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Abstract: In this paper, we sketch an empirically based theory about how class teaching seems to change in the era of digital media. The research question is: what consequences do access to the Internet have for classroom based teaching? We propose a dialectic process between 'new conditions' and 'school reactions' running as a deconstruction of the old closed classroom in favour of an open community between students, teachers and third parties. Yet, the deconstruction does not happen at once. Rather, we suggest that it arises through three waves. In the first wave, the old classroom is opened. Students are distracted and teachers do not know what to do. The Internet becomes a challenge to teaching. In the second wave, attention is drawn back to the educational interaction between teachers and students through the use of social media. In this phase, social media are used to re-stabilise the educational situation and intensify it. In the third wave, teachers and students go a step further, succeeding in establishing educationally relevant interaction with third parties (authors, researchers, foreigners, etc.). Only in this final phase does the Internet become a mean of new perspectives that thoroughly alter the old educational setting.

Keywords: Education, Internet, social media, classroom, theory

INTRODUCTION AND PRECONDITIONS

This paper presents a theoretical structure for understanding the longitudinal influence of Internet and Web 2.0 technologies on educational settings. Our scope is limited to a discussion of the educational changes we have observed in

Danish upper secondary schools. Yet, we would argue that our findings might hold true for all educational settings with similar conditions. Briefly put, these conditions can be described as follows: Before the rise of the Internet, classroom teaching primarily took place in a closed room, only attended by students and their teachers (Luhmann 2006; Tække and Paulsen 2010a, 2010b). This was also the case in the Danish upper secondary school – as in many other schools – up to the point where the Internet, mobile devices and wireless networks entered the classroom. In the Danish upper secondary school, the new digital infrastructure appeared in the years after the Danish school reform from 2005 (Tække and Paulsen 2009). One of the new demands in this reform was that teachers should make use of information technologies (ibid). In compliance with this demand, the schools invested in wireless networks, computers and, to some degree, mobile devices. Also, it became frequent that students and teachers brought their smartphones and other devises to the classroom, using them for private as well as educational reasons (ibid).

What effects do the new media bring about? How do teachers and students react? Which difficulties arise? Which new possibilities? Does it alter the educational interaction between students and teachers fundamentally? Or does it only result in minor modifications? These are our questions.

We would ask the reader to keep in mind that our empirical starting point is the Danish upper secondary school from 2005-2015, but that we nonetheless propose a general theory that might hold true for similar educational settings. We admit that it might be a thought provoking proposal. Yet, it ties in nicely with the collection by Greenhow et al. (MIT Press, 2016) on *Education and Social Media*. It also ties in nicely with a number of ongoing efforts to make use of the Internet in a variety of school systems in different countries.

Firstly, researchers point to potentials for better learning. If social media are used in teaching, the opportunities to express oneself, participate, collaborate, find information, reflect and learn together are expanded. The opportunities for help, teacher feedback, knowledge sharing, student productions, differentiation, shared notes, knowledge storage and process

writing are also expanded (e.g. Crook 2008; Moody 2010; Liburd 2011).

Secondly, researchers point to potentials for forming better communities. If new media are used in the right way they can provide better opportunities for students to get to know each other, becoming familiar with each other, doing things together, making friends, connecting and maintaining relationships, getting to know each other's friends and forming communities (e.g. Blanchard and Markus 2004; Wright 2010; Atkinson 2010; Webb 2012).

Thirdly, researchers point out that the study environment at a school can be improved if social media are involved; the use of social media can expand opportunities for contact between the school and the students, contact between classes and between year groups, and between alumni and future students, as well as increasing participation in activities at the school in addition to teaching. Also, they observe better contact with absent students and opportunities to create virtual homework help (e.g. McNely 2009; Reid 2011; Zeng 2012).

Fourthly, researchers observe better opportunities for contact with the surrounding community, people in other countries, politicians, friendship classes, etc. (e.g. Lovari and Giglietto 2012).

Fifthly, studies show that an active inclusion of social media provides better motivation and commitment as it expands the possibilities for creating lessons that students find interesting and challenging. With new media it is possible to achieve greater diversity in teaching and exceed traditional classroom training (e.g. Junco 2010; Elavsky 2012; Yaros 2012,).

