

# TWEETING AS A TOOL FOR LEARNING SCIENCE: THE CREDIBILITY OF STUDENT-PRODUCED KNOWLEDGE CONTENT IN EDUCATIONAL CONTEXTS

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## ABSTRACT

In this paper, we will present and discuss data from a research project called MIRACLE, in which high school students learned about energy and energy transformation in a technology-rich learning environment. This learning environment spanned across a classroom, a science center, and an online platform specially designed to support coherence across resources and concepts. During the project, the students tweeted about different aspects of energy and energy transformation. These tweets were based on facts gleaned from previous knowledge or on knowledge that they found relevant during their learning trajectory. This knowledge could be found, for example, in textbooks, on web pages, or on posters in the science center. The tweets were meant to support the students in collecting and creating knowledge content themselves and to gradually increase their understanding of the curricular topic. At the end of the project, the students were asked to write a newspaper article and were encouraged to use their tweets as a source. However, the findings show that the students turned to officially approved knowledge sources when they had to write their assignments. This finding adds to previous studies on college and university students. We discuss the possible reasons for this by examining the lack of established practices for using tweets in schools; more specifically, we discuss how this becomes particularly evident when activities are assessment-oriented.

## KEYWORDS

Mobile learning, inquiry-based learning, tweeting, microblogging, museum learning, design-based research.

## 1. INTRODUCTION

The school system's view on resources for students' learning and education has changed over the last decades. Educators have moved from a more traditional strategy, in which curriculum textbooks and a handful of well-known teacher-*approved* resources were the only thinkable sources for knowledge in use, to a more open-minded view where students are thrown into a pool of *possible* resources. Here, they swim around with some guidelines given by their teachers as lifelines while they search for good resources for their personal knowledge building. In pedagogy today, we have great expectations regarding students' own activities and their independent creation of knowledge as an alternative to or equally important source as traditional textbooks or approved web pages. Taking the students' perspectives into account begs the question: How do they evaluate their independently created knowledge compared to more traditional resources when it really matters and when assignment deadlines draw near?

## **2. MAIN TOPICS IN THE PAPER**

### **2.1 Objective**

The aim of this paper is to scrutinize beliefs about student-produced knowledge and how they are followed up and used across different settings. We follow an inquiry-based approach to learning that emphasizes the importance of activating students and stimulating them to produce content and use this as a resource for later learning (Linn & Eylon, 2011; Sawyer, 2006). However, the data we present and discuss point to some challenges in implementing these ways of working with knowledge in technology-rich environments in and across school and science center settings.

### **2.2 Existing Knowledge about Microblogging and Learning**

Web 2.0 tools such as microblogging have been described as facilitating activities that resonate well with modern social theories on how learning environments in educational settings should be designed. Web 2.0 technologies enable people to collaborate and create knowledge in both large- and small-scale activities, create less authoritative forms of organizing information, give people new tools for inquiring the complexity of a topic of interest, provide new tools and opportunities to publish content and receive feedback from an audience, and offer new modes of representing knowledge and participating in new literacy practices (Crook, 2012).

Empirical research on the use of microblogging such as Twitter or Twitter-like tools in educational settings has also emerged (Ebner, Lienhardt, Rohs, & Meyer, 2010; Junco, Heiberger, & Loken, 2011; Veletsianos, 2012; Wright, 2010; Lowe & Laffey, 2011). Ebner et al. (2010) studied the use of microblogging as a platform for process-oriented learning in higher education. They concluded that microblogging is a new form of communication and that this form of communication can support, for instance, “informal learning through informal communication,” “facilitation of student group work,” and “direct examination of thoughts and causes of learning” (p. 99). Wright (2010) studied student teachers who tweeted three times a day during a practice period at a school about the experiences of being a practicing teacher. Wright found that they shared thoughts quite impulsively and freely with each other and were encouraged to reflect upon their experiences in developing ways. Lowe and Laffey (2011) studied a group of marketing students that were encouraged to use Twitter in an academic course. They found that the students used Twitter to share relevant examples from public discourse as it appeared in the news or personal events related to the curricular topic in question. In this way, Twitter worked to connect these students’ academic lives with what happened in the “real world.” Furthermore, in a controlled experiment, Junco, Heiberger, and Loken (2011) found that using Twitter facilitated cooperation among college students, helped them to create links between course material and their own experiences inside and outside of the classroom, and providing feedback in stimulating ways, something that led to increased student engagement and improved grades.

