Digital natives and Educational Traditions. What changes when exchanging textbook content with internet search?

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Abstract.
Use of technology challenge traditional concepts of learning in school. But what is actually changing? The paper shows result from a study that finds that the shift from textbook to internet content implicates significant changes. Textbooks present qualified content that is well adapted to the cognitive development of students of certain ages. Using internet content gives no such guarantees. The content validation has to be taken care of by the students. The internet search demands more complex skills than accessing content through the textbook. The students have to find relevant search terms, review and validate the results they find, select relevant content, use relevant strategies for storing and retrieving content and having the ability to present abstracts of their findings that are adapted to their learning purpose.

Collaboration works well for searching for content online because the students can benefit from each other's prior knowledge when discussing and reflecting during the learning work. Communicative and collaborative skills are important. So are good relations, to able students to work through obstacles and keep focus on the task even when internet searching takes them everywhere. Internet content has a flexibility that makes it easy adaptable to all students' learning prerequisites. Student collaboration between heterogeneous peers can work well because the complexity of the task involves a lot of different tasks to manage and are easy to distribute. It also makes possible for high performing students to find engaging content that will motivate and nourish the learning motivation.

Keywords: Digital content in school; learning content; technology supported teaching; learning with technology; profession oriented digital competence for teachers; didactics; content

1 Introduction.

To be able to understand how new technologies can benefit learning in classrooms, we need to understand the changes that come with teaching with technologies. This paper sum up how using technologies can impact the didactical categories content and methods in teaching when exchanging textbook content with internet search. The paper is based on a recent phd-study with a broader focus on students' learning with technology.

Research show that the use of technology in Norway so far tends to being adapted to a traditional teaching practice. After using technology in schools for decades, the expected pedagogical innovations have not occurred [1, 2]. This was the background for a phd-study which aimed to understand how the use of technology impact the ways students work, emphasizing content, methods and students' role behavior [2]. The aim of the study was to question the needs of revising the didactics when new technologies were introduced to a field of old professional practice in school teaching.

The study documented that using technologies in many ways challenged teachers' practices. It also put forward some perspectives on how didactical theory needs to change to meet new perspectives on teaching and learning when using technologies in classrooms. This paper will present the study's results on the changes that occurred when exchanging the textbook content with internet search.

2 Method.

The study was conducted as a multi-case study at two schools in the North of Norway, including 25 students at 4th (9-10 years old) and 10th grade (15-16 years old), selected on the background of their teachers' special interest and engagement for using technology, categorized as excellent cases. The empirical basis of the study mainly build on reflection notes from participating observations, students' products, notes from meetings and other documents, as documented in the thesis [2].

The case study strategy meets the need to investigate a phenomenon thoroughly through different sources of information [3, 4], even if it has some challenges generalizing results based on few units. However, literature supports the idea that knowledge generated from a case study can have general value for similar phenomenon [5, 6].

The data collection took place during five weeks during one academic year through participating observations. I conducted open observations to situations where students worked with technology, to try to capture what they really were doing and describe it. All observations were written down immediately after classes. Then the texts were elaborated into reflection notes which were distributed to the teachers within a week after observations. The teachers could respond to these narratives, and add and change if they wanted, but that never happened. The general response was that I had captured well what they tried to do and that my observations were more nuanced and detailed than expected. As a previous teacher I rapidly got the role as an extra teacher in both classes. This gave me solid experiences of the students and the teachers. But it also gave some challenges concerning the contradictive roles as teacher and researcher. These have been handled with a hermeneutic approach considering the researcher's preoccupations caused by professional experience within the field [7, 8].

To be sure I had understood the situation well, I discussed my observations and preliminary findings with the school leaders at each school and also presented the data describing each child in a specific report to their parents. This should assure that all participants would be well taken care of in the matter of informed consent.

Later, all texts were analyzed using qualitative methods and the digital platform NVivo. Through repeatedly reading, coding and reflections, the theoretical categories

emerged. Finally, the empirical data where elaborated into two narratives, one for each class/school. They contented a selection of specific narratives which could enlighten the research questions of the study. The narratives were analyzed, using a selection of theory of learning, knowledge and didactics, to be able to understand the matter in a general way and draw the final conclusions.

The thesis also contents a thorough review of theories of learning and teaching to establish a conceptual framework that makes it possible to value the results in a future perspective where knowledge and learning conditions are rapidly changing due to technological development [2]. It is not room for a full presentation of the framework here, but the next subchapter will present some of the perspectives that is important for the research question presented here.

