

The Hybrid Studio - Introducing Google+ as a Blended Learning Platform for Architectural Design Studio Teaching

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ABSTRACT

Much architecture and design teaching is based on the studio format, where the co-presence in time and space of students, instructors and physical learning artefacts form a triangle from which the learning emerges. Yet with the advent of online communication platforms and learning management systems (LMS), there is reason to study how these technologies may enhance this well-established learning format and transform it into a blended learning format.

In this paper, the introduction of an online communication platform – Google+ – as a supplement to an administrative LMS – Moodle – in a four month BSc level urban design studio course is evaluated and discussed with regard to its capacity to facilitate blended learning as a transforming blend. The online platform was used for general instructor/student communication, for student/student communication, as well as for sharing of student work in progress. It also worked as a one-on-one supervision platform for whenever students were in need of supervision and advice outside class hours.

Methodologically, a phenomenographic approach was adopted in a single-case study in the form of a student workshop using an adapted problem-tree analysis method as a participatory learning and action method, in order to understand the students' experiences and evaluation of blended learning systems and contexts.

The paper gives an introduction to the traditional architecture and design studio teaching format, to blended learning, as well as to the preparation and setup of the studied blended learning course. The implementation of Google+ into the studio course was experimental and ran alongside the administrative Moodle platform which was used in parallel.

The positive and negative aspects of both platforms were evaluated by the students. While they were mostly critical of Moodle, they valued the functionality of Google+ from several

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perspectives, although they also made critical remarks. While the experiment was not entirely successful, it seems to suggest that transforming blends, if well implemented, may offer a pedagogical enhancement to architecture and design studio teaching.

INTRODUCTION

Studio teaching in architecture and design is traditionally based on the presence of both instructors and material learning artefacts. Instructors typically give supervision to students one-on-one at their drawing tables. Students, in turn, work with tangible material such as pens and tracing paper, and scale model material such as cardboard and styrofoam. From this triangle of students, instructors and learning artefacts, the learning emerges. As such, the physical presence of people and stuff is a fundamental premise of the traditional studio learning format.

As the object of study in architecture and design is physical – the designed artefacts in the form of objects and buildings – a certain hesitation seems to reside in architecture and design education towards new mediated forms of learning. But while completely mediated forms of learning such as MOOCs may not be a feasible replacement for the traditional architecture and design studio, forms of blended learning, combining physical and online learning has the potential to make the best of both worlds, enriching studio learning without losing its indisputable merits in architecture and design education.

Blended learning (BL) has become an essential pedagogical approach in higher education due to the adoption and integration of learning management systems (for example, Moodle, Blackboard, etc.) and other web 2.0 platforms (for example, Google+). “Blended learning systems combine face-to-face instruction with computer-mediated instruction.” (Bonk, Graham 2012). Among many definitions of blended learning, Bonk and Graham (*ibid.*) reviewed and reported three most commonly mentioned definitions: (1) combining instructional modalities (or delivery media), (2) combining instructional methods, and (3) combining online and face-to-face instruction. In the online spaces, the communication and learning activities that occur among the teacher(s), students, and online learning objects are expected to contribute in achieving the teaching and learning goals.

Architectural design education emphasizes on gaining cultural, social, technical and technological aspects alongside studio teaching (Afacan 2015). “Since design pedagogy is project-oriented, studio assignments play a key role in architectural design education” (Chen, Heylighen 2012). Typically, studio projects include studying and working on “architectural space and form, using of appropriate materials and construction techniques and presenting of drawings and 3D models” (Afacan 2015, p. 2). The experiences of architectural design studio

students in the process of blending such online learning components has remained understudied.

Six reasons behind choosing a blended learning system are: (1) pedagogical richness, (2) access to knowledge, (3) social interaction, (4) personal agency, (5) cost-effectiveness, and (6) ease of revision (Osguthorpe and Graham cited in Bonk, Graham 2012). “Overwhelmingly, people chose BL for three reasons: (1) improved pedagogy, (2) increased access and flexibility, and (3) increased cost-effectiveness” (Bonk, Graham 2012, p. 5). In this study, the course instructor intended to improve the pedagogy, and increase access and flexibility of the studio course in a Danish context.

The case of this study is the Spring 2016 4th semester bachelor (BSc4) urban design studio course (15 ECTS) of the architecture and design programme at Aalborg University (AAU), Denmark. The study explores how the students of this architecture and design studio course perceived benefits and challenges in the process of adopting and integrating Google+, with the existing university-facilitated learning management system Moodle. Applying participatory and mixed research methods, this study addresses the following two research questions:

- What is the problem with the existing Moodle-supported studio at AAU? What are the causes and effects of the problem associated with Moodle-mediated studio courses?
- What are the students’ perceived problems, benefits and expectations with regard to achieving a more interactive learning experience by blending Google+ in studio project courses?

THE TRADITIONAL STUDIO

Architecture and design are making disciplines and thus fundamentally based on creative processes. Architecture and design essentially deal with configurations of physical form and space for the purpose of fulfilling criteria for use, construction and aesthetics. Hence, architecture and design education is focused on the creative processes of form-making. Teaching programmes in architecture and design have traditionally been oriented towards studio teaching and project based learning. As it has been beautifully demonstrated in the documentary film *Archiculture* (Krantz, Harris 2013), teaching programmes in architecture and design are traditionally oriented towards studio teaching and project based learning (Parsons 2007, Yürekli 2007), in, as contended by Turkienicz & Westphal (2012), a problem-solving format:

“Hands-on learning is generally thought of as the default path to follow through design school. It is thought to be epitomized in the design studio where design is exercised through solving

design problems of varying complexity. Design is generally learnt through practice because it simultaneously involves making, seeing (often with the whole body), reflecting, and forming habits.”

