EDC Center for Children and Technology

**Integrating Web 2.0 tools into the classroom:**

**Changing the culture of learning**

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**Executive Summary**

This report presents findings from a two-year investigation of the ways in which Web 2.0 tools and social networking technologies are being used to support teaching and learning in classrooms across the United States. With funding from Intel®, the Education Development Center's Center for Children and Technology (EDC/CCT) interviewed or visited over 30 educators in 22 different schools throughout the country as they employed these tools in their classrooms in innovative ways. We also spoke with and observed a number of students in these schools.

Currently, there is much discussion and excitement about Web 2.0 in education, but we still know very little about how these tools actually work in the classroom. Therefore, the goal of this research was simply to interview and observe educators and students who are experimenting with these tools in the classroom to see what uses are emerging and to explore the learning affordances of blogs, wikis, and other Web 2.0 tools.

Over the two years of our research, the sample of teachers was drawn from the Intel® Teach Essentials course and the network of master teachers and training agencies that has grown up around that program. Through this network of educators, we sent out a request for volunteers to teachers that are experimenting with Web 2.0 technologies in their classrooms. During the first year we recruited 12 individual teachers, but for the second year we targeted districts with larger groups of teachers experimenting with Web 2.0 and were able to reach 27 educators across three districts.

Our report is divided into two sections: (1) a summary of some of the most frequent Web 2.0 applications we encountered and (2) a discussion of different themes and issues concerning the use of Web 2.0 tools in classrooms that emerged from all the interviews and visits.

The first section of this report presents a catalog of the range of tools that we observed teachers using or that teachers reported using. We discuss the most salient examples in more depth, but we also present tables listing all the tools and defining how teachers reported using them. Web 2.0, a term we use almost every day, is actually an ambiguous concept referring to a large and shifting set of technological tools. We sought to solve the definition problem by limiting ourselves to the tools we encountered in our visits and grouping the tools into loose categories according to the teachers' pedagogical goals for them. Our list is not meant to be exhaustive. We divided the resources into the following four categories:

1. Tools that create or support a virtual learning environment.
2. Tools that support communication and cultivate relationships.
3. Resources to support teaching and learning.
4. Tools enabling students to create artifacts representing what they are learning.

The second part of this report discusses and interprets our observations about the use of these tools. The initial thrust of the research was intended to identify broad themes and to help demonstrate the extent of Web 2.0 use across a variety of classrooms and a range of teachers and students. While this project did not aim for a set of definitive findings, the following key themes emerged that will be a useful starting point for further and deeper research.

Our overall finding is that these tools show potential to transform many aspects of teaching when web2.0 teachers are thoughtful about how they use the tools and they are blended with careful instructional designs.

*Innovative teachers are using the networked nature and ease of Web 2.0 to create virtual extensions of their classrooms.*

Teachers and schools we visited are using different Web 2.0 tools or programs to create virtual spaces or networks that support and enrich their pedagogical goals, both at the classroom and the district level, and increase educational capacity by extending learning beyond the physical walls of the classroom. These virtual extensions are a daily part of teaching and learning in their classrooms.

*The Web 2.0 tools that teachers are selecting are very easy to use, and this ease of use appears to be a key factor in the decision to use any individual tool.*

A salient feature of this current generation of technologies is the relative ease with which users can create products and virtual spaces. From teachers creating virtual classrooms to support teaching and learning to fluid communication among students, teachers, and parents to students doing online activities to mashing up products from different programs, learning how to use the technology was seldom a focal point of the activity. Nor was much time spent logging into sites, designing spaces, or dealing with "decorative" aspects of creating products. In fact many teachers reported not using Web 2.0 tools that could not be embedded into their own virtual spaces, required a complex login, or presented any other type of roadblock to use.

*Educators are using Web 2.0 tools to promote new avenues of communication among teachers, students, and the community in ways that can strengthen the community of learners.*

When the assignment is meaningful and supports the learning objectives, Web 2.0 tools are being used to increase communication (not just dissemination of information) in ways that strengthen the educational community and help to center classroom—and out-of-classroom—conversation on issues and topics that support and deepen learning. We examine the following four lines of communication in the report: (1) communication among students, (2) communication between students and teachers, (3) communication with parents, and (4) communication among educators.

*As the networked nature of Web 2.0 begins to blur our traditional boundaries between school/home, public/private or youth/adult culture, it presents an emerging challenge.*

Web 2.0 technologies are fundamentally reshaping and realigning many aspects of the communication loop: the people with whom teachers, students, and parents communicate; how they communicate; what they communicate about; and where and when they communicate. These ongoing processes bring to the fore exciting opportunities and novel challenges for educators. As schools use these technologies to build communities, the old boundaries between public and private, in school and out of school, and youth culture and adult culture are melting away and being redrawn.

## Introduction

Current discussions among technology advocates suggest that Web 2.0 applications have tremendous potential to transform students' learning. Recent surveys show that although Web 2.0 tools such as Facebook, MySpace, wikis, and blogs are part of nearly every student's home life, these technologies are barely used in school (Consortium for School Networking, 2009; Interactive Educational Systems Design, 2009; National Center for Educational Statistics, 2010). Given high expectations but little school use, experts are renewing calls to do qualitative and situated research on Web 2.0 in the classroom to understand better how these new networked technologies and social media might play out and be harnessed for student learning (Greenhow, Robelia, & Hughes, 2009). With funding from Intel®, the Education Development Center's Center for Children and Technology (EDC/CCT) has been able to visit classrooms to observe and talk to teachers and students in order to document the range of activities that are emerging in U.S. classrooms using Web 2.0 tools and social networking technologies. To learn more about the educational benefits and challenges of such tools, we conducted qualitative research over two years with a sample of teachers who are innovating using Web 2.0 tools in their classrooms; the teachers were recruited through the Intel Teach Essentials Course V10 and its network of state-level trainers and technology coordinators.

### Analytical Framework, Methods, and Data Sources

This project represents our initial attempt to explore the learning affordances of blogs, wikis, and other Web 2.0 tools by interviewing and observing educators and students who are experimenting with these tools in the classroom. During this preliminary stage of the work, when we collected data broadly relating to a wide variety of Web 2.0 use, we needed a framework within which to analyze patterns and trends across activities.

We developed our analytical perspective from the emerging literature on the concept of technological pedagogical content knowledge (TPACK) (Ferdig, 2006; Freidhoff, 2008; Harris, Mishra, & Koehler, 2009). TPACK suggests first of all that the instructional design of technology –rich activities is crucial for success (Ferdig, 2006) and that specific tools work in particular ways that may or may not support the instructional objectives. Second, the technological affordances of a tool vary by specific learning goals and content area. In our descriptions of the uses of Web 2.0 tools we encountered, we attempt to highlight the teacher's instructional objectives, the affordances of each tool, and how these affordances facilitated or inhibited those pedagogical objectives.

Our sampling strategy changed over the two years of research, both in terms of whom we interviewed and the aspect of their practice on which we focused. In the first year the sample consisted of teachers who participated in a professional development experience promoting Web 2.0—Intel® Teach Essentials V10—and the research focused on the materials teachers developed from that training. In the

Essentials 10 course, teachers are asked to design a unit plan using Web 2.0 tools and other technologies with students. Study participants were recruited through trainers, as well as through an open e-mail request to teachers who had completed the training. We collected 28 unit plans, from which we randomly selected 12 units. Although our request specifically asked for unit plans using the Web 2.0 tools, only seven of the 12 teachers interviewed used wikis or blogs with their students. Two other teachers used podcasts, two included blogs in their unit plans but did not use them, and one teacher did not plan to use any social media.

We developed an artifact-based interview protocol about the Web 2.0-based unit plan and its implementation in the classroom. The interviews asked teachers to describe the lesson activities, note student reactions, and judge the success of the lesson. Each participant was asked about the use of Web 2.0 tools, as well as other aspects like the use of formative assessments or supporting 21st-century skills. The interviews were performed face to face when possible or over the telephone.