3 Digital technologies and new perspectives on content in school's education

An important prerequisite for the study was to be sure that concepts of knowledge and learning in school meets future standards for education. The need to measuring learning outcome has increased in Norwegian Education as result of Norway's participation and focus on international programs like PISA [9]. This tendency is worrying policy makers and Education scientist in Norway who point at the importance to develop sustainable competence instead of remembering bits of information. New technologies bring new concepts of what knowledge is or should be and challenge the traditional school's content [10, 11]. Hence, revisions of concepts of knowledge and learning is important to able teachers to develop profession oriented digital skills.

School knowledge in a European tradition is closely connected with content. Norwegian education is strongly influenced by the German Bildung tradition which emphasizes the transformation that certain content brings to the learner. An important issue for teachers were then to find the right content that could serve this purpose [12]. School knowledge is often connected with what is viewed as appropriate content. But this concept needs a revision for a future use. A sustainable concept of knowledge must meet the constant changes that occurs when information is nonstop available through digital sources. Technologies extend the abilities to store and retrieve knowledge and dismiss our need to remember in a traditional way [13, 14]. Hence the need of storing content as part of the individual learning process is no longer the main issue for education, but rather to develop good strategies to search and validate knowledge for certain purposes in certain contexts [15].

3.1 Learning as an infinite movement between previous learning experiences and future expectations

Danish professor Mads Hermansen describes learning as positioned in the actual point of *now* and stretched out between the two positions; *feed-forward* and *feedback*. Feed-forward is the expectation of new learning outcome while feedback relates to prior understanding. The learning process is an infinite movement between these positions and

changes both dynamically from the perspective of the actual now [16, 17]. This means that prior and future knowledge is continuously changing when the learning process develops. This is also the situation when students learn in school.

Before starting learning something new, the previous knowledge has to be put forward. This is important to establish a zone of proximal development (ZPD). This process involves creating expectations to new learning (feed-forward) based upon the review of what you already know (feedback). In class the teacher will start the new learning task with asking the students what they know about the new learning task, what they can recall from previous, involve students in concept mapping, mediate discussions and so on, to establish the feed-forward. When feed-forward is established, it will work dynamically with the actual learning outcome. As the learning task is going on, students will revise their prior knowledge which will impact their feed-forward. All learning leads to new perspectives on both what they know and what they expect of future learning.

Hermansen adds two more dimensions to his model; a dynamic movement between *habitus* and *reflection*, and between *toil* and *exuberance* [16]. The two pairs point at important movements that are crucial for learning. Through the learning process, students' cognition moves between the outer positions of habitus and reflection, meaning that they move between acting on automatized scripts and on conscious actions. The habituated skills and knowledge makes it possible to build new knowledge upon the existing because it releases cognitive capacity for conscious processes. Learning as an interaction between toil and exuberance, points at the fact that learning drives forward through both flow and resistance. The will to struggle when meeting resistance, is important to achieve results.

Hermansen's dynamic model embody learning as an infinite process moving forward through shifts between feed-forward-feedback, habitus-reflection, and toil-exuberance. The model and the concepts can be used directly to show how technology impacts learning as shown later in the paper.

3.2 Tiller's Learning Sun as motivational power

Norwegian scholars Rita and Tom Tiller are occupied with motivation for learning. Their model of the Learning Sun [18] is useful to understand how the learning process are nourished. Learning in school should carefully consider what the students will find meaningful. Like Freire who view education as the means to meaningful existence [19, 20], Tiller and Tiller state that schooling should enrich students' lives. Hence, school has to adapt to its students instead of students' adapting to school [21, 18].

Tiller and Tiller's metaphor, the *Learning Sun*, embodies four important prerequisites for motivation and learning in school. The four dimensions are presented as four learning suns with mutual effect on each other. The first sun, learn to know, is about the intellectual dimension of learning and point at the individual's need of knowledge [18]. The need to know is a natural force for humans and a motivation in itself. The second learning sun, learn to do, is connected with practical knowledge or skills [18]. Some knowledge is embodied in the individual without being possible to describe in words. In my work I understand this dimension as the tacit knowledge [22, 23], which

is necessary for performing within a social and cultural context. The third sun, learn to be, is about belonging and appreciation within a social group [18]. Taking turns, communication skills, and well behaving towards others etc. are social skills that promote a good adaption to the group and the class, are important for the third sun. The fourth learning sun, to learn to live, has to do with general well-being [18]. The importance of peers and companions who want will promote your well-being, to understand the needs of those around you and being willing to scarify something for others when it is needed. Empathy is important for this. It has to do with generally having a good time together with humor and a good spirit to make learning thriving. Tiller and Tiller add important prerequisites to Hermansen's concepts, and show that motivation is the basic force in learning. issues are important to understand the impact of technology in school.

