Integrating Facebook in upper secondary biology instruction: A case study of students' situational interest and participation in learning communication

Abstract

The sciences are often perceived by students as irrelevant as they do not see the content of science as related to their daily lives. Web 2.0-mediated activities are characterized by user-driven content production, collaboration, and multi-way communication. It has been proposed that employing Web 2.0 in educational activities will promote richer opportunities for making learning personally meaningful, collaborative, and socially relevant. Since Facebook is already in use among youths, it potentially provides a communicative link between educational content and students' lives. The present study was conducted as a case study to provide an inductive, explorative investigation of whether and how the integration of Facebook into upper secondary biology can affect interest in biology and participation in learning communication. The results indicate that the coupling of formal and informal communication practices on Facebook serves to maintain interest and open up new learning possibilities whilst at the same time creating barriers to communication. These barriers are due to distractions, ethical issues and a certain depreciation of the activities ensuing from the everydayness of Facebook as a communication platform. In conclusion, use of Facebook as educational platform is not clearly good or bad.

Keywords: Interest, Facebook, Web 2.0, biology

Integrating Facebook in upper secondary biology instruction: A case study of students' situational interest and participation in learning communication

Introduction

Many studies indicate that students' interest in science declines during secondary level (Baumert and Köller 1998; Christidou 2011; Gardner 1998; Krapp and Prenzel 2011; Osborne 2003; Potvin and Hasni 2014). This is worrying, both as concerns the recruitment of a sufficient number of students to scientific and technical higher education to ensure qualified labor, and as concerns the general issue of young people's scientific literacy.

The sciences are often perceived by students as irrelevant: Irrespective of how well they do in their science class, many students do not see the content of science as important nor as related to their daily lives (Aikenhead 1996; Osborne and Collins 2000). The lack of perceived relevance is probably one of the greatest barriers for students' learning as well as for interest in the subject. Thus, conversely, as suggested by the National Research Council (2012), it would seem a particularly rewarding path for improvement of students' interest to explicitly heighten their awareness of close connections between curricular content and real life. This should help establish meaningful contexts of learning for them.

Social networking and communication constitute an important part of young people's everyday lives and provide processes and practices of meaning-making for them. Therefore, one has reasons to believe that social networking sites (SNS) in education may provide a communicative link between educational content and students' lives. In recent years, Facebook has become one of the most prominent SNS, and many students use Facebook daily. It therefore seems plausible that science activities on Facebook will be given increased attention and are likely to maintain interest – even if the object of interest is, in the first instance, Facebook, not science.

The purpose of the present study is to investigate whether the integration of Facebook into upper secondary biology can actually provide such a communicative link and facilitate maintained situational interest in biology. The focus is on Facebook's motivational potential in a school context. This has not been studied before.

Background

Situational interest

Interest is a content-specific concept, i.e. it is always related to specific topics, tasks, or activities. Interest is characterized by focused attention and engagement, and the close connection between interest and learning is seen by many as self-evident; the more interest a student has in a particular topic, the more willing he or she is to learn about that topic (Hidi and Harackiewicz 2000; Rotgans and Schmidt 2014; Schiefele 1991; Schraw and Lehman 2001). The present study builds on the four-phase model of interest development (Hidi and Renninger 2006). Within this framework, interest is conceptualized as a motivation variable which develops through four phases: triggered situational, maintained situational, emerging individual, and well-developed individual interest. The variable is complex, in that it

a) has both affective and cognitive components: it includes feelings and valuing of disciplinary content (e.g. biology), as well as the perception of having and being able to develop knowledge about that content,
b) refers to both a current state of the learner and to his or her predisposition to return to engagement with a particular class of ideas (disciplinary content), events, or objects.

Situational interest, in the two phases of 'triggered' and 'maintained', refers to the psychological state of engagement with content (Ainley 2010; Hidi and Renninger 2006; Krapp 2002). The first phase, triggered situational interest, involves the immediate affective experiences that individuals associate with the environment, and it appears to be especially important in

catching students' attention (Mitchell 1993). Triggers for students' interest in science have been described as, among others, promoting surprise, novelty, hands-on, and complexity (Dohn 2011; Holstermann et al. 2010; Palmer 2009). Maintained situational interest is a more committed, deeper form of situational interest, in which individuals forge a meaningful connection with the content of the material, i.e. perceive it as personally meaningful for them in their present lives. Mitchell (1993) proposed that maintained situational interest could best be achieved by involving students in activities which they perceive as personally meaningful. When activities are not meaningful to them, triggered interest can fall off, go dormant, or disappear altogether. His point is articulated even stronger by Krapp who argues that a person's experience of his/her engagements with content as personally relevant is a prerequisite for triggered interest to develop into 'stabilized' (maintained) interest (Krapp 2002). The point is corroborated empirically for science content by Häussler and Hoffman (2000, 2002), who investigated the impact of a new interest-guided physics curriculum, and Hulleman and Harackiewic (2009) who studied the significance for interest development of designing the science curriculum to help students make connections between course material and their lives. Similar findings within the 'neighbouring motivational concepts' (Krapp and Prenzel 2011, p. 30) of 'motivation' and 'attitude' further document the significance of personally experienced meaningfulness (Çam and Geban 2011; Choi and Cho 2002; Graeber and Lindner 2008; Guzzetti and Bang 2010; Nieswandt and Shanahan 2008; Walczak and Walczak 2009). From an educational point of view, maintained situational interest is the real topic of concern in comparison with triggered situational interest because of its long-term significance for student engagement with content. (cf. Dewey 1913). However, research into situational interest has predominantly been concerned with identifying factors that trigger it. There are far fewer studies of maintained than of triggered situational interest.

In this study, we focus on students' situational interest in collaborative learning activities on Facebook. Although recent research has recognized the importance of social aspects for situational interest in collaborative learning activities, the social is mainly conceived as a unidirectional source of interest (e.g. 'social involvement' cf. Palmer 2009). We contend that both individual and social processes need to be considered to advance our understanding of interest in collaborative learning (Järvelä et al. 2010). A 'person-in-context' approach (Volet 2001) to studying interest was therefore adopted in this study. Person-in-context studies are inspired by Cobb's analyses of the evolution of mathematical practices in the classroom (Cobb et al. 2001). They bring cognitive, phenomenological views of interest together with the socio-cultural approaches of Greeno (1998), Lave and Wenger (1991), and Rogoff (1990). As argued by Nolen and Ward (2008), this approach is conceptually consistent with the four-phase model of interest development because the individual's cognitions are understood to be a result of participation in social contexts over time (Järvenoja and Järvelä 2005; Nolen and Ward 2008). On this approach, meanings, values, norms, and goals are socially mediated, and they create the context in which interest forms and develops. The diversity of students' experiences is acknowledged, but at the same time the diversity is regarded as socially situated.

Potentials of Web 2.0 for establishing connections

Above, we argued with Mitchell and Krapp for the need to help students forge meaningful connections with curricular content through relating it with issues they find personally relevant. There are, however, limitations to this approach. For educators it may be overwhelming to re-design curriculum content. They (ideally) have to connect science content not just to one student's interests, but to all of their individual students' different interests, goals and lives. Typically they will not have appropriate textbook support for this. Furthermore, re-designing curriculum content may not by itself be sufficient to enhance interest. In Häussler and Hoffmann's study (2000, 2002),

other factors (such as gender-partitioned teaching) contributed to the improvement of interest. The re-designed curriculum based on interesting topics did not do it alone. Likewise, in Hulleman and Harackiewic's study, the effect on interest was only significant for students with low success expectancies. Thus, alternative and supplementary ways of supporting students in establishing meaningful connections should be considered in addition to the one of revising the curricular content itself.

One such alternative approach, holding initial promise, is the employment of Web 2.0-mediated activities in the design of learning tasks. The term Web 2.0 has been used to denote both specific *tools* such as wikis, blogs, SNS, virtual worlds, media sharing and manipulation tools (Conole and Alevizou 2010; Crook 2008) and a certain kind of *practices*, supported by, but not limited to, these tools. The practices are characterized by bottom-up, user driven content production; a high degree of interactive multi-way communication between users, and continuous use and reuse of content across contexts (Conole and Alevizou 2010; Dohn 2009; Lankshear and Knobel 2006, 2011; Luehmann and Frink 2012). They represent a change in attitude towards sharing and producing knowledge in collaboration with others, through distributed authorship and with correspondingly diminished copy-right claims (Dohn 2009; Downes 2005). The practices are supported by the tools mentioned because of their *affordances* (Gibson 1986), i.e. the action possibilities they offer users. We understand 'affordances'– and its counterpart 'constraints' – as relational constructs, in line with the socio-cultural approach. According to this approach, an object's affordance for a given person is constituted by the interrelation between the features of the object and the skills and practices which the person masters (Bærentsen and Trettvik 2002; Dohn 2009; Greeno 1994; Greeno and TMSMTAPG 1998; Jones et al. 2006; Kaptelinin and Nardi 2006). '*Constraints'* similarly depend both on the features of the environment and on how the person in question is able to navigate these features. The technological functionalities of Web 2.0 thus afford

user-driven content production, collaboration, multi-way communication between users a) because of their technological features, and b) because these features have been developed in conjunction with user-driven, collaborative practices (Dohn 2009).