– (Steinø, Özkar 2012)

Originating in the beaux-arts tradition, there is a focus on learning by doing (Dewey 1966), and the predominant mode of instruction is one-on-one studio supervision, where supervisors discuss project ideas with students. As Schön explains (1983), learning in this process emerges as the result of reflection in action.



Figure 1: The traditional architecture and design studio. Middle East Technical University, Faculty of Architecture. Photo: Nicolai Steinø

In addition to this, the ‘critique’ – or crit – where professors and optionally invited guest critics (practitioners and/or academics) give their opinion and their comments on the students’ work in progress, plays a major role in the traditional architecture and design studio learning format (Krantz, Harris 2013).

Therefore, architecture and design is created and communicated, not (primarily) through text and numbers, but through visual representations in the form of drawings, scale models and prototypes. These artifacts are traditionally physical – graphite and ink on paper, and objects made from wood, cardboard, plaster and other materials – and therefore tangible. With the advent of computer-aided design (CAD), immaterial artefacts in the form of digital images, movies and models have been added to this list.

In extension, peer learning through sharing of visual material and work in progress (sketches) is central to the studio learning format. Learning from precedents (Potamianos 2012) or past examples of “good architecture” (Chen, Heylighen 2012) plays an important role in building a design vocabulary. Traditionally, displaying sketches, physical working models and reference material has been an important part of studio culture.



Figure 2: The architecture and design crit. Aalborg University, Architecture and Design. Photo: Nicolai Steinø

BLENDED LEARNING

“The capacity of online learning makes it possible to interact with learning assets (texts, videos, etc.) without having to go to the physical location of the library at whatever opening hours it may have. Likewise, it also makes it possible to interact with peers and instructors without being physically present at the same location at the same time. In addition, online learning systems make it possible to share work in progress, thus enabling collaborative learning and evaluation across time and space. These three qualities of online learning seem to represent the most important advantages of blended learning to traditional learning.”
 – (Steinø 2014).

The pros and cons of traditional and online learning have been much debated. But as several studies seem to suggest, rather than contemplating the complete substitution of online courses for campus-based courses, what may drive learning to new levels, is the combination and integration of ICT with face-to-face learning in what is generally referred to as blended

learning (Rovai, Jordan 2004, Lim, Morris & Kupritz 2007, Aspden, Helm 2004, Garrison, Kanuka 2004).

The term blended learning is used in different ways by different researchers. This leaves uncertainty about its definition (Mortera-Gutierrez 2006, Osguthorpe, Graham 2003, Oliver, Trigwell 2005). In fact, Oliver & Trigwell (2005) even make the argument that the term blended learning is redundant and unnecessary by all its definitions.

Blended learning may take on more or less radical forms. Bonk and Graham (2012), in their quest to answer “How to blend?”, divide blended learning systems into three categories (see table 1). They review and identify six major issues that are related to designing blended learning systems: “(1) the role of live interaction, (2) the role of learner choice and self-regulation, (2) models for support and training, (4) finding balance between innovation and production, (5) cultural adaptation, and (6) dealing with the digital divide.”

Enabling blends	Primarily focus on addressing issues of access and convenience, for example, blends that are intended to provide additional flexibility to the learners or blends that attempt to provide the same opportunities or learning experience but through a different modality.
Enhancing blends	Allow incremental changes to the pedagogy but do not radically change the way teaching and learning occurs. This can occur at both ends of the spectrum. For example, in a traditional face-to-face learning environment, additional resources and perhaps some supplementary materials may be included online.
Transforming blends	Blends that allow a radical transformation of the pedagogy, for example, a change from a model where learners are just receivers of information to a model where learners actively construct knowledge through dynamic interactions. These types of blends enable intellectual activity that was not practically possible without the technology.

Table 1: Categories of Blended Learning Systems

Source: (Bonk, Graham 2012, p. 47-49)

Enabling blends do not vary much from traditional learning formats. In fact, interaction with different media and interfaces happens in practically all learning formats (essentially, books and blackboards are media with interfaces). Hence, “what makes online learning particular is not the media (online material) or the interface (the computer screen) per se, but the fact, that

online interaction with media offers the opportunity to learn independently of time and space” (Steinø 2014).

Any blended learning software must offer affordance (Gibson 1986), i.e. it must speak of how it should be used. Human-computer interaction (HCI) is of the essence in this regard, as the online learning system may otherwise hinder rather than foster interaction and thus cause frustration (So, Brush 2008). If not, the user may be alienated as a result of not being physically co-present with peers and instructors (Rovai, Jordan 2004).

In traditional as in blended learning formats, social presence, or the psychological distance which exists among students, and between students and instructors, is important for successful learning outcomes. And establishing a sense of connectedness is particularly important in collaborative online learning (So, Brush 2008). The emotional learning climate, the sense of intimacy and immediacy, as well as the feeling of being connected and to belong, is an important indicator of the effectiveness of the learning (Wu, Tennyson & Hsia 2010).

Independent blended-learning can occur only when the media and interface usability factors are of required quality, the contents and communication options are desirable by the students, and learning objectives and students' learning goals are integrated with the real-virtual-mixed activity spaces. From a learner's perspective, Ehlers (2004) has devised a model of user preferences in e-learning to investigate the quality dimensions of instructional and technological interface design, and empirically categorized 30 dimensions of subjective quality in 7 fields of quality.

Offering satisfactory blended learning in all these quality fields and dimension is a major challenge. Furthermore, due to dearth of literature on blended studio teaching, which includes multiple activity spaces in both physical and virtual learning environments, the learners' expectations have remained unknown and understudied. Moreover, the implementation of learning and communication platforms (for example, Moodle, Google+, Facebook and Skype) bring along the issues of functionalities, personalisable functions, and privacy policies.