4 When content moves from textbooks to internet

The study showed that technology changes the way students work with content in different ways, with more or less significant impact. The study findings present these changes: the changes that occur when the content moves from textbooks to internet; the technology's possibility to support content creation in new ways; and the fact that online resources can provide content that are updated and adapted to the local context. This paper will focus specifically on the changes occurring when textbook content is exchanged with internet search.

The internet is a never ending source of information of more or less relevance and trust value. When using the textbook, the teacher can control and trust the quality of the content. When students search for information online, the teachers no longer control this and the responsibility of the content validation is distributed to the students.

Also the search for content in itself demands more complex skills on internet. Students have to decide what kind of information they need and find relevant search terms for the purpose. They need to review and value the results to be able to pick relevant information before storing what they find useful. And they need strategies to store and retrieve the essence of the content for various purposes. All these activities demand different strategies than working with textbooks. Textbooks have undergone quality control and present the information in a way that is adapted to the students' level of cognition and previous knowledge. With internet content, quality control, valuing relevance and adapting to students' level of cognition, needs to be implemented in the search strategies [2]. Narratives from the study will exemplify this.

4.1 Internet search and heterogeneous collaborations. Vivian and Thor.

Vivian and Thor are collaborating to find information about the planet Jupiter for a joint presentation. Sitting together by the computer, the two 10 year olds have to perform different tasks: first discuss and agree about relevant search terms and then review and validate their findings before they choose the content best suited for their task. The two enter the collaboration with different prerequisites. Vivian is an eager student with high level of achievement in all theoretical subjects. Thor is not so fond of theory and tend

to miss focus when the matter is not interesting. But they have a very good relationship and often play together in the breaks. The good relation makes it easy to work through the obstacles they meet about the task and the collaboration itself. When they search together for information about planet Jupiter, they have to calibrate their different conceptions, views and strategies. This is a complex process that depends on collaborative skills from both since their prerequisites are so different. Making this a real learning situation for both, require that both get the possibility to recall their former knowledge about the matter and communicate this to their mate to establish a common assumption of what they are looking for at the internet.

It is easy to picture a situation where Vivian, with her solid competence and advanced strategies, would take over the task and direct what Thor should do. But here they manage to create a collaborative situation where they both participate on an even level. Thor has some prior knowledge and interest for planets, and is also ahead of Vivian in digital skills. Their good relationship makes it easy to communicate well about the task and to established a common zone of proximal development where they both engage in the task and make their feed-forward-feedback-dynamic work. The work flow is good and motivating, nourishing the learning suns. This is obvious when listening to their learning dialogues during the search. They focus on the task and seem to communicate with intentions of scaffolding each other's thoughts and understanding. The result becomes very good.

4.2 Internet search and high performing students. Margaret and Sean.

In the same assignment, Sean and Margaret is presenting the planet Mercury. They show a different pattern of collaboration than Vivian and Thor. They are both high performing and ambitious students who rapidly settle for a common understanding of the task and start searching for proper information. In their communication about the content during the search, they don't spend time to negotiate about other things than the pure content. They look through a lot of sources and discuss how it will fit their purpose, quite a lot more sources than the average for the class. Margaret and Sean are used to working together and often prefer each other in collaborative tasks. But Sean's ability to focus is not as good as Margaret's. Sean's attention is often drawn to the other students because the tendency to compare his performance to them. But when the students work directly on screen, it is easier for Sean to focus on the content. This makes the collaboration with Margaret also easier. She doesn't have to repeatedly call on his attention to focus on their work, like she sometimes needs to.

4.3 Internet search demands new learning strategies. William. Theresa, Margaret and Vivian.

For another multimedia presentation, the 4th graders were searching for pictures to illustrate folk tales. They worked in pairs and started with defining some search terms. William was disappointed with his search terms because they gave too many different results. He was annoyed to find that when he searched for pictures of a wood he also got portraits of people named Wood. It is not possible to avoid situations where students

stumble upon content which is irrelevant or even abusive, when working with open google search.

During this activity we experienced the latter when one of the students retrieved a picture of a man holding his hands on a woman's breasts. Even quite so innocent, a picture like this can offend a child at this age. But the teachers in this class welcomed the situation because they got the chance to talk about abusive content on internet. They told me that they preferred to have these incidents in class instead of when students were sitting alone somewhere else, to be able to discuss digital awareness.

