Enhancing Professional Development for Teachers
Potential Uses of Information Technology

REPORT OF A WORKSHOP

Committee on Enhancing Professional Development for Teachers

National Academies Teacher Advisory Council

Center for Education

Division of Behavioral and Social Sciences and Education

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

THE NATIONAL ACADEMIES PRESS
Washington, D.C.
www.nap.edu

THE NATIONAL ACADEMIES PRESS 500 Fifth Street, N.W. Washington, DC 20001

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

Printed in the United States of America

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

The **National Academy of Sciences** is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Ralph J. Cicerone is president of the National Academy of Sciences.

The **National Academy of Engineering** was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. Charles M. Vest is president of the National Academy of Engineering.

The **Institute of Medicine** was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The **National Research Council** was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both Academies and the Institute of Medicine. Dr. Ralph J. Cicerone and Dr. Charles M. Vest are chair and vice chair, respectively, of the National Research Council.

www.national-academies.org

COMMITTEE ON ENHANCING PROFESSIONAL DEVELOPMENT FOR TEACHERS

Lyn Le Countryman (*Cochair*),* Malcolm Price Lab School, University of Northern Iowa
Chris Dede (*Cochair*), Harvard Graduate School of Education
Vinton G. Cerf, Google, Inc., Herndon, Virginia
Susan J. Doubler, TERC, Cambridge, Massachusetts
Janet English,** Serrano Intermediate School, Lake Forest, California
Javier Gonzalez,** Pioneer High School, Whittier, California
Will Tad Johnston, Department of Education, Augusta, Maine
Valdine McLean,* Pershing County High School, Lovelock, Nevada
Barbara Treacy, Education Development Center, Newton, Massachusetts

Staff

Barbara Schulz,† *Teacher Leader*
Jay B. Labov,† *Senior Advisor for Education and Communication and Staff Director*
Terry K. Holmer,† *Senior Administrative Assistant*
Steve Olson, *Writer/Consultant*
Donna Gerardi Reardon,†† *Staff Director*
Stacey Kyle, ††

---

*Member, National Academies Teacher Advisory Council
**Member, California Teacher Advisory Council
† National Academies Teacher Advisory Council
††California Teacher Advisory Council

NATIONAL ACADEMIES TEACHER ADVISORY COUNCIL

Wanda Bussey (*Chair*), Rufus King High School, Milwaukee, Wisconsin
Roxie Ahlbrecht, Robert Frost Elementary School, Sioux Falls, South Dakota
Bruce Alberts* (*ex officio*), University of California, San Francisco, California
Elizabeth A. Carvellas, Essex High School, Essex Junction, Vermont
Mario A. Godoy-Gonzalez, Royal High School, Royal City, Washington
Michael Koehler, Blue Valley North High School, Overland Park, Kansas
C. Ford Morishita, Clackamas High School, Portland, Oregon
Deborah Smith, Woodcreek Magnet School, Lansing, Michigan
Robert Willis, Frank W. Ballou High School, Washington, DC

Staff

Barbara Schulz, *Teacher Leader*
Jay B. Labov, *Senior Advisor for Education and Communication and Staff Director*
Terry K. Holmer, *Senior Administrative Assistant*

---

*Member, National Academy of Sciences (NAS). Alberts served as president of the NAS from 1993 to 2005 and founded the Teacher Advisory Council. He now serves as the representative from the NAS to the council. Because council members must spend at least 50 percent of their professional time working directly with students in classrooms, he serves as an ex officio member.

Contents

Appendixes

Preface

This report is a comprehensive overview of a unique workshop, held to explore a vision of the potential of online teacher professional development, its challenges, and the research needed to understand and advance this rapidly emerging area. In the workshop presentations and discussions, master classroom teachers joined with researchers, curriculum and information technology developers, professional development experts, state-level policy makers, principals, and foundation representatives. It is to all of the audiences represented by these participants that this report is addressed.