Finally, *sixthly*, researchers point out that students acquire better media and IT skills when social media are used actively in class and that students become better prepared for contemporary society that is permeated by digital media (e.g. Lowe and Laffey 2011; Shannon 2011; Levinsen and Sørensen 2011).

THE THEORY

Our theory describes the general patterns on how schools *respond* to the new

conditions digital media entail compared to the media situation before the Internet. We propose that these responses imply a shift from *closed* classroom teaching to an *open* community between students, teachers and third parties. However, the shift does not happen at once. Rather, we suggest that it arises through three *waves* containing different educational responses to the new situation. In Figure 1, we have outlined our narrative theory. On the Y-axis we have *educationally relevant attention* and on the X-axis we have *time*. In our theory, we assume that before digital media there was a given level of educationally relevant attention. This assumption can be called into question insofar as attention towards the educationally relevant subject matter differed from student to student, class to class, time to time, etc. Yet, there is no doubt that in *the first wave* of digital media and wireless networks we can generally observe a huge drop in educationally relevant attention (Mathiasen et al. 2014). Also, we know that activity irrelevant to the educational purposes (e.g. responding to private messages) significantly harm grade, recollection of information and note taking (Kuznekoff, Munz and Titsworth 2016).
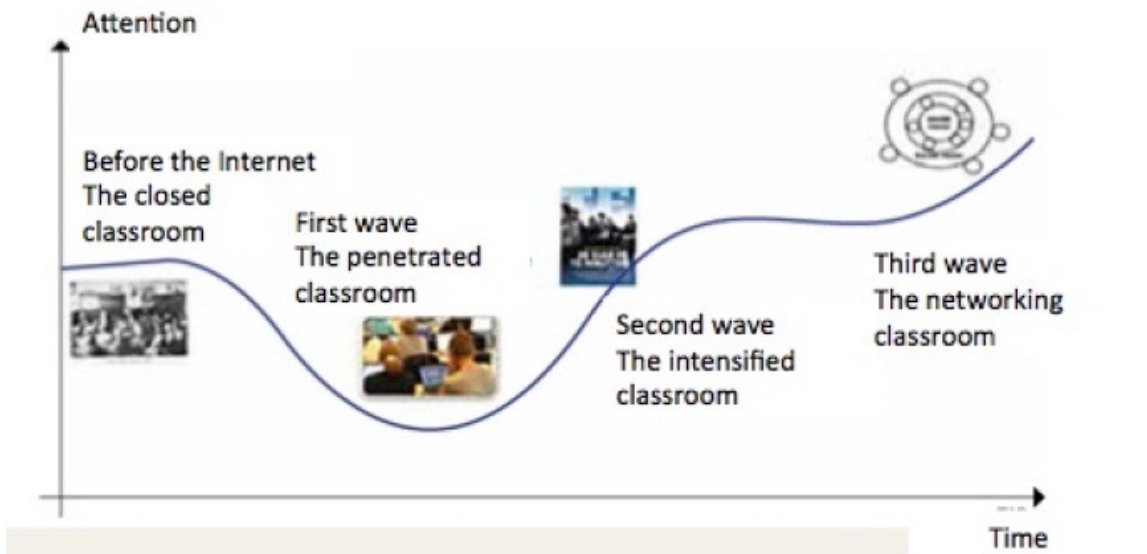

Figure 1. The three waves of digital media in education

In our research from 2005-2015, we have observed that the first respond by teachers and schools to the new media situation primarily is either to *ignore* the new difficulties and possibilities or to *prohibit* the use of digital media for educationally irrelevant purposes (Tække & Paulsen 2013). Both strategies – ignoring and prohibiting – generally fail for several reasons (ibid). At the same time, the new possibilities (listed above) are not actualised or invented. In the first wave, we consistently do not observe a realisation of new and improved teaching, but a destabilised teaching with students trying to multitask between computer games or social media *and* the educational interaction with teachers that do not know what to do.

