Affordance of a learning application for supporting student's development of academic literacy

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Abstract

This paper takes as its starting point the problem area that deals with how students at university can develop academic literacy. One of the methods is through learning technology. This paper examines what affordance a new developed learning technology - the study app - has for developing student learning technology. The RQ is: what are the affordances of a learning application and its integrated design of learning tools in order to support student's development of academic literacy? The study app is an example of technology enhances learning, where technology supports operational improvement in teaching and learning because students with the study app can experience a ubiquitous learning environment, designed on basis of user studies that are designed to be integrated in student's everyday life. The question is whether a learning technology also supports the student's activity oriented toward developing study competences and becoming more academic literate?
The background for this research is a project of development and designing an ICT based learning application for supporting student's development of study skills. The project is supported by the Faculty of Humanities at University of Southern Denmark and is organized in a project group related to department of Design and Communication. The purpose of the learning application is that it: 1) shall supports students in developing and enhancing study skills, 2) that it is relevant and motivating for users to use, 3) that it a new proposal in relation to existing solutions.
The study is based on Leontiev's theory of activity and its three levels - activities, actions and operations - which provide a systematic insight into the interaction of learners with a learning technology in order to develop their study skills. The paper examines here various learning contexts that are defined as central to study skills and which learning technology seeks to support: a general study competence, a concrete study competence and a link between study and future work. Furthermore, the learning theory on which learning technologies are designed is also examined. The paper concludes with a discussion of technology enhanced learning and which type of enhancement of learning that can be supported by learning technology.

Keywords

Learning application, technology enhanced learning, affordance, activity theory, academic literacy

Academic literacy

The background for this research is a project of development and designing an ICT based learning application for supporting student's development of study skills. The project is supported by the Faculty of Humanities at University of Southern Denmark and is organized in a project group related to department of Design and Communication. The purpose of the learning application is that it: 1) shall supports students in developing and enhancing study skills, 2) that it is relevant and motivating for users to use, 3) that it a new proposal in relation to existing solutions.
Study skills is related to academic literacy and is important skills for students in order to participate and succeed at university. Academic literacy can be defined as "the ability to communicate competently in an academic discourse community" (Wingate, 2015, p. 6). This definition points out that academic literacy is a way of using language in a certain social group, which Gee defines as a discourse: "a socially accepted association among ways of using language, other symbolic expressions, and artefacts, of thinking, feeling, believing, valuing and acting that can be used to identify oneself as a member of a socially meaningful group or 'social network'" (Gee, 2014, p. 158). Academic literacy is about using language, artefacts and develop familiarity with the academic way of thinking, valuing and acting both in a general perspective as a student at a university and in a disciplinary perspective where students participate in disciplines and subject courses (Airey & Linder, 2009). This paper focus on how the design of learning technology can support development of academic literacy.

Students developing of academic literacy is important according to several reasons. One is that students are characterized by diversity (Wingate, 2015) and that many students represent a generation of first-time academics and therefore not familiar with working academic (Lillis, 1999). Another reason is that learning at a university is

different from previous education as Lea & Street points out: “Learning in higher education involves adapting to new ways of knowing: new ways of understanding, interpreting and organising knowledge” (Lea & Street, 1998, p. 158). One example is that students are expected to manage their learning independently and develop skills for handling academic tasks and disciplinary orders. The students challenge is that university lectures in their teaching often take for granted that students can handle these tasks and orders (Airley & Linder, 2009). Therefore, it is important to bridge the student’ transition into university (Leese, 2010) through different kinds of support. A typical approach for supporting and developing students’ academic literacy is outlined in institutional programmes and courses that teach basic study skills often run by academic learning consultants. The student participating in the academic literacy courses is supposed to make a structural connection between the course and the student’s own practice working with academic tasks (Hambro, Skillingstad, & Strøm, 2019). This paper will investigate another way of developing students' academic literacy and that is through technology enhanced learning. I will make an analyse of the possible affordances of the learning application Study App. The technology enhanced learning dimension of the Study App can be understood as “operational improvement” (Kirkwood & Price, 2013) because students with the learning application can experience a ubiquitous learning environment designed on basis of user studies that are designed to be integrated in students everyday life: “Interventions and approaches [to support students’ development] should be embedded as far as possible in mainstream provision to ensure all students participate and benefit from them” (Thomas, 2012). The RQ is therefore: what are the affordances of the learning application "Study App" and its integrated design of learning tools in order to support student’s development of academic literacy?