However, reviewing the literature on educational use of microblogging reveals a lack of studies on the use of these tools in lower levels of education (Gao, Luo, & Zhang, 2012). This paper contributes to this void; we provide a detailed analysis of the use of microblogging in a science project that involves collaboration between a school and a science center by analyzing how this tool is used and appropriated in the project.

### **2.3 Theoretical Perspectives**

We employ a sociocultural approach to learning to study these issues. From this perspective, learning is perceived as being situated in a particular practice (Lave & Wenger, 1991; Rogoff, 2003). Learning is not first and foremost about internalizing knowledge or a set of skills, but it is about gaining an understanding of what kind of knowledge and skills are relevant within specific domains and how to use these as tools to competently participate in a specific setting. In order to study how tweeting functions as a tool for learning, it is necessary to study how this tool is interpreted and employed by students and teachers in existing classroom practices. We scrutinize how the content of the tweets is created, how it is elaborated, and most importantly, how it is valued compared to other resources that are available at different moments in the social practice under consideration.

## 2.4 Method and Context

The data in this paper are collected in a design-based research project (Sandoval & Bell, 2004) called MIRACLE, in which high school students learned about energy and energy transformation in a technology-rich learning environment. In this project, students participated in a learning environment that spanned across a classroom, a science center, and an online platform specially designed to support coherence across resources and concepts. The project focused on three distinct research interventions that aimed to support students' learning of scientific concepts (see Vygotsky, 1978), the coherence between resources (see Ainsworth, 2006), and the relation between schools and science centers (see Gutwin & Allen, 2012).

A class of 32 first-year high school students participated. Data collection lasted for six weeks during the spring of 2013. In total, the data consist of about 60 hours of video footage of the students, teacher's, and science center guides' interactions. The data further consist of the students' tweets, news articles the students wrote, individual interviews with some of the students, and resources that were part of the science center exhibit.

The students worked in groups of five or six. Four out of six groups were selected as focus groups and were video-recorded. During the project, the groups tweeted about different aspects of energy and energy transformation as a way of collecting and creating knowledge content and gradually increasing their understanding of the curricular topic. The tweets were supposed to serve different functions in the project. The activity of tweeting was introduced to foster coherence in the students' learning trajectories across concepts, resources, and learning contexts. Composing the tweets was a process of searching for and identifying relevant content from less relevant content. In this regard, we argue that this tool has the potential to condense or concisely sum up academic material not just for individual groups, but for the whole class. To emphasize the value of sharing and building upon one another's tweets, we designed sum-up sessions where the students were invited to share their tweets in plenum both at school and at the science center.

At the end of the project, the students were asked to write a newspaper article. The students wrote their articles in pairs, and the best article was printed in the local newspaper alongside a photograph of the winning pair of students. In total, the students produced 15 news articles. A crucial aspect of the project was that the students were encouraged by the teacher to use the tweets they had composed during the project as resources when writing their news articles.

We wanted to investigate how the students used the self-produced knowledge objects that the tweets represented when writing their newspaper articles. In order to do this, we analyzed the tweets alongside the interaction data (where the students are discussing what to tweet about and how to present the tweets for the rest of the class). We systematically searched for how the students referred to the tweets in the video footage and how the tweets appeared in the students' newspaper articles. Further, in the interviews after the project was completed, we asked the students about the activity of tweeting and using the tweets when writing their articles.

## 2.5 Results

As a starting point for our analytical work, we cross-referenced all of the tweets produced during the project with the final news articles, the informational posters, and other types of relevant resources that appeared in the science center's exhibit. We then scanned this data against open online sources using the software program Ephorus. During this process, we were unable to identify any *direct* relation between the tweets and the student-produced articles; however, this process pointed us in the direction of which online resources the students had used when writing their articles. Primarily, they used online encyclopedias and web pages from companies and public agencies devoted to the topic of energy as resources. However, the majority of the articles did not cite the online resources directly—only three out of the 15 articles contained citations from web pages. When investigating to what degree the content matched the web pages, we found a 4-25% match in five of the articles. In other words, this part of the analysis showed that the majority of the students did not directly use online sources as resources when writing their final news articles, and more importantly, that the students did not explicitly use the tweets they produced during the project.