The second wave arises when schools, teachers and students begin to make use of the possibilities of the new media for better interaction between the students and the teachers. In this phase, teachers begin to use the new media to draw attention back to the classroom by using digitally based written interaction within the class and also shared online documents where students collaborate, monitored and guided by the teacher. The result is an intensified educational interaction where the attention is re-conquered and more and better possibilities of *participation* arise. For instance, it becomes possible for teachers to get answers from *all* the students *simultaneously* through the use of microblogging media like Twitter, instead of only hearing one voice at a time. This – and similar uses – helps to get more students involved and engaged in the educational interaction (Tække & Paulsen 2013a; 2015; 2016). Despite the positive impact of the second wave it only consists of 'more' and 'better' interaction, not altering the classroom setting and the educational form radically. Yet, *the third wave* – which is truly radical – is made possible by the digital literacy developed and facilitated during the second wave.

The third wave arises when other persons than the students and the teachers, through the Internet, become integral parts of the educational interaction. When this happens on a regular basis, it changes the educational form that has existed more or less since the printing press. Instead of a closed system of interaction between teachers and students, we now observe an open

system of interaction in which other persons outside the classroom participate and contribute. This brings new *perspectives* to the form of education. On a regular basis, students meet persons with other perspectives, views and responses, and the teacher becomes a 'mediator of otherness'. In this wave, the teacher builds networks for educational purposes outside the classroom. Students connect to groups, other school classes, individuals and databases, using the new medium environment as a natural part of their education. They take part in the *convergence culture* (Jenkins 2008) carrying out *produsage* (Bruns 2008), learning to navigate and take part in the new society and its forms of production, network, communication and culture. The upshot is that teaching shifts from being a *closed production* to an *open activity*, inviting different people to participate. Instead of transmitting knowledge to the students, the role of the teacher becomes to connect students with relevant otherness and make knowledge sharing possible across borders and differences.

The tree waves correspond to some degree to Anderson and Dron's (2011) distinction between *three generations of distance education*. According to Anderson and Dron, first a *cognitive and behavioural generation*, next a *social constructive* and finally a *connectivistic generation* have appeared successively. Even if it is possible to say to some degree that the reactions we have observed fit with these generations, we would argue that our theory and the distinction between the three waves work on a more fundamental level than the *scientific differences* identified by Anderson and Dron. Hence, we would argue that teachers and schools move through the three waves regardless of theoretical inclinations. In the first phase, teachers and schools have to find middle ways between extreme versions of prohibiting and ignoring. This leads to the second phase: the use of digital media for educational purposes and what we call the 'intensified classroom'. Yet, this does not completely solve or repeal the distractions of the first wave but deals with it more adequately. Further, the digital skills, experiences and competences achieved through the second phase *enable and motivate* the class to enter the final and third wave, where other persons than the students and their teachers are contacted with the aim of

contributing to the educational process. These alterations are both more practical and fundamental than shifts in learning theory. What we propose is not only a model of shifting learning theories, and not only a theory of distance learning pedagogy, but rather a general educational theory of how the practice of education *as such* alters in the era of digital media, also accounting for the non-digital elements of education.

As part of our research leading to our theory of the three waves, we conducted a three-year-long action research project, the *Socio Media Education* (SME) experiment from 2011-2014 (Tække and Paulsen 2013a). The empirical findings in this project enable us to go into more detail and outline more specifically each of the three waves, but also difficulties of moving from phase one to phase two and from phase two to phase three. In the project, we followed an upper secondary school class and designed the teaching together with its teachers to try to provide the teachers and students with some good media habits and a higher level of reflectivity in relation to media use and attention. In this paper, having considered the first wave (based on empirical findings produced prior to the SME-project), we use the research to go further into the second wave where the teachers and students learn to use, especially, social media to improve education, re-stabilise the structure of the teaching and, last but not least, draw attention back to the educational subject matter. In the last section of the paper, we even consider the third wave from the viewpoint of our research on the basis of the two last years of the SME experiment where the SME class worked with academic cultivation in and out of class.

BEFORE DIGITAL MEDIA AND THE INTERNET

Before we go into detail about the three waves, let us first go back to the situation before the Internet to be more precise in regard to what has really changed and what has not. School teaching as we know it is not a universal form of education; it is based on a certain historical medium matrix (speech, writing