The journey to this workshop began in November 2002 when Bruce Alberts, then president of the National Academies, convened the first Teacher Advisory Council. This council was formed to enable classroom teachers to bring the wisdom of their practice into the Academies' work in education. That opportunity brought outstanding teachers together, empowering them as a community to "make a difference." The current members of the Teacher Advisory Council include teachers of science, mathematics, technology, reading, and English as a second language across the elementary, middle, and secondary grades. They teach in inner-city, rural, and suburban schools. Many are recipients of the Presidential Award for Mathematics or Science Teaching. At least one member from each educational level (elementary, middle, secondary) is certified by the National Board for Professional Teaching Standards. A primary criterion for serving on the council is that each member must spend at least 50 percent of her or his time in the classroom working directly with students.

ix

Over the past five years, the members of the council have spent substantial time in meetings providing advice to staff from across the National Academies who work on many aspects of education. The council was initially established for three years, after which an evaluation of its efficacy was undertaken. The Governing Board of the National Research Council (NRC) deemed the work of the council important enough to the education mission of the Academies that in 2005 it designated the Teacher Advisory Council as a standing board in the Center for Education of the NRC's Division of Behavioral and Social Sciences and Education.[1]

The teachers on the council also have sought to make a difference through designing and hosting two workshops, each on a different aspect of professional development, a topic that has direct relevance and impact, both positive and negative, on all teachers' professional growth, their willingness to remain in classrooms, and ultimately their ability to improve student learning. Teachers too often have experienced a "one-size-fits-all" professional development model, in which someone else decides what they need to learn. And too often experiences with professional development focus primarily on improvement (i.e., remediation) rather than professional growth and exploration of new ideas, cutting-edge developments in a teacher's field of expertise, or promising new pedagogies. This conventional model seldom meets the particular needs of teachers in specific fields and disciplines, such as mathematics, science, and technology. Recognizing ineffective professional development as a critical issue, the Teacher Advisory Council convened a workshop in October 2004 and issued a report called *Linking Mandatory Professional Development with High-Quality Teaching and Learning* (National Research Council, 2006).

At the same time, the council members sought to find organizations that might be willing to develop and sponsor state-level councils for teachers that would be modeled after the council at the National Academies. The first state council was established in California[2] under the sponsorship of the California Council on Science and Technology.[3] Javier Gonzalez, a founding member of the Teacher Advisory Council, worked with leaders at the California Council on Science and Technology to establish the California Teacher Advisory Council, becoming one of its charter members.

In an effort to build on the knowledge gained at the first workshop on linking mandatory professional development, the Teacher Advisory Council began to explore emerging opportunities in professional develop-

---

[1]Additional information about the council is available at http://www7.nationalacademies.org/tac.

[2]For more information see http://www.ccst.us/ccstinfo/caltac.php.

[3]For more information see http://ccst.us.

ment. Council members saw the potential for online learning technologies to provide professional development that could be far more tailored to the needs of science, mathematics, and technology teachers, to all teachers at different stages of their professional careers, and to teachers who are located in places where access to high-quality face-to-face professional development experiences to their schools is difficult.

Because so much of the information technology economy is centered in California, the Teacher Advisory Council began discussions with the California Teacher Advisory Council to organize the February 2007 workshop that serves as the basis for this report. According to the rules of the NRC, workshop planning committees must be comprised of experts in the areas on which the workshop will focus. Thus, a planning committee consisting of teachers from both councils and other outside experts was appointed by the chair of the NRC (biographical sketches of the planning committee members are found in Appendix D).

Flexibility is of primary concern for teacher professional development. Workshop participant Leah O'Donnell provided a clear statement about the potential of online learning technologies to transform professional development for teachers: "Different teachers have different needs, depending on such factors as the schools in which they teach, the students in their classes, their career stage, their previous experiences, and their individual preferences and learning styles." Information technology through online courses can deliver what teachers need, when they need it, and where they need it. This flexibility can make the same opportunities available to teachers everywhere, from the rural schools of Iowa, to the inner city of Boston, to the suburban schools of California—and beyond. At the same time, unless careful planning and budgeting are taken into account, these new technologies also could exacerbate inequities in hardware, speed, and dependability of connections to the Internet and technological training for teachers. It will be a challenge to provide equal access to all and not expand the "technology divide."