In the second year, because we wanted to explore a range of tools in the classroom and to visit all study participants, we decided to recruit schools or districts with multiple teachers. Using the network of Intel training agencies in three states, we recruited three districts that were well known in their state for experimenting with Web 2.0 tools in the classroom. In each chosen district five or more teachers who were using a variety of Web 2.0 tools agreed to speak with us. Not all teachers were Intel participants, although all were receiving support from district technology coordinators who were Intel Master Teachers. We spent two to three days in each district observing classrooms and interviewing teachers, administrators, and students about Web 2.0. In the second year we spoke with 27 educators from 13 schools in three districts.

During the entire two-year research period we spoke with 39 educators from 22 schools. The sample included teachers from Alaska to Florida and included classroom teachers, technology coordinators, and administrators.

## Findings

Our report is divided into two sections: (1) a summary of some of the most frequent Web 2.0 application we encountered in our visits and interviews with teachers and (2) a discussion of the different themes and issues concerning the use of Web 2.0 tools in classrooms that emerged from all the interviews and visits.

### Web 2.0 Applications

Web 2.0, a term we use almost every day, is an ambiguous concept that refers both to a large and shifting set of technological tools and to an approach to the socially and technologically integrated use of technology. Some studies use "web 2.0," others use the term "social computing"(Redecker, 2009) or simply the phrase "digital age," (Greenhow, et al., 2009). Some of the touchstone authors in the field talk about new media practices (Ito et al 2008) but they are all talking about tools, ranging from blogs, Facebook, and media-sharing sites to platforms such as virtual worlds or virtual learning environments, and even Web-based applications, for example, VoiceThread or Google Earth. In addition, scholars often refer to a Web 2.0 approach or connectedness as much as to any one tool. For example, videos have been available over the Internet for years, but it is the ability to upload and share videos on YouTube and similar sites that has brought video into a Web 2.0 context. We sought to solve the definition problem by limiting ourselves to the tools we encountered in our visits and grouping these tools into loose categories according to the teachers' pedagogical goals for them. Our list is not intended to be exhaustive, nor do we expect it to resolve the issues of how to define categories of Web 2.0 applications. The purpose of this section is simply to review the tools and applications we encountered in our visits and conversations with educators.

Our presentation of Web 2.0 resources is grouped according to the goals of the teachers using these tools. Some tools are so flexible that they can be used to support a variety of objectives, and the reader may therefore easily disagree with our categorization. Nevertheless, we hope that our discussions of how we saw the tools being used will still be informative. We divided the resources into the following four categories: (1) tools that create or support a virtual learning environment; (2) tools that support communication and cultivate relationships; (3) resources to support teaching and learning; and (4) tools enabling students to create artifacts representing what they are learning. We also saw teachers using devices—for example, iPods, interactive whiteboards, or Flip video cameras—that were critical to their ability to undertake many of the learning activities we saw. We did not specifically review those devices, but they are mentioned in the discussion of the relevant activities. Tables 1 through 4 list all the applications that educators mentioned in our conversations, but not all of them are discussed in the sections below. Appendix A lists all the tools and links to their websites.

### 1. Tools That Create or Support a Virtual Learning Environment

The teachers and schools we visited used different Web 2.0 tools or programs to create virtual spaces or virtual networks that support their pedagogical goals, both at the classroom and the district level. This section describes some platforms

teachers used to create or support their virtual learning environments and other tools they used to plan lessons or create virtual materials.

| Table 1. Tools that create or support a virtual learning environment | |
|---|---|
| ActivExpression | basic application on the Promethean board |
| Blackboard | learning management system |
| DropBox | stores and shares files and folders via Internet |
| Edmodo | social platform and learning management system |
| ExamView | builds comprehensive tests |
| GoKnow software | learning environment for mobile devices |
| iWeb | Apple software for building websites |
| MyUdutu | rapid e-learning authoring tool |
| Puzzlemaker | builds puzzles |
| Quia | builds activities, quizzes, online worksheets |
| Raptivity | rapid e-learning authoring tool |
| Sharepoint | Microsoft collaborative work space |
| Schoology | learning management system |
| Trackstar | lesson plan storage/depository |

**Virtual learning environments.** A virtual learning environment (VLE) is a software platform that provides a private (password-protected) virtual classroom space in which teachers can perform a variety of both static and interactive tasks and provide classroom resources. A VLE system might also be known as a course management system (CMS), or learning management system (LMS), but the concept of a VLE is used to emphasize that the platform is a tool for teaching and learning as much as for management. VLEs provide a range of functions: administrative tasks such as file storage; assessment and grading; links to a variety of activities for students; and tools such as blogs and forums for communication with and among students.

For the teachers we observed, these VLEs also served as a type of online "homeroom," functioning the way a Web portal might have functioned in the past—as the starting place for most of the online activity connected to a particular class. Many of the learning platforms had built-in tools such as blogs or wikis. Some of the more innovative teachers we visited had course pages built around a class blog that served as a central forum, or central meeting space, for the students. Some VLEs were districtwide, that is, the district had purchased a license and required teachers to have accounts and/or home pages. Other VLEs were created and used by individual teachers, who encouraged their use by word of mouth.

Examples of the ways in which we observed teachers using VLEs include the following:

- As a Web portal that connects students to resources (both outside and within the VLE).
- As a way to stimulate student interest in a topic.
- As a storage space for student work.
- As a way to track student progress.
- As a space for student discussion.

- As a place for to post assignments.
- As a way for students to work collaboratively on assignments.
- As a way to ensure that all virtual classroom work and discussion happens within an educational space and under the purview of the teacher.

Of the three districts we visited, two had districtwide platforms (Blackboard and Moodle); in the third, individual teachers created their own course site with a free VLE (Edmodo). These three VLEs are described below:

*Blackboard* is contracted through the district. Districts can opt for a variety of tools within Blackboard as part of their package, so it can be tailored to a district's needs. Teachers build a homepage, which links to different tools and sections (such as the discussion board).

*Edmodo* is currently free so does not offer districtwide contracts. Defining itself as a social platform for education, it has the look and feel of  Facebook, the popular social networking site. Most of the action on Edmodo happens on (or through) the teacher's homepage.

*Moodle* (*Modular Object-Oriented Dynamic Learning Environment*) is a free and open-source e-learning software platform. Moodle is similar to Edmodo in that it emphasizes classroom community building. The district we visited that was using Moodle had contracted with a local webmaster to use Moodle to develop its VLE.

*Other VLEs* are also available. A technology administrator in one of the districts mentioned her interest in a VLE called Schoology; however, we did not observe use of this site. Another teacher, who had previously used a number of Palm-based activities in her classroom, was using GoKnow**,** a VLE for mobile devices.

**Classroom management tools**. We found that teachers had very positive reactions to a variety of administrative tools that were either built into VLEs or were separate programs that they could embed into their pages. All of the virtual learning platforms had student accounts and ways for students to hand in homework online. All of the teachers liked the convenience of automatically keeping track of student work and progress. Some teachers were also using automatic e-mail and text messages to remind students about homework or field trips. Perhaps to compensate for adolescent tendencies not to tell parents anything, two middle school teachers, in different districts, were even using built-in e-mail notification systems to keep the parents informed of class activities.

**Quiz- and test-building tools.**[1] Teachers also spoke about tools, for example, *Quia* and *ExamView*, that allowed them to create and administer online quizzes and tests. They appreciated these tools because they offer quick and easy ways to check what students know, and students can do these quizzes as part of their own self-assessments. Quia allows teachers to create their own quizzes as well as other

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[1] Other tools, like BrainPop or Study Island, also offer quizlike activities but are not principally test-making tools for teachers. Those sites are covered in the group of Resources to support teaching and learning.

learning activities (flashcards, word scrambles, etc.). ExamView offers a bank of thousands of test items aligned to state standards for language arts, reading, math, science, and social studies. One teacher who used ExamView within Blackboard felt that it really helped her differentiate instruction, as the online tests and bank of test items made it easy for her to test, reteach, and then retest as many students as she needed for any level of her content. Most of these tools have an extensive bank of test items that will automatically update or refresh a test with new items if the same student takes it again.

