COLLABORATIVE TOOLS IN UPPER SECONDARY SCHOOL - WHY?

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ABSTRACT

The paper will discuss potentials of digital media to support student engagement and student production in Danish upper secondary education with a specific focus on group work and collaboration.
With the latest school reform, upper secondary education in Denmark has experienced an increased focus on problem-based and self-governed work of students. The paper is based on a large research project involving 800 students and around 100 teachers from 15 schools. The empirical study is based on observations, interviews with teachers and students from the involved schools and on a survey with answers from 500 students and 65 teachers. Within the period from 2010 to 2011, the involved schools have experimented with new teaching methods and integration of different kinds of digital media. Based on these empirical studies, the paper will discuss how students can utilize digital media to support group work and collaboration, including joint production of digital media. First, the paper briefly will present a system theoretical inspired approach to the key concept of communication, teaching and knowledge construction. Second the empirical method and design from the qualitative and quantitative studies, based on the system theoretical approach will be described. Third, the findings from the qualitative, and quantitative studies will be presented.
The paper concludes that the study demonstrates changes in the way group work is organised by the students using digital media, and a tendency to develop student engagement. Further more the study shows evidence of increased transparency between students and teachers, developments within student roles, a focus on new forms of assignments and potentially exams, and increased openness and sharing among students. Hence innovation trends within digital media usage and developments of teaching methods in Danish secondary education.

KEYWORDS

Teaching, learning, digital media, rethinking teacher/student roles and teaching approaches

1. INTRODUCTION

In Denmark today, upper secondary schools are facing great changes and challenges. The point of departure is based on an empirical study, which is the first in a series of four national studies with a focus on rethinking teaching methods and student activities with use of a range of digital media. The current study ran for two years in the period from 2010-2011, and the school projects covered two or three semesters depending on the schools. The objective of the studies is to examine opportunities and barriers in use of digital media in education, and to contribute to a continuing educational development in upper secondary schools.

The paper is based on the first empirical study and has a focus on the research question: What are the opportunities and barriers in digital media in relation to students' group work and student engagement? The empirical analysis' key concept is communication and the empirical study will examine technologies for communication, collaboration, sharing and production and discuss opportunities and barriers as fare it is possible in this first study. The involved schools have used a wide range of technologies and have chosen different approaches to their individual projects. The consequence is that the study shows a variety of teaching methods and technology use.

2. THE THEORETICAL FRAMEWORK

The theoretical foundation has been constructed on the basis of Niklas Luhmann's systems theory, particularly his concepts of social systems and psychic systems. This system thinking corresponds the way in which we observe the *empirical* study. The coupling of system definition and system characteristics (systems as operative closed, self-creating, self-referential and autonomous) with the concept of communication leads to a thinking, where it is impossible to work with the idea that thoughts can leave persons as thoughts and the idea that knowledge can be transferred (Luhmann, 1995). Thus thoughts, emotions, intuitions and other consciousness activities are observed in the empirical study as *communicative representations*, which have some decisive consequences for, among other things, a discussion of teaching and learning.

