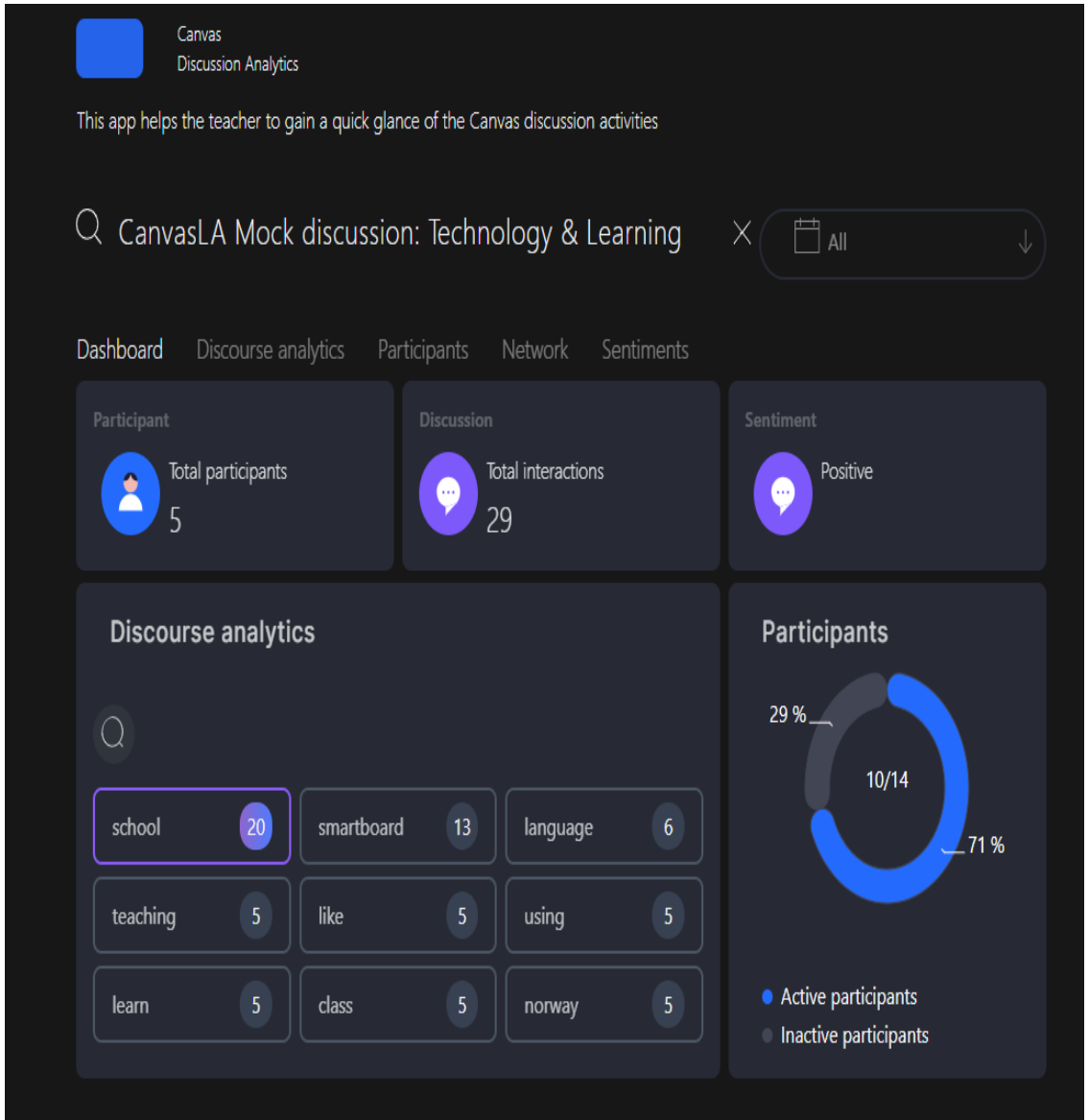
Leveraging Learning Analytics Dashboard to Support Teaching & Learning



Rogers Kaliisa

Doctoral Research Fellow
Department of Education, University of Oslo

Southern African Association for Institutional Research (SAAIR)
Learner Analytics Workshop 25 April 2022

SOLAR
SOCIETY for LEARNING ANALYTICS RESEARCH

UNIVERSITY of the WESTERN CAPE

UiO : University of Oslo

saair
Southern African Association for Institutional Research

Rogers Kaliisa - Background

UiO : University of Oslo

PhD Educational Sciences 2018-2022
Designing Learning Analytics Tools for Teachers with Teachers (Submitted)

THE UNIVERSITY OF ADELAIDE AUSTRALIA

MA Education 2015-2017

UiA University of Agder Norway

MSC Development Management 2010-2012

SOLAR SOCIETY for LEARNING ANALYTICS RESEARCH

Student Member Representative

MAKERERE UNIVERSITY

Bachelor of Adult & Community Education 2006-2009

Workshop Outline

- What are Learning Analytics Dashboards?

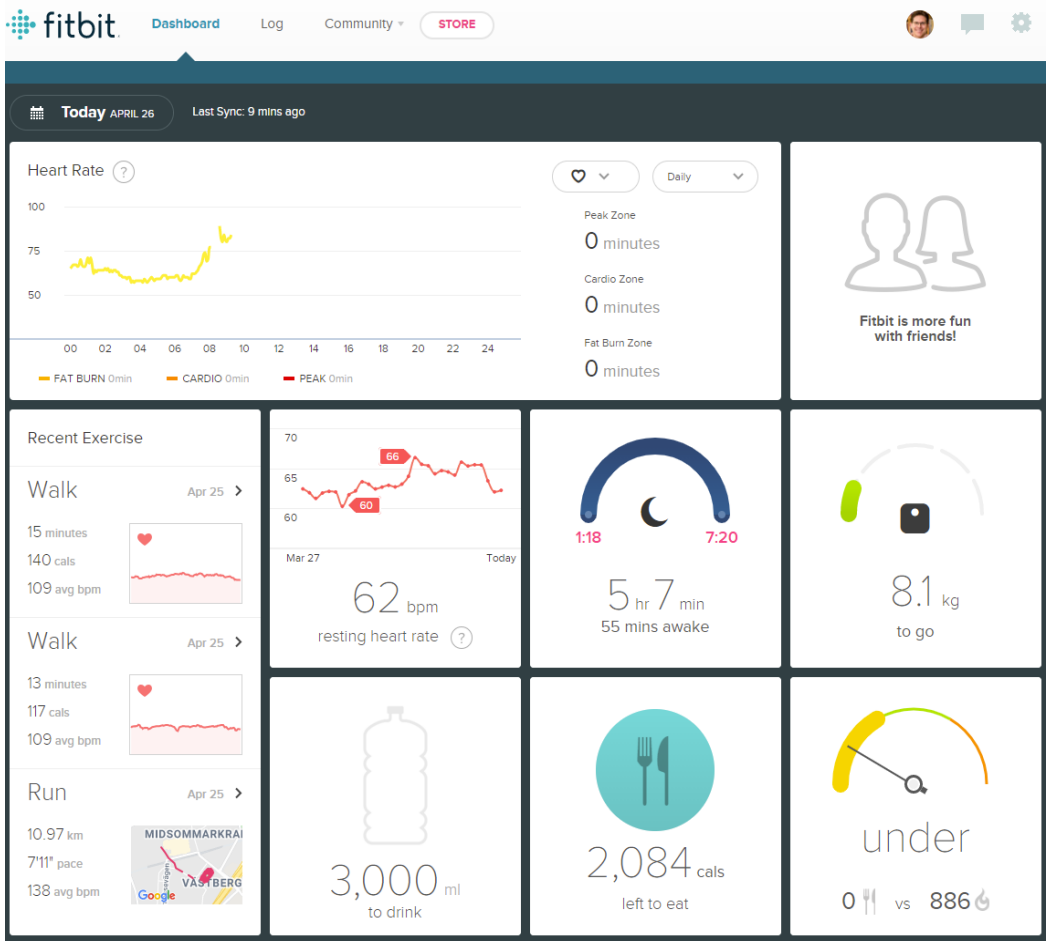
- Activity 1: Planning & Designing LA dashboards
- Challenges of Learning Analytics (Dashboards)
- Activity 2: Dashboard Critique
- Demonstrating a concrete example of a Learning Analytics Dashboard (CADA)
- Discussion & Questions