Another quiz tool, *ActiveExpressions*, is part of the Promethean board package. It includes a handheld device, or *clicker*, that students use to respond to questions; the responses are then collected in real time and in various formats (graphs for numerical responses, text for word responses) on the Promethean board. This application allows the teacher to check students' understanding in mid-lesson with quick quizzes with automatic tabulation ,on the whiteboard. The teacher we observed who used this tool told us that she often shows students pictures at the beginning of a unit and then asks them to text in, simultaneously, what they think the unit is going to be about. This approach both engages students and tests their foreshadowing abilities.

**E-learning authoring tools.** These tools help teachers quickly build interactive teaching resources or lesson plans that are then stored online. Most teachers we interviewed built their simple resources using either Word or Excel, which they then uploaded into their virtual classroom space, but one teacher did report using an e-learning authoring tool, *Myudutu,* to create lessons and resources that she was able to import into the district Moodle. E-learning or rapid e-learning resources allow teachers to create simple interactive learning materials, such as worksheets that auto-grade or quizzes that adapt to individual ability by changing subsequent questions based on the student's response to the previous one, or multimedia resources to support their lessons.

*Flipchart* is another software tool included with the Promethean board that teachers can use to create interactive presentations for students. Not only does it provide teachers with a wide variety of multimedia resources to use during the lesson, but the resulting flipcharts can also be shared with students via e-mail, so that they can then use the teacher's presentation to review the lesson. One teacher showed us a lesson she created on Flipchart incorporating music, text, photos, and videos to demonstrate the influence of gospel music on jazz. Her students had never heard of, say, Mahalia Jackson or Aretha Franklin, and she was able to embed links to audio clips of these singers and others in the Flipchart. She said she couldn't imagine teaching this unit with just a textbook, and that this tool "brought the outside world in" for her students.

This same teacher also created unit reviews for students using Flipchart and embedded quizzes into the review.

**Document- or resource-sharing tools**. These allow documents to be edited collaboratively and asynchronously, as well as making it easy for a community of users  to share professional resources such as websites. To the extent that VLEs provide places for teachers to upload and make resources available for students,

they support sharing resources; "document sharing," however, refers to a technology-enabled way to keep track of a co-authored document that may change over time. Some teachers, for example, mentioned Blackboard's document-sharing capacity, but those teachers also reported that it was easier to use Google Docs.

*Google Docs* allows multiple users to share, create, and edit documents (in Word or Excel) collaboratively and asynchronously. We saw students using this tool to work collaboratively on documents for group projects without having to schedule face-to-face meetings. We also spoke to a teacher who used it to provide fast feedback to students on their work.

*Delicious* allows for the storage and sharing of Web references. In the first year of our research, a group of teachers from the same school used Delicious to share websites with one another.

## 2. Tools That Support Communication and Cultivate Relationships

Two central features of the classrooms and teaching practices we encountered in the course of our observation visits were the range of tools and techniques that teachers and students used to communicate with one another (and with parents) in new ways and the ways in which this intergroup communication fostered a learning community.

| Table 2. Tools that support communication and cultivate relationships | |
|---|---|
| Blogs | online, chronological presentation of commentary and information |
| Communicator | Microsoft product that supports communication and collaboration |
| Diigo | social networking bookmarking tool |
| Delicious | social networking bookmarking tool |
| ePals | online international learning community |
| Jing | social networking tool |
| Twitter | social networking tool |
| Texting | sending text messages via cellphone to another phone or to a website |

This section presents some of the tools and techniques used to support both the method and content of student-teacher communication. Our emphasis here is on text-based communication; video- and audio-based activities are discussed in the section on tools enabling students to create artifacts.

Wikis and blogs are often lumped together as Web 2.0 communication tools, but our observations suggest that they function differently as pedagogical tools. Wikis are collaborative writing tools that permit the creation and editing of content by multiple users. Blogs ("Web logs") are chronologically organized online writing spaces that can be constructed individually or collaboratively. Another communication tool we found in use was Twitter. In addition, some teachers used

the automatic texting feature built into the VLE to reach students and parents (see section on classroom management tools above).

Some teachers we interviewed described **wikis** as having a more research-oriented focus than blogs, thus serving as an opportunity for students to collaborate while learning content or skills. Overall, we did not find very many teachers using wikis, and most teachers we interviewed did not seem to think them a particularly useful tool. We encountered a variety of wiki tasks, but found only a few teachers using the wiki for a group-authored document. Most teachers used wikis in more static ways, essentially as a place to store class documents. One elementary school teacher used wikis as a format for her students to collaborate on creative writing projects: she gave groups of students lists of characters, settings, and activities from which to choose and then had the groups work on building a story together using their selections from the lists.

We observed "static wikis" in use by teachers we observed in a district that required teachers to have a wiki. Most of those teachers had created their own VLEs elsewhere (e. g., Edmodo) but they were using the required wiki on the district's site to post the class syllabus, rubrics, and accompanying samples of student work. While their VLE was restricted to students, the wiki was open to parents as well. One teacher we interviewed was aware that this was not a sophisticated use of a wiki, but it met his need for increased transparency with parents and helped them gain a sense of the caliber of work that was expected for a given assignment. He felt that parents better understood the grades he gave as a result, particularly when these were lower than parents were hoping.

**Blogs** are chronologically organized online writing spaces that can be constructed individually or collaboratively. Outside the classroom context, blogs are usually written by one individual, with other individuals then posting comments. However, most teachers we observed did not use blogs in this way. The most common approach we saw was the creation of a classroom blog as shared space for students and teachers. The teachers we interviewed characterized blogs as more of a conversation tool, to inspire interest and communication. As with wikis, we observed a wide variety of blog tasks, which fell broadly into classroom blogs and individual blogs or journals.

*Classroom blogs,* centralized, teacher-directed blogs, were often found on the class or VLE homepage, where students would post comments. Often, the teacher's goal was to generate a discussion among students, via such comments, in response to a teacher-generated statement or question. We found examples of blog tasks that had at least one of the following four pedagogical objectives: to elicit prior knowledge, generate interest, support student debates, or provide students with feedback from their peers. A number of teachers used blog tasks as activities to test prior knowledge or generate interest. For example, one social studies teacher used a blog to introduce her Civil War unit. The night before beginning the unit, she posted the question, "What do you know about the Civil War?" to the blog and required students to post a response, as well as a comment on another student's response, by a certain time. Both the students and the teacher reported that this approach generated excitement as students posted facts, tried to outdo one another with more facts, or disagreed with one another on historical

interpretations. Generating hundreds of posts in one evening, this activity not only engaged students in the topic, it permitted the teacher to gauge student knowledge and misconceptions prior to beginning the unit. A language arts teacher in a different district used a blog task to generate interest and prior knowledge before teaching the science fiction novel *Flowers for Algernon*, posting the blog prompt, "What is intelligence, and does it matter?" After conducting a spirited online debate about street smarts, book learning, and human dignity throughout the evening, the next day her students started to read the tale of man whose very low IQ is artificially tripled but who then finds his newfound "intelligence" quickly slipping away as the effects wear off.

We also heard about many blog debates. The students really liked these activities, claiming that they were different from classroom discussions. Students felt that the class blog allowed them to participate even if they were too shy to speak in class. A blog also allowed them to give more critical feedback, because they could take the time to write a statement that was critical of another's position but not mean-spirited. Students in one middle school class told us of a very heated blog discussion they had had about whether the Iditarod dog sled race was animal cruelty or not. One final example of a blog task requiring students to give feedback to one another is both powerful and very particular. A middle school art teacher spends a lot of time helping her students learn to give and receive criticism about their artwork. After a few weeks of face-to-face "crits" for training, she moves online. Each week on her class blog, a student posts a digital image of a recent work and self-critiques it; over the week the other students post their feedback.