and printing) and a specific type of architecture. The school is one of the societal institutions built on what Foucault (1991) calls power of discipline. We have a closed room with a teacher sitting in front of a class of students, monitoring them, asking them questions, noting marks in a protocol, etc. During the teaching time there are no interruptions from the outside: " In order to minimise distraction from the outside world, the interaction takes place in closed spaces that are not publically accessible" (Luhmann 2006: 131). The teacher has authoritative power over the interpretations of the printed textbook and great power over the educational interaction: "In particular, the spatial seclusion of the teaching ensures that the education system can control its own thematics and decide the beginning of, shift between or abandonment of themes" (Luhmann 2006: 132). We call this closed classroom an echo room because the teacher explains X (from the textbook) and writes X on the blackboard and the students write X down in their notebooks etc., and finally they are examined in X and feedback is given only after the learning has happened. This form of teaching is developed to match the society of industrialisation and the media matrix of yesterday. In such a school system, there are two determinants for education, because there is a sharp division between school and what is outside school, between *the educational community* and *the learning network*. Outside school, the students are left to their own personal networks, which creates inequality and negative social heritage because some come from highly literate and cultivated homes where the parents have educations, read books and are used to the doxa of the school system. Others come from homes with no or very little doxa that matches with the culture of the school. Teachers naturally accept pupils with a dominant social origin, who through their receptions, attitudes, language codes, naturalness, elegance and personality are given more weight than students who communicate in other codes (Bourdieu 2000).

THE FIRST WAVE – THE PENETRATED CLASSROOM

With digital media and wireless networks the classroom is opened. This produces both a new space and a new time. Students can access the educational communication from almost everywhere and at any time. Teachers can contact and interact with their students while they are at home or elsewhere. Other people 'from the whole world' can contact students and teachers sitting in a classroom. The upshot is that communication in and out of the schoolroom increases massively and attention is drawn away from the content of the teaching. Also, the homework culture is undermined because media like Facebook, Instagram and Snapchat undermine concentration. When observing an upper secondary school class, you become witness to students trying to multitask: While they are surfing on the net and chatting on Facebook, at the same time they are trying to pay attention to the teacher and the educational interaction. This situation is experienced with much frustration among the students, but still they cannot escape it:

> **Researcher**[1]: What about computers and IT and things like that, how much do you use it?
> **Student 1**: Very much, I think. I also think, well, it can be difficult to administer sometimes (...) I'm being pulled slightly apart (...) then you could also just sit and play a little while something is being examined on the blackboard.
> **Student 2**: You become addicted, you really do. If you find a funny game on the web, or it's Monday, and you just want to know what the others have been up to on the weekend, or something.
> **Student 2**: You become addicted to it, because you know that you can always get hold of people and things like that, and if you are bored.
> **Student 1**: Yes, you take out your computer and switch it on and then it is switched on the rest of the day, and then you switch off it when you go home. And so I think maybe it would be a better idea if the teachers just went in and said; okay, well, you may now switch on your computers because now we have to do something. (...) When it is right there, it's just so easy just to open it and then...

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1 This is from a student interview from 2007 (see Tække and Paulsen 2013a), before we
launched the SME project, and at another upper secondary school in Denmark.

The students express a strong feeling of social ambivalence and interpret the feeling as a kind of addiction. They cannon help using the digital media for computer games and social interaction, even though they have observed that they do not learn as much when trying to multitask. Also, the teacher is in great doubt in regard to the use of digital media:

> **Teacher**[2]: I may well see on the students' faces what it is they're doing. Some are taking notes, while others are sitting with a broad grin – they are certainly not taking notes. But it is enormously difficult, and you cannot simultaneously teach and tell the students that they must be attentive, or switch off their computers. If you try to go down and see what they are doing, they are quick to switch over to something else. And I think personally that it is frustrating. And now we've got wireless network. Before, you could ask them to take out the network connector, but now they can sit and communicate with each other...

Also, the teachers experience social ambivalence and do not know what to do in the new situation provided by digital media. In our observations, we found two different strategies used by the teachers and the schools: either prohibition or indifference [Tække and Paulsen 2010a; 2010b]. In our analysis, we came to the conclusion that the problem could be explained as three ambivalences: 1) An *ambivalence of action* that comes about when students do not know if they should play a computer game, read a news article or look something up on Wikipedia, when the teacher for the third time explains something they have already understood, or when waiting to get help, 2) An *ambivalence of interaction*, which concerns when students can interact with others in the classroom or outside the classroom during lessons: When they receive an urgent message from home, or when they want to ask someone in or outside class for help 3) An *ambivalence of responsibility* that questions who is responsible for the other two ambivalences: We watched how students thought that the teachers should take responsibility, but when teachers actually banned and

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2 This is from a teacher interview from 2007 (see Tække and Paulsen 2013a), before we
   launched the SME project and at another upper secondary school in Denmark.

imposed control, the students began to cheat and oppose the teachers. Some teachers also tried to make their management or the students' parents take responsibility. In this way, the responsibility circulated around between the players without anyone really taking it on themselves or leaving it to others. Our conclusion was that the new media environment had undermined what could be regulated through the old norm system (see Meyrowitz 1985; Tække and Paulsen 2010a, 2010b).