Workshop Objectives

To introduce participants to the concept of learning analytics dashboards and how they are developed from a participatory approach

What are Learning Analytics Dashboards?

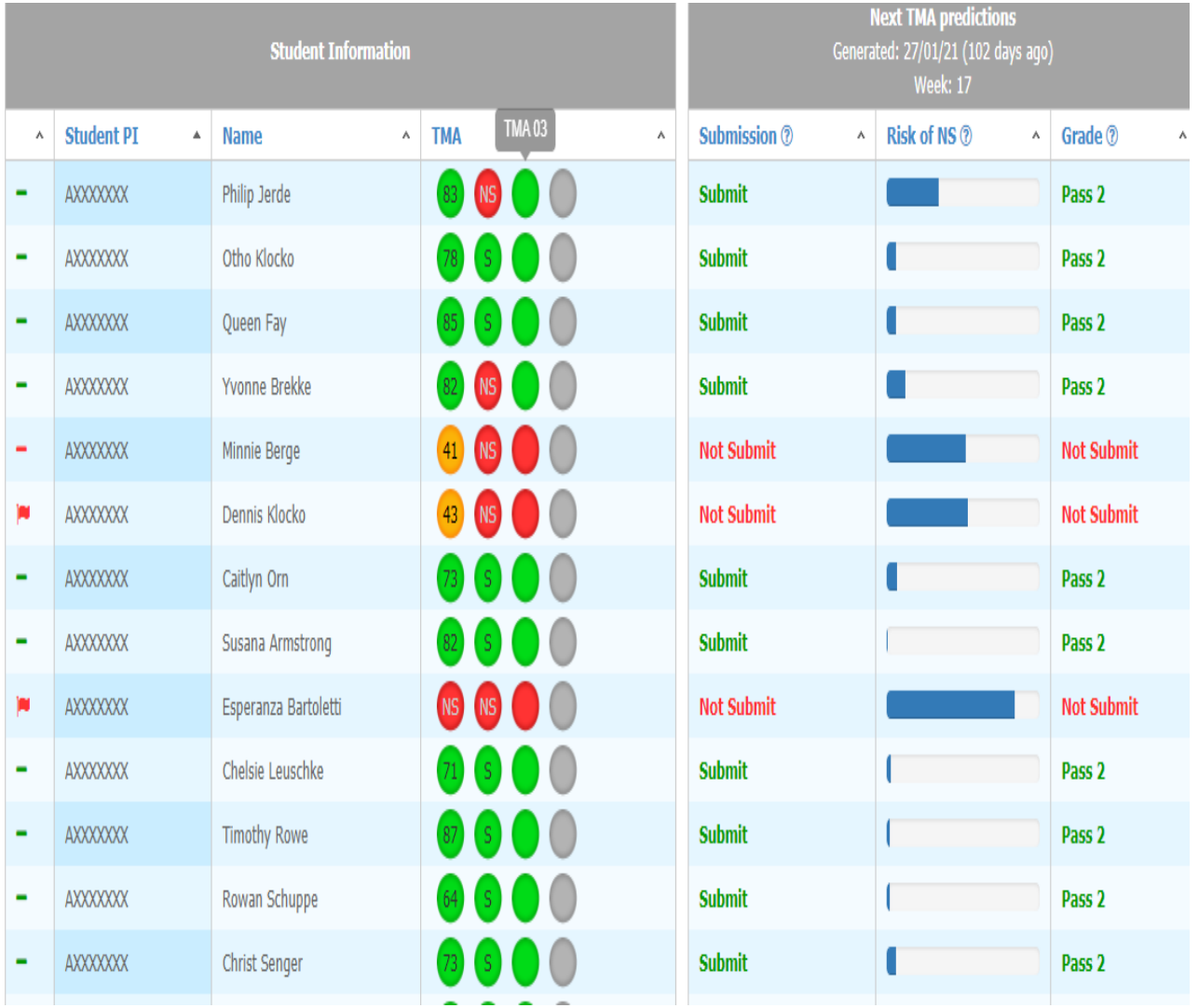
Interactive visual displays that summarise and visualise information for teachers based on students' learning patterns and interactions (Verbert et al., 2014)



What are Learning Analytics Dashboards?

LA dashboards combine automated analysis techniques with interactive visualisations for effective understanding, reasoning, and decision-making based on large, complex datasets on student activity

(Schwendimann et al., 2016; Jivet et al., 2017).



Student Information				Next TMA predictions Generated: 27/01/21 (102 days ago) Week: 17		
Student PI	Name	TMA (TMA 03)		Submission	Risk of NS	Grade
AXXXXXXX	Philip Jerde	83	NS	Submit		Pass 2
AXXXXXXX	Otho Klocko	78	S	Submit		Pass 2
AXXXXXXX	Queen Fay	85	S	Submit		Pass 2
AXXXXXXX	Yvonne Brekke	82	NS	Submit		Pass 2
AXXXXXXX	Minnie Berge	41	NS	Not Submit		Not Submit
AXXXXXXX	Dennis Klocko	43	NS	Not Submit		Not Submit
AXXXXXXX	Caitlyn Orn	73	S	Submit		Pass 2
AXXXXXXX	Susana Armstrong	82	S	Submit		Pass 2
AXXXXXXX	Esperanza Bartoletti	NS	NS	Not Submit		Not Submit
AXXXXXXX	Chelsie Leuschke	71	S	Submit		Pass 2
AXXXXXXX	Timothy Rowe	87	S	Submit		Pass 2
AXXXXXXX	Rowan Schuppe	64	S	Submit		Pass 2
AXXXXXXX	Christ Senger	73	S	Submit		Pass 2