*Individual blogs or journals,* which could be public or private, required students to write and post individually. For some of these blog tasks, other students were expected to comment. From what we observed, however, it was difficult for teachers to create meaningful educational activities using these individual blogs. Some of the problems were logistical, as students were often required to log in and out of several other students' blogs in order to make comments; thus, not only was the resulting communication isolated from the larger group and often inauthentic, but the mechanics were frustrating. For example, in a French class we observed, all students had an individual blog, where they both posted their homework and commented on other students' assignments on their respective blogs. Many students were not getting credit for their comments, however, because in order for the teacher to see them, the comment first had to be accepted, and thus made public, by the student to whose blog it had been posted. Most students did not remember to accept their peers' comments, so the teacher then had to create a paper-and-pencil checklist to track who had and had not completed the task.

Besides these logistical problems, it also proved challenging to design a meaningful blog task that would motivate students to write posts and read one another's comments. For example, in the same French class students were assigned to post the French names of three favorite foods to their blog and then comment on their peers' selections. The task of selecting an individual blog task that generates real, meaningful communication appears to be very difficult, which may explain why we found that the most successful individual blog activities were tasks that only the teacher read.

One teacher treated private individual blogs (not accessible to other students) as a space for students to reflect freely on their classroom experience and learning and to promote communication between herself and each student. She required students to post regular reflections on their blogs, in which they were free to express any and all feelings about the class. These blogs thus served as the students' private journals, and the teacher felt that they were an effective way for her to understand what individual students were thinking and feeling about the work of the class. In another example, a Spanish teacher we observed in the first year of our research used a travel blog activity for each chapter of her textbook, centered on a Spanish-speaking country. She had her students blog about an imaginary visit to that country. Her goal was to get her students to write in Spanish, but she also liked the fact that a Web-based journal allowed them to post pictures, news clippings, advertisements, and so on as part of their blogs.

**A social networking site** is designed to promote communication among the members of a particular community. While these sites are quite popular for personal use (most students we interviewed reported having either a Facebook or MySpace page), we did not observe much classroom use of them. However, many teachers used the VLE to create a truly educational SNS.

> *Twitter,* which we did encounter a few teachers using, is an SNS that allows users to post short blurbs, known as "tweets," of up to140 characters in length, as well as read the tweets of other users. These messages are by default visible to the general public, but a user can subscribe to other users' tweets, which then show up on that user's own home page. And this is the extent to which the community and/or audience can be controlled. In our research, we observed Twitter being used less as a space for dialogue and more as a way for members of the classroom community to read and post updates on activities. The most effective uses of Twitter we observed were highly supervised instances in which students were asked to post with a particular audience in mind—usually parents—about what they were doing or learning in that class or on a field trip.

> One teacher who taught a gifted and talented pull-out program for students in grades 1 to 3 used a class Twitter account so that each group of students could share what they were doing with the students from the other grades: "They can see what other kids are doing in the other classes. First graders get to see [what] third graders are doing. My first graders like it more than anyone."

> We also observed Twitter being used in less successful ways. In one classroom the teacher asked students to post reactions to their classmates' final projects while they were actually presenting. While the comments were positive (e.g., "Nate's was cool; I liked his diorama"), they were not very constructive; nor did students appear to take it very seriously.


## 3. Resources to Support Teaching and Learning

In the networked world of these innovative classrooms we visited, teachers used a variety of Web-based resources to present material to students and engage them in

larger conversations about the content. Unlike the e-authoring tools described above, teachers do not need to build such resources themselves. This section presents some of these resources and provides examples of how they were used in the classroom.

| Table 3. Resources to support teaching and learning | |
|---|---|
| Brainpop | animated, curriculum-based content activities |
| Curriculum Associates | online curricular materials |
| Google Earth | satellite images of the Earth |
| Grammar Girl | audio and text "mini-talks" on grammar |
| Holt Online | online textbook and grading system |
| Kto8.com | database of exercises that reinforce critical skills |
| Mountain Math/Language/Science | skill building and test prep software |
| ReadPlease | text-to-speech software |
| Starfall | phonics website |
| Study Mate | interactive assessment activities |
| Study Island | online standards-based learning tools |
| SurveyMonkey | online survey tool |
| Thinkfinity | standards-based lesson plans and resources |
| YouTube | video-sharing site |

**Video and audio resources.** Teachers downloaded these materials from online libraries or resource repositories. Some of these repositories, like Teacher's Domain, were specifically for education; others were general audience sites such as YouTube. While many of these sites also allow users to upload their own resources (e.g., posting one's own video to YouTube), we did not observe this use as an educational activity for students in our research. We mostly learned how teachers used these sites to bring audiovisual resources into their classrooms, and we noted how they could become exciting tools for learning via display devices such as interactive whiteboards. In the classrooms we visited, the technology was able to bring such resources into the learning process quickly and seamlessly.

A teacher with a collection of well-chosen videos is well placed to take advantage of a teachable moment. For example, we observed one teacher whose students were reviewing literary devices for the state language arts assessment. A question about flashback and foreshadowing came up. The teacher quickly pulled up the Disney cartoon "Ugly Duckling" on YouTube (http://www.youtube.com/watch?v=k3t5BmU3uYQ) on the interactive whiteboard and had the students identify the different literary devices used in that nine-minute version of the story. The class stopped or replayed the cartoon at various points to discuss the difference between foreshadowing and flashback (as well as other literary devices), or to compare the use of devices here to their use in other films and television shows (the use of flashback in *Lost* was of particular interest to these students). In another example, a high school world history teacher shared how he changed his way of teaching the movie *Gandhi* once he obtained a digital version through United Streaming. The students read about Gandhi in the textbook, but he uses the movie to help students connect to history as real life. He likes to stop the video at key points to discuss events portrayed with his students,

and it used to take him over three days to go through the entire movie. But with a whiteboard and a digital version, he now goes directly to the key scenes he needs in order to set up the discussion and shows only about 15 minutes of the movie in class. Students watch the entire movie on their own first, but he needs only one teaching period.

> *YouTube and Vidler* are free video-sharing sites. *TeacherTube* is an educational version of YouTube but the teachers we interviewed used the general site because of the far greater number of resources.

> *Teacher's Domain*, a free online media library created by the Corporation for Public Broadcasting, offers material produced by public television and specifically packaged for use in K–12 classrooms.

> *United Streaming* is a subscription site for video resources that schools or districts can purchase.

**Multimedia resources**. Other types of visual resources available online besides videos include the mapping program *Google Maps* or earth imaging program *Google Earth*. Google Earth is an interactive satellite image of the entire planet that allows one to "fly" over the Earth and zoom in on any spot close enough to see buildings and cars. As one zooms in close, a setting on Google Earth displays webcams and pictures tagged to different places on the globe. One history teacher we interviewed explained that he uses a Google Earth "flyover" on the interactive whiteboard to introduce each new region to his class. For the unit on Asia, he starts the flyover from above his midwestern school; spins over to Asia to show the students the Great Wall of China and the Japanese Islands; and finally zooms in to India, then New Delhi, and eventually a webcam showing a live feed of a particular commuter train station in that city. As the students watch the ebb and flow of thousands of people in the station, he begins to discuss the role of public transportation in the social and economic life of a city, which he then connects back to a conversation about highways and public transit in the students' own city in the Midwest.

**Simple games and skill-building sites.** These tools support individualized student reinforcement activities and test preparation. Some teachers we observed were able to use these tools to meet students' individual learning goals without the students themselves being aware that they had been placed in different ability groups. For example, the teacher would direct students to a set of exercises at one of these sites through their individual folders in the virtual classroom space, simply assigning different ability levels as appropriate without announcing the variations publicly. Students were then able to move at their own pace, and the teacher could easily check on their progress. Here are three sites the teachers we interviewed mentioned:

> *Brain Pop* provides free, animated, online educational activities (concepts and review) in a variety of subject areas that are tied to state standards.

> *Kto8.com* is a subscription site that offers skill-building exercises from kindergarten to eighth grade. Game activities are interspersed with the

exercises, and students earn more "lives" depending on how well they do in the exercises.

*Study Island* offers online test preparation activities in a variety of subject areas ; schools must purchase a license to use it.

