ONLINE INFORMATION SEEKING AND KNOWLEDGE SHARING PRACTICES OF SCIENCE TEACHERS

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ABSTRACT
Despite a preponderance of research into student online information seeking behaviors, we still know precious little about the online information seeking of their teachers. Yet teachers are the ones who shape the curriculum in the classroom and shape the way Information and Communication Technology (ICT) is utilized in formal learning contexts. Online information resources are particularly important for science teachers, who require sound, up-to-date knowledge in a field where new breakthroughs are always emerging. To better understand the way science teachers use and share information online, the research team performed five case studies, following five science teachers’ online behaviors for their classroom practice over the course of three months, collecting initial data through questionnaire, two interviews, and longitudinal web histories. This study contributes to a broader understanding of information behavior of professional practice, and provides valuable information about an understudied group of users.

Keywords
Science teachers, Internet, information behavior, information sharing, social media.

INTRODUCTION
In discussions of Internet use in the classroom, one popular narrative that has taken hold in the media is a story of diversity between students, internet-savvy digital natives, and teachers, reluctant to incorporate the online world into their lessons, and confused by its use. (Burn, Buckingham, Perry & Powell, 2010; Oblinger & Oblinger, 2005; Levin & Arafah, 2002; Prensky, 2005). This narrative, though widely repeated, underestimates teachers. Teachers have actually been found to express enthusiasm about the role of online resources in the classroom, and to show skill in its use. (Hennessy, Ruthven, & Brindley, 2005.) Every day teachers perform, in their own time, contextually situated professional development, outside the eye of the school district or schools of education. Teachers put in an enormous amount of time, every day, in a number of different areas. Science teaching requires accurate knowledge of pedagogical practice, of scientific concepts, and the technology that allows them to teach and perform science in their classrooms. The Internet is a valuable source of expanding information for them.

Researchers often look at formalized systems of professional development, but relatively little attention has been paid to teachers’ personal professional development through their own Internet use. How much of a role does the Internet, accessed in the course of doing their job, play in the development of teacher knowledge? What kinds of online resources do teachers access, and how often do they turn to this form of knowledge to inform their practice? What criteria are they using to assess and select resources? And what drives their decisions to turn to the internet rather than other sources of knowledge? This study attempts to address these questions.

BACKGROUND
ICT integration has been of great interest to educators since the personal computer revolution began. (Watson, 2006.) Many studies have attempted to assess teacher attitudes and confidences towards classroom Internet integration, generally finding teachers eager, but cautious about introducing ICT simply for its own sake. (Hennessy, Ruthven, & Brindley, 2005.) Jimoyiannis & Komis (2007) examined science teacher beliefs about the efficacy of classroom ICT, including the Internet, and found that it strongly predicts the degree to which teachers adopt ICT in the classroom. This has been born out by subsequent studies (Ertmer & Ottenbreit-Leftwich, 2010; Hermans, Tondeur, van Braak & Valcke, 2008). Ruthven, Hennessy, & Deaney (2005) studied science teacher incorporation of Internet resource in the classroom by having teachers participate in self-devised projects designed to incorporate Internet resources. The study found that teachers developed...
unique pedagogical strategies to make use of the internet resources.

Teacher information seeking and internet use “in the wild” remains elusively documented, however. Particularly, relatively few information professionals have studied the online information seeking habits of science teachers. (Tahira & Ameen, 2009.) This topic remains an area ripe for further study, particularly in North America.

**METHODOLOGY**

**Participants**

Six participants were recruited to participate in a longitudinal, multi-method study, with an attrition rate of 1. The research team observed participants for three months to gather a long-range view of the web use of the teachers over the course of a semester in the classroom. These case studies are not generalizable (see VanWynsberge and Khan, 2007), but participants were carefully selected to provide a cross-section of teaching perspectives. Participants were recruited for diversity in grade level and school contexts.

<table>
<thead>
<tr>
<th>Participant Number</th>
<th>Name</th>
<th>Grade Level Taught</th>
<th>Years Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dropped Out</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Sydney</td>
<td>6th</td>
<td>4 years</td>
</tr>
<tr>
<td>3</td>
<td>Jackson</td>
<td>8th, 11th</td>
<td>3 years</td>
</tr>
<tr>
<td>4</td>
<td>Savannah</td>
<td>Kindergarten</td>
<td>20 years</td>
</tr>
<tr>
<td>5</td>
<td>Bailey</td>
<td>9th, 10th, 11th, 12th</td>
<td>9 years</td>
</tr>
<tr>
<td>6</td>
<td>Paul</td>
<td>3rd, 4th, 5th</td>
<td>5 years</td>
</tr>
</tbody>
</table>

**Procedure**

Data collected from each participant included 10 interviews (2 each, at the beginning of the study and one at the end), 6 questionnaires answering 35 questions each, and web logs containing over 1500 total individual URLs. Multi-method data collection tools were utilized to provide a rounded picture of each participant.