License to Evaluate: Preparing Learning Analytics Dashboards for Educational Practice

Ioana Jivet
Open University of the Netherlands
Heerlen, the Netherlands
ioana.jivet@ou.nl

Maren Scheffel
Open University of the Netherlands
Heerlen, the Netherlands
maren.scheffel@ou.nl

Marcus Specht
Open University of the Netherlands
Heerlen, the Netherlands
marcus.specht@ou.nl

Hendrik Drachsler
Goethe University Frankfurt/DIPF, Germany
Open University of the Netherlands
Heerlen, the Netherlands
drachsler@dipf.de

ABSTRACT

Learning analytics can bridge the gap between learning sciences and data analytics, leveraging the expertise of both fields in exploring the vast amount of data generated in online learning environments. A typical learning analytics intervention is the learning dashboard, a visualisation tool built with the purpose of empowering teachers and learners to make informed decisions about the learning process. Related work has investigated learning dashboards, yet none have explored the theoretical foundation that should inform the design and evaluation of such interventions. In this systematic literature review, we analyse the extent to which theories and models from learning sciences have been integrated into the development of learning dashboards aimed at learners. Our analysis revealed that very few dashboard evaluations take into account the educational concepts that were used as a theoretical foundation for their design. Furthermore, we report findings suggesting that comparison with peers, a common reference frame for contextualising information on learning analytics dashboards, was not perceived positively

ACM Reference Format:
Ioana Jivet, Maren Scheffel, Marcus Specht, and Hendrik Drachsler. 2018. License to Evaluate: Preparing Learning Analytics Dashboards for Educational Practice. In *LAK'18: International Conference on Learning Analytics and Knowledge, March 7–9, 2018, Sydney, NSW, Australia.* ACM, New York, NY, USA, 10 pages. https://doi.org/10.1145/3170358.3170421

1 INTRODUCTION

Learning Analytics (LA) aims to exploit the potential of the increasingly large amounts of data describing interaction data, personal data and academic information generated by the widespread use of online learning environments [22]. LA is a relatively new field established in 2011 and defined as "the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs" [55].

Ruipérez-Valiente et al. [49] identified two main approaches of using LA to make sense of the vast amount of learning data: (i)

IEEE TRANSACTIONS ON LEARNING TECHNOLOGIES, VOL. 10, NO. 4, OCTOBER-DECEMBER 2017

Review of Research on Student-Facing Learning Analytics Dashboards and Educational Recommender Systems

Robert Bodily and Katrien Verbert, *Member, IEEE*

Abstract—This article is a comprehensive literature review of student-facing learning analytics reporting systems that track learning analytics data and report it directly to students. This literature review builds on four previously conducted literature reviews in similar domains. Out of the 945 articles retrieved from databases and journals, 93 articles were included in the analysis. Articles were coded based on the following five categories: functionality, data sources, design analysis, student perceptions, and measured effects. Based on this review, we need research on learning analytics reporting systems that targets the design and development process of reporting systems, not only the final products. This design and development process includes needs analyses, visual design analyses, information selection justifications, and student perception surveys. In addition, experiments to determine the effect of these systems on student behavior, achievement, and skills are needed to add to the small existing body of evidence. Furthermore, experimental studies should include usability tests and methodologies to examine student use of these systems, as these factors may affect experimental findings. Finally, observational study methods, such as propensity score matching, should be used to increase student access to these systems but still rigorously measure experimental effects.

Awareness Is Not Enough: Pitfalls of Learning Analytics Dashboards in the Educational Practice

Ioana Jivet[1(✉)], Maren Scheffel[1], Hendrik Drachsler[1,2,3], and Marcus Specht

[1] Open Universiteit, Valkenburgerweg 177, 6419 AT Heerlen, Netherlands
{ioana.jivet,maren.scheffel,hendrik.drachsler,marcus.specht}@ou.nl
[2] Goethe University Frankfurt, Frankfurt, Germany
[3] German Institute for International Educational Research (DIPF), Frankfurt, Germany
drachsler@dipf.de

Abstract. It has been long argued that learning analytics has the potential to act as a "middle space" between the learning sciences and data analytics, creating technical possibilities for exploring the vast amount of data generated in online learning environments. One common learning analytics intervention is the learning dashboard, a support tool for teachers and learners alike that allows them to gain insight into the learning process. Although several related works have scrutinised the state-of-the-art in the field of learning dashboards, none have addressed the theoretical foundation that should inform the design of such inter-

Staying on target: A systematic literature review on learner-facing learning analytics dashboards

Natercia Valle[1] | Pavlo Antonenko[1,2] | Kara Dawson[1,2] | Anne Corinne Huggins-Manley[2]

[1]School of Teaching and Learning, University of Florida, Gainesville, FL, USA
[2]School of Human Development and Organizational Studies in Education, University of Florida, Gainesville, FL, USA

Correspondence
Natercia Valle, College of Education, University of Florida, 2-051B Norman Hall, Gainesville, FL 32611-7048, USA.
Email: naterciavalle@gmail.com

Funding information
None

Abstract

The advances in technology to capture and process unprecedented amounts of educational data has boosted the interest in Learning Analytics Dashboard (LAD) applications as a way to provide meaningful visual information to administrators, parents, teachers and learners. Despite the frequent argument that LADs are useful to support target users and their goals to monitor and act upon the information provided, little is known about LADs' theoretical underpinnings and the alignment (or lack thereof) between LADs intended outcomes and the measures used to evaluate their implementation. However, this knowledge is necessary to illuminate more efficient approaches in the development and implementation of LAD tools. Guided by the self-regulated learn-

Examples of Learning Analytics Metrics to track through dashboards

1. **Sessions vs. total users.** Are your users coming back for more or just dropping in for a one-hit wonder?
2. **Completion rate.** Do completion rates matter to your project? If it's a linear elearning experience, is everyone getting through to the end? If not, why? If it's a range of performance topics that learners can explore freely, look instead at which pages/topics are visited, and by whom.
3. **User stats.** Are you reaching your target number of users, and in the locations you are aiming for? Do you need to market your product more in certain areas, or help it spread virally?
4. **Device type.** What devices are being used, and how does this differ from your expectations and the way your elearning is designed? Can you do more to make it mobile-friendly?
6. **Session times.** This is a great indicator of interest, but also "learning windows." What might be the optimum topic length?
7. **Poll results.** What results are you seeing from polls, and what do they tell you about user attitudes/preconceptions/beliefs? Do these need to be challenged ahead of "learning"?
8. **Tricky questions.** Which really important question are users struggling with? What does this tell you about where they may really be struggling on the job? How can you further help them?

Examples of Learning Analytics Metrics to track through dashboards

9. Drop off. What pages are you seeing the total number of users drop off from? Dig deeper to find out why this might be: page errors/lower engagement/less relevant content/navigation or UX issues, or perhaps they simply have all that they need and the rest can be cut!

10. User navigation. If you've created branches in your content, where are the majority of users going? What does this tell you about their needs/behaviors/profiles?