### 4. Tools Enabling Students to Create Artifacts Representing What They Are Learning

Web 2.0 tools also offer a variety of ways for students themselves to create products that reflect what they are learning. Some tools are completely online, and students need nothing more than Internet access to create a document or a presentation; others are programs that can be run from a class computer or a mobile device such as a Flip® video camera or iPod.

**Video production.** We found a number of teachers using simple video production tools to allow students to create quick video presentations. The tools ranged from Flip cameras and Moviemaker software to online video tools, such as Newsmaker, that use a laptop's built-in webcam. A central feature in all cases was that teachers sought to limit the amount of production time involved in making these videos. The teachers using these tools spoke about their ease of use and specifically limited the amount of time students spent on editing or production. They wanted students to focus on content and learning rather than production values. For example, a pair of teachers working on a poetry unit with their middle school students were using the book *Immersed in Verse*, by Allan Wolf, which covers six genres of poetry from classic poets to hip-hop to Goth poets. Students were divided into groups, with each assigned to make a video about their life if they were a poet from a different genre.  The videos we saw were engaging, humorous, and to the point, and the students had completed them in two class periods. Using a Flip camera and a quick upload to Moviemaker, they made a short video in no time at all. An elementary teacher had her students making short newscasts about the *Titanic* using the online tool Newsmaker. Using only the webcam attached to their classroom computer, they finished their newscast in about 10 minutes. Such activities provided the students with another way to think about how to organize their information creatively, but without taking up too much time.

*Newsmaker* allows students to create their own newscasts, from writing to recording to publishing online.

*Camtasia* is used to make video presentations for teaching.

**Podcasting.** This tool uses audio productions. We saw a couple of podcasting activities used to support learning. In one first-grade classroom, students recorded themselves reading their favorite story and then uploaded the podcast to the class website, where they were able to access and listen to it with their parents at home. In a middle school English class, students produced audiobook reviews that were then uploaded to the class website. Creating an audio version of their own writing allowed the students to explore the difference between reading and hearing information. In our focus group with the students, they talked about having to

rewrite some of their book reviews because "some of the words didn't sound right."

| Table 4. Tools enabling students to create artifacts representing what they are learning. | |
|---|---|
| Animoto | video production tool |
| ArtRage | painting and drawing software |
| Audacity | open-source software for recording and editing audio files |
| Audio streaming | creates sound files |
| BibMe | creates citations |
| Camtasia | video production tool |
| Frontpage | Microsoft web design software |
| Garage Band | Apple software for recording and editing audio files |
| Glogster | creates interactive posters |
| GoAnimate | cartoon maker |
| Google Docs | document sharing |
| KidPix | drawing software |
| Mixbook | creates picture books |
| Newsmaker | platform to make student newscasts |
| Notetaker | note-taking software |
| PhotoPeach | creates slideshows with photos, text, sound |
| Picasa | photo-editing software |
| Picnik | photo editing |
| Prezi | online presentation tool |
| Sketchy | animation and drawing tool |
| Slideshare | upload and share presentations |
| Snagit | screen capture tool |
| Tuxpaint | drawing program |
| VoiceThread | creates online slide show with text or voice descriptions |
| Wordle | creates graphics of word usage |

**Web-based multimedia tools.** These allow students to create projects or presentations completely online using a variety of media. They are similar to PowerPoint but, because the tools are all online, it can be easier to embed links to other websites into a presentation. We saw these tools being used for final projects, as a way for students to demonstrate what they had learned from a particular unit.

> *VoiceThread* is a public online photo documentary tool that offers the option to attach text or voice descriptions to the photographs. It also has the capacity for viewers to comment on the pictures using voice or text. One teacher devised a project for which she asked students to share stories about their home traditions using photographs of objects and places important to them. Using VoiceThread, students narrated comments discussing the photographs. The teacher had previously assigned this activity as a text-only assignment, and she reported that students used to write, on average, a five-paragraph essay, about a page and a half, describing their home traditions. When students created their work using VoiceThread, most wrote about four pages. When we

asked students why they had written more this time, they told us that although using this tool made the writing longer [in length], it was "more fun to do." They said that they "didn't think about the writing" when using this tool.

*Mixbook* creates picture books from users' uploaded photos and text. It contains a feature that simulates turning the actual pages of a book. One teacher we observed offered this tool to her students as one of their options for the creation of a study guide for an end-of-unit review of language and grammar. The teacher reported that one of the things she liked about Mixbook was that it comes with an embed code that students will post on the class homepage when they are finished with their projects. She can then go to homepage and click on the link a student has posted to go directly to that student's work.

*Glogster* is actually an SNS, but we saw it used to make multimedia posters (glogs) with text, hyperlinks, images, music, and video. It advertises itself as an SNS to promote the idea that there is a community of creators that encourages meeting new people.

*Picnik* is a photo-editing tool that allows students to compile photographs into a slide show. One teacher showed us a project for which students photographed their hands, eyes, and profiles; edited them; put them together with a poem they wrote; and gave the finished products to their parents or another family member as a holiday gift.

## Emerging Themes

The Web 2.0 applications and tools that we encountered were seldom used in isolation from other Web 2.0 tools, and in most cases they formed a daily part of classroom activities. Most teachers we interviewed and observed routinely used a variety of these tools to create a virtual reflection of their classroom and establish a certain learning environment or network of resources for their students that helped them meet their long-term pedagogical goals. The following discussion examines the broader issues and patterns that emerged from our data.

### Creating the Virtual Classroom

Teachers and schools we visited use different Web 2.0 tools or programs to create VLEs that support their pedagogical goals, both at the classroom and the district level, and extend learning beyond the physical walls of the classroom. Throughout the districts we visited we observed ways in which these virtual classrooms or class resources supported a range of pedagogical goals—from educators leveraging the communication aspects to promote the social construction of knowledge and collaborative groups to those using the spaces to connect students to individualized learning resources. The most innovative virtual classroom spaces that teachers created fulfilled multiple functions: static elements such as storage of student folders, the syllabus, and support materials; more active components for students and teachers such as forums, blogs, or wikis; links to individualizable learning resources; and even a system tracking students' completion of online activities.

*Teachers can use Web 2.0 to create virtual spaces that support classroom community building.*

Some of the teachers we interviewed had created VLEs that functioned as an extension of their classroom community, with a focus on generating an ongoing discussion among the students about what they were learning. These virtual classrooms used interactive communication tools such as class blogs, text messages, or wikis to encourage students to share and debate ideas or to work collaboratively.

In one classroom we observed, which was using Edmodo, the teacher and students used the virtual classroom constantly. The class website linked the students to all the online resources they would need: a class blog in the center of the screen was a forum of constant communication, and students could collaborate through the site and hand in work. Students knew to go to this space to keep up with the latest information about assignments, as well as to communicate with their teacher and connect with one another about the work in which they were engaged.

*Teachers can use a Web 2.0 approach to create a virtual classroom that supports individualized learning by connecting learners to a vast network of resources.*

Other teachers we interviewed used Web 2.0 tools to support their goal of differentiation and individualized learning by creating a VLE that served as a Web portal to a variety of resources adaptable to the needs of individual students. Teachers were able to tailor this space to students' particular needs by connecting

them to a variety of level-appropriate and relevant resources. Students were thus able to meet their individual learning goals at their own pace during class time, and, if desired, in their own time. In these types of spaces the VLE functioned less as a virtual gathering place (less evidence of blogs or other group communication) and more as a conduit to link individual students easily and flexibly to constantly changing resources and learning activities. This type of virtual space can act just as much as an extension of the learning that happened in the classroom and as an opportunity to build capacity, in this case by focusing on individual student progress.