Theory on learning application

Dirckink-Holmfeld (2004) unfolds with inspiration of Koschmann (1996) 5 paradigms of instructional use of technology: computer-based training, intelligent computer-based training, microworlds, computer supported collaborative learning (CSCL) and virtual learning environment. The development of these paradigms has gone from the individual learning and stand-alone ICT-application to a collaborative aspects of learning processes as well as communication and collaboration tools. The latest generation of these paradigm - virtual learning environments - offers both teaching and training activities as well as access to resources, information and an informal learning network and builds a philosophy of "self-directed" learning and socialization as a means of learning. A typical design of virtual learning environment is that it offers different physical and intellectual tools that student can use to make experiences, gather information and collaborate with others (Säljö, 2001, p. 258). Design of learning application is related to the theory of design thinking, i.e. how interactive technologies can support ways of staging, accessing and addressing student learning (Dalsgaard, 2014). The design task involves designers both interpreting what needs to be learned, how to learn and reflecting a particular learning theoretical basis. Designers draw on theories and preconceptions of learning and knowledge in order to scaffold a learning practice. Theory and practice are thus closely interrelated in design, as discussed by, e.g., Buchanan (1992), who states that “Designers are exploring concrete integrations of knowledge that will combine theory with practice for new productive purposes” (p. 6). In relation to network learning theory the paradigm of CSCL is often used as a background for understanding network learning where technology can be used to make connections between people and supporting human-human interaction mediated through digital technologies:

> learning in which information and communication technology (C&IT) is used to promote connections: between one learner and other learners, between learners and tutors; between a learning community and its learning resources (Goodyear et al., 2004, p.1).

This paper is interested in the last part of the quote: how technology can promote connections "between a learning community and its learning resources". A further development of this approach is how technology can promotive connection between learners and context in order support learning (Hansen & Dohn, 2019). This approach supports the paradigm "virtual learning environment" and the examination of how a learning application can support student's connection to different kinds of contexts made possible by a learning application as a mediating artefact. The question is how to analyse these affordances in a learning application?

Methods for analysis affordance of a learning application

Learning application can be seen in the context of a Sociocultural Learning Theory. Vygotsky (1978) points at a triadic relationship between the active subject, the object of cognition and the tool or artefact that mediate the interaction. The mediating artefact can be material tools (as a hammer) or psychological tools (as signs and language). Both tools can function as solving a given problem, but the psychological tools can support master psychological function as perception and intellectual problem solving. A learning application is typical an

umbrella for different learning tools that are integrated in a learning design in the form of an ICT-application based on different assumptions of learning and e-learning concepts.
A tool's affordance is about how it can support subjects' action in the environment (Gibson, 1979, p. 127). Affordances are thus not related to properties of the artefact alone, but properties seen in relation to the subject's possible activities. Designing for learning activities can be understood in light Leontiev's (1978) Activity Theory and his descriptions of human activity as a hierarchical structure of activities (Kaptelinin & Nardi, 2006). This hierarchical structure can describe an approach to exanimating affordances of a learning application (Bærentsen & Trettvik, 2002; Lauridsen & Hansen, 2016). The top layer describes a subject oriented towards an object that encompasses a process based on a specific need and motive. For example, studying at university can support the motive to acquire an education, become wiser and qualify for an exciting job. Studying is an activity organized as a multifaceted system of teaching and exams aimed at acquiring a university degree. The second layer describe how an activity is composed as a sequence of actions directed to certain goals. For example, actions in relation to studying at university are enrolling in a course, acquiring study skills, participating in courses and passing exams. These actions can also be described at the lower layer of the activity model as operations. Operations can be reading articles, taking notes, doing practical research and writing assignments.

The three-layered activity model can be used as a method to examine the affordance of a learning tool with a particular focus on how it supports motives for developing study skills through interaction with different activity situations. Relevant activity situations are:

- Activity where the motive is to develop skills for participating in a future and general study context
- Activity where the motive is to develop skills for participating in a current and concrete study context
- Activity where the motive is to develop skills for connection actual study context with a future work context.

Develop skills to participate in a future and general study context

A learning tool can support students in developing awareness and readiness to handle future academic challenges, such as academic reading and writing. The content is both knowledge of academic methods (what is academic reading and what types of reading are available?) and methods of dealing with academic working methods (which methods can be used in order to read academic texts?). The view of academic literacy is that there is a certain propositional knowledge that can be used across different contexts.

Develop skills to participate in a current and concrete study context

A learning tool can assist the student in dealing with a particular study situation, e.g. the situation where an academic text is to be read. The student can for example use a tool to focus his reading and scaffold the learning situation.

Develop skills for connection actual study context with a future work context.

A learning tools can support the student employability in order to bridge between actual study context and a future work context by visualising tracks of how the student's interests, courses and development can lead to future career path and employment opportunities.