Activity 1: Planning & Designing Dashboards

Activity 1 (15 mins)

a) Discuss the main managerial/pedagogical problem(s) facing you as an institution/teacher/adviser/researcher?

b) Taking a Learning Analytics perspective, what data is available about students that could support dealing with such a problem?

c) What kind of information would you be interested in collecting about students using the data sources highlighted in section b

d) What is the best possible way to present this information to the teachers/students/advisers?

Record your responses through this google form

https://docs.google.com/document/d/1oqpo-HbjJxljvA1nGTaN6mIKRfsCtgvHi1tg5opH_oY/edit?usp=sharing

Challenges of Learning Analytics (dashboards)

- Integration of technical & pedagogical expertise
- Lack of connection btn LA & learning theory
- Failure to align LA with teachers' practice
- Ethical & Privacy issues
- Additional workload

SCANDINAVIAN JOURNAL OF EDUCATIONAL RESEARCH
2022, VOL. 66, NO. 3, 367–381
https://doi.org/10.1080/00313831.2020.1869082

Routledge
Taylor & Francis Group

Check for updates

Overcoming Challenges to the Adoption of Learning Analytics at the Practitioner Level: A Critical Analysis of 18 Learning Analytics Frameworks

Rogers Kaliisa, Anders Kluge and Anders I. Mørch

Department of Education, University of Oslo, Oslo, Norway

ABSTRACT

Learning analytics (LA) is a fast-growing field but adoption by teachers remain limited. This paper presents the results of a review of 18 LA frameworks and discusses how they have tried to address prominent challenges in LA adoption. The results show that researchers have made significant advances in developing appropriate frameworks to conceptualise LA adoption among teachers, and have advanced considerably in connecting LA and learning theory. However, few frameworks are concretised into technological artefacts and concrete data streams. Moreover, there is a need to empirically validate and put into use the most promising existing frameworks. We hope that this review will be informative for teachers who have little LA experience but are interested in adopting LA in authentic practice.

ARTICLE HISTORY
Received 6 July 2019
Accepted 2 October 2020

KEYWORDS
Learning analytics; frameworks; models; teacher adoption; challenges; orchestration

Learning Analytics Dashboard Challenges

- The current versions of LA dashboards are located outside of LMSs & tend to only provide general, sometimes obscure (unreadable) and high-level statistics

Learning Analytics Challenges

- Best *practice* examples that involve stakeholders in the development of LA dashboards remain limited.

- A growing interest in human centered learning analytics during dashboard development

Activity 2: DASHBOARD CRITIQUE

Activity 2

1. https://foodadvisor10.github.io/FoodAdvisor/#charts
2. https://viral50vis.github.io/
3. https://work-vis.firebaseapp.com/
4. https://ivis-project-staffiz.firebaseapp.com/
5. https://fstal.github.io/jobVis/
6. https://riksdagsviz.herokuapp.com/
7. https://adaszyn.github.io/info-vis-final-project/
8. https://sonia-ch.github.io/ivis-project/#
9. https://ivs18.000webhostapp.com/viz.html
10. https://wska.github.io/Royal-Seaport-Project-Visualization/project.html

In Groups of 3-4

1. Visit one of the links
2. Discuss and highlight
   a. Dashboard pros
   b. Dashboard cons
3. 15 minutes
4. Use the following link: https://docs.google.com/document/d/1Jz1-JMExyLsFHX53WpPPbDrPtFMqDyVRtSvMpW-6ImQ/edit?usp=sharing

Demonstrating a concrete example of a Learning Analytics Dashboard Design & Implementation Process

The Canvas Analytics Discussion Dashboard (CADA)

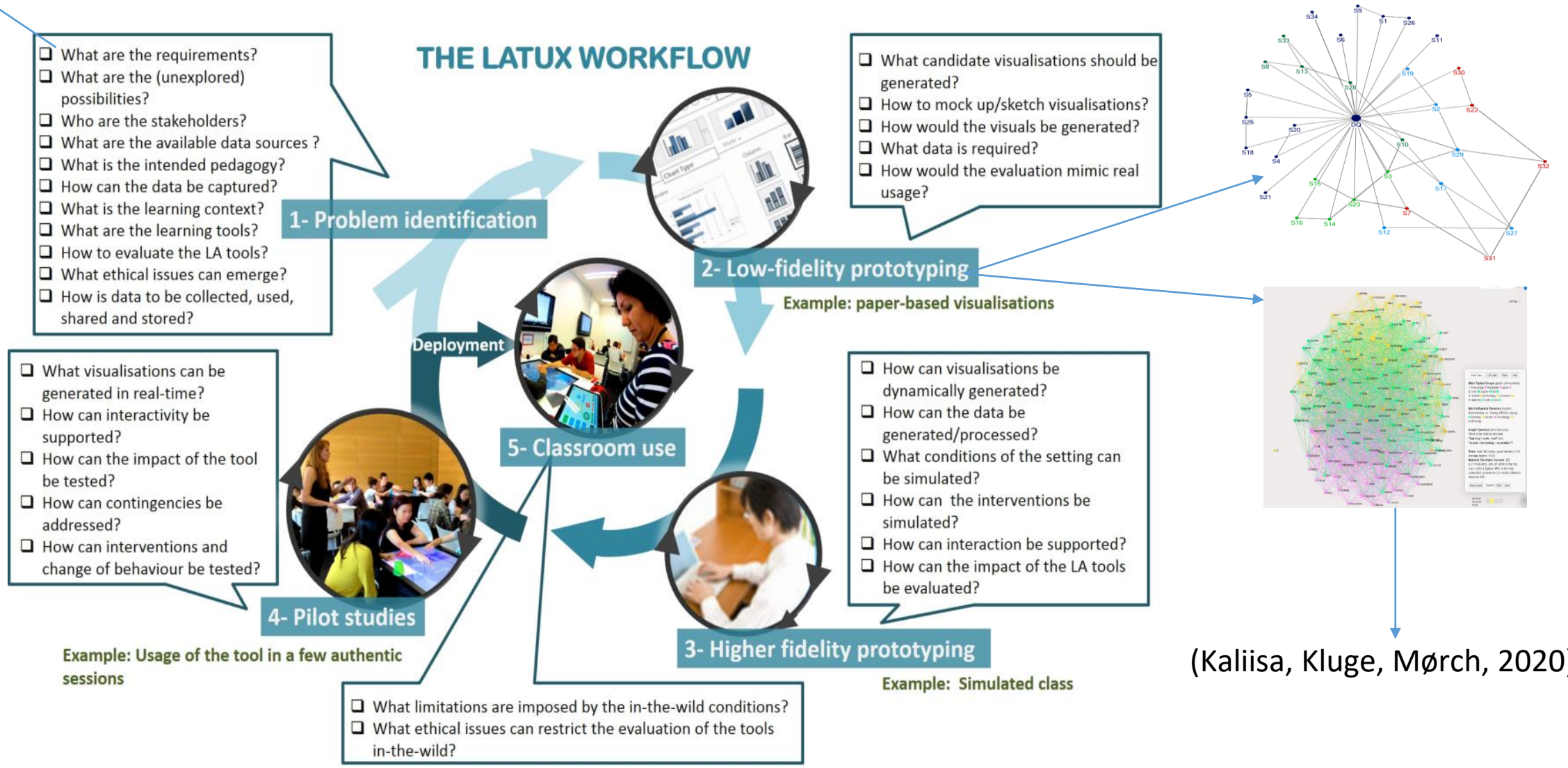
https://link.springer.com/article/10.1007/s10758-022-09598-7