2.1 Communication, Teaching and Learning

The concept of communication must be understood in the system-theoretical frame in which systems are operative closed, self-referential and autonomous. Social systems operate in, constitute, reproduce and maintain themselves through communication. For instance, net-mediated discussion forum will maintain itself, if there are persons who constantly take part by writing a contribution, if not the social system (the forum) will slowly "die". Thus, communication is the minor element in social systems, and this minor element is defined as the synthesis of three selections; the selection of information, the selection of utterance, (made by the "utterer") and the selection of understanding (made by the "addressee") (Luhmann, 1992). It takes so to speak two to tango - the point of departure of the empirical study. Observation that involves distinction and indication is another central concept. (Luhmann, 1998, Spencer-Brown, 1969, p. 3). Multitasking e.g. will not be an option in this theoretical lens. All observations are system internal operations, cf. the system characteristics above. Thus, Luhmann calls his form of constructivism for *operative constructivism*. The communicator, the utterer, undertakes the selection of information and the selection of utterance, and the addressee undertakes the selection of understanding (Luhmann, 1995, p.141). The utterer and the addressee is called psychic systems, and these operate in and maintain themselves via consciousness activities (thoughts, emotions, intuitions etc.) which are activities we do not have direct access to, cf. the point that thoughts etc. are communicative representations. We have to make our own construction/interpretation of the uttered information by the utterer. This is presumably a truism for most educators, however the educational system often acts like the transfer model of knowledge is still working. Psychic systems are as well as social systems based on meaning, implying that they choose to actualise something and let other things rest. Based on the system characteristics already mentioned, the result is that in principle the individual system's unique selection decides what the system chooses to actualise. That includes us, as researchers, when we observe e.g. students' communication every observation is dependent on the observer. For instance the assumption that when a teacher has presented a lesson, all the students have understood the same is risky business in the presented theoretical frame, since the individual student often has no possibility of controlling comprehension, if all communication is one-way communication from teacher to student. Therefore it is more likely, with the systems theoretical approach, that each student has chosen his/her own understanding, which is not necessarily the same understanding as the teacher- and his/hers intention concerning the students' knowledge constructions. In short, it's all about communication and the premises for communication, when the intention is to facilitate knowledge construction. That is why we have chosen to focus on students' use of digital media and related activities concerning group work settings.

The concept of teaching is regarded as communication that intends a change of person, in the sense that the knowledge construction may be possible - not that it will happen per se (Luhmann, 1995). The teaching environment can be considered the perturbing activity with the intention of activating knowledge construction. The characteristics of the concept of teaching has to be add a very important detail, namely that teaching is a concept not only concerning a traditional teacher-student relation. Students collaboration with student e.g. in groups we will call teaching as well as feedback processes, guidance, direction and supervision. This is the point of departure when it concerns the selection of the methodological design of the empirical study and the subsequent analysis.

In this concept learning is defined as the construction of individual mental constructions, while teaching is understood as a special form of communication intended to bring about change. In brief, the result of learning is knowledge construction. According to the system's characteristics teaching and learning are two different modes attributed to respectively social systems and psychic systems and important, teaching and learning are considered mutually dependent (Mathiasen, 2008).

3. THE EMPIRICAL DESIGN

The study includes a variety of different teaching methods. In this paper we focus on students activities when they work in groups, sometimes characterised by being problem based and self-governed by the students sometimes based on tasks set up by the teacher. The different kind of group work settings gives different premises for learning activities. Hence you can approach the concept of group work as a progression from "task set up by teacher" to "self-governed problem based project work". This study will not focus on the different types of group work, but centre around communication facilitated by a variety of digital media used in the group work, seen as a superordinate term. Further more - in consequence of teaching methods involving students and the expectation of students' self-governed activities - the teacher roles changes and generation of corresponding teacher roles is observed, e.g. moderator, discussion partner, adviser, supervisor, mentor, counsellor etc. (Mathiasen, 2005). The empirical study was carried out on the basis of consecutive research design inspired by systems theory. Data collection methods: Observations, group interviews, questionnaires and questions asked in plenary sessions.

3.1 The Qualitative Part of the Study

This part includes observations of the communication face-to face and the web-mediated communication in different web-based forums used by the students during the group work. Furthermore, the empirical study includes two 45 minutes group interviews at each school, with 4-6 students and 4-6 teachers respectively. The students were selected by teachers from the school project to participate in the group interview. The criteria was to pick out students that covered a certain broadness of approaches to "being an upper secondary school student" and their use of IT in relation to the project. The researchers' school visits were organised by the same model for all school projects. A meeting with teachers in the specific project and some representatives from the management group, then observation in class, observation of communication, use of IT in different teaching settings, followed by student and teacher group interviews respectively, based on the presented research question and formed as a semi-structured questionnaire (Patton, 1990). Observation notes and transcribed interviews have – along with written comments from the questionnaires – been the qualitative foundation for the thematic analyses.