The workshop participants made clear that online professional development has the potential to alleviate many professional development concerns through flexibility, versatility, and leveling the playing field for teachers. For example, many workshop participants emphasized the versatility of information technology in teacher professional development. Online courses can be developed to address individual teachers' needs to increase their content knowledge, learn new pedagogies, and in the process build a common professional language. Online professional development also has the ability to expand learning communities beyond the boundaries of individual districts, states, and even nations, tying teachers together worldwide in their desire for personal improvement. The ability of information technology to expand the boundaries of professional learn-

ing communities brings the world to the fingertips and minds of teachers, improving the experience for all.

One of the challenges of online professional development is a general dearth of research on its effectiveness, combined with the facts that many teachers are unaware of these new technologies and are not included in discussions about their future uses. Bruce Alberts addressed both of these issues during the workshop:

> More broadly, the role of teachers in shaping online professional development needs to be a focus of research. . . . One thing we badly need research on, which I don't think has been directly addressed here, is exactly how to give teachers a voice, an appropriate voice, at school district levels, in what professional development they get. I would like to encourage a variety of different approaches in different school districts, associated with some evaluation of how those work. . . . If we can't give teachers a voice in their professional development, I don't think we are going to solve this problem.

It is our hope that, through this report, readers will discover the potential for expanded opportunities in professional development for all teachers that can be enhanced by information technology, as well as learn about the challenges that teachers face when expanding their own learning and the learning of students in their classrooms. Above all, we hope everyone who reads this report will better understand the benefits of empowering teachers to express their "wisdom of practice" and consider that wisdom to be an integral component of decisions about future research, products, and implementation strategies in what could be a new era for teacher professional development.

Lyn Le Countryman and Chris Dede
Cochairs, Committee on Enhancing
Professional Development for Teachers

Acknowledgments

xiii

The review of this report was overseen by Melvin D. George, president emeritus, University of Missouri, Columbia. He was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authors and the institution.

Model programs described in this report are those that were presented by workshop participants. Their inclusion in this report does not necessarily imply endorsement of any kind by the National Research Council. All web addresses listed in this report were operational as of April 2, 2007.

Introduction

Education researcher Gary Sykes has written that the professional development of K-12 teachers is "the most serious unsolved problem for policy and practice in American education today" (Sykes, 1996, p. 465). Teachers, like other professionals, need to stay informed about new knowledge and technologies. Yet many express dissatisfaction with the professional development opportunities made available to them in schools and insist that the most effective development programs they have experienced have been self-initiated (e.g., see National Research Council, 2006).

On February 8-9, 2007, a National Research Council planning committee hosted a 1.5-day workshop to explore a particular approach to the improvement of teacher professional development: the use of online learning technologies. The Committee on Enhancing Professional Development for Teachers operates under the aegis of the National Academies Teacher Advisory Council (TAC),[1] a standing board in the National Research Council's Center for Education,[2] and the California TAC,[3] which is part

---

[1]Additional information about the National Academies Teacher Advisory Council is available at http://www7.nationalacademies.org/tac.

[2]Additional information about the Center for Education is available at http://www7.nationalacademies.org/cfe/.

[3]Additional information about the California Teacher Advisory Council is available at http://www.ccst.us/ccstinfo/caltac.php.

of the California Council on Science and Technology.[4] The provision of professional development through online media has had a significant influence on the professional lives of a growing number of teachers. Growing numbers of educators contend that online teacher professional development (OTPD) has the potential to enhance and even transform teachers' effectiveness in their classrooms and over the course of their careers. They also acknowledge that it raises many challenging questions regarding costs, equity, access to technology, quality of materials, and other issues (e.g., Dede et al., 2006).