In one district where we observed this approach, every teacher had a Blackboard homepage where students could access the class. One teacher reported that because her students' reading ability ranged from a third-grade to a 12th-grade level, for her the ability to differentiate learning for those students was a key benefit of using Web 2.0. We observed her class of seventh graders engaged in learning stations, each using different technology tools to which they connected through her homepage. Some students were writing a short skit, another group of students was sitting together, but all were working on individual language arts exercises through the Kto8 program. Although the students were working individually, they remained engaged with one another; they talked about what they were each doing, asked one another questions about a particular activity, yet were all working at different levels. The atmosphere in the room was lively and engaged. The teacher saw herself as a facilitator. "Differentiation is the key—and [these tools] help me with that." She said that her goal was for all her students to demonstrate competency by achieving the same product, and believed that these tools provided them with different, individualized means to get there. "All roads lead to Rome," she told us, but here it was, "All roads lead to the test." This teacher also used online tests and quizzes like ExamView or Holt Online for students to self-assess and track their own progress.

## Usability

A salient feature of the Web 2.0 tools and this current generation of technologies is the relative ease with which users can create products and virtual spaces. From teachers creating virtual classrooms to support teaching and learning to students doing online activities to mashing up products from different programs, learning how to use the technology was seldom a central aspect of the activity.

*Web 2.0 can make things easier for teachers and students, regardless of technology background or prior experience.*

The Web 2.0 tools that we saw used supported teachers' management of classroom activities and materials. It was easy for teachers to upload and update materials, and equally easy for students to download materials and keep track of assignments. In addition, many of the tools have features that allow teachers to track student progress (e.g., time stamps). Generally, there are few or no complicated features to learn, and programming or technical expertise beyond understanding how to navigate online space is seldom required.

Both teachers and students we interviewed mentioned this ease of use. We have been promoting educational technology for over 10 years, and in earlier iterations the time it took to learn, teach, and use the technology often emerged in the findings as one of the leading barriers to effective and sustained use. However, when we asked one particularly zealous Web 2.0 user and technology trainer what she considered the biggest impediment to teachers' use ofWeb 2.0, her response was, "They don't know it exists!" Another veteran teacher, who described herself as a "reformed technophobe," mentioned Web 2.0's "convenience" as a primary benefit it brought to the classroom.

This ease of use allows both teachers and students to focus on the content rather than on the look of their products. Several students in a class we observed described how the seamlessness of using Web 2.0 tools removed mechanical barriers to their writing or brainstorming process. While using an online Venn diagram program to brainstorm similar traits in characters from two novels, one student remarked, "It makes it easier to think because your thoughts can just flow." He described how he had previously had to struggle to write clearly in the tiny spaces provided in paper Venn diagrams, whereas the Web-based tool simply expanded to fit whatever he typed in.

*Ease of use is important to teachers and students. Teachers make decisions about which websites, tools, or activities to use with their students based on how easy it is to access, use, and embed those sites or the final product into their virtual class website.*

The educators we spoke with worked to keep their technology use easy. They tried to avoid websites if they required passwords or if they could not link to them from their virtual classroom. For example, one district created a district Moodle site that allowed teachers to set up a virtual classroom with an internal blog and wiki capacity. The district also provided teachers and students with accounts that could be accessed through the Moodle site from any computer on the network. One password was all students needed to access all the virtual resources for their class. Students told us that this accessibility made a difference.

The ease and transparency of many of these tools also shortens the learning curve and supports increased use. One technology coordinator relayed how she wanted to share a great project idea she had developed using Audacity with a teacher who could not come in for training after hours because she had to get home to her young children. The teacher didn't want to learn the tool in the classroom either, because she was anxious about the amount of class time it would require. She just couldn't imagine learning the tool at the same time as her students, believing she needed to become expert in it first so that she could help them over the learning curve that she assumed existed. And all of this just seemed like too much work to her. When the coordinator finally convinced her and arranged in-class training, after the session both teacher and students were confident with and excited about the program. The teacher was both surprised and pleased that mastering it taken so little of her (and her students') time.

Because teachers now largely believe that these tools should be easy and know that there are multiple tools available, however, when teachers or students experienced anything cumbersome about the applications, they said they were

unlikely to continue using that tool. A student in a school that did not have a VLE echoed a common frustration: "Our biggest negative is that all of these places have different logins and it is hard for us to remember all of the logins." A teacher we spoke with, who often used the online interactive poster-making tool Glogster, reported that he had attempted to use the "education version" of the tool but had experienced more glitches in that version and therefore preferred the "regular" version. Because of this, he had to use a public tool that contained advertisements and made his students' work publicly accessible; but he preferred navigating a tool with these drawbacks to one that was vetted for school use but still had unacceptable kinks.

This desire for convenience, along with teachers' growing ease with these new tools, is also encouraging teachers to bring in new resources if the tools provided by the district are too limiting or restrictive. For example, in one district teachers using Blackboard deemed it cumbersome and used different tools even though Blackboard was supposed to have the capabilities they needed. As an example, one teacher explained that she used Google Docs document sharing because she found Blackboard document sharing too unwieldy. In another district, the teachers who found the district wiki site too limiting all used Edmodo to create their own VLEs.

### Communication

When the assignment is meaningful and supports the learning objectives, Web 2.0 tools increase communication (not just dissemination of information) in ways that strengthen the educational community and help center classroom —and out-of-classroom—conversation on issues and topics that support and deepen learning. We observed this benefit in the following four areas: (1) communication among students, (2) communication between students and teachers, (3) communication with parents, and (4) communication among educators.

### 1. Communication among Students

*Teachers are using Web 2.0 tools to create ongoing conversation among students that appears to support deeper engagement and learning of the content.*

Most of the conversation we observed among students took place either on class blogs or directly on the homepage of virtual classroom spaces. Teachers were thus able to manage and monitor these conversations, as well as allow students to engage in them as natural extensions of their classroom dialogue.

One teacher we interviewed required students to respond to an online discussion prompt, "What do you know about the Civil War," prior to beginning a unit on the Civil War. Not only did this ignite advance interest in the topic, it allowed the teacher to get a sense of students' previous knowledge of the topic before she began the in-class lesson. The students used the space to discuss, challenge, and explore their own and others' knowledge and assumptions.

The students we spoke with enjoyed engaging in these online conversations. Some students reported liking online debates because the format allowed them to gather their thoughts before entering the discussion.

One elementary school teacher who taught enrichment programs to gifted and talented students from third to sixth grade used Twitter to connect her students across classes and grade levels, even though they all met with her at different times. All of her groups followed one another on Twitter, and each group of students sent tweets about what they were learning for the others to read. This allowed younger students to see what the "big kids" were doing and enabled all students to share projects and ideas with one another.

*Developing an authentic or meaningful conversation was fundamental to generating a student discussion that supported learning and engaged their interest. Attaining this goal required careful selection of the tools and prompts and was difficult for some teachers.*

As noted in the Findings section of this report, developing a blog prompt or a Twitter task that fostered a meaningful or "learning" conversation using these tools was challenging. We observed both successful and less successful attempts by teachers to get their students to engage in meaningful discussion using Web 2.0 tools. Often, the prompts missed the mark, and many tasks that one would think should work did not. Matching of the tool to the pedagogy was understandably tricky for teachers, particularly when they were experimenting with new activities, as in the case of the teacher we observed who asked students to post to Twitter while classmates give a presentation. Another teacher asked students to post on one another's individual blogs and created a guessing game to try and make the comments meaningful. This was the first time the teacher had attempted this activity, and she reflected that it did not work the way she had intended.

## 2. Teacher-Student Communication

*Some of the most interesting uses of Web 2.0 tools we observed created positive shifts in teacher-student communication by offering ways for students to interact with teachers both privately and "in front of" their peers. Additionally, the technology helped teachers follow students' online conversations and debates, enabling them to intervene at just the right time.*

Our interviews with teachers show that their use of the tools extended their options for communicating with students. Many of these teachers had a virtual classroom site that contained one or more communication tools. Embedded in the sites were two ways for students to communicate with teachers. First, students always had the ability to post or send private comments to the teacher through the site. Second, teachers were able to monitor student comments to the group blog, so that students could pose public questions to the teacher within that space.

Additionally, some teachers programmed the virtual classroom site or blog to notify them via text message to their cell phones when a student posted a comment. These teachers could monitor the conversations in real time and also post their own comments in response. For example, one middle school teacher felt that it was important for her always to respond after the first few student postings for each new activity: "When the first kid responds, I immediately respond back to that kid so they see that I am engaged and watching them so they know that they have to respond."