3.2 The Quantitative Part of the Study

Our study's survey design consists of a questionnaire distributed to the teachers involved in the specific school project and a more or less similar questionnaire for the students involved. The two questionnaires are developed on the basis of common guidelines and standards for survey design and construction of questions (e.g. de Vaus 2002, Bradburn, Sudmand and Wansink 2004, de Leeuw, Hox and Dillman 2008, Tourangeau, Rips and Rasinski 2000, Schuman and Presser 1996 and Foddy 1994). At first, these two questionnaires identify which IT tools have been used – and to what extent – in teaching related activities. Hereafter, the main purpose of the survey is to describe the potential for using the applied IT tools in relation to a variety of teaching methods, learning tasks etc. from student and teacher perspectives.

To ensure reliability and validity the phrasing of the actual questions in the questionnaires were tested on a test group of students and teachers. The combined test consisted of observations during the filling in of the questionnaire combined with "thinking-aloud" test and a follow up "probing" test (cf. Beatty & Willis, 2007). On the basis of the conducted test a slightly revised version of the two questionnaires were distributed via Internet (mainly e-mail) to the classes involved in the project. All the involved schools were asked to work out contact lists with e-mail addresses on the involved students and teachers.

3.3 The Applicability of the Quantitative Data

A shade under half of the informants completed the questionnaire. Due to the quite varying – and far from optimal – response rates it is obvious that we cannot generalize broadly on basis of these quantitative data. In addition to this, premises, goals and settings for the participating school projects are quite differentiated and thereby difficult to compare. Yet the quantitative data can provide us with some indications. Keeping the above mentioned points and reservations in mind it is our judgment that the survey, however, gives a useful description of the examined components for pointing out interesting tendencies to follow up upon in the upcoming second, third and fourth round of the research project.

4. NEW TECHNOLOGIES FOR GROUP WORK- EMPIRICAL FINDINGS

The study has examined teachers' and students' experiences with a range of digital media in relation to different teaching methods. The study shows a clear tendency that both teachers and students give certain types of digital media a very positive evaluation in relation to group work. In the study the theme collaboration within group work were highlighted by students and teachers as methods that are especially supported by digital media. This is both supported by the qualitative and the quantitative studies.

4.1 Technologies and Potential - Student Activities

In the quantitative study teachers were asked their opinion on the overall potentials of technologies and digital media in relation to different teaching methods. Teachers found that technologies have a large potential to support the activities of students, and that technologies were able to increase student activity.

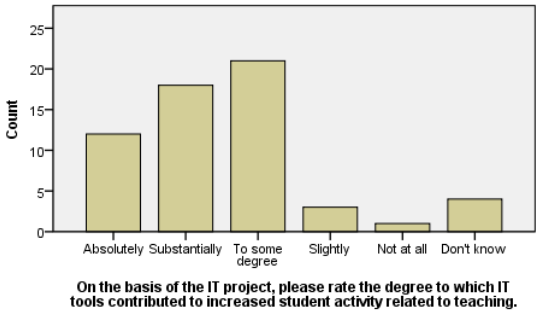

Figure 1. Teacher ratings of IT tools in support of increased student activity.

The qualitative interviews confirm this opinion from the survey. Concerning the general conclusion on the potentials of digital media to support group work of students, two teachers from different schools made the following statements: "It is evident that the technologies support collaborative working methods" and "Work similar to project work is promoted enormously". In the quantitative survey, teachers were also asked to evaluate a number of specific used technologies (such as Google Docs, TypeWith.me, Fronter, Blackboard, interactive whiteboards) in relation to different teaching methods. The teachers evaluated Fronter, FirstClass, Google Docs and Skype as the most useful technologies to support students' group and project work. Students evaluated Dropbox, Fronter, Google Docs, TypeWith.me, e-books, and Wikipedia as the most useful technologies to support their group and project work.

4.2 Evaluation of Specific Technologies

The survey asked students and teachers to rate a wide range of technologies in relation to different teaching methods. Students and teachers were only asked to rate technologies that they had experiences with in their own classes. This section will focus on the technologies that were rated as the most useful regarding group work. These were Google Docs, Dropbox, typewith.me, Facebook, and wikies. Teachers were asked to rate

each technology within each teaching method on the following scale: Absolutely necessary / Large potential / Some potential / Limited potential / No potential. Similarly, students rated the technologies based on the following scale: Always useful / Often useful / Sometimes useful / Rarely useful / Not useful.