The workshop had several major goals. It sought to define the boundaries of OTPD, in part by examining online programs that are already in place. (Appendix C contains brief descriptions of several such programs and provides links to other programs that were described or referenced during the workshop.) It explored how online professional development could meet the varied needs of teachers throughout their careers and in a range of settings. The workshop also investigated the drawbacks and barriers to online approaches that have limited them to date and could continue to do so in the future.

Perhaps most important, the workshop was specifically designed to provide significant participation by and input from classroom teachers. Too often the "wisdom of practice" is largely missing from discussions of education research, policy making, and decision making. As Bruce Alberts of the University of California, San Francisco, said, "if you want to know how to make something work better, you go to the people who are doing it, as you do in the automobile industry. We learned from the Japanese that you have to go to the people on the shop floor to figure out how to make a better car. Why we continue not to do that as we should in the field of education is beyond me." Both the National Academies and the California TACs were founded and operate on the premise that teachers must have a voice in shaping what they do in their classrooms, the resources that are available to them, the policies that enhance student learning, and the future of the teaching profession itself.

Presenters at the workshop reviewed the relevant research undertaken to date and outlined future research that needs to be pursued. Participants also discussed what teachers, administrators, and policy makers at the local, state, and federal levels need to do to make much more widespread and effective use of these approaches. Although the programs and examples cited in the workshop focused primarily on professional development for teachers of mathematics, science, and technology, it should be

---

[4]Additional information about the California Council on Science and Technology is available at http://www.ccst.us.

noted that the general principles that were articulated at the workshop apply to any subject area of teaching and professional development.

This report is written as a narrative rather than chronologically to highlight the major themes that emerged from the presentations and from the rich discussions that occurred in both plenary and breakout sessions throughout the 1.5 days. The agenda, which lists the plenary, breakout, and discussion sessions in the order in which they occurred, appears in Appendix A. The diversity of interests and expertise of workshop presenters and participants is evident from the list of participants and their institutional affiliations, which also appears in Appendix A. Readings, case studies, and other materials that were distributed to participants prior to and during the workshop appear in Appendix B. Model programs of OTPD that were highlighted during the workshop are summarized in Appendix C, along with a list of helpful websites that were mentioned. Biographical sketches of the planning committee members and the workshop presenters appear in Appendix D. Readers are encouraged to contact speakers if they wish to obtain additional information about any of the points in this report. Access to all PowerPoint presentations is available on the website of the National Academies Teacher Advisory Council at http://www7.nationalacademies.org/tac/Potential_Uses_Presentations.html.

Quotations are from a transcript of the speakers' comments, and the report draws on PowerPoint presentations and other materials distributed prior to and during the event.

The planning committee and the two TACs that oversaw the committee's work viewed the workshop as an initial step into largely unexplored territory. By exploring the potential benefits and barriers to OTPD, the National Academies and California TACs hope to initiate more thorough investigations of the potential of online technologies to dramatically improve the professional development of K-12 teachers. They also intend to ensure that the voices and perspectives of teachers are fully reflected in future discussions and uses of online learning.

WHAT IS ONLINE TEACHER PROFESSIONAL DEVELOPMENT?

Just as new technologies have the potential to transform teaching, they also have the potential to transform teacher professional development. "Teachers used to teach in a one-room classroom," said workshop participant Barbara Thalacker of the California Department of Education. "Now they teach in a no-room classroom."

Ten to fifteen years ago, discussions of teacher professional development using advanced communications technologies would have focused on videoconferencing, satellite-based lessons, electronic bulletin boards, and other distance learning techniques. The use of these technologies

remains important today. For example, in settings such as isolated rural communities, electronic conferencing can be an important way for K-12 teachers to remain in contact with colleagues and other professionals elsewhere. At the same time, new interactive media are replacing older, more expensive means of distance learning. For example, Internet-based videoconferencing is less expensive than telephone or satellite-based videoconferences.