*Web 2.0 technologies can create new ways to support teacher-student communication outside of formal class time.*

Teachers we interviewed who were engaged in both public and private online discussion and communication with their students saw this form of communication as an opportunity to move the conversation about what they were studying beyond the textbook and beyond the walls of the classroom.

One teacher we interviewed, who received text messages whenever her students posted on her class blog, mentioned that one of her goals since using these tools was to create more constant conversation and discussion with her students. Another teacher believed that her students would not remember to do an assignment if she didn't text them reminders about it, and she saw this as a useful tool that she employed often.

A third talked about the importance of her ability to be constantly available and was happy that these tools just expanded this availability. She remarked, "Kids can contact you around the clock. But I am that kind of teacher. If I don't make myself accessible I am not teaching them. . . . I want the kids to be thinking about learning outside of the classroom. If I really want them to be changing their lifestyle to think about learning . . . I don't want to stifle that. . . . It does give them more access to me, but isn't that what we want? It depends on what kind of teacher you are."

*Teachers we interviewed mentioned that Web 2.0 tools allowed them to feel more connected to their students and provided a new way to engage them in class material.*

One teacher who used a variety of tools to support students' individualized learning told us that the tools helped her to meet the kids "where they are, because they are so networked and these tools are in their lives anyway." She went on to say, "Web 2.0 drives their engagement, which is really hard to do otherwise. These kids are so focused on television and instant gratification and multitasking. They feel like . . . why would we do just paper and pencil at school—we don't do that at home."

The teacher we described earlier who used Google Earth and webcams felt that his students really developed a stronger connection to the content because they were seeing live images from India. Likewise, the  Spanish teacher who required her

students to create fictitious travel blogs felt that surfing the Web to find news articles or current information from Costa Rica or Spain helped connect students more to the real, living culture of those countries than just seeing photos of art museums and bullfights in their textbooks would.

## 3. Communication with Parents

*The schools and teachers we visited used Web 2.0 technologies to communicate with parents in ways that gave parents more immediate information on their children's activities and invited them into their children's learning in new ways.*

Web 2.0 tools can be used to increase transparency regarding both the practice of teaching and student progress. One teacher we observed used a class wiki to post rubrics and accompanying samples of student work. While he was aware that this wasn't a sophisticated use of a wiki, it met his need for increased transparency with parents and helped them gain a sense of the caliber of work that was expected for a given assignment. He felt that this tool helped parents understand the grades he gave, particularly when these might be lower than parents were hoping.

Some of the teachers  used Web 2.0 tools to incorporate the parents into their children's learning in new ways, either by sharing more technology-based products made by students or by using the tools to involve parents in discussions and reflections with their children and other parents. After a lower elementary school teacher posted audio clips of her students reading books on the class website, she reported that students would come in and talk about listening at home together with their parents.

*A small number of educators used SNS technologies like Twitter and texting to keep parents updated about special class activities*

Schools still seem to be wary of technologies such as Twitter, and we found this tools in use in only a few instances. Twitter and texting (the latter being much more widespread in teacher-student interaction than in teacher-parent communication) were used in similar ways: to push quick updates or reminders to parents about school or classroom activities. A middle school teacher we interviewed had set up Twitter accounts for her classes so that parents could sign up to follow their child's class. She used Twitter to remind parents about field trips or special presentations that the students might be making. Generally, the teacher always worked with the students to decide what to tweet to the parents and to draft the message.

## 4. Communication among Educators

*A few schools also used Web 2.0 communication tools as an addition to their professional development and professional community-building activities.*

The activities we observed were different from the online professional development courses in which some of the districts were involved, and were less formal instances of professional support. For example, at one school the principal hosts an online reading group using a blog. Every semester, on a volunteer basis, a group of teachers pick a book that is relevant to their teaching, which they read and discuss throughout the semester. The teachers have added a shared blog space where teachers respond to a guiding question. This allows teachers to stay on track even if they miss a section, but it also changes the dynamic among the teachers to strengthen their professional community and create ways for teachers who don't often meet to support one another by sharing lesson ideas or intervention strategies. The principal commented that teachers whose classrooms are at different ends of the building are now beginning to share ideas and talk about visiting each other's classrooms in person.

## Blurring Boundaries

Web 2.0 technologies are reshaping and realigning many aspects of the communication loop: the people with whom teachers, students, and parents communicate; what they communicate about; and where and when they communicate. These ongoing processes bring to the fore exciting opportunities and novel challenges for educators. As schools use these technologies to build communities, the old boundaries between public and private, in school and out of school, and youth culture and adult culture are melting away and being redrawn.

*Issues of privacy, anonymity, tolerance, ownership, and student voice are complex concerns that teachers must consider when using SNS tools.*

The public nature of many SNS tools is an issue of concern for some teachers. Some expressed concerns about student voice and the ability to encourage students to speak freely, yet appropriately, while ensuring that they would not face negative consequences. Teachers were concerned about students who might feel too inhibited to speak their mind, as well as about repercussions for those who expressed their viewpoints freely. For example, one creative writing teacher abandoned the class blog, reporting that she works hard to get her students to trust her to read their intimate writing and found that blogging undermined that trust and inhibited her students. Another teacher attempted to conduct a project on bullying, but her students would not freely engage in a blogging activity about when they had been bullied or had seen bullying.

Other schools relied on strict filtering systems in an attempt to avoid some of the ambiguity around this issue. In some cases these decisions were made for the teachers at the district level, or even at the federal level as part of a funding requirement. In one district the leadership seemed frustrated by the strict filtering set as a condition for federal funding. "I personally believe that it is more important to educate people to navigate it all rather than prevent them from going there in the first place," noted one administrator. An art teacher in that same district mentioned the drawbacks of the filtering system, commenting that she

would like to have access to more online image databases, but that many are restricted. She reported that she had argued her case with the district, mentioning that even her textbooks have some nudity in the images, but the filter was not usually lifted.

Some trends seem to be emerging with regard to the way virtual space is perceived, the goals of using Web 2.0 tools, and the perceptions of how tightly the spaces should be controlled. For example, teachers who used virtual classroom spaces in which the online community was simply an extension of the existing classroom community did not often share these concerns. These teachers had built strong in-class communities and had intentionally and carefully carried that achievement over into their online environments. Students in these classes extended their in-class modes of behavior to the online learning environments; they did not mistake these spaces as places for social and personal interactions, but rather saw them as belonging to the classroom and thus limited their use of them to learning activities. In environments where the tools are seen more as a way to connect students to resources, with a focus on individualization rather than community building, educators appeared more concerned about regulating student behavior in online space. These themes would benefit from further exploration and unpacking through future research.

*Most teachers and schools reported limiting students' ability to post private comments or send personal e-mails to one another inside the virtual classroom in order to ensure a safe and comfortable learning environment, free of bullying. Nearly all student-to-student communication happened in communal spaces, under the supervision of teachers.*

Teachers who were comfortable and sophisticated users of online classroom space were quite intentional about their management of that space. In most of the classrooms we visited, private online student-to-student communication was restricted. Teachers did not have to worry about students engaging in potentially negative communication, because, just as in their classroom, they were a constant presence and were in control of the means of communication, which was always "public," that is, under their supervision. This approach did not mean that the teachers was always online, but rather that all communication from students was stored and easily visible to the teacher whenever needed. One district, for example, had a policy that all student communication must be archivable and searchable by teachers, which meant that it did not allow student e-mail.

Teachers were also intentional about translating their expectations of students' comments in educational space, and they understood that constructive communication might have to be modeled, just as it would in a face-to-face or handwritten interaction. For example, one art teacher we observed reminded students of the difference between blogs and their online journals: She emphasized that only she would read their journals, so they were free to write things there that they might not want the rest of the class to see, whereas everyone would read the blog. This same teacher, who required students to blog art critiques of one

another's work, reported spending six weeks at the outset of the year modeling how to do this constructively. She also made sure that she commented at least once on everyone's blog "so they know [I'm] looking."