With the before-mentioned SME action research project, we tried to take the consequences of the documented ambivalences by getting a school class, along with their teachers, to generate new norms more adequate to the contemporary media environment. Since neither prohibition nor indifference is a particularly appropriate strategy to generate norms, we gave the teachers the double obstacle that they were neither allowed to prohibit nor to be indifferent to students' media use. In addition, they had to help students reflect on their media use and, in particular, to demonstrate to them that we cannot multitask without very large attention and memory-related costs (König 2005; Lee et al. 2012; O'Brien 2011; Pashler 1994; Tække & Paulsen 2013a). One cannot, for example, write and post a status update on Facebook and simultaneously listen carefully to the teacher's instructions. Moreover, the teachers themselves had to use social media in their teaching, partly because international research shows that it offers many new opportunities for teaching (Tække & Paulsen 2012a, b, 2013a, b), and partly because it helps generate educational forms and norms that are adequate to the new media environment. On the basis of the teachers' and students' work following these guidelines they moved from the first wave to the second wave.

THE SECOND WAVE – THE INTENSIFIED CLASSROOM

The second wave arises when schools, teachers and students begin to make use of the possibilities of the new media for making better interaction between students and teachers. In this second 'moment of the Internet', teachers begin

to use the new media to draw attention back to the classroom.

As documented in Tække and Paulsen (2013a), the teachers in the SME-class temporarily succeeded in recapturing the attention when the students simultaneously had to tweet about films they saw and presentations they attended. This re-colonisation of the communicative space also has the advantage that the students shared notes, for instance about the film they had discussed while they saw it (ibid.).

> **Student 1**: When we saw a film, then the teacher questioned us on Twitter and we had to answer. I think it was really good.
> **Researche**r: And why was it good?
> **Student 1**: Because then you got it if it was something essential…
> something that you did not get.
> **Student 2**: … instead of remembering it all after the film. It can be relatively difficult to remember a whole film afterwards.
> **Researcher**: Wasn't it difficult?
> **Student 1**: No, not really, you only lose a few seconds because it is running at the same time. What you lose is just how the picture was.
> *Student interview 2 d. 2/11 – 2011*

As evident in the interview, the parallel microblogging works as a support in relation to generating educational attention and understanding in the process, and as production of notes and memory that the students can draw on later. The fact that the student has to relate actively to the teacher's and other students' questions trigger reflections and focus. At the same time, the student can ask questions if their understanding blocks for keeping up with the plot. On the other hand, the student does not look down on their screen to follow other things on the web. This is also helped on its way because the teacher is sitting together with the students, motivating them to take part in the collective analytical work. However, not everybody can manage to write while watching (e.g. writing notes) but in a writing interaction medium one still gets the benefit of what others write both during and after the film (Tække and Paulsen 2013a). We have documented similar effects in relation to oral presentations and, for example, brainstorming about a novel before the analytical work. The

method falls short when the teacher gives presentations because they cannot have their attention on the students' attention while speaking. But on the other hand, if the teacher feels that the students pay attention to other things, Twitter is helpful.

> I had some students today that did everything else than pay attention, or were totally passive while we listened to a German song. Then I asked everybody to tweet all the German words that they picked up. That helped on the activity.
> *German teacher 5:27 PM Mar 15, 2013 from the Google site*

Also if all students are "totally stoned" (quote from the German teacher), it has great effect to ask everybody to answer a question on Twitter. The educational community using microblogging in this way is able to *interpellate* students and thereby initialize involvement, and maintain attention, activity, participation and work discipline. Also, according to both observations and interviews with teachers and students, more students are included in the educational interaction than if it only took place orally. Further, following our interviews, the quality is better when also microblogging is used, and the students feel that the educational interaction better calls for attention when it also is on their screen. The use of microblogging demands practice; it is not easy to multiplex[3], express yourself in 140 characters and be precise in an academic sense, using hashtags (#), links and tags (@). According to teacher interviews, they experience that they cannot perform educational interaction in other classes with the same quality and participation as they do in the SME class.