Today professional development based on electronic technologies increasingly refers to web-based, interactive experiences combining text, video, and sound. It is often asynchronous, in that all participants do not have to be engaging in an experience at the same time (as is the case with e-mail). Yet OTPD also can be richly interactive, in that it can give participants multiple opportunities to reflect on issues, questions, or answers before responding online. With courses taken in person, said National Academies TAC member Valdine McLean, who teaches science at Pershing County High School in Lovelock, Nevada, "often you are just a name or a number, with very little interaction with the professor or classmates. Only the loud extroverts are heard in any discussion-type settings. . . . That's not who I am. I am the quiet person who you will never hear. By the time I think and feel that I have something valuable to contribute, your conversation has already passed me, so you never hear my voice. How many students are like that?"

Online, said McLean, "my voice can be heard. I am a reflective thinker. I can contribute quality responses to my peers. It's very intense and specific. I improved my knowledge, my skills in content, and my ability to deliver better as a teacher with each course." (For a description of McLean's experiences with OTPD, see Box 1, "One Teacher's Experience—Pursuing a Master's Degree Online.") McLean indicated that research documents that many students who are mute in face-to-face settings find their voices in some form of "mediated" interaction.

The movement of teacher professional development to the web reflects important trends in the broader society, according to Chris Dede of the Harvard Graduate School of Education, cochair of the workshop planning committee. Today, thinking is distributed in ways that it has not been in the past. For one thing, thinking is distributed among groups of people. "A lot of work has moved to teamwork," he said in his keynote address. "In the 21st century, that is going to be even more true. It may not be true in schools, but it is very much true in society."

Thinking also is distributed across space and time, Dede observed. "Not only do you have to be able to collaborate with whoever is sitting across the table from you, but you may have to collaborate with somebody halfway across the world from you."

K-12 education has been slow to recognize and react to this seismic

---

BOX 1
One Teacher's Experience—Pursuing a Master's Degree Online

Valdine McLean had been teaching science for 15 years at Pershing County High School in Lovelock, Nevada, when she decided that she wanted to get a master's degree in science education. McLean has two children, and Lovelock is too far away from a college to attend in person, so she searched the web for an online program, and in 2003 she enrolled in the online master's program at Montana State University.

"I really struggled with my first two courses, because I never had to do this on campus," McLean recalled. "You had to reflect on the readings. You had to illustrate an application of the science and pose a thought-provoking question. If you didn't do that, you scored low. I had never done that before. It was a whole new level of participation."

McLean took a course on science education and one or two science courses each semester, putting in 40 to 50 hours in addition to her normal teaching responsibilities. But "my classroom students were my partners in research," she said. She did special projects with them in such areas as hydrology and astronomy, applying what she was learning online in the classroom even as she used her school experiences to satisfy the requirements of her online courses.

She found herself bonding with a far greater range of people online than she ever had in a face-to-face course. "The experience was shared from a worldwide audience—professors from UCLA, Arizona, Alberta, Canada, and the Montana State staff. We had student colleagues from Colombia, Japan, Afghanistan, Sarajevo, Pakistan, and all across the U.S." At the capstone event, at which the online students finally met each other in person, "it was like trying to find your lost brother or sister."

Since receiving her degree in 2005, McLean has been a steadfast proponent of online professional development in her work in Nevada and as a member of the National Academies Teacher Advisory Council. "This can be a valid and rigorous form of learning," she said. "I am very passionate about sharing that, because this experience changed me."

---

shift in the broader society, Dede said. "If teachers are going to prepare students for 21st-century work, they have to understand 21st-century work. In schools, there is no opportunity to do that. . . . Thinking, working, and learning are now richly distributed in just about every sector of society except education. Why don't teachers deserve the best? . . . If we believe all these reports on global competitiveness and the centrality of the U.S. education system for economic development, why don't we think about online professional development from a sophisticated perspective?"