Analyse of affordances of the Study App

The study app can be characterized as a learning platform integrated with a collection of interactive online features and tools designed to provide students with resources to support and enhance development of academic literacy. These tools are designed to tailor and scaffold the motive of students learning. In the following analyse I analyse three of the tools that support the three kinds of study contexts.

The Study Skills Wheel

The Study Skills Wheel is a tool for self-evaluation and mapping of the student's study skills. It is an example of a tool that can support student work in a future and general study context. By using the tool, the student gets a visual description of his or her actual skills in a diagram with six branches (reflecting different study skills) based on a test. The test is dynamic and is continuously adapted to the individual study stage. The tool works as a feedback tool, what Hattie & Timperley (2007) calls feedback About Self-regulation and addresses the way student monitor and regulate actions towards the learning goal of developing study skills (Hattie & Timperley, 2007, 93). The tool supports through feedback different goals and actions: what are important study skills? (feed up), how am I going in order to achieve these skills? (feedback) and where am I to go to next in order to develop my study skills (feed forward). Furthermore, the tool also can serve as a dialogue tool for tutorial meetings with teachers. The tool provides the student with an overview purpose of general study skills that the designers have

selected as the most central: academic reading, academic writing, academic presentation, academic collaboration, academic evaluation and research dissemination. The student gets feedback in relation to what extent the student has acquired these skills. This feedback is based on a five-level taxonomy, here exemplified by the skill academic reading:

- Knowledge of the purpose of academic reading and the two types of academic texts: the research article and the dissemination article
- Knowledge of reading strategies, both annotation reading and process reading
- Skills in using reading strategies
- Skills in using reading strategies as an integral part of your academic reading
- Competence in flexibly selecting a reading strategy in relation to the situation in which you read academic texts.

The Study Skills Wheel is connected to another tool in the learning application: The Handbook of Study Skills. This handbook outline in six articles the basic academic skills structured by the following themes: definition, content, methods, how to learn (the skill) and a taxonomy of 5 different taxonomic ranks of the skill.
The student's interaction with the Study Skills Wheel (the operational layer) consist of the three operations:

- Testing existing skills by doing a questionnaire. The wheel shows, as a starting point, an empty diagram that is not yet active. By clicking "START" the student is guided through the test, after which the student is presented with the result. The wheel will then be active.
- Get visualized feedback on the student skills. Hovering over the chart highlights the personal result.
- Compare the development and progression of skills to former test. Clicking on a result brings up a window that shows a detailed overview of results and developments in relation to previous self-evaluation sessions. The student will receive reminders to regularly carry out new self-evaluations.

The Focus Timer

The Focus Timer is a tool for supporting a focused work process and is an example of tool that can support participating in a current and concrete study context. It is basically a timer where the user can manage time spend and set intervals on relevant study activities (e.g. reading, writing). This interval-based method of time management is inspired by the Pomodoro technique (Cirillo, 2006). The motive for student to use the timer is related to an actual study situation, where some student can experience a need for structure and scaffolding in order to create and maintain focus doing a study activity, e.g. reading an article. The goals for the student doing his actions is to create awareness, structure and reflection in his daily study work. The tool also functions as a feedback-tool because the students focus session is registered and visualized as a weekly and monthly overview. The documentation of activity can create awareness and reflection about the user's productivity.

On the operational layer the student's operations consists of

- Accessing the tool by pressing the tool and create a focus session.
- The user selects / adds a study activity (e.g. a reading activity) and then sets a time interval (e.g. 20 min) and starts the countdown.
- After the 20 minutes have elapsed, the user will be encouraged to take a short break and then continue with a new focus session.

The Study Portfolio

The study portfolio is a tool that can support students preparing and participating in a future work context. The tool shows the student's "efforts, progress, and achievements in one or more areas" and "evidence of student self-reflection" (Paulson, Paulson & Meyer, 1991, p.60). The portfolio is a collection of the student's choice of education, courses and personal documentation on choices, challenges and further study goals. The tool consists of several functions. The overall feature is a timeline that shows the students participation in Education, Subjects, Courses and Projects. Furthermore the student can create a semester log, where the student's with own words can evaluate their progression in the study and e.g. describe what have been challenges, what kind of progress they have achieved, what project they have been working on and make reflections on next semesters work and goals. The tool supports the students in order to make connection to actual study contents, future study context and also future work context. In that sense the tool supports the student's employability (Yorke & Knight, 2006). The overall motive for students using the tool is to develop awareness of study choices and possibilities for future employability opportunities. In this sense the tool can empower the student to control their study progression and take confident and reflective decisions in future study choices. The study portfolio

supports the student's metacognition as an ability to reflects on own learning and study choices. Klenowksy defines that metacognition involves “active monitoring”, “consequent regulation” and “orchestration of cognitive processes” (Klenowski, 2002, 33). The essential is not just the study portfolio as a product bud also the process that leads to it (Hansen & Dohn, 2017). On the action layer the Study Portfolio 1) support the students goal of getting a visualisation of progress in the education and choices of subjects and courses, and 2) offers a space for reflection on challenges, results and further goals and at the same time reflects on the pattern of study that the students want to create. On the operation layer the tools support operations through different steps:

- The first is that the tool automatic create an overview over the students Education, Subjects and Courses.
- The second is that the tool offers opportunities for students to create their own input to the system through the semester log. The student has to point at a semester, e.g. ”4. Semester” and fill out information in the field that pops up in the system.
- The third step is that student afterwards gets a visualization of the timeline and the content of the study portfolio.

In this last part of the analysis I will analyse what kind of learning theoretical assumptions that is the basis for the design of the learning application (Jones, 2015). Overall the Study App is a mix of cognitive learning and socio-cultural learning theory. The cognitive aspect, that understands learning as an individual cognitive phenomenon, lies in the way that the application supports the student metacognition, i.e. the ability to relate to own learning and approaches to learning. The focus here is that the application supports student’s reflection on his own learning strategies and development of study skills. Besides of supporting students' development of study skills, the tool also supports a developing of awareness of how and why these skills developed. Fundamentally the study application can be used as a basis for reflection on learning development.
The other influential learning theory in the design is a sociocultural theory that sees learning as social, both in the sense that it takes place in interaction with other people and in the sense that it is determined by the sociocultural concepts, insights and behaviours that apply in the contexts that the interaction takes place in (Dysthe, 2005; Hansen & Dohn, 2017). The Study App supports the student’s appropriation of concepts and methods of academic literacy and participation in the practice of learning at a university. The three tools all support different kind of learning situations that are relevant for studying at a university. The actual design of the learning application does not strongly support learning with others, but the different feedback tools can be used as a tool for meeting with teacher or learning staff in order to guide the students learning and as an anchoring point for meaning negotiation.
Overall the design seems at a first sight to be closely related to an individual cognitive activity and development of academic learning strategies and to a lesser extent support the student's interaction and dialogical negotiation of meaning and collaborative knowledge-building. But examined more closely the design also has a strong notion on the community aspect of learning. The sociocultural perspective can both be seen in the connection to different kinds of learning situations and the support of the student development of an academic study identity and development of membership to an academic community of practice (Lave & Wenger, 1991; Lea, 2005). In this sense Jones (2015) points out that all communities of practice are networked and state his argument by referring to Wenger et. all (2011): “The community aspect refers to the development of a shared identity around a topic or set of challenges. It represents a collective intention – however tacit and distributed – to steward a domain of knowledge and to sustain learning about it" (Wenger et. all, 2011, 9). In this perspective the Study App present academic literacy as a domain and sustain learning about this domain and at the same time develop the student's identity as part of an academic community.

Concluding remarks

This paper has examined the designed affordance of the Study App design based on Leontiev's (1978) Activity Theory and his descriptions of human activity described as a three-layered activity model. This model is used to examine the affordance of the Study App with a particular focus on how it supports motives for developing academic literacy. The analysis has unfolded how the learning application supports possible actions users can take in order to interact with the learning application in order to develop academic literacy. The analyses are not based on students’ empirical interactions with the application, what Norman defines as “the perceived or actual properties of the thing” (Norman, 1988, p. 9) but on the designed affordance. The affordances are analysed in three different aspect of the learning application, that represent different activities where students are learning to participate in different study context that reflects different ways of developing academic literacy: Activities where the motive is to develop skills for participating in a future and general study context, for participating in a current and concrete study context and for connection actual study context with a future work context.

The paper can expand the understanding of how student can develop academic literacy. Academic literacy is just not about developing general study skills that can be used in a future study context, but also skills that can support specific learning activities in a current study context and activities that can support student's connection between study life and future work life. All three types of activities can support the main goal of developing academic literacy as "the ability to communicate competently in an academic discourse community" (Wingate 2015).

Finally, I will discuss how the analyse of the Study App relates to technology enhanced learning. Bayne (2015) discus the understanding of technology enhanced learning and point out that technology can be described in instrumental terms that either "subordinate social practice to technology or subordinate technology to social practice" (Bayne, 2015, p. 17). In this study technology has be considered as a mediating artefact that can support students' motives of developing academic skills and participating in an academic community of practice. My analyses show that technology is not just an instrument for operations, but a mediated artefact integrated in an activity with the goal to accomplish tasks and fulfil motives. The quality aspect of the Study App is that it is designed to support top level user activity and connect this activity with actions and operations. Further empirical analyses will show if this also are true in their practice.

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