GOOGLE+

There are some previous examples of Google+ being integrated as a blended learning platform for higher education. “Google Plus has the potential to improve students' collaboration through circles, conduct research for projects with sparks, improve the student-instructor relationship by using this kind of social media to get in touch with each other, and support blended learning with the hang out functionality” (Erkollar, Oberer 2011, p. 569). Erkollar and Oberer (2012a) have emphasized educators' preparedness and challenges to

integrate Google+ throughout a course in higher education, and demonstrated cross-course Google+ integration (Oberer, Erkollar 2012b).

Erkollar and Oberer (2013) also reported a research design, which will compare Google+ functionalities with Blackboard by devising and applying three hypotheses in relation to collaborative (student-student, student-group) communication functionalities available in Google+, core learning activities offered and implemented through a learning management system (LMS), and student-instructor interaction in LMS versus Google+. Kang et al. (2015 p. 1444) investigated and suggested in favour of “using Google Plus as a project-based learning platform for higher education context.”

There is little existing knowledge, however, on whether the integration of Google+ with LMS is meaningful in order to circumvent or alleviate the limitations of LMS as faced by educators in higher education. The same is true for the perception by students towards Google+ as a complementary (to Moodle) or alternative blended-learning platforms.

The perceived advantages and disadvantages of blended learning using Google+ by architectural design studio students could not be extracted from existing literature. Furthermore, it is assumed that the interaction between students, instructor and learning resources in architecture and design studio courses raises sets of expectations among students and instructors, which are different from those of other courses. This study, therefore, contributes to the scope of research on architecture and design students’ perception towards a blended learning environment using Google+ and Moodle.

SETUP OF THE BLENDED LEARNING STUDIO COURSE

The AAU architecture and design programme takes its point of departure in the traditional architecture and design studio format, although with some variation. The general pedagogical format at AAU is the project oriented problem based learning approach (PBL/POPBL). This format is akin to the studio approach in the shared focus on projects and reviews. However, while the studio approach focuses mainly on the work of individuals, the AAU version of PBL is based on group work.

A major difference exists in the attitude towards evaluation. The traditional studio crit, based on the (unquestionable) opinion of the critic (a professor) in a kind of master-apprentice hierarchy between professors and students, is subject to increasing criticism (Turkienicz, Westphal 2012, Oxman 2001), and in line with this, the PBL review format is based on a critical approach of questions and dialogue. Still, the PBL studio project modules of the AAU architecture and design programme take their point of departure in a design challenge which the students will try to respond to through repeated cycles of design.

AAU uses Moodle as its general e-learning platform across all programmes. As explained above, studio teaching depends heavily on peer learning and sharing of visual artefacts. In addition, while the AAU architecture and design programme does not involve individual one-on-one supervision, even group supervision is under pressure from receding resources. Therefore, making efficient use of instructor time and resources is of the essence.

In its AAU implementation however, Moodle does not offer the functionality one could desire in these regards for an architecture and design studio course. In addition, the information and training resources made available to instructors at AAU with regard to the use and functionality of Moodle, as well as general support for the system, are virtually non-existent. As the built-in functionality of Moodle is deeply integrated into the administrative procedures of the programme, however, it could not be entirely replaced by another system.

Therefore, in order to introduce transformation blend qualities to the course, a supplementary platform had to be found. The platform would have to offer functionality not present or not well implemented in Moodle. This involves supporting chat for questions, answers and comments, and sharing of visual material for sketches, photos of physical working models and reference material in an easy-to-use and graphically acceptable format.

The initiative was not supported by funding and the platform of choice therefore had to be free of charge – and preferably add-free. No resources were made available for technical support and it therefore also had to be easy to set up, manage and use (which is a serious constraint of Moodle), and finally, it had to be restricted (not public). After some research, Google+ was chosen, as it fulfils all of these requirements.

Once set up and introduced, students were asked to sign up for the G+ community. The community was organised into categories for tasks, messages, documents and links, submissions, discussions, as well as for each of the twelve study groups into which the students were organised. In a blog-like structure, posts could be added into each category. While instructors would post assignments and general info into the tasks and messages categories, students would post working material into their respective group categories (see figure 3), questions and into the discussion category, and partial submissions into the submissions category. Everyone would post documents and links into the documents and links category.