Most teachers are eager to learn and change, workshop participants said. But they need to be engaged in the same way that students are

engaged. Teachers "are like anyone else," said California TAC member Janet English, a former middle school teacher currently working for KOCE-TV in Huntington Beach, California. "They want things that engage their learning, but they are not going to do something that is boring, that takes their time, or is another requirement, because teachers' schedules are so filled with requirements now that it is harder to teach."

Because of their immersion in an online world outside school for entertainment, communication, and personal expression, many students have skills and perspectives that previous students did not, Dede pointed out. Today's students are accustomed to acquiring information when and where they want. Using search engines and instant messaging, they often look for small bits of information to support a position. Most high schoolers have grown up with the World Wide Web.

Most teachers, in contrast, have to undergo a cultural change to become thoroughly fluent with current technologies. Yet such a change can have a dramatic impact on individual teachers and on their students. "We need to inspire teachers to look beyond their classroom model, to inspire deeper thinking, to think about things in new ways, to communicate with people around the world, to act like scientists," said English.

Teachers also need to be familiar with new ways of learning to take advantage of them in schools. "If we are not increasing the effectiveness and efficiency of teachers in the classroom, managing curriculum and managing information, I think we are missing the point," said Thalacker. As Dede said, "Maybe the real thing about online professional development is not whatever content we put into it, but the process of experiencing it, and experiencing something that is like what kids experience."

Unless teachers can experience this world themselves, they may be unaware of the influence and power these technologies have on students' lives. "And if I have learned one thing in my own 35 years of teaching, it is that you have to start where the learner is," said Dede. "If you don't do that, you're dead, no matter what else you do."

In that respect, experiencing the online world through professional development opportunities may be as important for teachers as the content conveyed. "We know as teachers that the process of communication is as important as the content of communication," said Dede. "Anyone who has sat through a professional development lecture on the importance of doing has resonated to the impact of that."

Online technologies have slowly begun to have an impact on K-12 education, and considerable discussion at the workshop centered on how much more forceful that impact could be. Maybe some math lessons will become immersive collaborative electronic simulations. Or maybe students will someday use their cells phones as an augmented technology to guide their interactions with each other or with the learning environment.

Rather than telling students to turn off their electronic devices when they enter a classroom, teachers could put those sophisticated artifacts to work for learning. "In this way," said Dede, " learning could be deeply embedded within the social context in which many students live."

These approaches could be applied to online professional development as well as to classroom teaching. In this way, online experiences for teachers could be tailored for their individual learning styles. "People learn in different ways," said Dede. The comparison he often makes is with sleeping, eating, and bonding. Sleeping is fundamentally the same for all people, Dede observed. That's why it is not difficult to design hotel rooms, because they are all designed to help people sleep.

Eating is more diverse. "People like to eat really different things, and they like to have the process of eating take place in different ways." That's why restaurants are so diverse, because they are trying to serve these many different needs and preferences.

Bonding is even more complex. "People bond to pets, to sports teams, to groups. They bond sexually, platonically, with the same sex, with the opposite sex, with people who are opposite, and with people who are similar."

"The punch line is that we treat learning like it is sleeping," said Dede. "But from everything we know, learning is like bonding, or at least like eating. Yet the very best of our academic environments at every level of education have less variety than a bad fast food restaurant. . . . And even more narrow than the bad fast food restaurant is the range of learning styles our professional development accommodates now."

The flexibility of OTPD can enable schools, districts, and states to tailor material to meet their individual needs. For example, William Thomas of the Southern Regional Education Board (SREB),[5] a policy organization that works with 16 state governments to improve student performance, noted that "every one of the SREB states is doing some level of online professional development." But departments, schools, and districts "are picking and choosing where it makes sense for them."

