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Students' digital learning environments

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Abstract

The objective of the paper is to examine the nature of students' digital learning environments to understand the interplay of institutional systems and tools that are managed by the students themselves. The paper is based on a study of 128 students' digital learning environments. The objectives of the study are 1) to provide an overview of tools for students' study activities, 2) to identify the most used and most important tools for students and 3) to discover which activities the tools are used for. The empirical study reveals that the students have a varied use of digital media. Some of the most used tools in the students' digital learning environments are Facebook, Google Drive, tools for taking notes, and institutional systems. Additionally, the study shows that the tools meet some very basic demands of the students in relation to collaboration, communication, and feedback. Finally, the study shows that most of the important tools are not related to the systems provided by the educational institutions. Based on the study, the paper concludes with a discussion of how institutional systems connect to the other tools in the students' practices, and how we can qualify students' digital learning environments in relation to existing and emerging needs.

Keywords

Personal learning environments, LMS, virtual learning environments, digital learning environments.

Introduction

Within higher education, implementation and use of Learning Management Systems (LMS) still prevail as the key educational technology from the perspective of institutions. The systems are provided and managed by the institutions and they primarily represent an institutional and teacher-oriented perspective on what a learning environment consists of. Also, activities within those systems are primarily initiated and managed by the teachers or the institution, rather than by the students. The systems are called learning management systems or virtual learning environments, which implies that these systems constitute learning environments of the students. In this paper, we wish to challenge the assumption or idea that institutional systems reflect students' educational practices and learning environments - an issue that has previously been raised within networked learning (Hannon, Riddle, & Ryberg, 2014; Thomsen, Sørensen, & Ryberg, 2016). We will do this by examining what roles these systems and other digital tools play in the educational practice of students. The paper applies a student perspective on examining digital learning environments.

Students' educational use of digital technologies

The motivation for studying students' digital learning environments is found in a number of recent studies of media use of youth and students (Ito et al. 2010; Boyd 2014). However, the studies provide a somewhat diffuse picture, and there seems to be a polarisation within the understanding of students' educational use of

technology. As Sørensen (2017) writes, there are conflicting conceptions of students' use of social media in educational contexts. For instance, there are both examples of students' relevant use of Facebook for educational purposes (Aaen & Dalsgaard 2016; Cuesta et al. 2015; McEwan 2011) and of more critical voices that are concerned with the use of social media within education (Kirschner 2015; Friesen & Lowe 2012). There is, however, a general agreement that the view of students as self-governed and "digital natives" is problematic. As an example, Clarke, Logan, Luckin, Mee & Oliver (2009) argue that young people's use of digital technologies is often less advanced than the ideals and potentials attributed to the technologies. Similarly, Henderson, Selwyn, Finger, & Aston (2015) and Henderson, Selwyn, & Aston (2015) claim that students use technology in a more pragmatic way than the ideal description of technology use often circulating within EdTech.

The reason for this somewhat blurred image of students' educational use of digital technologies is possibly to be found in a distinction between 'state-of-the-art' and 'state-of-the-actual' as Henderson, Selwyn, Finger & Aston (2015) have introduced. If we try to understand students' use of technology from a 'state-of-the-art' perspective, it becomes obvious that their use is not as advanced as we would like it to be. However, if we on the other hand view students' technology use from a more pragmatic 'state-of-the-actual' perspective, we might see that students use technologies in interesting ways to support their educational practice (Ryberg, Davidsen & Hodgson, 2017). In this paper, we study and discuss state-of-the-actual by understanding how students' digital learning environments are shaped from a student perspective, and how students describe the relevance of the digital tools in relation to their educational practice.