Within education, there has been an increasing interest in employing Web 2.0 because of its affordances for connecting knowledge, community, and learning and, more specifically, for student participation in learning communication. It has been proposed that Web 2.0 might promote potentially richer opportunities to make learning more personally meaningful, collaborative, and socially relevant (Brown and Adler 2008; Greenhow et al. 2009; Luehmann and Frink 2012). Generally, Web 2.0 allows students to interact with peers. This provides them with opportunities to give and receive peer feedback and provides instructors with opportunities to model how a task should be performed (Kitsantas and Dabbagh 2011). Web 2.0 enhances the inherent potentials of information and communication technology (ICT) for connecting learning contexts in and out of school and of facilitating learning based on active student engagement (e.g. Ares 2008; Dirckinck-Holmfeld et al. 2009; Scardamalia and Bereiter 1994, 2006). Learning activities with SNS, in particular, hold the promise of boundary crossing (Akkerman and Bakker 2011): Such activities may establish connections between the out-of-school self-directed leisure time practices of students on SNS (e.g. sharing experiences with friends or commenting on issues in their daily lives or in the news) and the engagement with curricular content (Lantz-Andersson et al. 2013). Thus, learning activities employing Web 2.0, and SNS in particular, may be hypothesized to be an appropriate alternative way to support students in establishing meaningful connections with curricular content. More specifically, such activities may facilitate student participation in learning communication and thereby help them develop maintained interest.

Facebook

The social networking site Facebook is a very popular communication platform for youths today (boyd 2008, 2014; Livingstone 2008). According to the most recent data from Statistics Denmark relevant to this study, 92% of the 16-19 year old Danes had a profile on a social networking site in 2010, and 96% of this group had a Facebook profile (Statistics Denmark 2011).

Facebook has changed interface somewhat since the time of our study in response to (and enabling) changes in practices on SNS, especially ones concerned with media sharing and news feeds (Ellison and boyd 2013). The interface change is not significant for our study because the possibility of establishing meaningful connections with curricular content through the use of SNS does not hinge on a specific interface. Furthermore, the features used in the course we have studied are still available on Facebook, despite the change in interface. However, as stressed by Ellison and boyd (2013), it is vital that researchers describe the technological artifact at the time of study to ensure that research results endure across technology shifts. As our study was conducted, characteristic features of Facebook and of Facebook usage were the following: Members (then as now) could create profiles of themselves, create and join groups with other members, make 'friends', and share pictures and messages. A feature in wide use at the time was the Facebook 'wall' which essentially is an asynchronous 'chat' facility owned by each user. Here, users exchange text messages with their nominated 'friends', with 'wall-to-wall' exchanges then visible to all other users who belong to the local network. This feature has since been replaced by the Facebook 'timeline'. Young people often use Facebook in the micro-management of their social lives, as an arena for social exploration and to develop social networking skills with their peers at school (Lankshear and Knobel 2011; Livingstone 2008).

Two reviews of research on the use of Facebook as an educational environment provide further, SNS specific, support for our hypothesis that Facebook may facilitate student participation

in learning communication. Thus, Aydin concludes quite generally on the basis of his review that 'Facebook contributes to an easier flow of communication between teachers and students' (Aydin 2012, p. 1095). One important reason is the increased, informal relationship which Facebook affords. Aydin further points to studies which highlight the pervasiveness of Facebook in students' lives and to the easy-to-use functionalities for knowledge-sharing and interaction. This leads him to say that 'Facebook is an ideal environment for communication and interaction among students' (p. 1101) and to recommend that 'as Facebook is very popular among students, the potential of Facebook as an educational environment should be channelled into educational practices' (p. 1101). These statements echo our hypothesis that Facebook may be used for boundary crossing between students' out-of-school leisure time practices and engagement with curricular content. Manca and Ranieri cite studies that document that students post and interact much more actively when Facebook is used as educational platform than they do on traditional Learning Management Systems (LMS) such as WebCT or Blackboard. They do, however, emphasize that 'Many of the most enthusiastic views [on Facebook's pedagogical potential] espoused by some authors… are still to be achieved' (Manca and Ranieri 2013, p. 496) and that an obstacle to the potential's realization may be implicit institutional, teacher and student pedagogies which may lead to reproduction of established academic practices on Facebook.

Research questions

The aim of this study was to explore how the use of Facebook integrated in learning activities in upper secondary biology has impact on students' situational interest. The study was framed by the following research questions:

- *How are situational interests of upper secondary students maintained by collaborating on Facebook in a biology course?*

- *What are the affordances and constraints for students' participation in learning communication on Facebook?*

Specifically, we analysed the reasons the students gave for how the Facebook activities affected their interest through their experiences of affordances and constraints for participation in learning communication.

Method

Participants

Participants in the present case study were students (N = 30, 25 girls and 5 boys, aged 16-18 years old) from one Year 10 class in a Danish public gymnasium (upper secondary school).

Of the 30 students, 28 had Facebook profiles. Two students did not have a profile: one was limited by access (she had no Internet or smartphone at home), the other one had chosen not to have a profile. Informal chat with the students revealed a large variance in how much they used Facebook in everyday life: Some were logged in continuously and had a very active social life online, while others only logged in once or twice daily.

Educational context

The Danish upper secondary school system requires students to choose one study programme among several (e.g. science, social studies, physical education etc.). This class consisted of students who had chosen either music or social studies at the highest level (Level A). The gender distribution noted above is typical for this kind of class. The students had biology at mandatory level (Level C) by default, but could choose biology at a higher level (Level B) afterwards (at Year 11 or Year 12 by choice). The three weekly biology lessons (each 45 minutes) were dominated by traditional instructional methods; teacher talk, interactive whiteboard, and textbook as well as laboratory work. The curriculum included themes like cell biology (pro- and eukaryotic cells, structure and biological

significance of DNA, proteins, carbohydrates and fat), human physiology (organ systems' structure and function), ecology (ecosystem and different organisms' adaptations, including photosynthesis and respiration), and examples of biotechnological methods and their application.

Because the students had other majors than biology, the teacher anticipated in advance that they would be rather disinterested in biology in general. This anticipation was based on prior experience with similar students. The teacher decided to adopt Facebook as a participatory medium for supporting multiple modes of learning and engagement. Her basic intention was to stimulate student interest in biology by providing a less formal learning environment for topic-related discussions.

She was inspired by the work of the second author on how Web 2.0-mediated activities facilitate boundary crossing and students' collaborative knowledge building through the use of distributed author- and ownership. To encourage the latter, i.e. a sense of distributed ownership, the teacher asked the students to create the Facebook group and add the entire class to it. This is in line with the general affordances and practices of Web 2.0. One of the students accordingly created a group named '1.e Biology debate'. He added the class' other students, the biology teacher and the first author under his real name (Weeks 1-2). Two politicians were invited to join the group to contribute to the debates (Week 3). The politicians did this on a few occasions.

The Facebook group was closed, i.e. no one had access to the group except for invited individuals. The teacher and the first author had full access to all posts within this group, but did not have access to students' personal profiles. Students' security settings only allowed us to retrieve few bits of information, e.g. profile pictures.

Almost all virtual activities were initiated by the teacher. They varied from open-ended questions on topics characterized by a close connection between learning content and real life issues (e.g. Diet and health: 'What does it mean to be a healthy human being?') to closed assignments

narrowly determined by curricular topics. The teacher had hoped that the students themselves would initiate posts and questions connecting curricular content with real life issues, but this only happened once (Designer baby: 'Technology has made it possible to genetically design babies – Is it ethically correct? Should it be legal?'). On the other hand, the students participated actively in the debates once the teacher had asked a question.

Most activities took place in the classroom, where students collaborated on posts in small groups. Several posts and comments were made in evenings/early mornings from cell phones or tablets. The total count of posts represents all activities; including both posts made by a group of students in class and ones posted individually after school.

During a period of 27 weeks (Weeks 1-27), Facebook was used in lessons for 14 weeks in total.

Methodological design

A mixed method design was selected for the case study: observation of Facebook activities, classroom observation, and interviews with students and the teacher. In addition, we designed a short self-report questionnaire, which we gave to the students at the end of Week 27. All data were collected with the research questions as outset. More specifically, we focused on collecting data on the following themes *interest*, *affordances for participation in learning communication*, *constraints on participation in learning communication*, and *interaction of contexts*. The theme 'interaction of contexts' was included to allow a more narrow focus on student experience of boundary crossing (Akkerman and Bakker 2011) between their leisure time life within Facebook's informal setting and the formal setting of school. In particular, the theme addressed the specific affordances and constraints which the connection between these settings had for their participation in learning communication. The classroom and Facebook observation formed the outset for the student and the teacher interviews; both structured around these themes. The student interviews supplied 'student

voices' on the themes. We then utilized interview statements in the formulation of questionnaire items.

Facebook observations

The first author observed Facebook activities through Weeks 2-27. The Facebook observations formed the outset for a descriptive content analysis (see below). During the Facebook observations the first author 'inhabited' the Facebook site alongside the students (Selwyn 2009). The researcher did not participate or interact directly with any of the students. In this nonparticipant role he logged onto Facebook on a daily basis and observed the development of the site '1.e Biology debate'. The researcher systematically observed and noted the characteristics and qualities of the biological content as it was developed.