One of the ways in which OTPD is flexible is that it occurs on different scales, according to Raymond Rose of the consulting group Rose & Smith Associates. Some professional development experiences can be very brief. "If you want to get help to do a specific application, you can go online and get a tutorial. Short [i.e., brief sessions] works online," said Rose. Other online experiences can extend over the course of a year or longer. "As with face-to-face professional development, there is a range of things online," Rose said.

In addition, online professional development can be geared toward

---

[5]Additional information is available at http://www.sreb.org/indexPage2.asp.

teachers at different stages of their careers, observed Louis Gomez of Northwestern University. "The goal of new technologies, rather than trying to find the best of the best, is to find things that people at all stages of their careers can talk about and improve."

Peter Bruns of the Howard Hughes Medical Institute expressed interest in the "power and strength" of online professional development. He asked about the importance of the "human connection." Do proper facilities for promoting professional development and a support structure of experts and teacher colleagues need to be in place first or are finely tuned and exciting programs sufficient in and of themselves? Bruns ventured that "I'm sure there is utility in both, but is there some way we need to worry about that?" Dede agreed, "I do think that it is both. I think which is more important first depends on who you are and where you sit and what your needs happen to be. If we took a survey in this room, we might end up with a pretty diverse set of needs that would be answered by different parts of this complex professional development design space."

OTPD is often combined with other kinds of professional development experiences, observed Rose and others (e.g., Marcia Linn, of the University of California, Berkeley) at the workshop. These blended or hybrid models provide an additional dimension along which online programs can vary. "There are a lot of pieces that you can pull together from some of the face-to-face channels and some of the online channels to craft professional development that meets the needs of individual teachers," said Leah O'Donnell of the consulting firm Eduventures.[6]

This flexibility has led many schools to take at least some initial steps to provide their teachers with online professional development. In one survey reported by O'Donnell, a third of school districts reported that they provide some form of online professional development for teachers (Wiley, in press).

Yet more traditional forms of professional development remain prevalent. In another survey of 300 teachers across the country (Wiley, in press), more than six in seven teachers reported participating in one-day workshops, face-to-face training, and other conventional professional development experiences. Participation in online programs was markedly lower. "I don't think this is particularly surprising," said O'Donnell. "The online channel is a new kind of technology, a new way of thinking, a new way of doing things. . . . The more traditional forms of professional development still dominate what we are seeing today."

The same survey showed that administrators expect to be investing new money for professional development into traditional rather than

---

[6]Additional information is available at http://www.eduventures.com/index.cfm?pubnav=home.

online channels. "Despite the fact that you are getting more and more feedback from teachers and from administrators that one-shot workshops are not very effective, that they want things that are more tailored to their experiences and more interactive—all these wonderful things that online professional development can bring to the table—it's a slow tide that is changing," O'Donnell said.

MODELS OF ONLINE TEACHER PROFESSIONAL DEVELOPMENT

At various points during the workshop, participants described online programs of professional development with which they have been involved. The workshop planning committee decided to include both for-profit and not-for-profit programs so long as the organization offering a program had an ongoing research program to evaluate its efficiency and planned to share those data with the research community.

The programs described at the workshop are presented in Appendix C. They represent just a fraction of the programs currently being offered. Nevertheless, they demonstrate the diversity of approaches being taken and the opportunities offered. Appendix C also lists several additional programs reviewed by workshop participants but not discussed at the 1.5-day event.

Advantages of Online Professional Development

Online teacher professional development (OTPD) has many potential benefits for teachers, schools, districts, and states. According to statements and discussions by a number of workshop participants, its greatest potential benefit should be the improvement of student learning, as is the case for all forms of high-quality professional development. "Online professional development, when it is done well, has the opportunity to change teachers' practice," said National Academies Teacher Advisory Council (TAC) member and planning committee cochair Lyn Le Countryman of the Malcolm Price Laboratory School in Iowa, "and we know that teachers' practice is the most important factor impacting student achievement." Rose concurred, saying "Experience is the encapsulation of practice. I believe that those data, collected by a whole bunch of folks, suggest that teacher practice is probably the most important thing that we can improve to improve kids' lives."