In the class, especially two of the teachers became known as Twitter teachers because they used Twitter a lot in their teaching. These two teachers expressed a better trust relation to the students. They also acquired a much

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3 Multiplexing is the situation in which the attention is pointed towards one intentional object but in more than one medium at the same time, such as listing and writing notes. It is not the same as multitasking, where you try to point your attention towards different things at the same time.

bigger knowledge about the students and the relations between them, helping the teachers to perform better classroom management.

After the students and teachers during the first year acquired the sufficient competences in microblogging, the teachers began to provide homework help one hour five evenings a week.

> **Researcher**: Do you think it's an advantage that you can get help when you are at home?
> **Student**: Yes, I do, because you know it is not always that your parents can help with all subjects. So yes it is great that you can write to your teacher and not have to wait until the next day.
> *Student interview 17 14/3 2013*

According to a teacher interview, the teacher felt that she (because the community was also mediated through written interaction) had the opportunity to catch up on students that she felt she had not had contact with during the school day.

A last experiment with Twitter to be mentioned here was the use of the medium on a trip to Copenhagen where the students and teachers used Twitter to organise many of their visits around the town.

Another medium that was used from the second year was shared online documents in Google docs. These online documents allowed students working together in the same document from different computers while the teacher was able to monitor all the groups' work. Students could even do homework together from different geographical places. The teacher could help them directly in their document if they, for instance, were on the wrong track. If it was group work at school, the teacher talk to groups not working or having difficulties. This is process feedback and not just feedback after the work is done and the students are occupied with new topics.

During the second wave, we see that the students acquire better digital competences. According to the teachers, the difference compared to other classes became huge, meaning that the other classes could not initiate the same

educational methods as the SME class. The students also developed skills and experience with using Twitter as a backchannel transforming the class into a new form of public, constantly discussing the educational content and the teaching, or presentation of it. Also, more students gained a voice and joined the educational interaction. We found that multiplexing is a form of single-tasking through which the students focus on the educational object with the advantages of the digital media for interacting, storing and retrieving. Also, the border between school and home was surpassed with the virtual homework help that the teachers provided. We also saw a better relationship between teachers and students, especially a better trust relation based on the fact that teachers were not any longer a threat who would prohibit media use or, for instance, confiscate smartphones etc. Also, the knowledge about the students was increased, with better group work and cooperation as a result.

As an overall observation, the re-stabilisation and restructuring of the educational interaction by means of the new media intensify attention on educational subjects and reduce the social ambivalences and, to a high degree, the students' self-distractions. The students acquired a culture that matches the new media environment. In the second wave, we also noticed an increased transparency, but also more surveillance and control. Somehow, the class turned into a teaching machine leaving out the surrounding world, as a new technified first-order cybernetic echo room.

THE THIRD WAVE – THE CONTACT SEEKING CLASSROOM

In the third wave, the possibilities for interaction out of the classroom are in focus. In the SME class, Twitter has been the primary medium for this purpose, but also Facebook, Google+, Google Sites and Skype have been used.

From the second year, the teachers had to work on cultivating the contact between the class and its surrounding world to establish dialogue with network resources. The re-stabilised educational community of the class should in this way achieve that the otherwise disturbing contact with the surrounding world

would become an educational asset and hereby turn the situation for the better so the contact, instead of drawing attention away from the educational interaction, would qualify it. Moreover our thesis was that this contact would enrich and inspire the information situation with angles and perspectives going beyond what the teacher could offer. Generally seen, this move would cultivate the class to work in a modus adequate to the contemporary media environment.[4]

One example was when a Danish teacher initiated contact with the Danish poet Kasper Anthoni. The class read one of his collections of poems and through two sessions asked him questions on Twitter. According to the teacher, the students usually have little or no interest in poetry, but this contact really got them interested. Also, according to the students the experience was very motivating and mind-blowing.