Classroom observations

The first author observed 20 classroom lessons through 7 weeks (Weeks 21-27). For logistical reasons, it was unfortunately not possible to observe in Weeks 1-20.

Classroom observations were 'naturalistic', i.e. they took place in the regular settings of the activities (Angrosino 2005). During classroom observations, field notes were taken and reviewed later in the same day for preliminary analysis to help inform subsequent classroom observations and interview guides. The intention with the classroom observations was to understand the context in which the Facebook activities were situated and to acquire a background understanding of the atmosphere in the class. The background understanding concerned both the students' take on biology issues and their social relationships. It served to inform the formulation of interview questions and subsequent analysis.

Interview

Informal interviews were conducted in the classroom (Weeks 21-27) as short-term informal conversational interviews (Patton 2002). For this method, interview questions emerge from the immediate context and are asked in the natural course of things; there are no predetermined questions or wording. The advantage is the salience and relevance of questions and the possibility of adapting the interview to individuals and circumstances. Students working in groups can be interviewed together which may provide detailed information quite quickly. A limitation, however, is that group interviews may trigger group dynamics with possible effects on the individuals' interest development. The informal interviews involved all the students. Students were interviewed alone or in small groups of 2-3 individuals. They were asked how they experienced a given situation, whether it was interesting and why/why not. The informal interviews were short: 2-4 minutes. Students' responses were recorded as notes. This way, the interviews did not interfere with the flow of the activities in the classroom.

Formal interviews were conducted as semi-structured qualitative research interviews (Kvale 1996). This type of interview aims to produce qualitative descriptions of the interviewee's life-world to interpret the meaning of the described phenomena. Five students (3 girls, 2 boys) were asked to describe their interests and experiences during semi-structured interviews. The aim was to acquire statements for the questionnaire phrased in the 'words of the students'. Consistent with this aim, students were chosen on the basis of the classroom observations according to the following criteria. The primary criterion was engagement in classroom activities: engaged students were presumed to have elaborate and/or reflective views on the research themes and thus to produce detailed statements. A subsidiary criterion was to have both frequent and infrequent Facebook contributors represented among the engaged students.

All interviews were conducted by the first author who also conducted the classroom observations. Thus, the students were familiar with the interviewer. The formal interviews were conducted in the biology classroom after the lessons in the latter part of the observation period (Weeks 25-27), and they lasted between 30 and 60 minutes.

The formal student interviews were structured around the following themes:

- How did you experience the use of Facebook in lessons?
- Describe something you did on Facebook which was interesting. Why was it interesting? Did you learn from it?
- Describe something you did on Facebook which was not interesting. Why was it not interesting? Did you learn from it?
- Did biology become more relevant/interesting to you? Give some examples of why/why not?
- Was it easier or more difficult to understand biology on Facebook? Give some examples why/why not?
- How did you experience discussions around biology on Facebook? Differently than verbal ones in class?
- Have you experienced something that did not work on Facebook? Expectations, which were not met?

The teacher was interviewed last by the first author (Week 27). The interview lasted 80 minutes. In addition to questions about the research themes, the teacher was asked about her intentions and pedagogical goals with the Facebook activity and the degree to which she found these intentions and goals fulfilled.

Questionnaire

The aim of the questionnaire was to add one piece of the ‘puzzle’, with each piece contributing to our understanding of students’ experiences (Eisenhardt 1989). Thus, the intention was 1) to explore the range of student views on the use of Facebook (open questions) and 2) to assess to which degree the experiences reported by the interviewed students were representative of all participating students (closed statements based on statements from the student interviews).

The questionnaire consisted of 15 items in total. The questionnaire contained three open questions concerning a) positive and b) negative aspects of using Facebook in the biology class and c) further comments. There were 12 closed statements. 9 statements concerned the research theme 'interest'. Five of them were on the subject of biology in general (subject interest); four were on the Facebook activity (Facebook mediated interest). A further 3 closed statements concerned the research theme 'interaction of contexts' (perception of Facebook as school). All 12 items were scored on a 7-point Likert-type scale ranging from 7 (agree) to 1 (disagree).

The questionnaire was produced in a pen-and-paper-format and distributed to all students (N = 27) present at the last day of data collection (end of Week 27).

Ethical considerations

Danish rules are somewhat less restrictive than in many other countries as concerns the content, materials and activities allowed as learning resources. Quite generally, Danish educational thinking and practice is very influenced by the German Bildung tradition (Brejnrod 2005; Raae 2012). In line with this, the teacher's freedom of method (understood in a very broad sense) is considered a prime virtue of pedagogics at all educational levels. Similarly, the ethical norms for involvement of researchers – and for researchers' access to personal information on their subjects – are moderate. That said, we have ensured full anonymity of the students. They have all voluntarily consented to our investigation after having been informed of its purpose and of their possibility to decline participation. We have abided by all requirements in the Danish Act on Processing Personal Data given by the Danish Protection Agency (www.datatilsynet.dk).

Analysis

Our 'person-in-context' approach uses a combined analytical tool to capture both the social and the individual aspects of interest. The individual analysis is carried out concurrently with the social

analysis, which addresses the socially negotiated meaning of the individual's participation. The two perspectives are not independent of one another, insofar as each constitutes the background on which the other one appears. The resulting analytical approach brings students' situational interest to the fore while situating that interest in the social context of their collaboration on Facebook activities. Students' collaboration around Facebook postings is constantly negotiated (social perspective) as the teacher and students interpret and respond to each other's actions (individual perspective). On the other hand, the teacher's and students' interpretations and actions (individual perspective) do not exist in a vacuum, but must be seen as part of a shared practice (social perspective). Data from multiple sources were converged in the process of analysis to capture both the social and individual perspectives. To give an example: As noted above, only once did a student introduce a new topic on Facebook (content analysis). One of the interviewees commented that: 'No one has really made use of this [opportunity], I don't think it really occurs to us, it sort of transcends the frame, we very much have the understanding that the teacher will take care of that, at least I felt it that way that the teacher would take care of it and so we can't write in there'. This comment is to be understood within the social context of the classroom where it was normative that the teacher was the one to initiate curricular discussions (classroom observation).

The interviews were transcribed and coded according to the research themes; *affordances for participation in learning communication*, *constraints on participation in learning communication*, *interaction of contexts* and *interest*. Likewise, the answers to the open ended questions in the questionnaire were coded according to the research themes.

More specifically, the initial coding of both interview transcripts and open ended questionnaire questions were conducted by the two authors independently with the research themes as coding categories. The authors compared and discussed coding after each coding session. The

contradictory findings (less than 13%) were negotiated and re-coded until a unified opinion was reached.

Of the comments supplied in answer to the open questions in the questionnaire, 44 concerned affordances for participation in learning communication, 11 constraints on participation in learning communication, 19 interaction of contexts, and 17 interest. We have summarized the (often lengthy) student responses in themes. Examples of the summarized themes are shown in Table 1. A similar count of statements for the interviews has not been made. Since the interviews were conducted with strategically chosen students who were not necessarily representative of the class opinion, such a count is not relevant.

A content analysis of 1.e Biology debate showed great variation in student understanding of biology issues. However, the analysis revealed no clear indicators of student interest. Therefore, we restrict ourselves here to representing a descriptive analysis of item themes and postings. A count of the Facebook postings is depicted in Table 2.

Due to the small group of subjects the closed items in the questionnaire were only subjected to descriptive statistics (frequencies and mode). The reliability coefficient (Cronbach alpha) of the questionnaire was calculated to be 0.78 (see Table 3). Obviously, the cogency of the descriptive statistics should be regarded with caution. We therefore use the quantitative data as supplement to qualitative data rather than the reverse.

Results

Interest

Some students found biology interesting, but it was not a favorite subject for any of the students. This is indicated by the three items ‘I like biology’ (median = 5, mode = 5), ‘Biology is interesting’ (median = 5, mode = 4), and ‘Our biology lessons are fun’ (median = 4, mode = 5) and by the two items ‘I like biology more than other subjects’ (median = 3, mode = 1) and ‘I think other subjects

are more interesting than biology' (median = 3, mode = 2). This corresponds to the teacher's initial anticipations and was confirmed by interview statements from two engaged students. However, as indicated by the response frequencies (Table 3), student opinions vary greatly as concerns their interest in biology in general. This variation also applies to student interest in the Facebook activity.

Many of the students found the idea of using Facebook in biology stimulating, as Facebook provided something 'new', 'alternative' and 'different' to traditional instruction. One of the interviewed students put it this way: 'Just when you hear the word Facebook, then… uh, fun [laughter]'. On the other hand, the same student said that her first reaction to the introduction of Facebook as a learning activity was 'come on… don't come with such idiotic pedagogical ideas where we are supposed to find it more interesting because it's Facebook'.

The three debates on Facebook around socio-scientific issues; bioethics ('Designer baby'), health ('Diet and health'), and sex (advice column: 'Sexlinien.dk') were interesting for most students. Informal interviews indicated that most students found the three debates interesting because of the relevance to their present life, i.e. because the debates helped them forge meaningful connections with curricular content. As illustrated in Table 2, students posted 16 comments on 'Designer baby', 17 on 'Diet and health', and 29 comments on the advice column 'Sexlinien.dk'. Additionally, they posted 4, 3, and 18 likes, respectively. An extract of 'Designer baby' is presented in Table 4 to illustrate the kind of posts made by students.