In the presentation of the findings, we have contrasted both teachers' and students' ratings in relation to group work with the ratings in relation to individual work. Google Docs was used by a large number of schools. Findings show that both students and teachers see Google Docs as a useful technology for both group work and individual work. However, it is also evident that the potential for group work is larger. From the interviews we have learned that some of the more sceptical users have experienced problems of accessibility and speed when using and collaborating in Google Docs.

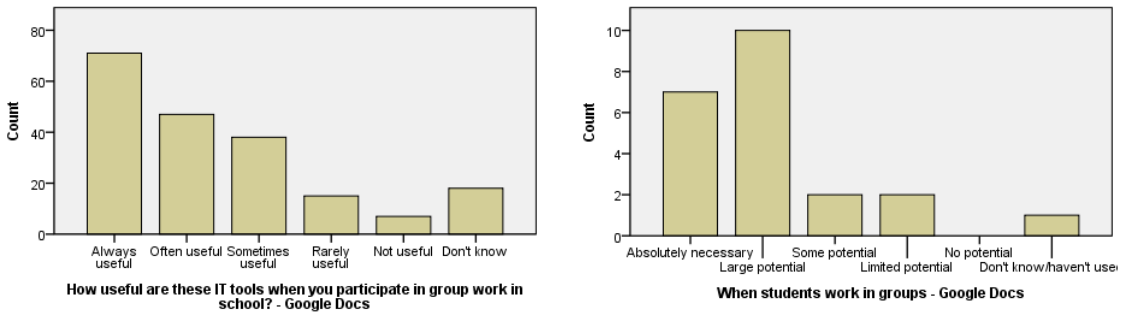

Figure 2. Student (left) and teacher (right) ratings of Google Docs, group work

The evaluation of wikis is not clear-cut, and the difference between potentials of group work and individual work is small.

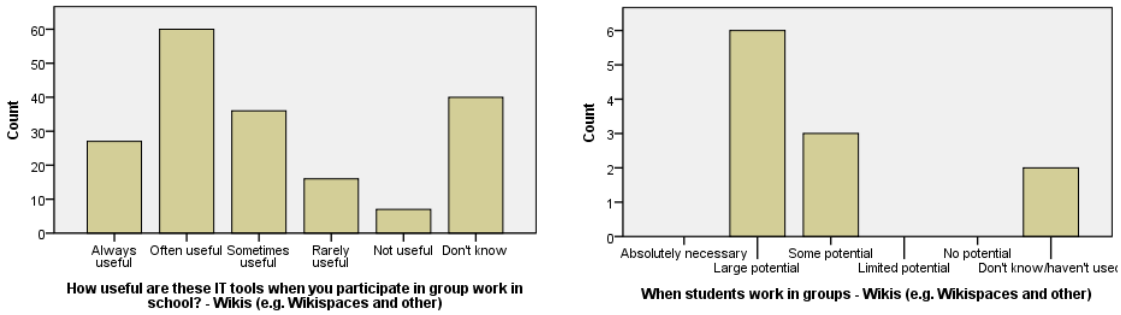

Figure 3.Student (left) and teacher (right) ratings of Wikis, group work

Dropbox has been widely used by many students and teachers. The majority of both students and teachers see Dropbox as a very useful technology both for group work and individual work.