> **Student 1**: I think it was a totally different way to analyse poems. A much better way I think.
> **Student 2**: Yes, when we have the author [on Twitter] we can question him if there is something we cannot understand in the poem and ask him what he meant and then he can come with a tweet about it.
> *Group interview1 31/10 2012*

> **Student 1**: It helps with the interpretation. If I ask him how he got the idea, then he says that he had a feeling, and then it is essayer to interpret the poem. I think it was good.
> *Group interview 5 31/10 2012*

The interaction with the poet is exemplary for the concept of the third wave, where the class definitively moves out of the echo room. The teacher falls a little back but still takes the responsibility, letting the students get to the source and letting it be the centre of their attention and reflection. The teacher

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4 Following Jenkins (2013; 2008; 2006), we now see a participation culture characterised by shaping, sharing, reframing, remixing and appropriation, and with Bruns' (2008) produsage and intercreativity.

has made the appointment with the poet, helped the students reading the book and formulating questions, and divided students into groups for the sessions. These efforts are good investments because the students' motivation and involvement are triggered by the direct contact with a real author through Twitter.

In another example, a teacher gave the class assignments where they should contact local companies using predefined types of media that the teacher knew the companies used, like Twitter and Facebook. This also gave a positive result for motivation, involvement and the information situation. The students, also some who were not usually motivated, explained in interviews that it felt very relevant and authentic to communicate with local businesspeople and that it helped them to apply theory to their cases.

Another example is two actions where other school classes were contacted (one in Denmark and one in Germany, both with positive results). Again, we see that the students were very involved and motivated by communicating with others outside the class, here with other students of the same age. According to the teachers, more students were drawn into the schoolwork than usually. It felt more important to the students to contribute, and also the quality was higher than normal because of a feeling of being observed by others of the same age and representing their own class. In relation to both classes, they also acquired new angles on their subjects, and also information from other angles than represented by their own teacher. In relation to the German class, it also became important to write correctly and the students felt that the language written by the German students was a more real German than in the books and spoken by the teacher.

> **Student**: I feel that I learn better by communication instead of reading a book. Also the lingual, not just the grammatical. If you communicate with someone from Germany, then you learn better German than if you sit in the class talking German. That's the way it is.
>
> *Student interview 13 14/3 2013*

Moreover, the students also felt that they themselves had something to contribute to the other classes.

Gradually, the students built up networks, for example the poet, that they could ask questions, both when they were at home and in the class. An example was when a student asked her sister who studied economy in Copenhagen:

> **Student 2**: We were to do a presentation about the American presidential election and then the presenter said something I did not understand – and we had to use Twitter during the presentation so I wrote to my sister on Twitter about it. Then she answered and I could catch up and understand the presentation again.
> *Group interview 6 autumn 2012*

After the presentation, the student explained the difficult part of the presentation to the rest of the class. Again, we see new and useful knowledge come from the surroundings of the class through the new media.

The last example was an action where some of the students and teachers from the class, according to an appointment, sat at home one evening watching a TV documentary about the financial crisis, using Twitter to interact about it. After some time, one of the students observed that the rest of the Danes watching the documentary while on Twitter used a global hashtag to interact about it.

> **Researcher**: So you were discussing the documentary with the others from the class and then it was extended. What do you think of that?
> **Student**: You also got other people's opinion […] and there were really many opinions and tweets and it was going on log after the programme ended. It was really exciting.
> **Researcher**: Was it good for the discussion that it was not just the class and your teachers?
> **Student**: Yes, I believe so. Because we maybe have a little bit the same opinion in the class, because we have the same teacher, and it is the same things we do. And then there were other people's opinions, people that are another place in their life, and have another perspective on society.
> *Student interview 9 9/1-2013*

Here, an educationally relevant hole is knocked in the class' re-stabilized educational interaction, and perspectives arrive from the outside. The typical situation in the echo room, where the teacher decides what is good and what is evil, right and wrong, fades away. As we saw with the poet, the cultivated opening pushes this position and the teacher must find a new position. Not necessarily weakened, but more adequate with the new media environment as a facilitator, moderator and organiser that helps the students understand the different opinions in society. We asked the student what it would be like if the SME class had not had the contact to the external world:

Student: Yes then I believe, then it would be biased, the teacher's opinion would shine through very much. Now we get others' opinions, others' view on the things. This means that what the teacher says is not just right, but that you then also can find information about: can this really be true? Why does she say that? And such things. So it makes us think in another way.
Student interview 9 9/1-2013