In relation to the concept of Personal Learning Environments (PLE), a student perspective on the use of technologies has been promoted. The concept of PLE emerged as a reaction to Learning Management Systems (Wilson et al., 2005), and it describes tools and technologies that are chosen, managed, organised and used by students in relation to their study activities (Martindale & Dowdy 2010; Sclater 2008). van Harmelen (2006) describes PLEs as tools or systems "that help learners take control of and manage their own learning". This means that PLEs are often in opposition to institutional systems, a teacher-centred perspective and also, to some extent, to the formal dimension of education (Martindale & Dowdy, 2010). In this paper, we do not wish to pursue this opposition, but instead we acknowledge the field of PLE as a position that applies a student perspective to the understanding of learning environments.

Methodology

To understand the roles and functions of institutional systems and other digital tools in students' digital environments, the following research questions were formed as a basis for the empirical studies:

- What are students' digital learning environments composed of?
- For what objectives are the tools used?
- What roles do the different tools play for the students?

To answer these research questions, a study of 128 university students' digital learning environments was completed. The students were from two Danish universities (within the humanities), Aalborg University (AAU) and Aarhus University (AU). The study involved 91 students from 1st semester (AAU), 22 students from 3rd semester (AU) and 15 students from 7th semester (AU).

Data collection

A form was distributed to 128 students (in three classes) in the fall of 2016. In the form, students were asked to 1) draw their personal learning environment, 2) identify and list all tools and resources within their personal learning environment, including a) naming tools and resources, b) describing the use activities of the tool or resource, and c) rating the importance on a scale from 1-5. Students' drawings of learning environments were meant to answer the first research question, whereas the identification of tools and descriptions of their use was intended to answer the second and third research questions.

The key objective of the study is not to establish a statistically generalisable and valid overview of students' learning environments. Rather, the objective is to get insight into the students' own understanding of learning environments and study practices.

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Data analysis

The analysis of the data is inspired by thematic analysis (Braun & Clarke 2006; Guest, MacQueen, & Namey 2011): 1) an initial familiarisation with the data, 2) all tools are coded with categories, 3) within each category the descriptions of tools are studied to identify themes for use of tools, 4) the themes are reviewed and 5) named, and 6) finally, this paper is the reporting of the study. The results of the data analysis are firstly an overview of categories of tools and secondly a number of categories for students' use of technologies.

Tools in students' learning environments

Table 1 shows the identified categories and specific digital tools that most students mentioned as part of their learning environments.

Table 1. Overview of categories and tools in students digital learning environments.

Categories and tools	% (n=128)	No.	Rating	Standard deviation
Collaboration tools Google Drive/Google Docs Dropbox	88% 13%	112 16	4,3 3,8	0,87 1,10
Communication tools Facebook. FB Messenger Google Hangout, Skype o.l.	73% 16%	93 21	4,1 3,8	0,91 0,97
Word processing Word, Pages (traditional WP)	72%	92	4,4	0.97
LMS Moodle, Blackboard	61%	79	4,8	0,39
Reading and annotation tools Books Ad hoc sw (OneNote, Evernote etc.) Word for note taking PDF reader	50% 50% 36% 23%	65 64 46 30	4,4 3,8 *4,3 3,9	1,22 1,24 *0,87 0,96
Search tools Google and similar Library Online dictionaries	46% 27% 18%	60 35 24	4,1 4,1 3,8	1,00 0,79 0,81
Video services YouTube, Vimeo	27%	35	3,6	0,93

* The average corresponds to a total rating of word processing tools

Use of digital tools

In order to answer the second research question, all student comments were analysed and coded within the categories. In the sections below, and based on the descriptions from the students, we describe how students have used specific categories of tools in relation to their study activities.

LMS

For the student groups, we have combined the records for Moodle and Blackboard under the category Learning Management Systems (LMS). These are mentioned by 79 students (61%). Most noticeable in this category are the ratings and comments from which it can be derived that they appear very important to the students (avg.