Taking a user centered approach to LA

- Human Computer Interaction (Helander, 2014)
- Design based research (Barab, 2006)
- Human centered learning analytics (Buckingham-shum et al., 2019)
- Learning Awareness Tools –User eXperience method (LATUX) (Martinez-Maldonado et al., 2015)

(Kaliisa, Mørch, Kluge, 2021)

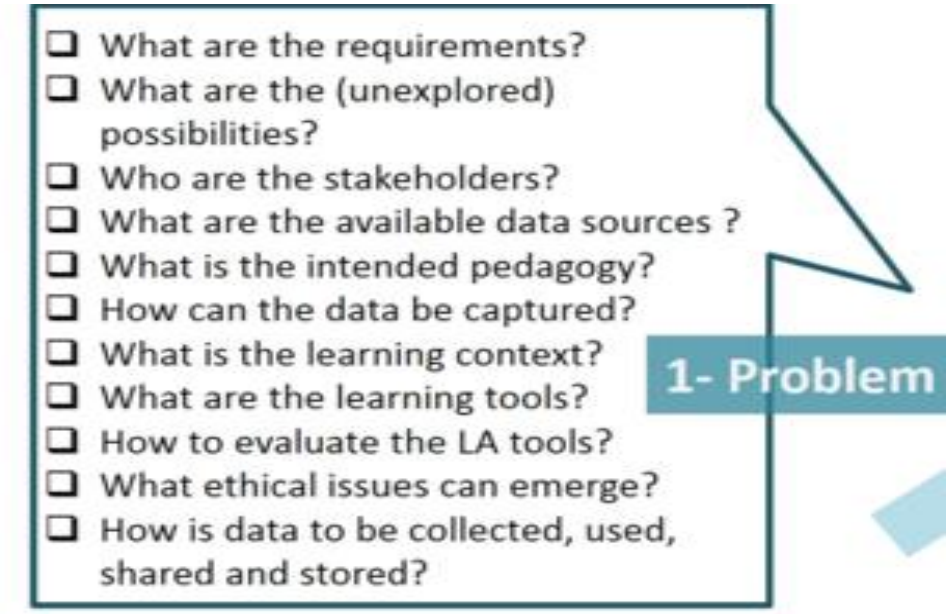
CADA DESIGN PROCESS



(Kaliisa, Kluge, Mørch, 2020)

Figure 1. Conceptual Representation of the LATUX Workflow used for the designing and development of CADA (Martinez-Maldonado et al., 2015).

Stage one: Prob ident



Context

- 16 teachers
- 2 Norwegian universities
- Qualitative interviews/mini survey

Analytics needs

- Social analytics
- Discourse analytics
- Feedback analytics

Technology, Knowledge and Learning
https://doi.org/10.1007/s10758-020-09488-w

ORIGINAL RESEARCH

Check for updates

'My Point of Departure for Analytics is Extreme Skepticism': Implications Derived from An Investigation of University Teachers' Learning Analytics Perspectives and Design Practices

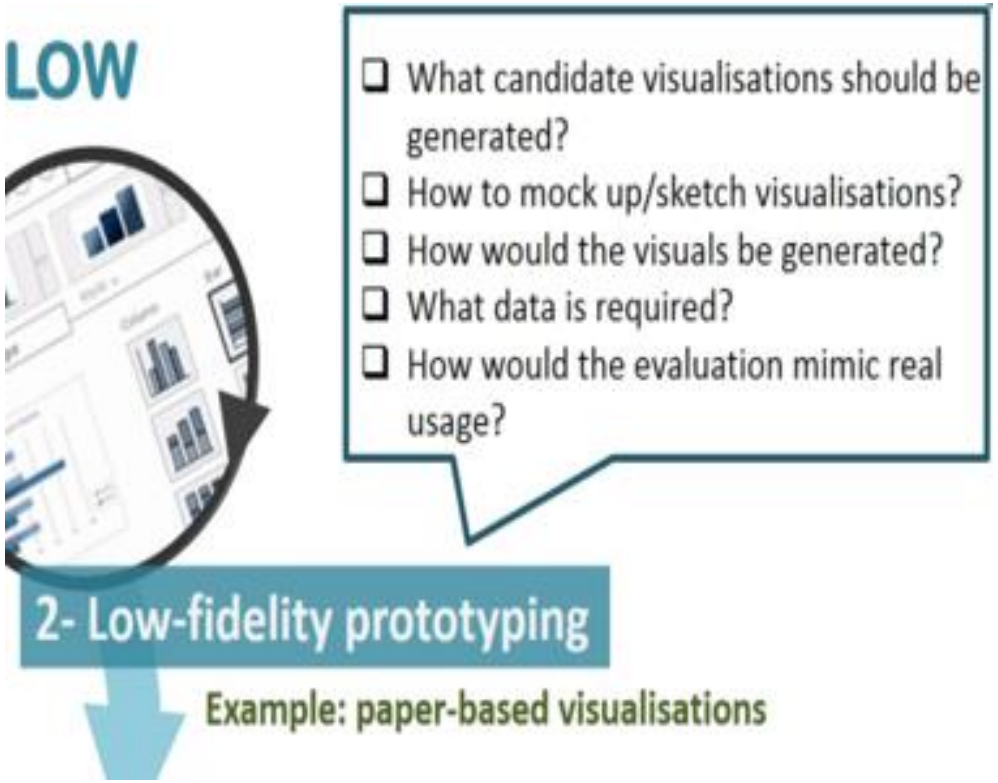
Rogers Kaliisa[1] · Anders I. Mørch[1] · Anders Kluge[1]