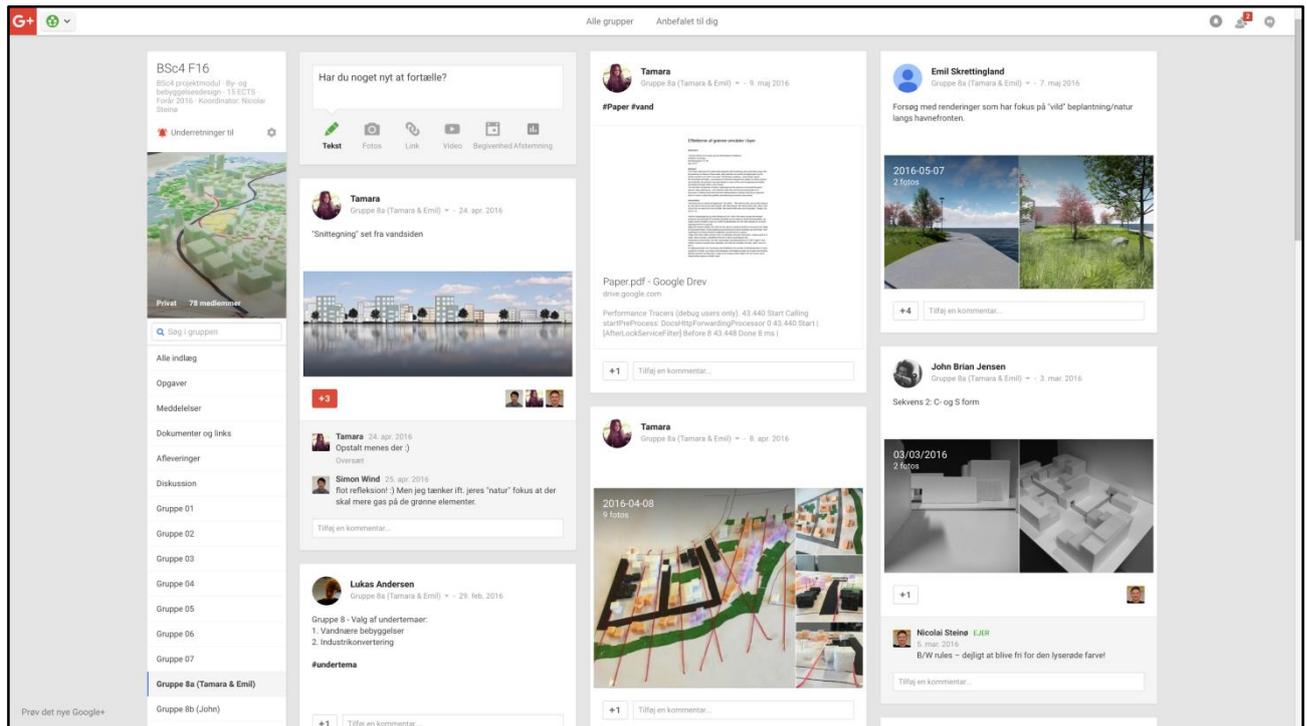


Figure 3: Screenshot of posts (section drawing (with comments), theory paper, renderings, message, and physical work model photos) in Google+ group category.

While most students seemed to quickly learn how to use the platform, there was much variation as to whether they would actually do so. During the early phases of the studio, there was some enthusiasm about sharing material, while this activity tended to level out towards the end of the studio when everyone was increasingly busy finalising their course projects. Throughout the course, asking questions to the supervisors between class hours was consistently popular. As a smartphone app for Google+ exists which makes this feature function much like sms texting, supervisors would respond quickly whenever possible.

The existing Moodle implementation may at best be characterised as an enabling blend (Bonk, Graham 2012), as it merely facilitates the access for students to learning materials, and facilitates the communication from programme administration and instructors to students. With the application of Google+ however, new forms of learning were enabled, turning the studio into a transformational blend (ibid.). Students could communicate graphically and in writing about their work in progress peer to peer. They could engage with the instructors across time and space, independently of class hours. And answers from instructors could be shared by all students, rather than just by the students asking the questions.

RESEARCH METHODOLOGY

Learners, as e-learning system users and blended-learning context participants, can be categorised into four target groups according to their quality preferences: (1) the individualist, who is content-oriented, (2) the result-oriented, who is independent and goal-oriented, (3) the pragmatic, who is need-oriented, and (4) the avant-gardist, who is interaction-oriented (Ehlers 2004). Due to these differences in expectations among students, their experiences and evaluation of blended learning systems and contexts might not be sufficiently understood through surveys and individual interviews.

In order to identify qualitative details of the complex inter-dependent satisfaction and dissatisfaction factors experienced by the students, and thus to give a qualitative answer to the research questions, this study applies methods that engage students in group discussions and does not categorize the students according to their quality preferences. Positioned within the transformative paradigm, this research therefore applies a phenomenographic approach.

The course instructor of the studio course, the first author, played an active role in integrating Google+. The transformative paradigm (TP) encourages the empowerment of the students in formulating the research problem (Akner-Koler s.d.). Inheriting the properties of the social constructivist paradigm, instead of beginning with a theory, this TP-based study “generate[s] or inductively develop[s] a theory or pattern of meanings” (Akner-Koler s.d., p. 39).

The research was designed as a single-case study (where the studio is considered as the case) with embedded units (i.e. students) (Steinø 2006). It was situated in the AAU architecture and design programme. 24 students of the Spring 2016 BSc4 architecture and urban design studio course (15 ECTS) were invited, and 14 participated, in an hour-long workshop (see table 2). An adapted problem-tree analysis (PTA) method was used as a participatory learning and action method (Khalid, Nyvang 2013).

Among the two problem-tree analyses, the first activity for the students was to establish a problem focusing on the use of Moodle in studio courses they had participated in, in order to identify the underlying causes and to identify both desirable and undesirable effects. The researchers' intention of the second PTA was to establish a problem focusing on Google+ and to identify the causes and effects, which would essentially function as an evaluation of blending Google+ in the studio course. The two PTAs deal with the two research questions of this study.

In the workshop, students were divided into three groups. The groups were provided with paper, pens and post-its, and discussions were video-recorded. Strict facilitation could not be

provided as video recording had to be monitored and one facilitator per group was not an option. So, for the first PTA, two of the groups didn't seem to understand the methodology and an agreed-upon problem statement was not established. As a result, the causes and effects in the PTAs overlapped the desired reflections in relation to the two research questions. So, the PTAs could not be reported as-is, and the analyses of students were reconstructed by the authors, based on the video, observed discussions, and meaning-condensation.

Units	Method(s)	Outcome	Participants
Commonly agreed problem selection and definition	Three focus group discussions (FGDs)	Problem statement	Group A: 5-member group Group B: 5-member group Group C: 4-member group
Cause-and-effect relationships with the problem	Two problem-tree analyses	What are the causes and effects?	
Context-dependent clarifications about cause and effects	FGDs and SSIs	Explicit examples to understand the terms causes and effects	
How are the causes inter-dependent? How are the effects inter-dependent?	Further refinement of the two problem-tree analyses	Unfolding of the "how" question(s) of the phenomenographic study.	