When scrutinizing the data from the interviews and the video footage, a more complex pattern emerged—how the tweets were used. First, all of the groups produced tweets at different moments during their trajectories. For example, they turned parts of the content from the science center exhibit into their own

produced knowledge through tweets. Second, they brought up the content of these tweets during the plenary sessions, in which the students discussed specific topics connected to some of the themes addressed in the tweets while others were overlooked. Several of the students explained that the sum-up sessions with their teacher and the rest of the class created situations where they were provided with the correct answers, but also facilitated interesting discussion topics and allowed them to look at the other groups' work. However, it is worth mentioning that these settings in which ideas were shared were strongly teacher initiated, and the content of these discussions was hardly evident in the students' articles.

Third, the tweets the students produced during their learning trajectories were later accessible at the school; further, the teacher mentioned them and encouraged the students to use them when doing further work on the subject. In spite of this encouragement, we found that the students employed the tweets to a limited extent when writing their articles. That they could have used the tweets as resources even came as a surprise to the students when they were confronted with this issue during their individual interviews. Many of them simply were not attuned to this possibility. Yet, a few of the students were oriented toward the tweets when writing up their articles, arguing that they considered the tweets a potential resource. One student said: "we found it [tweets] useful, for example, when we were writing the article, cause the information was about the same, we made use of it, we had a look at . . . some of the old tweets we had made." However, those students who reported that they looked through the tweets when working on their articles primarily considered their own groups' tweets and only afterward considered the tweets from the rest of the class. If they looked at other groups' tweets, it was mainly for inspiration while working on their own articles. Other students again reported that they were conscious of the tweets, but left them out. As a follow-up question, we asked one student if he relied on the tweets when writing his article, and he said: "No, not directly. I read some tweets about water for my article, that's it, I didn't use so much, but read through just to see what information I could use in my article."

Finally, the majority turned to the internet when writing their articles. One student explained this as follows: "Because that's what we always do, when we are to find out something in a class then it is like; 'use the textbook or internet,' we are told, and then we go online and use the internet instead of thinking a lot for ourselves." As tweets are not an established resource in school, and the project asked students to mobilize previous knowledge about the topic and their experiences from the science center visit, the students may have found it challenging to make use of these types of resources when writing traditional assignments, instead resorting to well-known resources. The students used their textbook frequently. They also used even more popular sources such as Wikipedia and online encyclopedias.

### 3. CONCLUSION AND IMPLICATIONS FOR FUTURE RESEARCH

In this short paper, we analyzed how tweeting is used and appropriated as a tool for learning in a science project. In line with Ebner et al.'s (2010) study of students in higher levels of education, we found that tweeting seemed to help our high school students focus on tasks and facilitated their group work both at school and at the science center. However, if looking at the practice of sharing and building on each other's ideas, Wright's (2010) student teachers; Lowe and Laffey's (2011) marketing students; and Junco, Heiberger, and Loken's (2011) college students all seemed to be more willing to initiate and share ideas more frequently than our high school students. Their students were less reliant on their teachers' ingenuity than our students were. There are several possible explanations for these different results. Many of these studies investigated the use of Twitter, whereas in the MIRACLE project, we investigated the use of a tweeting tool created specifically for the project. This means that the tool was unfamiliar to the students and more structured within the framework of this project, whereas Twitter is normally part of a more open ecology of information flow. Furthermore, there are reasons to believe that the college students had a greater interest in sharing and integrating tweets into educational activities since using Twitter was a part of their self-elected academic courses.

The main research question we raised was how students evaluated their independently created knowledge compared to more traditional resources when it really mattered and when assignment deadlines drew near. There is one crucial issue that differentiates our data from that collected in the other studies: the assessment element (the very fact that the newspaper articles the students wrote were evaluated and graded). We have reasons to believe that the students did not wish to risk using their tweets in graded assignments. Moreover,

their school's assessment practices are challenging in regard to evaluating the quality of knowledge that does not have a direct link to the curriculum or other approved sources. Finally, as many science center and education researchers have documented, there are limited established practices for how to bring knowledge from a science center back to a school (see DeWitt & Osborne, 2007).

Microblogging might be a powerful tool for developing educational approaches that are based on students' knowledge production as part of inquiry-based learning; however, it is necessary to establish clear criteria for what counts as valuable and credible content in such learning environments to make the working conditions predictable for the students. In addition, if we wish for better implementation of student-produced knowledge objects in all phases of their learning trajectories, we must work toward establishing practices in which student-produced knowledge, in addition to already defined knowledge, is seen as valuable and subsequently becomes a more natural and integrated part of the formal school culture.

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