Four students stated in the interviews that it was interesting to debate dilemmas on Facebook. The interviews show that student views are more complicated on this issue than is obvious from the quantitative results: Two of the students commented that they found the debates interesting, but that they didn't find them very 'biological' in nature. One of them said she found the debates belonged more in her social studies class. The other one explicated that she saw biology as facts which are 'hard to discuss'. A third student commented that he did not think they learned much about subject

issues through the Facebook activities but that they learned to ‘act and have a discussion that stayed on track… and respect people which is important, too’. Thus, the interest mediated by the Facebook debates arguably only concerned biology to a minor degree. Content analysis of the debates corroborates student reservations: The majority of posts express opinions without reference to biological argumentation. In this context, it is worth noting that a simple scatter plot shows no correlation at all between items concerning biology interest in general and items concerning the motivational effect of the Facebook activities.

Situational interest was also maintained by collaborative production (picture hunt, moviemaking). Students found it interesting to share photos and videos on Facebook and to post comments and likes to each other’s photos/videos (‘It was more interesting to share the videos [than to make them]’). Informal talk with the students revealed that the closed assignments (‘Explain figures’ from the textbook, and ‘1.e’s genetic dictionary’) did not maintain interest. In the closed assignments, students’ predominantly searched for information and paraphrased text found in textbooks and Internet sources.

Affordances for participation in learning communication

Except for the two students without a profile, all students were familiar with Facebook. They therefore found it very easy to post comments, likes and photographs and to share links and documents. This is indicated by interview and questionnaire statements like ‘Easy to use’, ‘Easy to share’, ‘Very user friendly’, ‘I have Facebook open all day, anyway’, ‘Fast information’, and ‘Teacher can comment’. Nearly all comments on affordances for participation in learning communication concerned the user-friendliness of Facebook. A few comments concerned positive effects of visibility. The students indicated that their involvement was positively affected by the fact that posts were seen by peers and teacher: ‘gets you to make an extra effort’ and ‘gets me to do

more than I otherwise would have done'. The students found Facebook much easier to use than the school's Learning Management Systems, and thus better for communication and sharing.

Constraints on participation in learning communication

Several students complained that Facebook presented many distractions for their participation on 1.e Biology debate: 'There are many other temptations on Facebook' and 'It is easy to lose concentration on Facebook'. Notifications were an especially distracting element particularly for those students who had a very active social life on Facebook. They received a steady stream of notifications from peers whilst online. One of the students reported that she managed the distractions by going offline while she was on 1.e Biology debate.

A constraint which acted to demotivate students was the feeling of surveillance by the teacher and classmates. This was commented on by four students. One student found the lack of anonymity on Facebook negative; two students did not like the fact that the other students could see questions posed to the teacher. Two students mentioned reservations about the teacher's access to their profile/profile picture (e.g. 'I don't like my teacher to see my profile picture – she is teacher but not my Facebook friend'). One of them also noted reservations about seeing the teacher's profile. Such statements were not made in the interviews. Two of the interviewed students commented on surveillance issues but only in the positive sense reported above that visibility affords focused engagement. We ascribe this difference between questionnaire and interview statements to the fact that the interviewees were not representative of the class in general in that they were all active and engaged students (primary selection criterion).

A few comments concerned technical issues (mentioned by two students) and the architecture of Facebook (one student complained that posts ended up being 'messy').

Interaction of contexts

In Denmark, mandatory schooling ends with lower secondary education (Year 9). The gymnasium is voluntary and aims at preparing students for tertiary education. Thus, students are introduced to a more formal and academic way of working than they have experienced in prior schooling. For many students, this shift is demanding. The teacher adopted Facebook as an alternative, less formal learning context to support multiple modes of learning and engagement. Specifically, her aim was to ease access into the subject of biology and, more generally, into the formal school setting for those students who found the new academic demands of the gymnasium difficult.

The results show diversity in the degree to which this aim was attained for the students. In the questionnaire, this issue is measured quantitatively by the items; 'I think 1.e Biology debate is schoolwork', '1.e Biology debate is school', and '1.e Biology debate makes Facebook school'. The results indicate that the Facebook activities were considered school activities by most students. However, the frequencies in Table 3 indicate disagreement on the question whether the Facebook activities were viewed as formal to the same extent as other school activities. This disagreement is backed by the diversity in the qualitative statements. Thus, one student wrote that 1.e Biology debate made biology less school-like and 'got Facebook which is a great part of our lives into something school-related'. Another student found that 1.e Biology debate 'forms a connection between leisure time (Facebook) and homework'. Similarly, one of the interviewees said that 'It was kind of like mixing school and your normal leisure time'. Another interviewee said that 1.e Biology debate 'was sort of a break, or not a break, but … normal blackboard teaching… then you would much rather do this'. However, the same student also said that 1.e. Biology debate was '100% school… you go in there if you have homework to do'. She did point out, though, that it was easier to get homework done because notifications about activity on 1.e Biology debate came up when she was on Facebook anyway. The four other interviewees all made statements in line with

this latter comment about 1.e Biology debate being ‘100% school’, e.g. ‘I don’t think it has anything to do with anything else but school’, ‘I found that it quickly became like an extra burden in a way, with homework’ and ‘I actually had the feeling that you were a little scared to write there because it was subject-related, not for fun and not just what you felt like writing, right’.

The students also disagreed on whether they approved of the integration of Facebook’s informal forum into the formal school setting. This must be contrasted with the expectations of the teacher, as evidenced in interview statements and in informal conversations before and after class. She appears to have implicitly assumed that students would like their informal Facebook life to be drawn into school life.

Data indicating the disagreement amongst students on this point are to be found both in the questionnaire statements and in the interviews. Thus, the abovementioned two statements from the questionnaire concerning the mixing of school and leisure time were presented as positive aspects of the Facebook activity. Likewise, one interviewee expressed that ‘It is cool that you have school on Facebook’. In contrast, other students comment negatively on this integration of informal and formal contexts. One student reports as negative the ‘obligations’ on 1.e. Biology debate. Another student writes that s/he would never post a biology question on 1.e Biology debate. Instead s/he poses questions to the teacher alone on the school’s Learning Management Systems because ‘That is more appropriate, more school-like and professional’. This statement is echoed in one of the interviews: ‘students may feel that the professional collaboration-like stuff may be harmed a little’.

As a concrete concern in this context, one student writes that ‘since it was homework to discuss, it was difficult if what you thought had already been written’. This points at a specific problem in the interaction of informal and formal contexts namely that the resulting demands on students may lack transparency for them. One of the interviewees articulated this explicitly: ‘you don’t quite know how you should use it so it [the activities] doesn’t become so thorough’. As far as

our observational and interview data indicate, teacher and students had not negotiated the curriculum and the intentions with the Facebook activities to any large extent. Specifically, the teacher appears not to have articulated her hopes of facilitating boundary crossing and of easing access to curricular domains for less academically trained students.

Lastly, some students commented in the questionnaire that a downside to the informality of 1.e Biology debate was their tendency to not take it quite seriously. They wrote e.g. that homework on Facebook was not as 'serious' as other homework; that they did a bad job of it; and that it was easy to forget it 'because you don't relate Facebook to homework'.

Discussion

Interest

Frequency and evidence of voluntary engagement are important indicators of interest (Renninger et al. 2015). In all three debates, students posted voluntarily after school in addition to the mandatory postings made in class. This indicates that their situational interest was maintained beyond initial triggering. In 'Advice column: Sexlinien.dk', for example, 21 of the 29 comments were posted voluntarily in student leisure time. One boy in particular was active in posting comments and likes. This same boy did not participate in any classroom discussions. The teacher's aim to ease access into the subject of biology thus apparently was fulfilled for this student.

The results clearly show that the use of Facebook was not by itself sufficient to make an activity interesting. Whereas debating on Facebook was interesting for most students, the closed assignments were not. This suggests that the experience of interest depended very much on content and the degree of student autonomy in the given Facebook activities. The latter corresponds to recent theoretical work within motivation theory: Deci (1992) and Krapp (2002) have argued that humans have an inherent need for autonomy and that this may explain why self-directed activities

have the potential for generating interest. Similarly, Palmer (2009) has identified autonomy as a source of situational interest in science classrooms.

Socio-scientific issues may be found interesting for two reasons. First, they allow students to make decisions, which promote a sense of autonomy and competence. Second, they may provide a connection to real life and thus be interesting in themselves (Sadler 2009). The informal interviews indicate that this was indeed the case in our study: The reason most students gave for finding the three debates on Facebook interesting was the relevance of the content to their present lives. It is, however, likely that the socio-scientific debates would have promoted interest also without the use of Facebook. Many students believe that in science they solely acquire factual, non-negotiable knowledge. The recognition that science also includes social and/or ethical dilemmas may itself enhance students' interest and motivation.