Table 2. Stage-Outcome-Method-Participants Sequence of Participatory Learning and Action for Problem Formulation (adapted from (Khalid, Nyvang 2013))

The PTAs and discussions were conducted in Danish. The first author (as the course instructor and native Danish speaker) has translated and reconstructed the PTAs upon translating into English. The second author, to whom Danish is a second language, contributed in the subsequent analysis and discussion. Considering the strength of the PTA method, which covers participant-contributed compilation and analysis, the video recordings were not transcribed and only used for validation at the conceptions stage.

Considering the procedure for analysis reported above, this study falls into the category of *discursive phenomenography* for the following reasons: “firstly to the attributed status of conceptions by phenomenographers, secondly to their ideas concerning the genuine location or residence of conceptions and thirdly in terms of the notion that they can be voiced in a

general and context free discourse to be understood non-hermeneutically” (Akner-Koler 2007 , p. 197). The five steps of *discursive phenomenography* are: conversation, transcription, compilation, analysis and conceptions (ibid.). *Discursive phenomenographic* methodology does not build on existing frameworks or models for the investigation, but emphasizes the specific context and situation experienced by the participants

ANALYSIS AND FINDINGS

In order to understand how the students experienced the existing Moodle-supported studio at AAU and the possible causes and effects of the problems associated with Moodle-mediated studio courses, as well as the problems, benefits and expectations with regard to achieving a more interactive learning experience by blending Google+ in studio project courses, they were asked to perform two problem tree analyses.

The first problem-tree analysis which the students were asked to perform was this:

Our purpose is to establish that there is a need for blending other online platforms, in addition to or excluding Moodle, to create better learning opportunities in a studio project course. In groups, please discuss and establish/agree on a problem statement that you consider as the main issue behind suggesting Google+ and/or other platforms. The underlying question is: What is the problem with the existing/traditional studio at AAU (supported by Moodle)?

The second problem-tree analysis which the students were asked to perform was this:

Our purpose is to evaluate Google+ as a means to offer a more interactive learning experience in an architecture and design studio course. In groups, please discuss and establish/agree on a problem statement that will enable you to illustrate the causes and effects of the problem.

The workshop discussions and outcomes, in the form of video recordings and posters, were analysed and organised in four categories which resulted from the students’ evaluation points on Moodle and Google+:

1. The structure and design of the platform
2. Implementation
3. Graphic communication aspects
4. Written communication aspects

Both positive and negative aspects of Moodle and Google+ respectively were evaluated. Evaluation points in category 3 and 4 have been sorted into two sub-categories:

1. Peer to peer communication
2. Student to/from instructor communication

In addition to organising the workshop results into categories, negative evaluation points were organised graphically into problem trees (figure 4 and 5) in order to establish causes and effects.

MOODLE

Students were strongly critical of Moodle, particularly with regard to its structure and design (as set up at Aalborg University). It is notable that some of their points of critique address the lack of aspects which they had come to appreciate from Google+. Hence, their contention that Moodle only offers one-way communication and that students have no editing rights may stem from this experience. In terms of its implementation, it is notable, that the students contend that both instructors and students may have little knowledge of how to use Moodle. On the positive side, the students contend that Moodle provides composure and overview for the students. Again, this may stem from the observation that Google+ does not (see below). It should be noted that the fact that only one aspect of Moodle is evaluated positively does not necessarily mean that they are highly critical of Moodle. As the evaluation workshop was framed with regard to Google+ as the ‘new’ platform, they may as well have focused more on Moodle’s deficiencies than its adequacies.

	Positive aspects	Negative aspects
Structure and design	<ul style="list-style-type: none"> ○ Provides composure and overview for the students 	<ul style="list-style-type: none"> ○ Only one-way communication ○ Poor interface ○ Poor tool ○ Conceived as an administrative tool; does not offer freedom to the instructor ○ Guest instructors do not have access to Moodle and therefore cannot use it to communicate with the students ○ This leads to information scattering ○ Students do not have editing rights in Moodle
Implementation	(no evaluation points)	<ul style="list-style-type: none"> ○ Instructors may have little knowledge of how to use Moodle ○ Students may have little knowledge of how to use Moodle

Table 3. Positive and negative aspects of the structure, design and implementation of Moodle

The students' criticism of Moodle with regard to its graphic and written communication functionality is even harsher than of its design and implementation. They list a range of deficiencies resulting from its lack of peer to peer graphic and written communication features. That Moodle offers no way to get mutual inspiration from peers through graphic communication and the effects of this on the quality of the design work is mentioned in several forms. That Moodle offers no way to communicate in writing between peers and the effects of this on lack of feedback is also mentioned. Notably, Moodle is criticised for what it does not, rather than for what it does poorly.

When it comes to communication between students and instructors, the students are critical of Moodle for its lack of features allowing immediacy and informality in communication, They also note that Moodle does not facilitate group learning and thinking. No positive aspects were mentioned of Moodle's graphic and written communication features, neither peer to peer, student to instructor (as none of those were available), nor instructor to student.