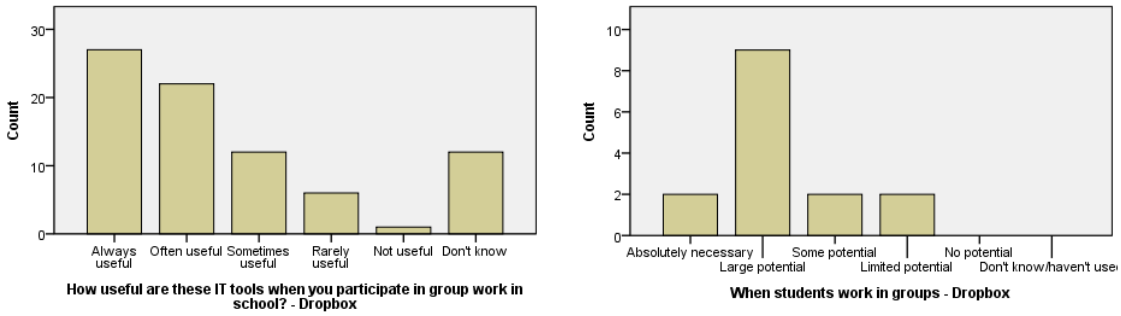

Figure 4. Student (left) and teacher (right) ratings of Dropbox, group work

TypeWith.me has been used by fewer students and teachers compared to the previous technologies, but a clear difference is seen between the evaluations in relation to group and individual work. Especially the students evaluate TypeWith.me to be very useful for group work, whereas the potential for individual work is more mixed. The same trend is seen in the teachers' assessment, however not so clear.

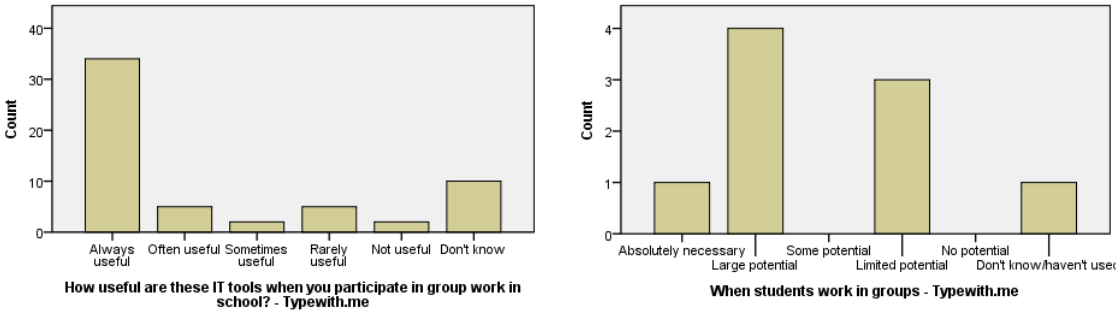

Figure 5. Student (left) and teacher (right) ratings of TypeWith.me, group work

The final technology we wish to present is Facebook. It is interesting that despite the criticism of Facebook for being a distractive element in school, many teachers believe that Facebook can be a useful technology - especially in relation to group work. The numbers from the students are more mixed, but a majority also believed that Facebook is a useful technology for schoolwork, and also among students, Facebook is believed to have a larger potential for group work than for individual work. The qualitative study confirms these findings. Although students and teachers are very aware of the distractive element of Facebook in class, it is also evident that students utilise Facebook for schoolwork both in and outside school hours.

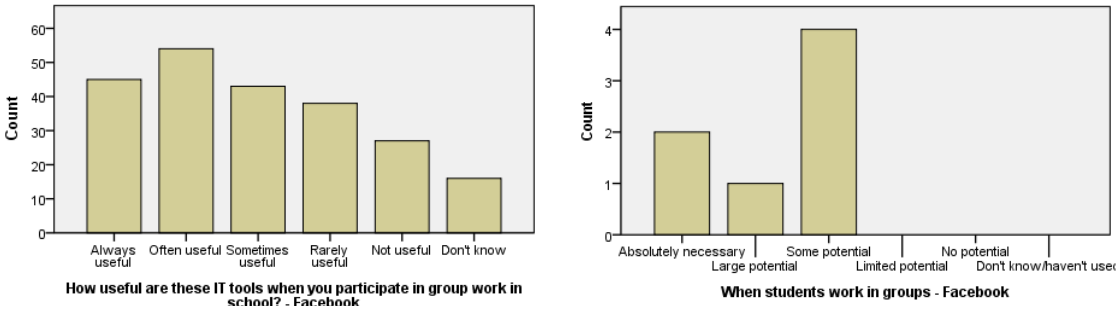

Figure 6. Student (left) and teacher (right) ratings of Facebook, group work

From the interviews we learned that both students and teachers observed Facebook as a two-edged sword, given that Facebook invites students to non-teaching activities, when the intention is to participate 100% in the group work.