Two of the students commented that they didn't find the debates very 'biological' in nature, and one of them said she found the debates belonged more in her social studies class. This is in line with the findings of Nieswandt and Shanahan (2008). In their study, curricular content involving social and environmental issues were linked to daily life. This resulted in a change of student motivation for engaging with the curricular content. It did not, however, lead to a change in the students' general motivational goal structure as concerns science. Instead, because students perceived the topics as easy and everyday they understood the course as 'not a real science course' and 'a course for non-science people'. Our study concurs with theirs in suggesting that students may perceive socio-scientific issues as interesting but also as 'non-science' due to the everydayness of the science content. Based on similar findings, Hughes (2000) concludes that socio-scientific content is easily marginalized and devalued in the classroom discourse. He stresses that the situation is aggravated by syllabus content demands and assessment deadlines. Consequently,

students' narrow and individualistic perceptions of science remain unchallenged and the potential for student motivation through socio-scientific issues is undermined.

Affordances and constraints for participation in learning communication

Our study corroborates the results of the research reviewed by Aydin (2012) as concerns the affordances of Facebook. The platform affords participation in learning communication because of its status as an integrated part of students' lives. This allows for easy access to the educational communication. Participation is further afforded by the technological functionalities which the students found easy to use (in part, of course, because they already knew how). In addition, our study suggests that Facebook as an 'everyday platform' tends to increase the conspicuousness of the educational activities taking place on it. However, our study also reveals some counteracting characteristics of Facebook as an educational platform. These characteristics imply a decrease in opportunities for participation in learning communication.

First, distractions are many on Facebook. According to Harp and Mayer (1998), distracting details do their damage by grabbing and holding students' selective attention. For example, when a student receives a steady stream of interesting but irrelevant posts from friends on Facebook, the student's selective attention is 'seduced' away from the educational activity. Self-regulated learning strategies may be needed to overcome the distractions. One such example is provided by the girl who chose the strategy of going offline when doing educational activities on Facebook. However, self-regulated strategies depend on motivation and volitional control to stay on track (Paris and Paris 2001). Therefore, students who lack the motivation and skill to achieve academically may be more prone to be seduced by distractions on Facebook. This consideration is in line with a recent study which indicates that online settings in general require learners to be more autonomous and self-directed (Rienties et al. 2012). It is to be contrasted with the teacher's aim of easing access into the subject of biology and into the academic way of working for less academically trained students.

It is also to be contrasted with Manca and Raineri's finding that 'matching the expectations of 'millennial students' is regularly provided as a reason for utilizing Facebook as a platform for learning (Manca and Ranieri 2013). The issue points to the need for activities on Facebook to be interesting in themselves, not just in terms of taking place on Facebook, to motivate students with low self-regulating skills to stay on track.

Second, four students criticized the invasion of their privacy by the educational activities and by the teacher. Views on this issue are to some extent balanced by positive assertions concerning the convenience and meaningfulness of forging links between school settings and everyday activities. Still, the critical comments highlight a risk of coercing students into surrendering more information about themselves than they want to. The divergent student views on the significance of privacy versus convenience correspond to the variances reported by Roblyer, McDaniel, Webb, Herman and Witty (2010): In a study of college student and faculty attitudes towards using Facebook in education, 46.7% of the students (N=120) agreed that 'it would be convenient' whereas 22.5% agreed that 'Facebook is personal/social – not for education!' and 15.0% that 'My privacy would be invaded'. Incidentally, the corresponding percentages for faculty (N=62) were 21.0%, 53.2%, and 22.6%, respectively. This indicates that faculty in general is more sceptical than students about coupling the formal practices of education with the informal practices of Facebook. A further study has shown that undergraduate and graduate students found passive behaviour (e.g. viewing profiles, photos and videos) significantly more acceptable than active behaviour (e.g. sending messages and commenting on photos) for both teachers and fellow students (Teclehaimanot and Hickman 2011). This suggests that breaches of private life are deemed more offensive when the teacher initiates interaction in comparison with mere pulling of accessible personal information. Notably, our study shows that students may also feel the breach of privacy when their educational performance is displayed to their classmates against their wish.

Third, in one obvious respect, not discussed in the literature, the employment of Facebook as an educational platform poses a clear decrease in specific students' opportunities for participation in learning communication. This concerns the minority which does not have a Facebook profile. In our study, it was 2 out of 30. For some activities – primarily the ones taking place in class – these students were able to pair up with other students and participate through their profiles. For other activities, they were effectively left out of the learning communication. This constitutes a clear ethical problem. Learning opportunities should formally be equal for all students in a given educational program. However, Facebook activities make them contingent on student engagement in a specific virtual environment not hosted by the educational institution itself. The problem is accentuated by the fact that Facebook is owned by a commercial enterprise which may exploit user information on the platform in marketing offensives. As such, it would be a violation of student rights for the school to formally require a profile on the platform. An American study reports that students who disapprove of having a profile on social networking sites often do so for ideological reasons, e.g. because they disapprove of the way identity is constructed on these sites (boyd 2008). It seems reasonable to hypothesize that Danish students decline on similar grounds. In effect, the utilization of Facebook for learning amounts to giving such students the unfair choice between joining a platform of which they disapprove or missing out on learning opportunities.

Interaction of contexts

The reviewed literature had some success in developing new curriculum designs based on the introduction of 'real life issues' into school settings. In general, successfully introducing such issues is not a simple matter of posing questions from out of school settings in class. The questions tend to be transformed into 'school tasks' by the requirement characteristics (Dohn 2007) of the class context which differ from the requirement characteristics of the real life settings in which they arise. This point has been argued extensively at the theoretical level by situated learning theorists (Greeno

1997, 1998; Lave 1988; Lave and Wenger 1991; Packer 2001; Resnick 1987; Wenger 1998) and has been given empirical support by a number of studies of classroom work on real life issues (Lave 1988; Roth and Lee 2004; Säljö and Wyndhamn 1988; Schoultz et al. 2001). Therefore, to succeed in establishing the desired close connection between curricular content and real life, it is necessary to focus on the remediation and resituation (Dohn 2014) of the real life issues into the classroom.

We expected that Facebook would provide a link between students' lives and curricular content because of student familiarity with participation in its informal communicative practices. We therefore expected that Facebook would facilitate the required remediation. We further expected this to be a potential factor in maintaining interest. However, it appears reasonably clear that utilizing Facebook as an educational platform does not itself increase the meaningfulness of the educational activities for real life. Moreover, the lack of transparency of educational demands on Facebook is an indication that the communicative practices themselves had to be transformed to fully embrace learning communication. So is the variation in student views on how the contexts of Facebook and of school interacted to make the former more or the latter less school-like. In other words, the integration of out-of-school self-directed practices of students on SNS into a formal educational setting is not a straightforward matter.

This last observation is supported by Crook who argues more generally that communicative practices are shaped and constrained by the socio-cultural settings in which they take place. Therefore the opportunities of utilizing Web 2.0 tools may flounder due to divergences in the 'operating characteristics of out-of-school and in-school communication environments' (p. 78). 'Digital fluency', he concludes, is not 'an idealized characteristic of people – decoupled from the situations in which they act' (Crook 2012). Similarly, several studies indicate that the employment of Web 2.0 activities in educational settings may lead to tensions and practical challenges because of the incompatible views of communication, learning, knowledge, and activity goals inherent in

educational and Web 2.0 practices, respectively (Dohn 2009; Dohn and Buus 2013; Hemmi et al. 2009; Lantz-Andersson et al. 2013; Naismith et al. 2011).

Thus, our study adds important qualifications to previous research on the use of Facebook in education (Aydin 2012; Manca and Ranieri 2013). It serves to give some counterbalance to the optimism displayed in the literature concerning 'the potentials for learning' of Facebook (Ajjan and Hartshorne 2008; Lampe et al. 2011; Mazman and Usluel 2010).

Conclusions and limitations

By way of conclusion we shall summarize what our study has shown about our research questions: a) How are situational interests of upper secondary students maintained by collaborating on Facebook in a biology course? b) What are the affordances and constraints for students' participation in learning communication on Facebook?

The overall answer to the questions is that the coupling of formal and informal communication practices on Facebook serves to maintain interest and open up new learning possibilities. At the same time, the coupling creates barriers to communication which rest both on ethical issues and on a certain depreciation of the activities ensuing from the everydayness of Facebook as a communication platform. More specifically, our study has shown the following:

- Debates about socio-scientific issues and the sharing of photos on Facebook maintain situational interest.
- The affordances of Facebook as a platform for learning are high; both technologically and in terms of familiarity of use, but distractions are many.
- The coupling of formal and informal contexts leads to Facebook activities being viewed as schoolwork. The relevance of activities to other settings is not established automatically.

- The everydayness of the platform at once raises the conspicuousness of educational activities (notifications act like reminders) and leads to a diminished significance of them ('It's just Facebook…').
- Students who have chosen not to be on Facebook are faced with an unfair choice between joining a commercial platform of which they disapprove or missing out on learning opportunities.
- Students disagree on their attitudes towards the coupling of their private/social Facebook sphere with their educational sphere. To some the coupling is convenient and raises the meaningfulness of their educational activities. Others consider it a breach of privacy and feel under surveillance by teacher and fellow students.