Another situation also showed that using internet for content search depends on having sufficient competences. Vivian and Margaret was involved in this situation together with Theresa. The three girls were usually good friends but this day some relational issues disturbed their collaboration. They had worked out a set of search terms to find pictures for their task. But they did not manage to agree about using any of the results. This was a stressful experience and they expressed doubt about how to fulfill the task. Theresa went back to the computer and ran the same search terms again. Vivian and Margaret got very angry at her because they meant that running them again showed lack of trust in what they previous had done. This led to an intermezzo which ended with agreement that Theresa agreed to change learning partner, which solved the problem. It came up that the girls had had a conflict the day before at home and that this had fostered some insecurity that had strong impact on their communication. They did not manage the task because of the underlying conflict. It can be argued that this situation is not about internet content in itself but the class as a learning environment is full of relational issues that also impact learning tasks. When the work with content gets more complex because it has to undergo discussions, it is also important that the students have the communicative skills and guts to say what they mean and to confront each other's different opinions.

5 Discussion and conclusion

The narratives above document various challenges that occurs when changing from textbooks to content retrieved from internet search.

They all demonstrate the necessity of good collaborative skills to work together with searching for information on the internet. Internet search is a more complex task than looking it up in the textbook. When students collaborate they have to start with defining a joint understanding of the task. This involves a calibration of what they think the task is about and how they can work to fulfill the task. Communication is important to establish a feed-forward, an expectation of what the task is about based on the feedback to prior knowledge and understanding. They establish a feedforward together based on their previous knowledge and skills and the resources they both bring in to the collaboration, and they support each other's dynamic movement between habitus and reflection through discussing the task [16, 17].

The collaborative peers will have different prerequisites to take part in the common task. Prior knowledge will vary and make the dynamic between feed-forward and feedback different. They will also experience differences between habitus and reflection.

While some have an intuitive understanding of what to do, others need to reflect to be able to decide what is the right action. Therefore, good communication is important. If the relations between the peers are good they will be able to communicate well and be motivated to do a good work together. The learning sun will get energy and learning will thrive.

The situation with Thor and Vivian shows that students can form well-functioning collaborative partnerships with different levels of basic knowledge and attitudes towards learning in school. The use of technology, as in internet searching, seems to frame their collaborative learning well. Using technology increases the field of task specific knowledge and opens for using skills and knowledge gained from other activities than school work. When Vivians' learning strategies are more developed than Thors', he adds his interest for planets and his digital skills to their collaboration. A more complex task demands more complex strategies and opens for distributed learning. In practice more different tasks will need attention and makes it possible to draw on both students' resources. Vivian's advanced learning strategies and basic school knowledge will benefit Thor's learning and his knowledge of planets and digital skills will be of use to her. Even if what is learnt are different for Thor and Vivian they will experience the collaboration as meaningful. Their good relation will support their dynamics between habitus and reflection [16], and feed the learning energy and all four learning suns [18] are nourished and they will be motivated for further learning and further collaboration. The collaboration will form a strong force to overcome exuberance when occurring [16].

Margaret and Sean experiences something similar in their work. But here the actual content is the driving force. Since they both have high ambitions and are high performing, they extend the use of internet content to a high level. For them the source of information is the main issue, and they use it to deepen and widen their understanding of planet Mercury. Their discussions show that they are reviewing their search results thoroughly in a way the textbook never would promote with its' quality secured content. Margaret and Sean have together the ability to elaborate the information with a critical view, looking for real information to use in their presentation. They discuss and discard, discuss and accept, source after source, before they agree about something they can decide to use. The feedforward-feedback-dynamics are fed with a lot of information which they never would have found in the textbook alone. Finding advanced content online motivates them for further investigation. Students with high academic performance can get the extra stimulation that they need to find to extend their feed-forward – feedback and habitus – reflection-movements [16]. For these two the textbook content will limit their learning instead of nourish it They are highly motivated for the work and the collaboration and the learning sun shines.

When working with different content the possibility of comparison with other peers is not the same as when you can cast a look towards your peer's textbook to find out how much he has read compared to yourself. For Sean, whose attitude was quite competitive, this is an advantage.

William's frustration about search terms might on the other side, be an example that shows how literally children at the age of 10 understand their results. Open internet

search doesn't discriminate between adults and children and it is impossible for teachers to determine searches to assure that they don't get unwanted results, either of irrelevant or abusive kind. Using internet as a source of content therefore involves work with critical review of all results and general digital awareness. Students need to know about the dangers of meeting unwanted and abusive content to develop strategies to handle these situations.

Finally, the narratives show that good relations are important prerequisites for a successful internet search collaboration. Retrieving content from internet demands the ability to question and be critical towards the peers' arguments. Without confronting and questioning the content, the validation process can be too shallow and the content will be accepted without the necessary discussions. Therese, Vivian and Margaret couldn't work themselves through the obstacles that a present conflict gave them, and all their feed-forward – feedback-processes was about their relationship and not the content. It is always a danger of losing focus at the actual content when collaboration problems occur. Teaching therefore also must have focus on learning communication and social skills to be able to establish a good situation that makes the learning suns shine [18].

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