	Positive aspects	Negative aspects
Graphic communication peer to peer	(no evaluation points)	<ul style="list-style-type: none"> ○ [As this is not a feature,] you can have no inspiration from peers ○ [As this is not a feature,] you only talk to peers whom you already know about design ○ Students in the outset do not want/dare/manage to share with their peers. Moodle does not help them to overcome these obstacles ○ [As this is not a feature,] views and ideas get lost ○ Lack of a graphic communication feature may lead to narrow projects with lack of variation ○ Without mutual inspiration, projects may become esoteric and uninspired ○ Without mutual inspiration, students may be going in circles
Written communication peer to peer	(no evaluation points)	<ul style="list-style-type: none"> ○ [As this is not a feature,] there is no means of instant communication between all students ○ [As this is not a feature,] there is no means of getting feedback from other than the instructor ○ [As this is not a feature,] there is no way of knowing what peers are working on ○ Lack of communication options ○ Lack of feedback/views ○ It is important for students to have the

		feeling that they are going in the right direction
Written communication student to instructor	(no evaluation points)	<ul style="list-style-type: none"> ○ [As this is not a feature,] questions are asked by email ○ When questions are asked by eMail, answers do not reach everyone ○ No scope for informal communication with instructor
Written communication instructor to student	(no evaluation points)	<ul style="list-style-type: none"> ○ Only one-way communication ○ not good for instant messaging ○ Only used for distributing material ○ Students are themselves responsible for retrieving the teaching material ○ No possibility for group thinking; questions are asked several times ○ Not suitable for instant feedback

Table 4. Positive and negative aspects of the graphic and written communication in Moodle

When organised into a problem tree (see figure 4), it becomes clear how the students’ feedback distributes across causes and effects in different categories. Among the causes, it is mentioned that not everything is communicated through Moodle, as, for different reasons other communication channels are used. It is mentioned that Moodle is used only for distributing information. It is mentioned that Moodle only facilitates one-way communication, and (as a consequence) no peer to peer communication is possible. Importantly, it is also mentioned that students as well as instructors have little knowledge of how to use Moodle.

Among the effects, it is mentioned that, as a consequence of the deficiencies of Moodle, students share less with their peers, they cannot have inspiration from all peers, and have no way of getting feedback from peers or knowing what peers are working on altogether. It is also mentioned that there is no means of instant communication, that questions from students are asked by email and (as a consequence of this) there is no way of getting feedback from the instructors from within Moodle.

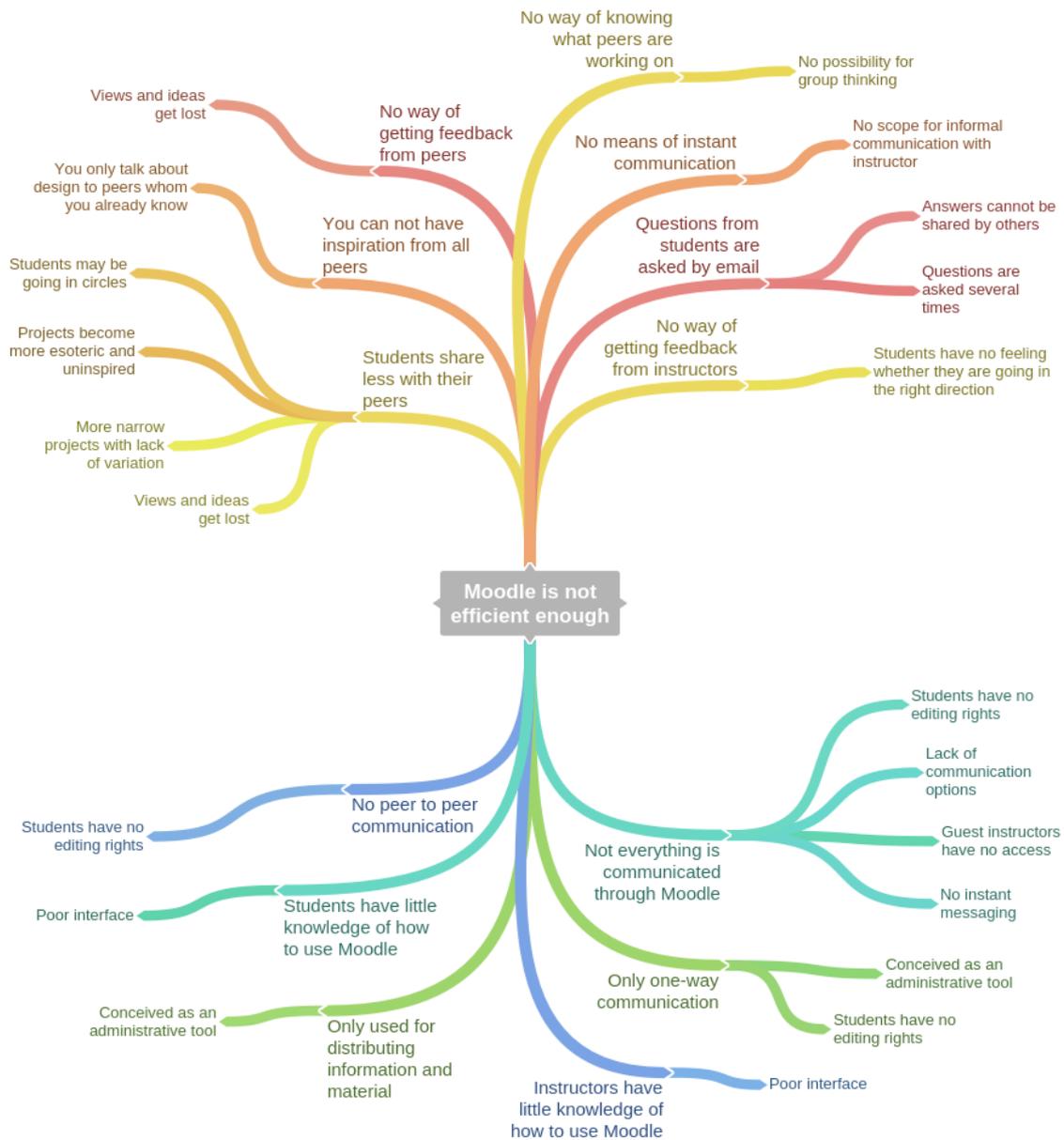


Figure 4. Moodle Problem Tree

GOOGLE+

The students perceive Google+ as a social networking platform which is more formal than Facebook, and experience more (creative) freedom with Google+ than with Moodle. While notification of new information is desirable, the lack of *categorization*, *priority level* and *searchability* appear to be the underlying causes of the perceived negative aspects. Moreover, the relevance or priority of a material or information is not the same for all the students.