Thus, use of Facebook as educational platform is not clearly good or bad. Utilizing Facebook for educational purposes, especially debating socio-scientific issues seems to maintain interest for students because of the increased conspicuousness of the educational activities taking place on the platform. On the other hand, our study shows the continued relevance of Dewey's (1913) classic admonition against viewing interest as an ingredient that can be added to spice up an otherwise boring activity. This is illustrated in the student comment: 'come on… don't come with such idiotic pedagogical ideas where we are supposed to find it more interesting because it's Facebook'.

This study is, to our knowledge, the first attempt to investigate students' situational interest and participation in Facebook activities integrated in upper secondary science education. Our study has limitations and further research is needed to support our conclusions.

First, the interview data suggested that students often equated 'interesting' with 'fun', 'likeable', or 'motivating', which quite possibly represented different meanings. What people mean when they express their interest is not evident (Valsiner 1992). This calls for triangulating methods, and the importance of aligning the methods with their intended conceptualization. As a whole, the

motivational aspects of educational activities on Facebook are complex and difficult to distinguish, and several other motivational variables should be taken into account, such as goal orientation, self-efficacy, self-regulation and utility-value.

Second, we cannot separate interest in Facebook from Facebook-mediated situational interest, since activities and Facebook were inextricably tied together. Conducting this study in the actual classroom instead of conducting it under experimental conditions allows for a holistic and naturalistic inquiry. The drawback is that the phenomenon and the context are not easily distinguishable. More systematic sampling needs to be done in follow-up studies to gain a more comprehensive picture of student interest in educational Facebook activities.

Third, our analyses are based on a limited number of subjects. While the study design allowed us to extract valid information with only a small number of participants (30 students in total), the results may only be generalizable to similar populations. It is likely that different motivation and participation aspects would emerge with different populations. Replicating this study with different populations, not least ones with different gender distributions would be an important next step.

References

Aikenhead, G. S. (1996). Science Education: Border Crossing into the Subculture of Science. *Studies in science education, 27*(1), 1-52, doi:10.1080/03057269608560077.

Ainley, M. (2010). Interest in the dynamics of task behavior: Processes that link person and task in effective learning. *Advances in motivation and achievement, 16*, 235-264.

Ajjan, H., & Hartshorne, R. (2008). Investigating faculty decisions to adopt Web 2.0 technologies: Theory and empirical tests. *The Internet and Higher Education, 11*(2), 71-80, doi:http://dx.doi.org/10.1016/j.iheduc.2008.05.002.

Akkerman, S. F., & Bakker, A. (2011). Boundary crossing and boundary objects. *Review of Educational Research, 81*(2), 132-169.

Angrosino, M. V. (2005). Recontextualizing observation: Etnography, pedagogy, and the prospects for a progressive political agenda. In N. K. Denzin, & Y. S. Lincoln (Eds.), *The SAGE handbook of qualitative research* (pp. 729-746). Thousand Oaks, CA: Sage Publishers, Inc.

Ares, N. (2008). Cultural practices in networked classroom learning environments. *International Journal of Computer-Supported Collaborative Learning, 3*(3), 301-326.

Aydin, S. (2012). A review of research on Facebook as an educational environment. *Educational technology research and development, 60*(6), 1093-1106.

Baumert, J., & Köller, O. (1998). Interest research concerning secondary level I: An overview. In L. Hoffmann, A. Krapp, A. Renninger, & J. Baumert (Eds.), *Interest and learning. Proceedings of the Seeon-conference on interest and gender* (pp. 241–256). Kiel: Institut für die Pädagogik der Naturwissenschaften (IPN).

boyd, d. (2008). Why Youth (Heart) Social Networking Sites: The Role of Networked Publics in Teenage Social Life. In D. Buckingham (Ed.), *Youth Identity and Digital Media* (MacArthur Foundation Series on Digital Media and Learning). Cambridge, MA: MIT Press.

boyd, d. (2014). *It's complicated : the social lives of networked teens*. New Haven: Yale University Press.

Brejnrod, P. H. (2005). *Grundbog i pædagogik : oplysning, dannelse og fusionspædagogik i senmoderniteten* (Gyldendals lærerbibliotek). Kbh.: Gyldendal.

Brown, J. S., & Adler, R. P. (2008). Minds on Fire: Open Education, the Long Tail, and Learning 2.0. *Educause Review, 43*(1), 16-32.

Bærentsen, K. B., & Trettvik, J. An activity theory approach to affordance. In *Proceedings of the second Nordic conference on Human-computer interaction, 2002* (pp. 51-60): ACM

Çam, A., & Geban, Ö. (2011). Effectiveness of case-based learning instruction on epistemological beliefs and attitudes toward chemistry. *Journal of Science Education and Technology, 20*(1), 26-32.

Choi, K., & Cho, H.-H. (2002). Effects of teaching ethical issues on Korean school students' attitudes towards science. *Journal of Biological Education, 37*(1), 26-30, doi:10.1080/00219266.2002.9655842.

Christidou, V. (2011). Interest, Attitudes and Images Related to Science: Combining Students' Voices with the Voices of School Science, Teachers, and Popular Science. *International Journal of Environmental and Science Education, 6*(2), 141-159.

Cobb, P., Stephan, M., McClain, K., & Gravemeijer, K. (2001). Participating in Classroom Mathematical Practices. *Journal of the Learning Sciences, 10*(1-2), 113-163, doi:10.1207/s15327809jls10-1-2_6.

Conole, G., & Alevizou, P. (2010). A literature review of the use of Web 2.0 tools in Higher Education. *A report commissioned by the Higher Education Academy*. Milton Keynes: The Open University.

Crook, C. (2008). Web 2.0 technologies for learning: The current landscape–opportunities, challenges and tensions. Canley: Becta.

Crook, C. (2012). The 'digital native' in context: tensions associated with importing Web 2.0 practices into the school setting. [Article]. *Oxford Review of Education, 38*(1), 63-80.

Deci, E. E. (1992). The relation of interest to the motivation of behavior: A self-determination theory perspective. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 43-70). Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc. .

Dewey, J. (1913). *Interest and effort in education* (Riverside educational monographs). Boston, MA, US: Houghton, Mifflin and Company.

Dirckinck-Holmfeld, L., Jones, C., & Lindström, B. (2009). *Analysing networked learning practices in higher education and continuing professional development*. Rotterdam: Sense Publishers.

Dohn, N. B. (2007). Knowledge and Skills for PISA—Assessing the Assessment. *Journal of Philosophy of Education, 41*(1), 1-16, doi:10.1111/j.1467-9752.2007.00542.x.

Dohn, N. B. (2009). Affordances revisited: Articulating a Merleau-Pontian view. *International Journal of Computer-Supported Collaborative Learning, 4*(2), 151-170.

Dohn, N. B. (2009). Web 2.0: Inherent tensions and evident challenges for education. *International Journal of Computer-Supported Collaborative Learning, 4*(3), 343-363.

Dohn, N. B. (2011). Situational interest of high school students who visit an aquarium. *Science Education, 95*(2), 337-357, doi:10.1002/sce.20425.

Dohn, N. B. (2014). Implications for Networked Learning of the 'Practice' Side of Social Practice Theories: A Tacit-Knowledge Perspective. In V. Hodgson, M. de Laat, D. McConnell, & T. Ryberg (Eds.), *The Design, Experience and Practice of Networked Learning* (pp. 29-49). Cham: Springer International Publishing.

Dohn, N. B., & Buus, L. (2013). Teaching PBL with Web 2.0 - A case study of possibilities and conflicts. In E. Christiansen, L. Kuure, A. Mørch, & B. Lindström (Eds.), *Problem-based learning for the 21st century* (pp. 235-258). Aalborg: Aalborg University Press.

Downes, S. (2005). Feature: E-learning 2.0. *Elearn magazine, 2005*(10), 1.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management Review, 14*(4), 532-550, doi:10.2307/258557.

Ellison, N. B., & boyd, d. (2013). Sociality through social network sites. In W. H. Dutton (Ed.), *The Oxford handbook of internet studies* (pp. 151-172).

Gardner, P. L. (1998). Students' interest in science and technology: Gender, age and other factors. In L. Hoffmann, Krapp, A., Renninger, K.A. & Baumert, J. (Ed.), *Interest and learning. Proceedings of the Seeon-conference on interest and gender.* (pp. 41–57). Kiel: Institut für die Pädagogik der Naturwissenschaften (IPN).

Gibson, J. J. (1986). *The ecological approach to visual perception*. Hillsdale: Lawrence Erlbaum Associates.

Graeber, W., & Lindner, M. (2008). The Impact of the PARSEL Way to Teach Science in Germany on Interest, Scientific Literacy, and German National Standards. *Science Education International, 19*(3), 275-284.

Greenhow, C., Robelia, B., & Hughes, J. E. (2009). Learning, Teaching, and Scholarship in a Digital Age: Web 2.0 and Classroom Research: What Path Should We Take Now? *Educational Researcher, 38*(4), 246-259, doi:10.3102/0013189x09336671.

Greeno, J. G. (1994). Gibson's affordances. *Psychological Review, 101*(2), 336-342.

Greeno, J. G. (1997). On Claims That Answer the Wrong Questions. *Educational Researcher, 26*(1), 5-17, doi:10.3102/0013189x026001005.