Each participant first filled out an introductory questionnaire of 35 demographic, behavioral, and perceptional questions about their internet practice. The participants also logged all websites visited for their science classroom practice for twelve weeks. Building questions from the data collected in the questionnaire and web histories, a 30-60 minute semi-structured interview was conducted, allowing us to seek elaboration about the data collected so far. The interviews delved deeply into the participants’ school culture, teacher practice, and information behavior, as described in their own words. When all web history had been submitted, a follow-up interview of 15 minutes was conducted for final reflections and clarifications.

**Data Analysis**

The participants’ web logs were deductively analyzed using categorization based on the seven forms of teacher knowledge in Mishra and Koehler’s TPACK framework (Mishra & Koehler, 2006), and quantified for frequency. The TPACK frequencies were compared across cases. Researchers identified and isolated specific themes and topics that emerged within interviews and compared respondents’ responses along those topics. Incoming data from the questionnaire prompted the creation of particular questions as follow-ups in the semi-structured interviews. Data collection is still ongoing, but an extensive amount of data has already been collected, and we have begun to identify emerging themes.

**FINDINGS**

Three key themes have emerged as the data is being analyzed.

**Creative Appropriation**

The teachers frequently felt that traditional forms of knowledge disbursement are inadequate (for example, outdated or biased science content) or out of reach (e.g., schools unable to afford a complete set of textbooks.) The teachers turn to the internet and its resources creatively to overcome institutional limitations. One participant works in a turnaround school in a low-income neighborhood without access to enough textbooks for the entire class. The participant also questioned the credibility of the textbooks, which were written according to the Texas state standards, and which the teacher found unscientific in its coverage of topics such as climate change and evolution. The teacher turned to the website CK12, an open source repository of textbooks written by professors. The teacher described searching the repository for textbook chapters, reading and assessing them, and stitching together relevant sources to build a textbook that covered the classroom’s curriculum. The teacher printed copies and distributed them to students.

Similarly, participants have adapted social media tools like Pinterest and Facebook to their needs, using them, and websites like Better Lesson, to share lesson plans, ideas to encourage girls’ confidence in science, and other innovations. Teachers were found to be highly flexible in their adoption of tools for new purposes, such as adopting the anti-plagiarism tool Turnitin as an entire learning management system. Others made use of the endless graphics available online to bridge barriers with students who don’t speak English, allowing teachers to bridge gaps that were not being readily addressed at an institutional level. The basic tools of classroom management are changing, and science teachers are creative in their use.
Age and Grade Level

The age of the students played a critical role influencing what categories of TPACK knowledge teachers sought. Generally, the younger the grade level of the teacher, the more that teacher searches emphasized a need for pedagogical content knowledge. The priorities of high school teachers, however, suggested a far greater emphasis on purely content knowledge resources, suggesting that the higher the reading level of the students, the less teachers sought out online resources to help them bridge the gap between the content knowledge and the students’ cognitive development. The youngest grade level represented was kindergarten, and the teacher expressed frustration with the lack of pedagogically appropriate material. These concerns were not reflected in high school teachers, who, when interviewed, expressed little concern about the pedagogical delivery of the resource, and were more concerned with accuracy, authority, and values.

Access and Availability

Stark contrasts in access between schools led to stark contrasts in information behavior. Teachers’ access was usually determined primarily by the school’s budget and the financial status of the students’ families. Use of the internet as a resource was generally high with all teachers, but access was a strong determinant of how teachers used the resources available. Both high and low-access teachers reported completing professional development on implementing a flipped classroom; both groups expressed enthusiasm for the idea. But only the high access teachers were able to implement the program successfully; the low-income teachers found the model impossible to practically implement. One teacher noted that the only internet her students had at home was most likely a smartphone. This issue of access severely limited teachers’ ability to use their formal training in ICT integration, and diverted teaching time away from science content to teaching basic online skills like searching.

Interestingly, ICT integration was not simple even in high access environments. One teacher, working primarily with high access foreign students, recounted her attempt to implement the use of the Polls Everywhere survey tool to evaluate student comprehension. The students, however, while equipped with technologically advanced smartphones, struggled with incompatibility between their international phones and the Polls Everywhere system. Taken together, these stories illustrate that barriers exist that problematize the wired classroom even when teachers are philosophically on board with the approaches. In the face of complicating factors like a low income school or international students, teachers must assess the right level to implement these changes at, and to create new, innovative uses for internet resources that fit their classroom’s needs.

CONCLUSION

Data collection continues, and we are confident more findings will emerge from the data as the study continues. Our longitudinal case study of participants allows us to build rich profiles of teachers behavior that observe both teacher perception and on-the-ground teacher behavior. These in-depth case studies allow us to see just how varied teacher information seeking and sharing may be. Particularly, teacher professional development doesn’t end as they leave school but is an ongoing process of innovation, evaluation and reflection. We can see in these few cases alone how tensions emerge that must be addressed and better understood. We believe this study is the first step towards furthering our understanding of how professional development might be better calibrated to address the evolving needs of science teachers as information seekers.

REFERENCES