During the discussion it also became clear that while some students expect all actions to be notified by email, some expect only priority information to be sent by email, and some prefer the notification through app only. So, a student-centred structure can be designed, and students might be provided guidelines for customizing notification preferences. It is unclear from the discussion how Google+ is expected to be integrated with Moodle and which functions or features of Pinterest is better than Google+.

	Positive aspects	Negative aspects
Structure and design	<ul style="list-style-type: none"> ○ Appears more serious than Facebook ○ Is less private than Facebook ○ More free / creative than Moodle 	<ul style="list-style-type: none"> ○ Lack of structure/overview of the posted information ○ Not possible to find older material ○ Messy ○ Too much information ○ Irrelevant information ○ Not suitable for sharing materials and information ○ Not suitable for important information ○ Important information must be sent out by email ○ All types of communication melt together ○ G+ is not integrated with Moodle ○ Pinterest is better than G+
Implementation	(no evaluation points)	<ul style="list-style-type: none"> ○ No information about how to use G+ ○ Poor knowledge of G+ ○ Lack of training about the file hierarchy ○ The status of G+ relative to Moodle is unclear ○ Are communications voluntary or mandatory ○ Problematic to use more concurrent platforms ○ Students are not inclined to check G+ very often ○ In times of high activity, it is difficult to find important communications

Table 5. Positive and negative aspects of the structure, design and implementation of Google+

Table 5 shows that both student-student and student-instructor graphic communication in Google+ are perceived as positive for sharing and receiving feedback on posted visual material. Both positive and negative aspects of written communication, whether peer to peer or student to/from instructor, are perceived. The phrase “poor feedback” refers to both irrelevant or not-so-interesting peer feedback, and very little or no peer feedback. Such

dilemmas will remain irrespective of the choice of platform. While some students value Google+ for instant feedback, other students contend that Google+ (or any online platform) is a replacement for face-to-face interaction.

	Positive aspects	Negative aspects
Graphic communication peer to peer	<ul style="list-style-type: none"> ○ Has capacity to share visual material ○ A good way to get inspired ○ Good for sharing work in progress ○ Promotes peer learning ○ Promotes sharing ○ Promotes openness 	(no evaluation points)
Graphic communication student to/from instructor	<ul style="list-style-type: none"> ○ Get comments on work in progress 	(no evaluation points)
Written communication peer to peer	<ul style="list-style-type: none"> ○ Communicate with everyone (rather than only project group) ○ Promotes personal contact 	<ul style="list-style-type: none"> ○ Online communication often leads to misunderstandings ○ Lack of interest in what is being posted ○ Poor feedback from other students
Written communication student to/from instructor	<ul style="list-style-type: none"> ○ Ask questions ○ Get feedback ○ Get feedback fast ○ Efficient way to get inputs from instructors ○ Feedback is shared (not individual) 	<ul style="list-style-type: none"> ○ Feedback can be shallow ○ Poor feedback from instructors ○ Sometimes feedback is not constructive ○ Online communication often leads to misunderstandings ○ Cannot replaces face-to-face meetings ○ Some see G+ as a replacement for face-to-face interaction and therefore as negative

Table 6. Positive and negative aspects of the graphic and written communication in Google+

It is agreed among the groups that Moodle should not be replaced with Google+. These offer two different types of advantages. While Moodle is good to get the course organised (education), Google+ is good to get the projects going (inspiration). The different platforms facilitate different activities and offer conveniences throughout the phases of the course. Google+ is good for inspiration during the start-up phase of the project. However, one group stresses that concurrent implementation of both Moodle and Google+ is undesirable (see figure 5).