Most of the teachers we interviewed also saw a clear separation between what they had control over (the educational space they created and the learning that happened within it) and what they didn't (how students communicated with one another outside of class time and class space, whether in person or online).

*Students made clear distinctions between their virtual classroom community and their other Web 2.0 virtual presences. It is important for educators to keep these distinctions in mind to use the virtual classroom effectively for educational purposes.*

Although they enjoyed their Web 2.0 learning activities and participation in the virtual classroom community, the students we interviewed made clear distinctions between this community and their personal activities on social networks such as Facebook. In fact, some students identified three distinct virtual communities that overlapped in their lives: the classroom network of their fellow students, the social network of their school and neighborhood friends, and a third, private, virtual community of people they knew only online. In a classroom conversation about the similarities and differences between their class Moodle and Facebook, one student said that she also had a Fanfiction.net account where she posted her artwork and writings, but added, "No one here is ever going to see it." Her visitors to this site came from all over the world, yet she kept it hidden from her fellow students and friends at school. The students recognized that there were different expectations and rules within each sphere.

*Whether in online debates or in creative projects, students' work is shaped by the knowledge that it will be seen by their classroom community.*

Students are aware that whatever they post in a virtual classroom space is shared by the teacher and by their classmates. Instead of viewing this as limiting, they understand that this is what happens in a virtual educational space, as opposed to an online social space; some students we interviewed felt that it made them more thoughtful about the work that they did post.

Second-grade students engaged in an educational videocasting project stated that they "had to practice and talk well[sic]" because they did not want to embarrass themselves on video, so they really thought about what they were doing and saying.

## Conclusion

Like a naturalist exploring an undiscovered forest, our initial objective for this research was exploratory: to just go out and collect examples of how teachers are integrating Web 2.0 tools into the classroom. Although we cannot yet offer any definitive conclusions, a number of hypotheses emerged from the data. While this study suggests great potential for these tools, it also demonstrates that careful planning is required to align instructional activities and the affordances of these tools. Teachers need to design activities in which the communication facilitated by the Web 2.0 tools is meaningful and relates to students' learning of the content or to their own lives. But when the communication is useful for a larger or more authentic goal, the students' use of the tools promotes different student and teacher relationships. Additionally, the way in which these networked tools blur older boundaries between public and private, school and home requires more reflection and research.

One of the most salient themes, consistent among more sophisticated users across all of our sites, is that we are perhaps beginning to see a Web 2.0 approach or mentality. It may not be the tool itself that defines Web 2.0, but *how* it is used to support teaching and learning, both in individual classrooms and as part of a school's or district's larger vision. All the tools employed within this approach do not necessarily have to be what immediately comes to mind when one thinks of "Web 2.0" (e.g., blogs and wikis). However, the philosophy that has developed through the use of these tools embraces a Web 2.0 mentality. The tools are interactive, they can by used asynchronously, they are collected together as a suite of resources within a virtual platform, and teachers are integrating them seamlessly into their classrooms to extend and deepen the educational environment.

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# Appendix

## Tools that create or support a virtual learning environment

| Application | Description | URL |
|---|---|---|
| Edmodo | social platform and learning management system | http://www.edmodo.com/ |
| Blackboard | learning management system | http://www.blackboard.com/ |
| Quia | builds activities, quizzes, online worksheets | http://www.quia.com/ |
| GoKnow software | a learning environment for mobile devices | http://www.goknow.com/ |
| ExamView | builds comprehensive tests | http://www.einstruction.com/products/assessment/examview/index.html |
| iWeb | Apple software for building websites | http://www.apple.com/ilife/iweb/ |
| Trackstar | lesson plan storage/depository | http://trackstar.4teachers.org/trackstar/ |
| ActivExpression | basic application on the Promethean board | http://www.prometheanworld.com/server.php?show=nav.15997 |
| Sharepoint | Microsoft collaborative work space | http://sharepoint.microsoft.com |
| Puzzlemaker | makes puzzles | http://puzzlemaker.discoveryeducation.com/ |
| DropBox | stores and shares files and folders over the Internet | https://www.dropbox.com/ |
| Schoology | learning management system | https://www.schoology.com/home.php |
| MyUdutu | rapid e-learning authoring tool | http://www.myudutu.com/ |
| Raptivity | rapid e-learning authoring tool | http://www.raptivity.com/ |

## Tools that support communication and cultivate relationships

| Application | Description | URL |
|---|---|---|
| Twitter | social networking tool | http://twitter.com/ |
| Jing | social networking tool | http://www.jingproject.com/ |
| Communicator | Microsoft product that supports communication and collaboration | http://office.microsoft.com/en-us/communicator/?CTT=97 |
| Diigo | social networking bookmarking tool | http://www.diigo.com/ |
| Delicious | social networking bookmarking tool | http://delicious.com/ |
| ePals | online international learning community | http://www.epals.com/ |

**Resources to support teaching and learning**

| Application | Description | URL |
|---|---|---|
| YouTube | video-sharing site | http://www.youtube.com/ |
| Study Island | online standards-based learning tools | http://www.studyisland.com/ |
| Study Mate | creates interactive assessment activities | http://www.respondus.com/studymate/samples.shtml |
| Kto8.com | database of exercises that reinforce critical skills | http://kto8.com/ |
| Mountain Math/Language/Science | skill-building and test prep software | http://www.mtmath.com/forum/mtmath.php |
| Grammar Girl | audio and text "mini-talks" on grammar | http://grammar.quickanddirtytips.com/ |
| GoAnimate | cartoon maker | http://goanimate.com/ |
| Starfall | phonics website | http://www.starfall.com/ |
| Google Earth | satellite images of the Earth | http://earth.google.com/ |
| Brainpop | animated, curriculum-based content activities | http://www.brainpop.com/ |
| SurveyMonkey | online survey tool | http://www.surveymonkey.com/ |
| ReadPlease | text to speech software | http://www.readplease.com/ |
| Thinkfinity | standards-based lesson plans and resources | http://www.thinkfinity.org/ |
| Holt Online | online textbook and grading system | http://my.hrw.com/ |
| Curriculum Associates | online curricular materials | http://www.curriculumassociates.com/ |

**Tools enabling students to create artifacts representing what they are learning**

| Application | Description | URL |
| --- | --- | --- |
| Voicethread | creates online picture documentary with text or voice descriptions | http://voicethread.com/#home |
| Glogster | creates interactive posters | http://www.glogster.com/ |
| Wordle | program that creates graphic representation of word usage | http://www.wordle.net/ |
| Google Docs | document sharing | https://www.google.com/ |
| BibMe | creates citations | http://www.bibme.org/ |
| Picnik | photo editing | http://www.picnik.com/ |
| Mixbook | creates picture books | http://www.mixbook.com/ |
| PhotoPeach | slideshows with photos, text, sound | http://photopeach.com/ |
| Notetaker | note-taking software for students | http://www.apple.com/downloads/macosx/home_learning/notetaker_aquamindssoftware.html |
| Frontpage | Microsoft Web design software | http://www.microsoftfrontpage.com/ |
| KidPix | drawing software | http://www.mackiev.com/kid_pix.html |
| Sketchy | animation and drawing tool | http://www.goknow.com/Products/Sketchy/ |
| Prezi | online presentation tool | http://prezi.com/ |
| Newsmaker | platform to make student newscasts | http://www.aboutnewsmaker.com/ |
| Camtasia | video production tool | http://www.techsmith.com/camtasia.asp |
| ArtRage | painting and drawing software | http://www.artrage.com/ |
| Tuxpaint | drawing program for ages 3–12 | www.tuxpaint.org/ |
| Audacity | open-source software for recording and editing sounds. | http://audacity.sourceforge.net/ |
| Garage Band | Apple software for recording and editing audio files | http://www.apple.com/ilife/garageband/ |
| Snagit | screen capture tool | http://www.techsmith.com/screen-capture.asp |
| Animoto | video production tool | http://animoto.com/ |
| Picasa | free photo-editing software from Google | https://www.google.com/ |
| Slideshare | upload and share presentations | http://www.slideshare.net/ |