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4,8). This is the highest rating across all the tools, and in the comments students use words such as 'essential', 'cornerstone', 'most important' and 'backbone'. Clearly, these official learning management systems are very important for the students, but what do they use them for? In going through the comments there were many overlaps and very few that stood out, and it was clear that the LMS were important for (in prioritised order):

1. Accessing/finding - literature, slides, course descriptions, schedule
2. Overview - where and when to be for a lecture, and what to read
3. Upload of assignments
4. Communicate - receive information from lecturers, communicate with supervisors

Collaboration tools

Services for sharing and distributing documents is common among the students. In particular, technologies as Dropbox, Google Drive, iCloud, Mediafire and Onedrive. The latter of the technologies is mentioned by 1-3 students, whereas Dropbox (16) and Google Drive (112) is clearly playing a more central role among the students. Overall the tools for sharing are used in three ways:

1. Private backup of documents, including syncing between different devices
2. Collaboration and collaborative writing with fellow students
3. Interaction between the students and teachers

Communication tools

Facebook is mentioned by 93 students (73%), and the service has an average rating of 4.0. Thus, Facebook is widely used by the students in the study. Also, the relatively high rating indicates that Facebook is an important tool for the students' peer-to-peer communication. It is also evident from the student comments that Facebook plays a key role in their study activities. Students primarily use Facebook for:

1. Coordination of group work
2. Collaboration and exchange
3. Help and support

Word processing

112 students (88%) indicate that text editing and sharing of documents is an internet based activity, whereas 92 students (72%) mention traditional text editors as Microsoft Word (84) or Pages (8). Many students describe services as Dropbox (score 2,9) and Google Docs/Google Drive (score 4,3) as being advantageous in several study related activities. A few students indicate that they use these services for individual activities, e.g. note-taking, text editing or backup of private files or documents. Overall the students describe the following types of activities related to word processing:

1. Collaborative writing synchronous and asynchronous
2. Shared coordination of documents in groups
3. Individual work, e.g. note taking or backup of files
4. Setting up projects and reports in Word

Tools for writing and taking notes

4 out of 5 students (82%) report that they take notes in a digital format. 50% use OneNote or a similar annotation tool, whereas about 35% use a word processing tool. 41% also state that they use analogue tools for taking notes in lectures and while reading. The study shows that students use these tools for:

1. Taking notes (at lectures and while reading texts)
2. Annotating digital texts

Search tools

35 students report that they use different kinds of encyclopaedias and dictionaries. These are to a large extent web-based tools, but some students also prefer physical dictionaries. The students use search tools for:

1. Looking up words and concepts

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2   Literature search
3   Translation

Video services

YouTube is mentioned by 36 students (28%), and it receives an average rating of 4.0. This is somewhat surprising given that YouTube is often associated with entertainment. However, the students' comments show that YouTube is to a large extent used for specific academic purposes. Students use video services for:

1   Watching videos from lecturers
2   Participation in webinars
3   Searching for academic information

Specialised tools for different study activities

The analysis above shows that students use many different tools for a number of different objectives. On average, students state that they use 12.3 (median: 11) different tools in their learning environments (which can also include analogue tools and other people). However, with a standard deviation of 6.3, the number of tools varies greatly among the students. These numbers indicate that there is a diversity in the students' learning environments. Also, the analysis reveals that the educational practices of students consist of many different activities, and that these activities are supported by a large number of specific and specialised tools.

In relation to the third research question, we are interested in discovering the role of LMS in relation to other digital tools. From the analysis of students' learning environments, we can make an overall classification of student activities in three domains: 1) communication with fellow students, 2) communication with teachers, and 3) individual work. A point is that different digital tools are connected with the different domains of activities. For example, Facebook is dominant within "communication with fellow students", LMS appear as the key tool for "communication with the teacher", whereas Word/Google Docs and OneNote/Evernote dominate "individual work". It is evident from the student descriptions that the institutional LMS primarily support the second domain concerned with the teacher and teaching. Further, the institutional LMS are rarely used for communication between students, or for students' individual work. Although the LMS of both universities offer a range of built-in tools for collaboration and dialogue, the students involved in this study do not report such use in the comments. This means that a considerable amount of student work is unfolding in parallel practices that the students themselves are responsible for.