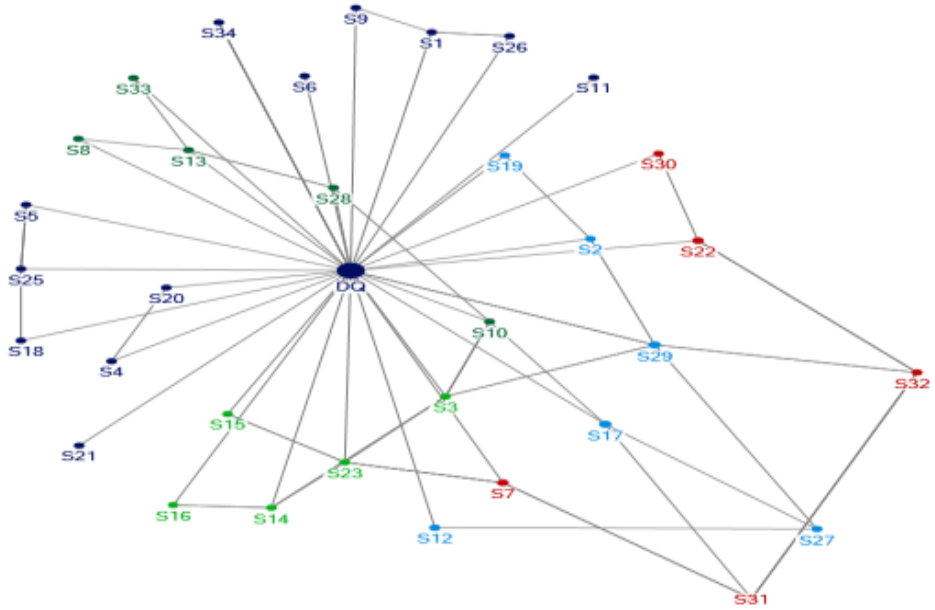
Accepted: 27 November 2020
© The Author(s), under exclusive licence to Springer Nature B.V. part of Springer Nature 2021

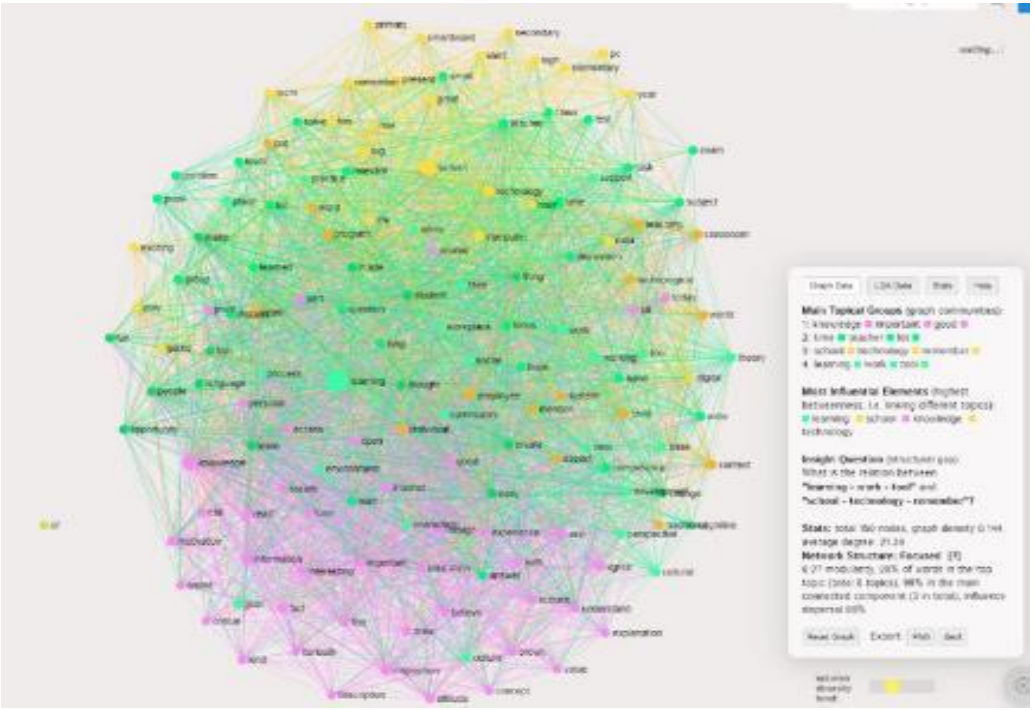
Abstract

The literature until 2020 has forecasted a significant uptake of learning analytics (LA) to support learning design in higher education. However, there remain only a few investigations into teachers' course design practices and their perspectives on LA as a tool to support their design practices. This paper presents findings from an examination of 16 university teachers' design practices and perspectives on LA at two Norwegian universities (The University of Oslo and Oslo Metropolitan University). On one hand, findings identified situational factors, feedback sources and teachers' intuition as key influencers of teachers' course design decisions. On the other hand, guided by principles of the technology acceptance model, this study identified mixed reactions amongst teachers regarding the awareness, understanding and potential use of LA to support course design practices. In particular, most teachers appreciated the formative and normative value of LA to provide more objective evidence about students' learning patterns and to shape learning trajectories, but some were skeptical about the evaluative role where LA is used to evaluate teachers' and students' performance based on unnuanced data (e.g. no theory guidance) with limited depth in observation. This article contributes to the understanding of factors fundamental to linking LA to teachers' course design practices by synthesizing findings to propose a 'bi-directional LA-course design' conceptual framework that clarifies key elements that influence teachers' design practices and highlighting their implications for LA integration.