Greeno, J. G. (1998). The situativity of knowing, learning, and research. *The American psychologist, 53*(1), 5-26, doi:10.1037/0003-066x.53.1.5.

Greeno, J. G., & TMSMTAPG, t. M. S. M. T. A. P. G. (1998). The situativity of knowing, learning, and research. *American Psychologist, 53*(1), 5-26.

Guzzetti, B. J., & Bang, E. (2010). The Influence of Literacy-Based Science Instruction on Adolescents' Interest, Participation, and Achievement in Science. *Literacy Research and Instruction, 50*(1), 44-67, doi:10.1080/19388070903447774.

Harp, S. F., & Mayer, R. E. (1998). How seductive details do their damage: A theory of cognitive interest in science learning. *Journal of educational psychology, 90*(3), 414-434, doi:http://dx.doi.org/10.1037/0022-0663.90.3.414.

Hemmi, A., Bayne, S., & Land, R. (2009). The appropriation and repurposing of social technologies in higher education. *Journal of Computer Assisted Learning, 25*(1), 19-30.

Hidi, S., & Harackiewicz, J. M. (2000). Motivating the Academically Unmotivated: A Critical Issue for the 21st Century. *Review of Educational Research, 70*(2), 151-179, doi:10.3102/00346543070002151.

Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist, 41*(2), 111-127.

Holstermann, N., Grube, D., & Bögeholz, S. (2010). Hands-on Activities and Their Influence on Students' Interest. *Research in science education, 40*(5), 743-757, doi:10.1007/s11165-009-9142-0.

Hughes, G. (2000). Marginalization of Socioscientific Material in Science–Technology–Society Science Curricula: Some Implications for Gender Inclusivity and Curriculum Reform. *Journal of Research in Science Teaching, 37*(5), 426-440, doi:10.1002/(sici)1098-2736(200005)37:5<426::aid-tea3>3.0.co;2-u.

Hulleman, C. S., & Harackiewicz, J. M. (2009). Promoting Interest and Performance in High School Science Classes. *Science, 326*(5958), 1410-1412, doi:10.1126/science.1177067.

Häussler, P., & Hoffmann, L. (2000). A curricular frame for physics education: Development, comparison with students' interests, and impact on students' achievement and self-concept. *Science Education, 84*(6), 689-705, doi:10.1002/1098-237x(200011)84:6<689::aid-sce1>3.0.co;2-l.

Häussler, P., & Hoffmann, L. (2002). An intervention study to enhance girls' interest, self-concept, and achievement in physics classes. *Journal of Research in Science Teaching, 39*(9), 870-888.

Jones, C., Dirckinck-Holmfeld, L., & Lindström, B. (2006). A relational, indirect, meso-level approach to CSCL design in the next decade. *International Journal of Computer-Supported Collaborative Learning, 1*(1), 35-56.

Järvelä, S., Volet, S., & Järvenoja, H. (2010). Research on Motivation in Collaborative Learning: Moving Beyond the Cognitive–Situative Divide and Combining Individual and Social Processes. *Educational Psychologist, 45*(1), 15-27, doi:10.1080/00461520903433539.

Järvenoja, H., & Järvelä, S. (2005). How students describe the sources of their emotional and motivational experiences during the learning process: A qualitative approach. *Learning and Instruction, 15*(5), 465-480, doi:10.1016/j.learninstruc.2005.07.012.

Kaptelinin, V., & Nardi, B. (2006). *Acting with Technology : Activity Theory and Interaction Design*. Cambridge, MA, USA: MIT Press.

Kitsantas, A., & Dabbagh, N. (2011). The role of Web 2.0 technologies in self-regulated learning. *New Directions for Teaching and Learning, 2011*(126), 99-106, doi:10.1002/tl.448.

Krapp, A. (2002). Structural and dynamic aspects of interest development: theoretical considerations from an ontogenetic perspective. *Learning and Instruction, 12*(4), 383-409.

Krapp, A., & Prenzel, M. (2011). Research on Interest in Science: Theories, methods, and findings. *International journal of science education, 33*(1), 27-50, doi:10.1080/09500693.2010.518645.

Kvale, S. (1996). *Interviews: An introduction to qualitative research interviewing*.

Lampe, C., Wohn, D., Vitak, J., Ellison, N., & Wash, R. (2011). Student use of Facebook for organizing collaborative classroom activities. *International Journal of Computer-Supported Collaborative Learning, 6*(3), 329-347, doi:10.1007/s11412-011-9115-y.

Lankshear, C., & Knobel, M. (2006). *New literacies: Everyday practices and classroom learning*. New York: Open University Press.

Lankshear, C., & Knobel, M. (2011). *New Literacies: Everyday Practices and Social Learning*. Maidenhead, Great Britain: Open University Press.

Lantz-Andersson, A., Vigmo, S., & Bowen, R. (2013). Crossing boundaries in Facebook: Students' framing of language learning activities as extended spaces. *International Journal of Computer-Supported Collaborative Learning, 8*(3), 293-312.

Lave, J. (1988). *Cognition in practice: Mind, mathematics, and culture in everyday life*. New York: Cambridge University Press.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, England: Cambridge University Press.

Livingstone, S. (2008). Taking risky opportunities in youthful content creation: teenagers' use of social networking sites for intimacy, privacy and self-expression. *New Media & Society, 10*(3), 393-411, doi:10.1177/1461444808089415.

Luehmann, A., & Frink, J. (2012). Web 2.0 Technologies, New Media Literacies, and Science Education: Exploring the Potential to Transform. In B. J. Fraser, K. Tobin, & C. J. McRobbie (Eds.), *Second International Handbook of Science Education* (Vol. 24, pp. 823-837, Springer International Handbooks of Education): Springer Netherlands.

Manca, S., & Ranieri, M. (2013). Is it a tool suitable for learning? A critical review of the literature on Facebook as a technology-enhanced learning environment. *Journal of Computer Assisted Learning, 29*(6), 487-504.

Mazman, S. G., & Usluel, Y. K. (2010). Modeling educational usage of Facebook. *Computers & Education, 55*(2), 444-453, doi:http://dx.doi.org/10.1016/j.compedu.2010.02.008.

Mitchell, M. (1993). Situational interest: Its multifaceted structure in the secondary school mathematics classroom. *Journal of educational psychology, 85*(3), 424-436.

Naismith, L., Lee, B. H., & Pilkington, R. M. (2011). Collaborative learning with a wiki: Differences in perceived usefulness in two contexts of use. *Journal of Computer Assisted Learning, 27*(3), 228-242, doi:10.1111/j.1365-2729.2010.00393.x.

National Research Council (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press.

Nieswandt, M., & Shanahan, M.-C. (2008). "I Just Want The Credit!" – Perceived Instrumentality as the Main Characteristic of Boys' Motivation in a Grade 11 Science Course. *Research in science education, 38*(1), 3-29, doi:10.1007/s11165-007-9037-x.

Nolen, S. B., & Ward, C. J. (2008). Sociocultural and situative approaches to studying motivation. In M. Maehr, S. Karabenick, & T. Urdan (Eds.), *Social psychological perspectives on motivation and achievement. Advances in motivation and achievement* (Vol. 15, pp. 428-460). London: Esmerald Group.

Osborne, J. (2003). Attitudes towards science: A review of the literature and its implications. *International journal of science education, 25*(9), 1049-1079, doi:10.1080/0950069032000032199.

Osborne, J., & Collins, S. (2000). *Pupils' and parents' views of the school science curriculum*: Kings College London.

Packer, M. J. (2001). The problem of transfer, and the sociocultural critique of schooling. *The Journal of the Learning Sciences, 10*(4), 493-514.

Palmer, D. H. (2009). Student interest generated during an inquiry skills lesson. *Journal of Research in Science Teaching, 46*(2), 147-165, doi:10.1002/tea.20263.

Paris, S. G., & Paris, A. H. (2001). Classroom Applications of Research on Self-Regulated Learning. *Educational Psychologist, 36*(2), 89-101, doi:10.1207/s15326985ep3602_4.

Patton, M. Q. (2002). *Qualitative Research & Evaluation Methods*. Newbury Park: Sage.

Potvin, P., & Hasni, A. (2014). Interest, motivation and attitude towards science and technology at K-12 levels: a systematic review of 12 years of educational research. *Studies in science education, 50*(1), 85-129, doi:10.1080/03057267.2014.881626.

Renninger, K. A., Kensey, C. C., Stevens, S. J., & Lehman, D. L. (2015). Perceptions of Science and Their Role in the Development of Interest. In K. A. Renninger, M. Nieswandt, & S. Hidi (Eds.), *Interest in Mathematics and Science Learning*. Washington, DC: American Educational Research Association.

Resnick, L. B. (1987). The 1987 Presidential Address: Learning in School and out. *Educational Researcher, 16*(9), 13-54, doi:10.2307/1175725.

Rienties, B., Giesbers, B., Tempelaar, D., Lygo-Baker, S., Segers, M., & Gijselaers, W. (2012). The role of scaffolding and motivation in CSCL. *Computers & Education, 59*(3), 893-906.

Roblyer, M., McDaniel, M., Webb, M., Herman, J., & Witty, J. V. (2010). Findings on Facebook in higher education: A comparison of college faculty and student uses and perceptions of social networking sites. *The Internet and Higher Education, 13*(3), 134-140.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. New York, NY: Oxford University Press.