In the third wave, we see that the students are much more involved and motivated in relation to the schoolwork. Our interpretation is that this has to do with the real and authentic cases. In contemporary culture we cannot expect that anybody, not even students, can muster real involvement and motivation if they have to work with pseudo cases or outdated texts or cases. The surrounding world is full of real authentic cases and every mediated communication of mass media content is selected with high relevance criteria, also counting actuality. The aspect that the students worked and interacted with real people in real situations with real consequences cannot be overestimated; it matches the everyday world of young people today. Such setups with real people in real situations apply to new normal expectations and interpellate the students in the academic work and educational interaction. An old man talking from an old book about an old outdated case simply does not appeal to most students in Danish upper secondary schools any more. Also, the methods presented and documented by the SME project have shown that

students feel that they represent themselves and not at least their school class and want to make a good impression. This has to do with social identity and the personal history of self-presentation, which is very important not least for young people. *You are what you tweet*. During the work with third wave methods, students form networks and are trained to do so and also trained to handle social codes on the web. This means that during their education, they actually learn something about the external world that the school has to prepare the students for. It must be a key function for the school to prepare the students for the world of today and not for the day of yesterday. This does not mean that they are not going to learn about old subjects like Ancient Greece or Rome or world literary history, but that the teacher must find setups that feed into the way young people can be attracted and interpellate in our present time. Lots of other school classes work with the same topics and also lots of specialists work with and would love to answer questions about history and literature. In addition, there are lots of opportunities for going to virtual museums etc. We have also documented a strengthening of the educational community because the third wave methods cultivate cooperation with differentiated roles. The echo room is broken; students get out and learn from people outside the classroom, with help from the teacher.

CONCLUSIONS

This paper has presented a theory claiming that the digital media revolution falls in three waves. In the first wave, the old classroom is opened up by the access to the Internet that wireless networks and digital devices makes possible. Students are distracted and teachers do not know what to do. Hence, the first wave undermines the old organisation of the classroom and traditional teaching methods. The Internet becomes a *challenge* to teaching. Initially, the teachers and schools react ineffectively by either prohibiting or ignoring, giving rise to a huge drop in educational attention in the classroom. The schools and teachers enter the second wave when they succeed in drawing attention back to the

educational interaction between teachers and students through the use of social media. In this phase, social media are used to re-stabilise the educational situation and intensify it. A new, strong echo room is produced with a combination of old and new means. The third wave arises when teachers and students go a step further, succeeding in establishing educationally relevant interaction (through the Internet) with third parties outside the class (authors, researchers, foreigners, etc.). Only in this third phase does the Internet become a means of new *perspectives* that thoroughly alter the old educational setting. In this phase, the teachers become mediators of otherness and students learn not only from their teachers and textbooks, but also from *many* others. Only in the third wave do the schools take full advantage of the new media, structuring teaching in accordance with the new media environment. Here, we see resources from and cooperation with the whole world included in the teaching, and students gaining digital literacy matching the current knowledge work described in new research literature (Jenkins 2013, 2008, 2006; Bruns 2008). We have built our theory on our empirical findings from our studies of the Danish upper secondary school from 2005-2015, especially the SME experiment from 2011-2014, where teachers worked with the use of, and reflection on, digital media together with their students within the educational practice. What we have observed other places and read about (e.g. Mathiasen et al. 2014; Kuznekoff, Munz and Titsworth 2016) mostly shows signs of the first wave. In other words, in the perspective of the theory of the three waves, the biggest attractor of the first wave is *distraction*, while the main attractor of the second wave is *concentration* but under the conditions of a technically closed classroom (the educational machine). In the third wave, the main attractor is *involvement* in the world, levelling out distraction and utilising the learning possibilities of digital media, brining education on level with the contemporary media environment. The SME experiment shows us the contour of how things might develop if schools and teachers take a few steps further. In the meantime, the question is whether the theory will come true even if schools and teachers try to hold back the socio-evolution of education? Looking back on former media

revolutions, the answer seems to be yes! Even though the church and governments tried to hold back the realisation of the scoop of the printing press and the analogue electronic media, their possibilities for communication and learning seem to have become realised.

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