Learning management system or media ecology?

In this section, we return to the first research question. The overview and the analysis of tools is missing an overview of the complete learning environments of students. What does a learning environment look like? Below, we have selected two of the students' illustrations of learning environments. The examples are not selected to provide a representation of how students conceive of their learning environments. Rather, our choice is based on what Pascale, Sternin & Sternin (2010) term positive deviance; i.e. examples that illustrate positive, singular and advanced learning environments.
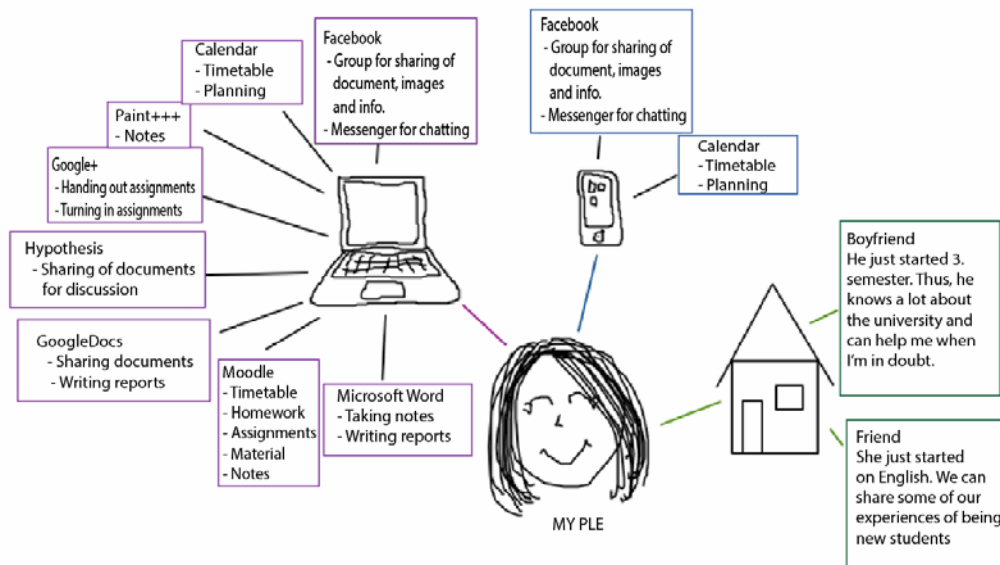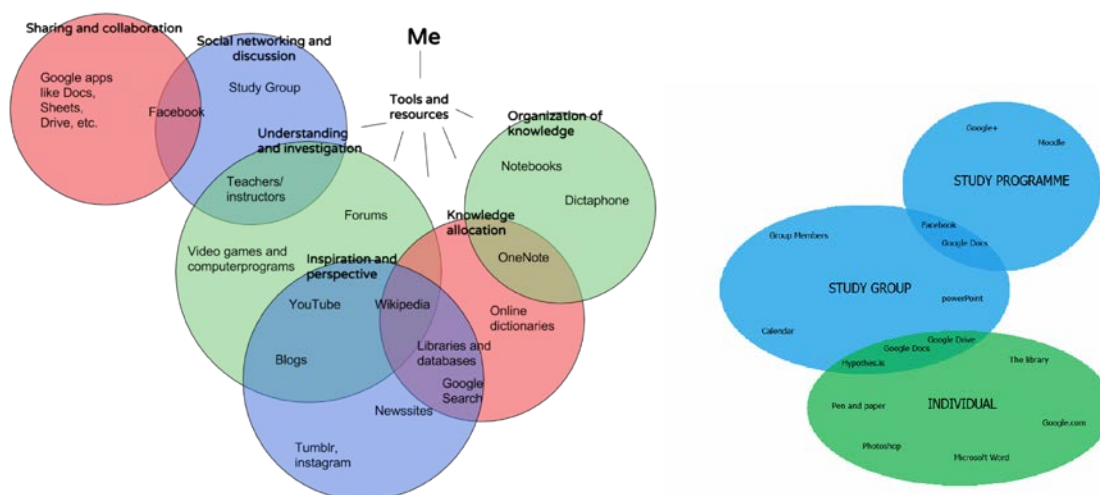
Figure 1: (AAU student, 1st semester)