Rotgans, J. I., & Schmidt, H. G. (2014). Situational interest and learning: Thirst for knowledge. *Learning and Instruction, 32*(0), 37-50, doi:http://dx.doi.org/10.1016/j.learninstruc.2014.01.002.

Roth, W.-M., & Lee, S. (2004). Science education as/for participation in the community. *Science Education, 88*(2), 263-291, doi:10.1002/sce.10113.

Raae, P. H. (2012). Den nordiske uddannelsesmodel og det danske gymnasium. *Nordic Studies in Education, 32*(03-04), 311-320.

Sadler, T. D. (2009). Situated learning in science education: socio-scientific issues as contexts for practice. *Studies in science education, 45*(1), 1-42, doi:10.1080/03057260802681839.

Scardamalia, M., & Bereiter, C. (1994). Computer Support for Knowledge-Building Communities. *Journal of the Learning Sciences, 3*(3), 265-283.

Scardamalia, M., & Bereiter, C. (2006). Knowledge building: Theory, pedagogy, and technology. In K. Sawyer (Ed.), *Cambridge Handbook of the Learning Sciences* (pp. 97-118). New York: Cambridge University Press.

Schiefele, U. (1991). Interest, Learning, and Motivation. *Educational Psychologist, 26*(3), 299 - 323.

Schoultz, J., Säljö, R., & Wyndhamn, J. (2001). Conceptual knowledge in talk and text: What does it take to understand a science question? *Instructional Science, 29*(3), 213-236, doi:10.1023/a:1017586614763.

Schraw, G., & Lehman, S. (2001). Situational Interest: A Review of the Literature and Directions for Future Research. [Article]. *Educational Psychology Review, 13*, 23-52.

Selwyn, N. (2009). Faceworking: exploring students' education-related use of Facebook. *Learning, Media and Technology, 34*(2), 157-174, doi:10.1080/17439880902923622.

Statistics Denmark (2011). Befolkningens brug af Internet 2010. Copenhagen: Statistics Denmark.

Säljö, R., & Wyndhamn, J. (1988). Cognitive Operations and Educational Framing of Tasks. School as a Context for Arithmetic Thought 1. *Scandinavian Journal of Educational Research, 32*(2), 61-71, doi:10.1080/0031383880320202.

Teclehaimanot, B., & Hickman, T. (2011). Student-Teacher Interaction on Facebook: What Students Find Appropriate. *TechTrends, 55*(3), 19-30, doi:10.1007/s11528-011-0494-8.

Valsiner, J. (1992). Interest: A metatheoretical perspective. In K. A. H. Renninger, Suzanne; Krapp, Andreas (Ed.), *The role of interest in learning and development* (pp. 27-41). Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc.

Volet, S. (2001). Understanding learning and motivation in context: A multi-dimensional and multi-level cognitive-situative perspective. In S. E. Volet, & S. Järvelä (Eds.), *Motivation in learning contexts: Theoretical advances and methodological implications* (pp. 57-82). Amsterdam: Elsevier Sciences.

Walczak, D. E., & Walczak, M. M. (2009). Do Student Attitudes toward Science Change during a General Education Chemistry Course? *Journal of Chemical Education, 86*(8), 985, doi:10.1021/ed086p985.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge, England: Cambridge University Press.

Table 1

Examples of the themes referred to by students'comments supplied in answer to the open questions in the questionnaire

Category	Count	Examples of themes
Affordances for participation in learning communication	44	Sharing files etc., well-known, easy to comment, easy to use, teacher can comment, easy to get help, fast information, user-friendly
Constraints on participation in learning communication	11	Distraction, surveillance (by teacher and/or classmates), technical problems, 'messy' structure
Interaction of contexts	19	Connect leisure time and homework, easy to forget homework, not seriously, obligations
Interest	17	New, different, debate, movie making

Table 2

Content overview of the Facebook group '1.e Biology Debate'

Event	Content
Picture hunt (Week 1-3) based on the themes 'adaptation', photosynthesis and energy', 'natural science', and 'hormones'	26 photographs 22 posts 33 comments (14 made by the teacher) 16 likes (7 made by the teacher)
Designer baby (Week 3-5)	1 post (made by students) 16 comments made by 5 students (plus 2 by the teacher and 2 by two politicians) 6 likes (2 by the teacher)
Diet and health (Week 6-8)	1 post (made by the teacher) 17 comments made by 14 students (plus1 made by a politician) 8 likes (5 made by the teacher, 1 made by a student who made no comment)
Movie making: heart dissection (laboratory) (Week 14-15)	4 posts (made by the teacher) 3 videos made by students
Explain figures (from the biology book - closed assignment) (Week 16-17)	17 posts (made by student groups of 2-4 students) 39 likes
Birth control (laboratory) (Week 18)	6 posts 6 photographs

	1 like
Advice column: Sexlinien.dk (Week 18)	2 posts (1 made by the teacher) 29 comments (21 made by 17 individual students and 8 by student groups of 2-4 students) 18 likes (including 2 from students who made no individual comments)
1.e's genetic dictionary (Week 27)	1 post (made by the teacher) including 28 genetic terms, specified by the teacher (closed assignment). The students were supposed to write a description of the terms (6 of them were never described)

Table 3

Frequency of students' responses to the questionnaire items (N = 27)

	Strongly agree	Agree	Agree somewhat	Neither agree nor disagree	Disagree somewhat	Disagree	Strongly disagree
Scale: Subject interest (Cronbach α = 0.88)							
I like biology	3	4	8	7	1	2	2
Biology is interesting	2	5	7	7	1	2	3
Our biology lessons are fun	2	2	9	4	3	6	1
I like biology more than other subjects	1	1	3	4	5	5	8
I think other subjects are more interesting than biology	5	7	5	6	1	0	2
Scale: Facebook mediated interest (Cronbach α = 0.78)							
Debating on 1.e Biology debate makes biology more interesting	2	5	12	4	3	1	0
It is interesting to discuss dilemmas on 1.e Biology debate	5	8	9	1	2	2	0
1.e Biology debate is fun	2	3	8	5	5	1	2
1.e Biology debate makes biology fun	4	3	6	3	5	3	2
Scale: Make Facebook school (Cronbach α = 0.78)							
I think 1.e Biology debate is schoolwork	4	2	1	3	4	1	11
1.e Biology debate is school	2	1	0	5	3	6	9
1.e Biology debate makes Facebook school	6	2	2	6	2	5	3

Cronbach alpha = 0.78

Table 4. Extract of the thread Designer baby, translated from Danish by second Author.

Initiating student: DEBATE 'DESIGNER BABY'. We live in a world where being normal is a necessity. We follow the ways of our times concerning fashion, technology and life style. A world where you can buy practically anything for money? Technology has now made it possible to genetically design your baby. Is this ethically right, should it be legal? If you wish to read more [link to a newspaper article]

Student respondent 1: It is ethically incorrect to experiment on humans so that makes it illegal, but of course it would be fun. But consider when something goes wrong and the baby just is fucked up!!! That would not be fun so it has to stay as it is and keep on experimenting on animals ☺ [comment gets 1 like]

Student respondent 1: but apart from that it is a solution for no Down's syndromes in the world. [Comment gets 1 like]

Student respondent 2: It is absolutely not okay – not only will fetuses be given up because they do not have the right gender, hair color or eye color, but at the same time this kind of human selection will lead to imbalance in the gender distribution. This has already happened in Asia where boys are more popular than girls and therefore there are far more boys than girls which may lead to loneliness among men in Asia. Some things must be left to chance, or the natural mutations sometimes found in DNA would not help us evolve because fetuses with mutated genes would be rejected due to incorrectness. [Comment gets 2 likes]

Student respondent 3: I actually don't think it is incorrect, but not correct either. However, you have the right to choose yourself, I find. It's the same as having an abortion. For some it is important to have the 'perfect' family consisting of one boy and one girl and that they come in a specific order. So that this can help these people is good. That you can actually 'design' your future child is perhaps a bit too much and the world would probably quickly become very uniform when it came to looks. Personally I think that not knowing what your future child will look like is a big part of pregnancy and of the whole process of having children, for me it would be taking the excitement out of it all. It is a choice that you have to take whether you want to know the gender or 'design' your future child. So I would not call it incorrect or wrong in any way but if you choose this opportunity it is definitely something you should have thought long and hard about.

Student respondent 4: It is totally correct to do it. If you can take precautions against certain genetic features such as handicap, hereditary illnesses or something else which no human should live with. It is also a huge challenge for the family to have a child or family member who is handicapped, listen to someone who knows. – To be able to decide the looks of the baby is condemnable in my opinion, given that the parents who may not be the most responsible persons in the world could quickly to something from which the child would not really benefit, e.g. get yellow eyes, be really tall and have blue skin just because they are huge fans of Avatar…

[Thread continues with 2 short comments from Student respondent 1, a comment and question from one of the invited politicians, two comments from a fifth student and one from a sixth student. The thread ends with two comments from the teacher in which she 1) corrects a misunderstanding on the part of a student and 2) refers to a quote from The Danish Council of Ethics.]