.

The normality of variables was verified with the Shapiro-Wilk test. All results were significant indicating that our data do not follow a linear distribution, therefore we used nonparametric Kendall's correlation.

The number of Gists created by a single user is weakly connected with academic achievements ($\tau = .17, z = 3.29, p = .001$) and with the number of friends ($\tau = .146, z = 2.73, p = .006$).

The number of people who viewed one's Gists is positively correlated with higher academic achievement in the course ($\tau = .18$, $z = 3.44$, $p = .0006$). We assume that high-achieving stu- dents tend to employ the Gist system more often to share their code snippets and examples while others seek help from them.

Table 1: Gist usage of students from different educational programmes

Programme	Students	Created (%)	Viewed (%)
Economics	54	0.907	0.833
Humanities	29	0.759	0.759
Logistics	38	0.895	0.842
Management	38	0.658	0.711
Sociology	21	0.619	0.81

Note: Number of students using the Gist system (Students), how many students created at least one Gist besides assignments (Created %), and how many students viewed Gists created by another student from any education programme (Viewed %)

We gathered students' feedback on the Gist system to inform our future design. One of the suggested improvements was an introduction of privacy settings that would allow students to share only with selected people.

7. Discussion and Future Work

With the Gist system, we tried to bridge the gap in PLE between university-enforced components (VLE) and students' private tools (SM).

The evaluation showed that the code sharing system was used for various purposes, not all of which were considered in the design (e.g., as a personal notebook).

Students with higher academic achievement were more likely to create Gists, which, in turn, attracted more views from others. The connection was also positive with the number of students' friends. While this is expected in many educational environments, this might indicate that the system supports existing structure of exchange and does not facilitate enough people with lower academic achievement and social capital.

In the current version, every Gist was available to any VLE user. Some students considered it an error as they perceived the code sharing system to be their private space in which they can store different artefacts of their current work. We plan to address this issue in further development.

We assume that the lack of privacy control might be resulting in students preferring to share with friends primarily. We plan to apply Social Network Analysis to investigate this suggestion and uncover the social structure of code exchange network.

Acknowledgements

This work is supported in part by Russian Foundation for Basic Research (RFBR) (project No. 17-03-00293-RFH).

Notes

[1] https://rstudio.github.io/rstudioaddins/

[2] https://vk.com/dev/sites

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WORKSHOPS / SYMPOSIUMS

Design Patterns and Learning Analytics

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Theme

Design patterns are used to document and communicate teachers' designs for learning. In this workshop we introduce design patterns, take a deeper look into them and their content, and discuss how they could be used for learning analytics.

Background

Teachers' design patterns are descriptions that range from lesson plans to students' individual learning activities outside school. As digital tools and learning activities are pointed at in design patterns, we propose that an analysis of design patterns could inform learning analytics.

Goals

Through hands-on exercises analysing design patterns we aim to discuss:

- What learning and teaching activities are documented in teachers' design patterns?
- How are teachers' design patterns related to students' activities?
- Is there a connection between the content of design patterns and what learning analytics might need to look for?
- Are the tools and systems that teachers propose in the design patterns in reach for learning analytics?

Motivation

The need for sharing and exploring good examples on teachers' use of technology for teaching and learning is urgent in many schools. An equally urgent question concerns the potential of learning analytics for supporting designs for learning.

Thinking twice online - How designing learning materials can promote digital critical literacy in public school

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University College of Southern Denmark, Denmark

Theme

The Internet and the 'digital age' have over the last decades put the public school in front of a number of new challenges, which has led to discussions, such as what is the purpose of the school and what should the students learn, which will also be of value to them in the future ((Collins & Halverson, 2009) (Hargreaves & Fullan, 2012) (Fullan, 2018). The ability to think and argue critically is one of the skills that is often emphasized in these discussions. Among these, there is a keenness of critical thinking in relation to the use of digital media, which is also described under the term digital literacy ((Alvermann, 2016) (Buckingham, 2006) (Buckingham, 2007) (Bundsgaard, 2009) (Bundsgaard J. , 2017) (Dezuanni, 2015 (2017)) (Lankshear & Knobel, 2012) (Pangrazio, 2016) (Selwyn N. , 2011) (Selwyn, (2014).)

The purpose of the workshop is to discuss how to accommodate the need to organize education to help promote students' digital literacy. There will be a particular focus on the design of a specific learning material – Omtanke online (Thinking Twice online) that aims to support critical-constructive dialogues among 8th/ 9th graders in relation to their use of the Internet.