4.3 How do Technologies Change Group Work?

In an interview, a teacher stated very clearly that it was his experience that the technologies helped change group work in a way that engaged the students more than usually. The prior experience was that group work invites the motivated students to do what is intended. Below we will expand on this by going into depth with the findings from the qualitative study with a focus on group work.

4.3.1 New Forms of Collaboration

Especially the use of collaborative tools (such as Google Docs and TypeWith.me) has contributed to qualitatively new ways of "contribution approaches" to group work. Several school projects have shown an extensive use of tools for student communication and collaboration. Technologies have been used both for collaboration at a distance (all students with own computer), and for group work in class. Collaborative tools

such as Google Docs and TypeWith.me have changed students' group work. Before the introduction of these tools, students would normally sit around the same computer, and one of the students would control the keyboard. As a teacher pointed out, oftentimes the consequence of this kind of group work is that several students do not participate actively in the group work.

In many of the school projects, use of collaborative tools has contributed to closer collaboration within group work, because students can work on shared documents synchronously. However, this development does not mean that division of work no longer exists. Using the same collaborative tools, some students divide their work whereas others work closely together. It is the general conclusion of the students that using the collaborative tools gives them a better insight into the work of the other group members. Further, the students have experienced that they inspires by reading the group work texts produced by fellow students in the group work. The project schools have experienced that the technology has brought new elements to group work. The collaborative tools have become a natural part of the daily work of many students. They use TypeWith.me and Google Docs, they chat and use Skype in their group work (at home and in school).

"For instance, when working in groups, we divide the work between us, and then we use our own PC and share - in this case - a spread sheet. It was great, instead of just one of us at the computer, whereas the rest of us would sit around the screen watching" (student)

A teacher stresses the same trend: "The most important advantage is that the technologies have contributed to more active group work. Without the technologies, oftentimes 75 % of the students do not contribute to the group work." A general conclusion regarding group work in school is that most students are activated in front of their own computer, and that the former trend, cf. both teachers and students, in group work that only a few students did most of the work, is reduced. Although students may still divide the work between them, all students contribute, not least because the technologies make it very visible what each student has contributed with.

4.3.2 Increased Transparency between Students and Teachers

Findings from the school projects show that collaboration and sharing tools can support transparency in students' schoolwork. The tools support new forms of transparency in between students and between students and teachers. Students' activities and products are made visible to fellow students and to teachers to a greater extent than previously. Several schools show examples of students using each other's productions and writings for reflection and inspiration. Not all students use the works of other students, but several students state that they have benefited from reading works and drafts of fellow students.

Not only final productions are made visible to the class. Also, the process itself is made transparent through the technologies. Through the sharing of documents between students and teachers, it is not only possible for students to follow the work-in-progress, but it is also possible for the teachers to take part in the process. There is so to speak new and fruitful conditions for the communication. Teachers can follow the group and individual work of students as it happens - both in school and outside school. It is made easier for teachers to take an active part in the group work and provide feedback in the process instead of afterwards. Both teachers and students have experienced that feedback during the process is more fruitful than feedback on the final product. A teacher states "Everyone can see the work from all the groups. They can see each others' work and get inspired by it". Students have the same experience, and they emphasise that the collaborative tools provide opportunities for students to get inspiration from each other - also between groups. As a student states: "It was easier to see the writings of the others and to get ideas from others, when they wrote something useful". Several students from different schools state that they have used the writings of other groups for help on how to solve new problems and assignments. They have not found the direct answers, but they have seen new perspectives on solving problems and writing assignments.

According to several teachers, an important consequence of the collaborative tools and the increased transparency in class is that it has become more difficult for students to hide themselves. The positive perspective on this is that teachers may be more likely to identify the students with academic problems. On the other hand, students who are insecure about their productions, writings and assignments do not welcome this kind of transparent group work. The involved schools have different experiences with increased transparency. Some schools have developed a transparent culture where sharing and openness is widely accepted. Other schools experience resistance from some students who do not wish to share, either because they feel intimidated by letting other see their work, or because they want to keep their supposedly brilliant ideas and points for themselves, cf. interviews with both teachers and students.