Figure 2: AU student, 3rd semester (left), AAU student, 1st semester (right)

It is evident from the students' illustrations that their digital learning environments do not consist of a single system, but draws closer resemblance to what Ito et al. (2010) term a media ecology. Ito et al. (2010) use the concept as a metaphor to emphasise how dynamic relations between different tools constitute a collected arena for use of media (Gislev, Larsen og Caviglia 2017).

It is also evident from the illustrations that there is a diversity in the students' use of technologies. Although a number of tools are widespread among the students, there is also a 'long tail' of different tools, for instance, Tumblr, Twitter, Paint, Mindnode, R-studio, etc. This means that it is not possible to draw a common learning environment for students.

Discussion: Do institutional LMS support the width in students' digital practices?

Although students describe LMS in words such as "essential", "cornerstone" and "most important", they are only mentioned within the domain we have termed "communication with the teacher". Thus, the LMS is

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primarily used to access course information and handing in assignments, whereas tools in the LMS such as wikis, forums, peer-review are not mentioned by the students in the study. The two other domains of student activities ("communication with fellow students" and "individual work") are dominated by tools that in most cases exist outside the institutional borders.

Whereas the study shows well-established practices within students communication and collaboration with fellow students (especially using Facebook, Google Docs and Drive), the domain of students' individual work provides a much more diffuse picture. There does not seem to be a well-established practice surrounding students' reading, note-taking and annotation.

Although our study indicates that students have a relatively varied and advanced use of tools for the educational activities, there are areas especially within their individual work where the practices seem more random and diffuse. Within this domain, students seem to be more left to themselves. This is especially evident within activities such as reading, note-taking, annotation and information search.

Our findings align in many ways with the studies of Henderson, Selwyn, Aston & Finger (2015). They argue that much technology use can be described as 'student logistics' i.e. managing the everyday work of being a student. The LMS play a central role in this regard as a resource to access material, provide an overview, communicate with teachers and upload assignments. However, while they highlight that the use of digital technologies "conform to (and reinforce) instructivist notions of content, knowledge, pedagogy and learning" (p. 317) the use collaborative and communicative tools is more pronounced for the student population we have studied. This, though, only confirms the point the authors make, that the use of technologies follows patterns of the institutional pedagogy. At AAU the students work with problem and project based group work and in the programmes surveyed in AU, collaborative learning is a central aspect of the courses.

Conclusion

In the conclusion, we wish to address the question: What role do the institutional LMS play in students digital learning environments? Although LMS in general play a central role for study activities, the systems only constitute a small part of the wider range of digital tools in the students learning environments. LMS are primarily used for students' communication with the teachers, whereas communication with fellow students and individual work takes places through other tools. This conclusion is supported by previous studies (Thomsen et al., 2016; Davidsen & Ryberg, 2016).

From this we can conclude that some of the very important tools and practices in relation to "communication with fellow students" & "individual work" of the students are not supported by the institutional systems. Based on the study, it is relevant to ask the question: How can the institution support and qualify the educational practices that exist outside the LMS? We do not wish to neglect the importance of LMS, but we wish to highlight the landscape or ecology of students' digital learning environments beyond the LMS.

It is important to note that the study has identified a number of interesting and advanced practices among the students, and that institutions should be better at discovering, supporting and qualifying such practices. This could be done, if institutions adopted a broader view of digital learning environments than the LMS, for instance by 1) expanding the number of tools provided beyond the LMS, 2) formally legitimising students' (and teachers') use of additional tools, and by 3) supporting students in their construction and use of a broad media ecology.

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