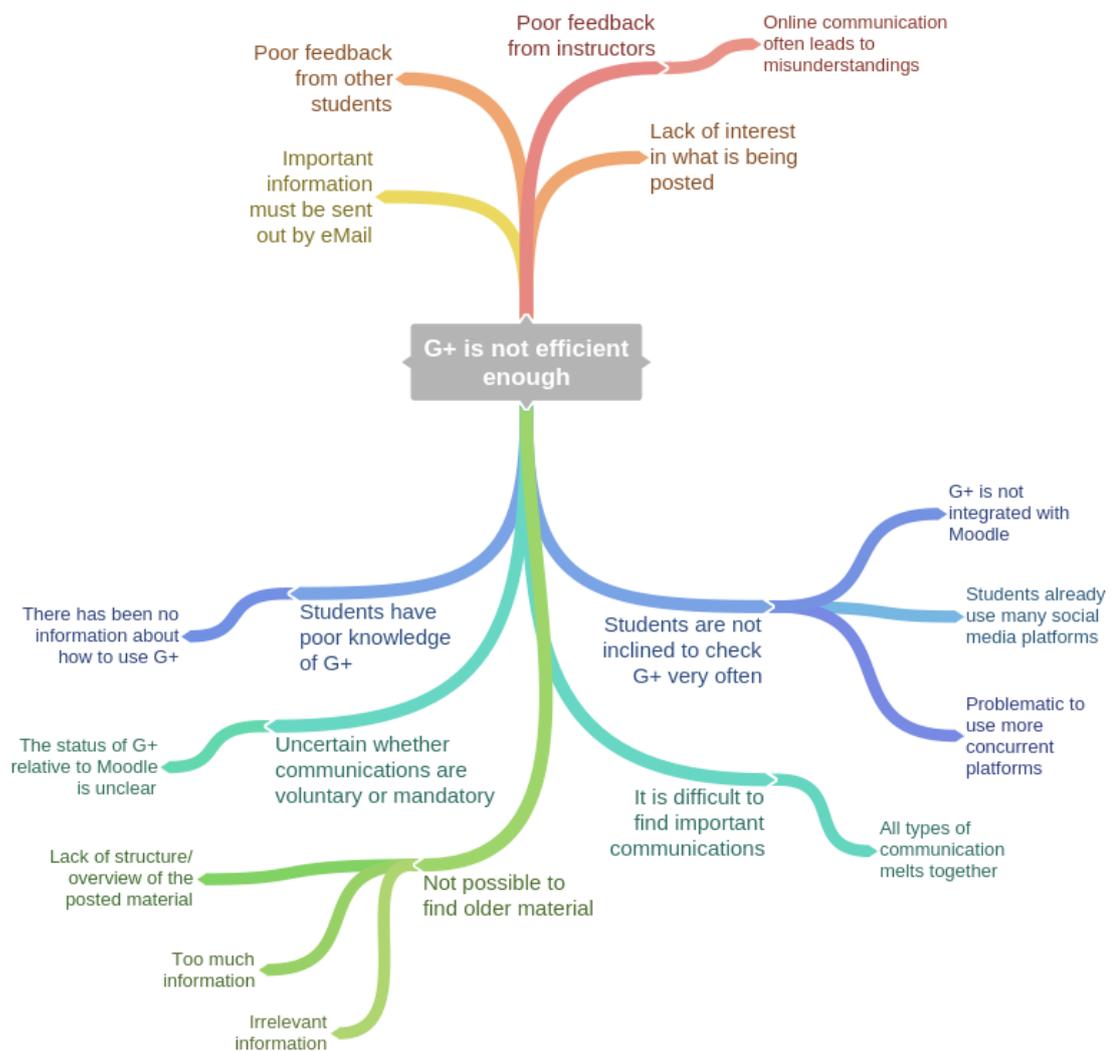


Figure 5. Google+ problem tree

DISCUSSION

The students’ major concerns during their evaluation of Moodle and Google+ were inspiration, efficiency and the importance of using a single online learning platform. The word ‘inspiration’ in various forms occurs ten times in the workshop posters. For instance, “Moodle does not give the option to show illustrations, which can inspire one-another.” (Group A, PTA 2). The word ‘efficiency’ in various forms occurs three times in the workshop posters. For instance, “supervisor’s input/links as effective source of inspiration” mediated by Google+ post (Group B, PTA 2).

In the visually oriented culture of the architecture and design studio, 'inspiration' relates to the functionality of peer sharing of graphics. In this regard, Google+ was evaluated more positively than Moodle. Efficiency relates to how well the platforms perform the tasks which the students expect from them. Here, they generally evaluate Google+ positively with regard to feedback, and particularly instant feedback, while they are overwhelmingly critical of Google+' capacity to present, structure and retrieve information and prefer Moodle in this regard.

Interestingly, the AAU Moodle version 3.0 allows activities (chat, feedback, forum, wiki and workshop), and enables or provides environments for communication and collaboration (comments, messages, SMS sender, online users and participants) which might offer similar functions to the ones that were evaluated positively in Google+. Hence, the students' discussions suggest that the lack of knowledge of how to use Moodle among both instructors and students may be a central barrier towards blended learning using Moodle.

Conversely, Google+ was perceived as a poor performer in presenting, organising and retrieving information. In fact, when used properly, tags and categories facilitate these operations also in Google+. Thus, the students' discussions indicate also here, that the lack of knowledge of how to use Google+ is a barrier towards blended learning using Google+.

While the students were critical of different aspects of the two platforms, they were also critical of using several platforms. While these two criticisms may appear irreconcilable, they might be mediated. Even if no one platform may be the best choice for all desired activities during a blended learning architecture and design studio course, much can be done in clarifying to the students, what the different platforms are good for and how they should be used.¹

CONCLUSION

This discursive phenomenographic study identifies the perceived problems, causes and effects of integrating Google+ as a concurrent platform with the institution-provided Moodle for the Spring 2016 BSc4 architecture and urban design studio course. The six problem-tree analyses, created and discussed by 14 students in three groups, were re-constructed by the authors. The causes and effects are grouped into positive and negative factors and further divided into four categories: 1) structure and design, 2) implementation, 3) graphic communication and 4)

¹ In this regard, it noteworthy that the students ran an informal Facebook group for student-to-student communication in parallel to Moodle and Google+. This, however, did not raise any concerns among the students. While students categorised Moodle as formal and Google+ as less formal, the complete informality of Facebook (as it did not involve the university, nor the instructors) led the students to leave Facebook entirely out of the equation.

written communication. The latter two communication categories are sub-grouped into peer-to-peer communication and instructor-student communication.

It can be concluded that even if Moodle may possess the functionality which was sought compensated for through the introduction of Google+, this is not clear to instructors and students. Hence the university, in this case, may not get the full potential of its Moodle implementation without better support and training for both instructors and students (and possibly administrative staff). It can also be concluded that Google+ facilitates blended learning functionalities for architecture and design studio such as graphic, peer to peer and instant communication very well. When used as a supplement to Moodle however, students should be better informed about how to use the different platforms and for which activities. The participant-contributed problem statements were: "Moodle is not efficient enough" and "Google+ is not efficient enough". It can be argued that the lack of knowledge about the functionalities of both Moodle and Google+ caused the perceived inefficiency of both. The lack of explicit information about the role of Google+, which was instructor-led and thereby imposed by the institution, turned it less efficient than desired.

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