The learning material is developed by University College South, commissioned by the National Center for Extreme Prevention, and following up on the 2015 Millennium Development Goals Convention on Extremism and Radicalization. The purpose of the learning material is formulated as follows - "Online- based teaching material that will strengthen children's and young people's critical sense, ethical understanding and resilience to negative impacts, including giving them enhanced skills for source criticism and understanding of the basic mechanisms and techniques of conspiracy theories, simulated enemy images and propaganda"

In the process of producing the learning material, teacher educators, students and practitioners were involved stressing a user perspective, whereby these processes will be discussed further from a design perspective on learning. (Selander & Kress, 2012) (Selander, 2017) (Anderson & Shattuck, 2012) (Barab & Squire, 2004)

The main focus on the workshop is to answer the following question:
How does the learning material meet the purpose, for example by proposing activities and thematic content, to scaffold and animate students to think twice online?

First we will describe the background for the digital learning material, which is intended to promote students digital literacy and critical thinking.

Next, through hands on activities, to discuss in interaction the concept of digital literacy in this context, and from this point discuss some of the design elements found in Omtanke Online to exemplify how to initiate and maintain critical thinking in the teaching context.

In conclusion, we will discuss the consequences this design analysis may have for further development of learning materials with the aim of promoting pupils' digital literacy and preventing the risk of moral disengagement. (Bandura, 2002)

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Balancing Fun and Learning: Serious Games Co-Design and Power Structures

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Background, theme and motivation

With computer games becoming a ubiquitous part of life, educational environments are no exception. After a phase of games as the silver bullet against boredom on the one hand and gaming as stealing time from learning on the other it is time for a nuanced view. Carefully designed games for learning balancing fun and seriousness can provide a great learning environment. However, they may put teachers (and learners) in the hands of the game developers. Using non-serious games for learning may overcome part of that but need a larger amount of game literacy and expertise from the teachers.

Following the Scandinavian tradition of participatory design, we believe the role of learners and teachers as co-designers of the gaming and learning environment and the demands this puts on the teachers are of key interest. In computer games, co-design and modification of games ("modding") have a long history, but in the area of games for learning there is little research on these issues even if there is some practice. We will use the initial results of a pilot study conducted during Spring 2018 to start the discussion. Tying different implementations and opportunities for co-design to learning theories and designs for learning will be central for the discussion.

Goals

The workshop will discuss current developments in games for learning, the changing position of teachers and learners that comes with it and how the positioning of teachers and learners as game co-designers interacts with the inherent power structure of a learning situation. For instance, how is debriefing and assessment dependent on game literacy and expertise when learners are co-creators of the learning situation?

Re-representation of multimodal empirical material

Re-representation of multimodal empirical material

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Abstract

Visual communication begins to dominate dialogue in several domains. For example, emojis are used to communicate feelings, Snapchat for instant messaging, and in education moving images are easily distributed to pupils with the help of digital tools. In educational research, it is also common to video-observe pupil's and teacher´s activities, and it is nowadays easy to record these activities in different ways.

A growing interest in new forms of representations in academic journals is to be noted. However, using video observation also results in a rich and dense flow of information, and there is a growing need for developing new possibilities of representations, as well as to discuss how multimodal transcriptions can be re-represented on a screen.

During this symposium, we will discuss and address challenges regarding re-representation of multimodal, empirical research material. An example will be presented how the Designs for Learning journal has pinpointed some of these issues. The following matters will especially be highlighted:

- How can transcription be transformed into audio-visual representations in a journal: implication and possibilities?
- The peer-review process: how can audio-visual representations be assessed and peer-reviewed?
- Ethical consideration: the use of audio-visual material calls for attention in several aspects related to objects under study.

Nordic Approach for Learning Analytics

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Abstract

Nordic models of education and general well-being of our citizens have captured global news headlines over the last decade. The Nordics have a student and teacher-centric focus that places people and rights as the key aim of our societies. Providing teachers and students with more autonomy and trust combined with the notion of active citizenship and focus on play for children provides an atmosphere that can be described as "Nordic Bildung". Learning Analytics is an emerging research field, focusing on collection and analysis of data about learners and their learning process to understand, enhance and optimise learning. Within the digitalisation of many operating activities in educational institutions - from records of achievements to evaluation, home-school collaboration as well as the core of studying and learning with digital tools and learning materials - provide new kind of opportunities and challenges for Learning Analytics.