Stage two: Paper Prototypes





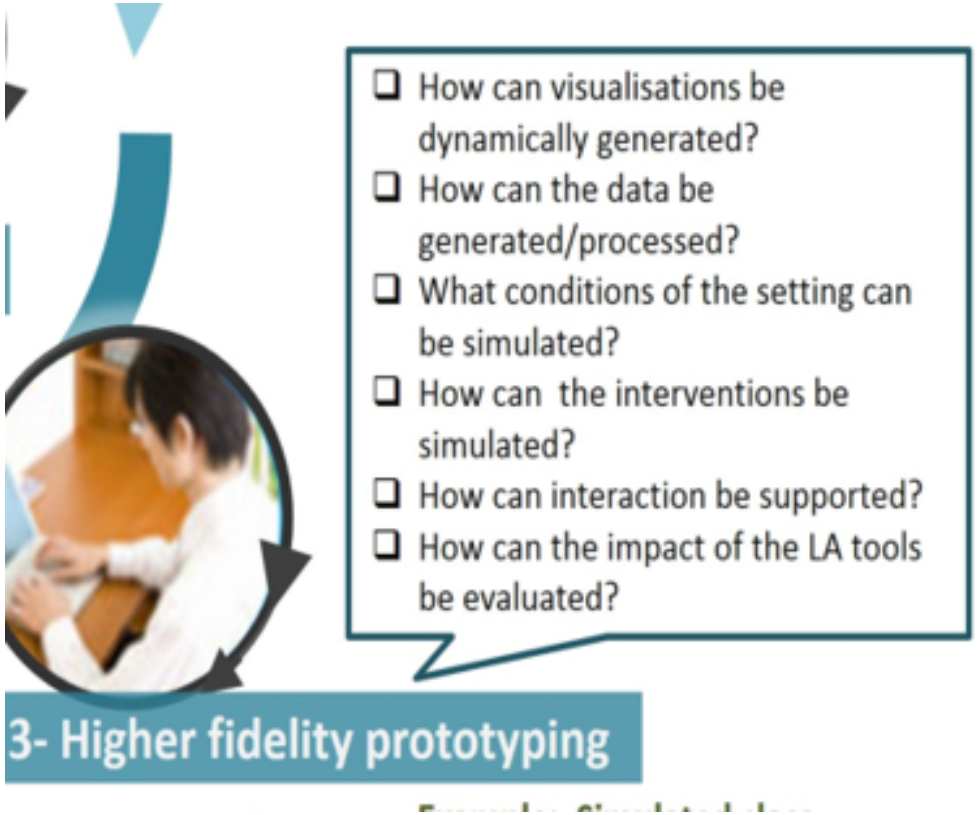


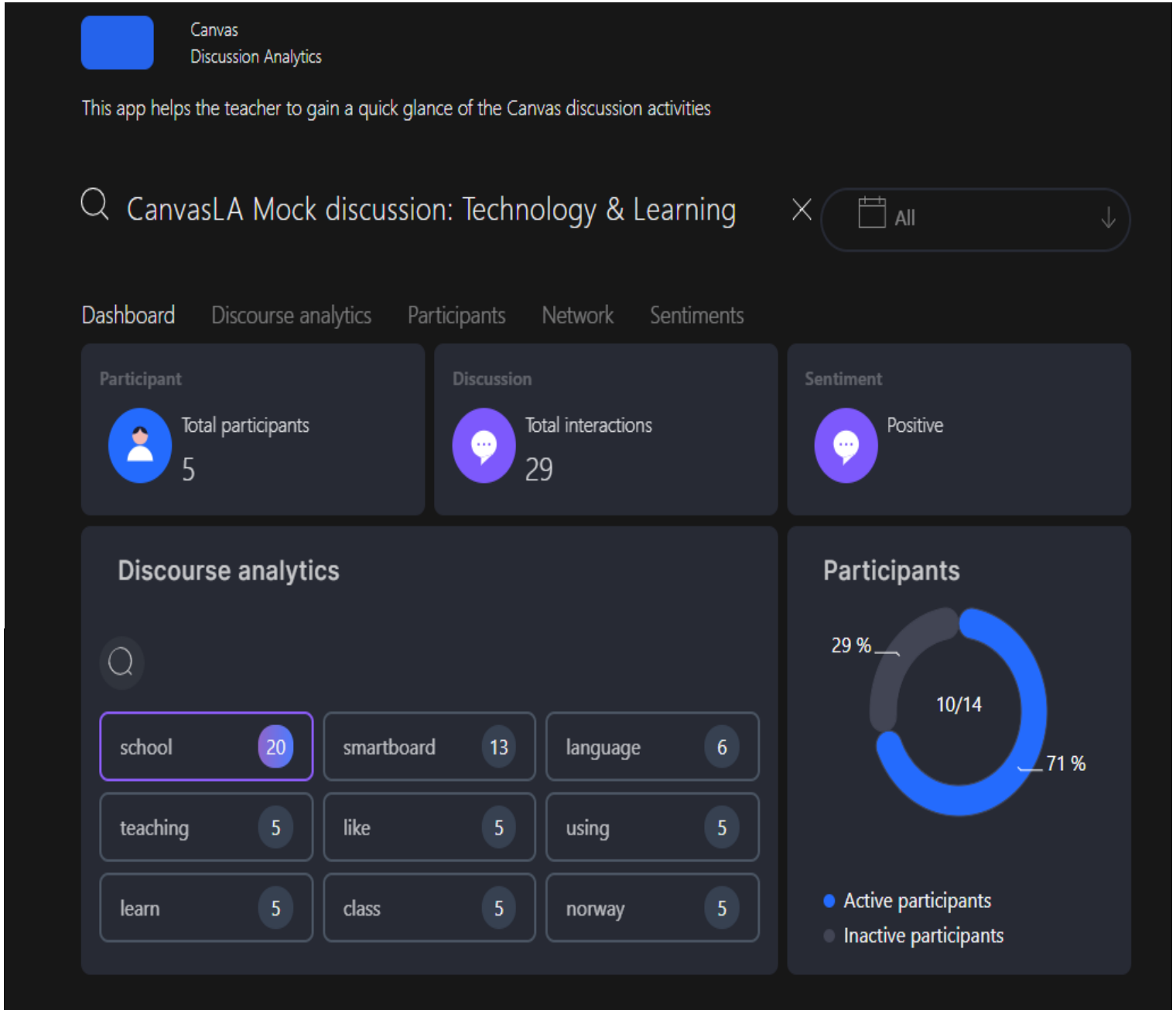
Teachers' feedback (Kaliisa, Kluge & Mørch 2020)

- Simplified visualisations
- Automated
- Embedded in an LMS (Canvas)

Kaliisa, R., Kluge, A., & Mørch, A. I. (2020). Combining Checkpoint and Process Learning Analytics to Support Learning Design Decisions in Blended Learning Environments. *Journal of Learning Analytics*, *7*(3), 33-47.

Stage 3: Iterative Development of an automated dashboard (CADA)