4.3.3 Working on New Forms of Products

Traditionally, group work in upper secondary education in Denmark consists of written papers and reports. Media production and IT tools thus increase the possibility of the diversification of producing presentations or reports. The result of this diversification may also be that quiet and shy students will be more active.
“The use of video supports another kind of students. Another range of students become active and is suddenly able to do a lot more, students who are not normally visible. That's quite clear” (teacher).

There is a reported valuable outcome of producing audio and video in foreign language education. As one teacher states: “Submission of audio is some kind of a revolution. It's obvious. There's no discussion about it: It's a definite improvement.” (teacher). Submission of audio and video trains and demonstrates the students' verbal skills. A Spanish language teacher concludes that the students speak more freely and fluently than in class: "It has provided a verbal freedom. They use their manuscripts as support and security but they express themselves more freely." One school experimented with using the students’ knowledge of media production in the form of video, screencasts, blogs, and websites in order to stimulate student activation and group oriented work. In two foreign language classes - English and Spanish - video production was a major part of the practical training of spoken language. In Spanish the writing and staging of a play were assigned to groups of students. As the teacher intended, the students shifted focus from reading a text to performing a play, thus creating fluency in pronunciation. A majority of the groups chose to stage their plays with puppets and with the students performing the dialogue. According to the teacher and the students the off-camera position made the students speak freely and subsequently they moved from reading to performing.

An unequivocal conclusion on the academic benefit of media production has not been reached. However, a vast majority of students state in interviews that media production e.g. screencasts, video, and websites forces them to work with and understand the substance of the curriculum. Likewise, the teachers regard media production as a success considering the activating nature of working with media.

4.3.4 A Change in Student Approach to Group Work

The qualitative study has shown that the new forms of group work bring challenges to student qualifications. It is also evident that some students do not prefer these ways of working but wanted to reduce the complexity, and preferred the traditional teacher and student roles and settings. Increased use of group work demands that students possess i.a. self-discipline and are able to carry out self-governed activities. However, it is the experience of several teachers, that successful group work has a positive influence on students’ participation, engagement, responsibility and motivation.

Several teachers have experienced that students are more likely to share their work with fellow students. In some schools this has contributed to a change in student culture towards more openness. A side effect of the open culture is that students often put more effort into their products, when they know beforehand that the products are shared with the rest of the students.

5. CONCLUSION

The study has shown that utilisation of digital media can support new forms of group work and can contribute to a higher level of student activity within group work. The quantitative survey pointed towards specific technologies that are rated very valuable for students’ group work. The paper has highlighted the potentials of digital media to support synchronous collaboration within groups and to support transparency between students - and between students and teachers – with a collaboration lens and not a control lens. The paper has also highlighted barriers that relate to transparency; some students do not like to share their work with fellow students. Finally, the study has shown that an extensive use of teaching methods based on students’ self-governed and collaborative activities demands that students possess qualifications and competences such as self-discipline, responsibility and interpersonal skills.

These conclusions tell about opportunities and challenges for future upper secondary schools. The increased focus on student collaboration and self-governed group work combined with utilisation of digital media poses a challenge for teachers' roles and pedagogical competences using digital media. The empirical study is followed by three projects of a similar nature. These projects are expected to contribute with more knowledge concerning both students’ and teachers’ roles and functions and relations between different teacher and student roles, in new forms of teaching and student activity utilising digital media.

The study points towards a number of central keywords for a movement in Danish upper secondary education with use of technology. Especially collaborative work has been highlighted as a focal area of attention. It is not only a matter of increased group work, but also a change in the form. Students are collaborating more closely, and teachers are able to follow the collaborative process of the students more closely. At the same time, several schools are experiencing higher degrees of transparency, openness and sharing among students. Hence it is about an innovative development of the educational culture.

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