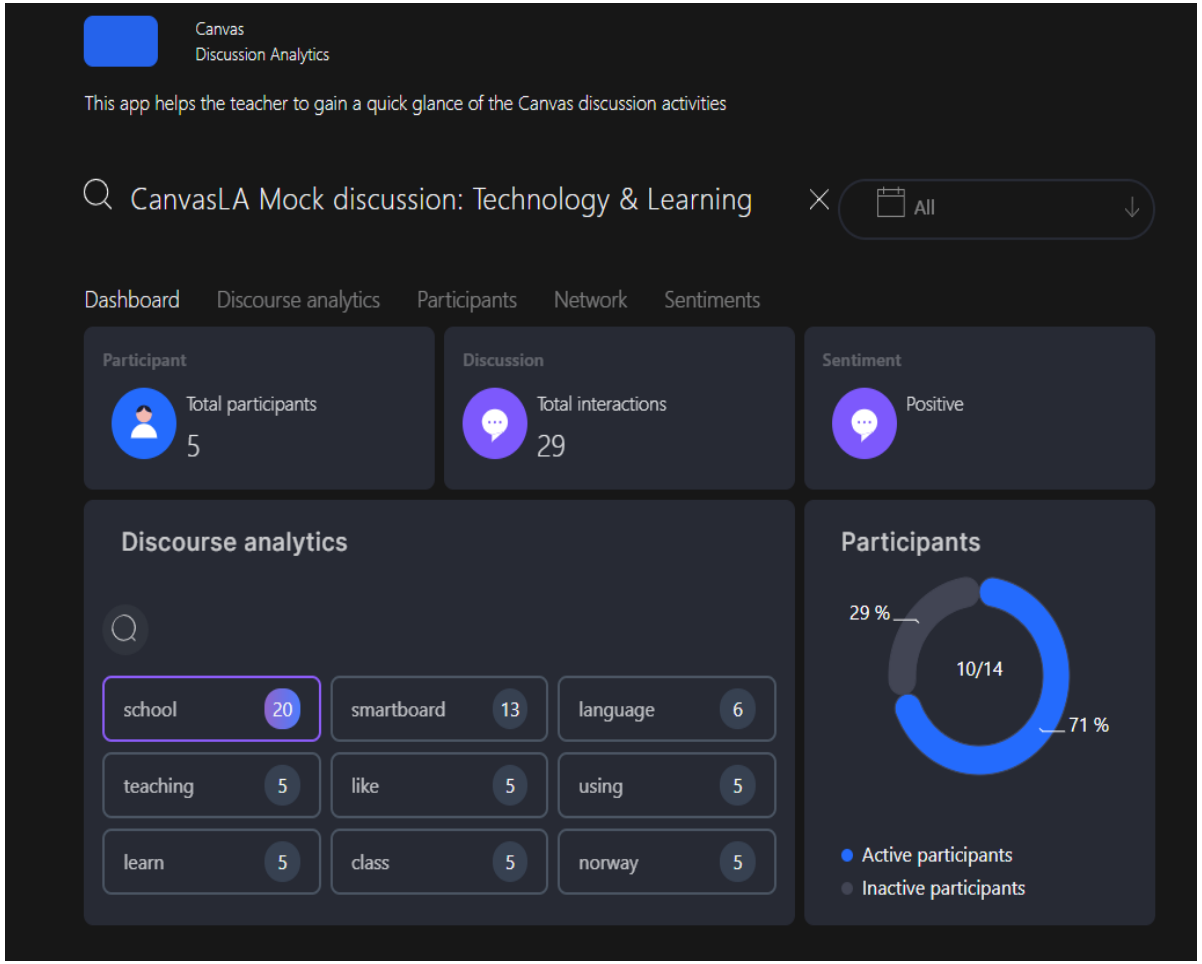
Features

- Participation
- Discourse analytics
- Network analytics

UiO : University of Oslo

CADA

CADA interface



CADA features

- Participation
- Discourse analytics
- Network analytics

CADA's Theoretical Background

- CADA rests on assumptions and principles from the learning sciences and HCI
- Learning as the participation in, and mastery of, subject-specific discourses and practices mediated by artefacts
- From HCI we built on principles for design such as collaboration with stakeholders, signifiers, constraints, error prevention, and reduction of cognitive load and decision-making time
- Meanings, interaction opportunities, functions and attributes defined with teachers

Stage 4: Pilot studies & Evaluation

Pilot Cases (Fall 2020 & Spring 2021)

- 10 teachers
- 7 courses
- Interviews & observation

Findings

Design

- Co-designing with teachers but with consideration of relevant theoretical constructs.
- Simple & informative visualisations prefered
- Configurable LA tools
- Focus on basic aspects of relevance to the teachers (e.g. summary of students' posts)
- Learning science constructs should motivate design decisions

Technology, Knowledge and Learning
https://doi.org/10.1007/s10758-022-09598-7

ORIGINAL RESEARCH

Check for updates

CADA: a teacher-facing learning analytics dashboard to foster teachers' awareness of students' participation and discourse patterns in online discussions

Rogers Kaliisa[1] · Jan Arild Dolonen[1]

Accepted: 7 March 2022
© The Author(s) 2022

Abstract
Despite the potential of learning analytics (LA) to support teachers' everyday practice, its adoption has not been fully embraced due to the limited involvement of teachers as co-designers of LA systems and interventions. This is the focus of the study described in this paper. Following a design-based research (DBR) approach and guided by concepts from the socio-cultural perspective and human-computer interaction (HCI), we design, test, and evaluate a teacher-facing LA dashboard, the Canvas Discussion Analytics Dashboard (CADA), in real educational settings. The goal of this dashboard is to support teachers' roles in online environments through insights into students' participation and discourse patterns. We evaluate CADA through 10 in-depth interviews with university teachers to examine their experiences using CADA in seven blended undergraduate and graduate courses over a one-year period. The findings suggest that engaging teachers throughout the analytics tool design process and giving them control/agency over LA tools can favour their adoption in practice. Additionally, the alignment of dashboard metrics with relevant theoretical constructs allows teachers to monitor the learning designs and make course design changes on the fly. The teachers in this study emphasise the need for LA dashboards to provide actionable insights by moving beyond *what things are* towards *how things should be*. This study has several contributions. First, we make an artefact contribution (e.g. CADA), an LA dashboard to support teachers with insights into students' online discussions. Second, by leveraging theory, and working with the teachers to develop

Findings

Technology, Knowledge and Learning
https://doi.org/10.1007/s10758-022-09598-7

ORIGINAL RESEARCH

CADA: a teacher-facing learning analytics dashboard to foster teachers' awareness of students' participation and discourse patterns in online discussions

Rogers Kaliisa[1] · Jan Arild Dolonen[1]

Accepted: 7 March 2022
© The Author(s) 2022

Abstract
Despite the potential of learning analytics (LA) to support teachers' everyday practice, its adoption has not been fully embraced due to the limited involvement of teachers as co-designers of LA systems and interventions. This is the focus of the study described in this paper. Following a design-based research (DBR) approach and guided by concepts from the socio-cultural perspective and human-computer interaction (HCI), we design, test, and evaluate a teacher-facing LA dashboard, the Canvas Discussion Analytics Dashboard (CADA), in real educational settings. The goal of this dashboard is to support teachers' roles in online environments through insights into students' participation and discourse patterns. We evaluate CADA through 10 in-depth interviews with university teachers to examine their experiences using CADA in seven blended undergraduate and graduate courses over a one-year period. The findings suggest that engaging teachers throughout the analytics tool design process and giving them control/agency over LA tools can favour their adoption in practice. Additionally, the alignment of dashboard metrics with relevant theoretical constructs allows teachers to monitor the learning designs and make

Implementation

- Institutional support key to classroom & institutional adoption
- Start small
- The process of combining learning analytics and learning design is bi-directional (adapt designs to get relevant analytics)
- Communicate value explictly
- Peer Training

CADA DEMONSTRATION: ENGAGELAB-VIVA COURSE

Demo: https://uio.instructure.com/login/canvas

Relevant Literature

Kaliisa, R., & Dolonen, J. A. (2022). CADA: a teacher-facing learning analytics dashboard to foster teachers' awareness of students' participation and discourse patterns in online discussions. *Technology, Knowledge and Learning*, 1-22.

Kaliisa, R., Kluge, A., & Mørch, A. I. (2021). Overcoming Challenges to the Adoption of Learning Analytics at the Practitioner Level: A Critical Analysis of 18 Learning Analytics Frameworks. *Scandinavian Journal of Educational Research*, 1-15. https://doi.org/10.1080/00313831.2020.1869082

Kaliisa, R., Mørch, A. I., & Kluge, A. 'My Point of Departure for Analytics is Extreme Skepticism': Implications Derived from An Investigation of University Teachers' Learning Analytics Perspectives and Design Practices. *Technology, Knowledge and Learning*, 1-22. https://doi.org/10.1007/s10758-020-09488-w

Kaliisa, R., Kluge, A., & Mørch, A. I. (2020). Combining checkpoint and process learning analytics to support learning design decisions in blended learning environments. *Journal of Learning Analytics*, *7*(3), 33-47. https://doi.org/10.18608/jla.2020.73.4

Thank You!

Questions: rogers.kaliisa@iped.uio.no; rogerskaliisa@gmail.com