Other potential benefits of online professional development were discussed by workshop participants:

- *flexibility and versatility,*
- *potential to build community among teachers and across groups,*
- *new possibilities for accountability,* and
- *improvement of teacher retention by enabling teachers to become more directly involved in their own learning and professional growth.*

FLEXIBILITY AND VERSATILITY

Compared with the one-time workshops and face-to-face sessions that are characteristic of most current professional development, online programs can take a very wide variety of forms, with concomitant advantages of convenience, scalability, and adaptability. "You can't compete with the anytime/anywhere [capabilities] that online professional development can provide," said O'Donnell.

Different teachers have different needs, depending on such factors as the schools in which they teach, the students in their classes, their career stage, their previous experiences, and their individual preferences and learning styles. If properly structured, online programs can be customized and tailored to meet these varying needs. For example, modern information technologies make it possible to store and tag huge amounts of data so that people can access them in different forms, edit them, comment on them, share them, interact with them, and acquire pieces to create their own lesson plans or resources. "There is a real ability to share vast amounts of content, keeping it up to date and relevant to what teachers are looking for," said O'Donnell.

Furthermore, although it may be labor intensive, once a flexible and versatile online system has been developed, the number of people who can make use of it is essentially unlimited. OTPD is therefore eminently scalable, in that the same system that can be used by the teachers in a single school can potentially be used by teachers around the world. As Thomas put it, "Once you have a course developed, multiple people can use it."

COMMUNITY OF PROFESSIONALS

Teaching, which is one of the most social of activities, can also be very isolating. According to TAC member Deborah Smith, a second grade teacher at the Woodcreek Magnet School for Math, Science and Engineering in Lansing, Michigan, "Sometimes schools are deserts for teachers, if there is really not anybody there you feel you can talk to about your passions in teaching and about kids in the way that you would like to talk about kids."

Online technologies in general and some kinds of online professional teacher development programs in particular can help build the community that is so often missing from the daily lives of teachers. Teachers can interact with each other online in real time or asynchronously, offering them time to reflect on an ongoing exchange. Online interactions "capitalize on the collaborative nature of learning to create an expansive synergy between people and connections," said Le Countryman. Or, as Bruns put it, "We can maybe think of it as 'no teacher left alone.'"

One great benefit of online professional development is that it can provide teachers with a common language to communicate about teaching and learning. "We don't have good language to talk about instruction," said Gomez. Online technologies "can go a long way to deepening the professional language of instruction that we can share." For example, such technologies can help generate "shared beliefs about what instruction looks like," according to Gomez. When an educator refers to "ambitious instruction," online technologies can show what that term implies. In this way, Gomez said, online exchanges can make instruction less idiosyncratic or ambiguous and thereby create a stronger professional community.

Online technologies also can build community between teachers and other groups. "Teachers work in a number of different contexts," said Hilda Borko of the University of Colorado's School of Education. "We work in our classrooms, in school communities, in the community, and in professional development courses. One feature of effective professional development is [that it] bridges these multiple settings."

For example, online communications can establish connections between teachers and the administrators in their schools, as several workshop participants pointed out. Such experiences can build the skills and knowledge of each group about the other's areas of expertise, which makes it easier to achieve consensus within a school. In turn, online communications can link teachers and administrators to education researchers. "[They can] make the practice of teaching and administration and doing research to help improve schools be a part of one shared community of language, beliefs, and values," said Gomez.

Professional development that uses online technologies can also connect schools to schools, schools to districts, districts to other districts, and states to states. It can seek out the commonalities among schools serving different groups of students, with benefits to all partners. In addition, it can tap into expertise no matter where it is located, so that teachers with a specialty or an expertise can serve as resources for teachers elsewhere. With online professional development, said Planning committee member Tad Johnston of the Maine Department of Education, "you can leverage, consolidate, and share promising practices in your district, so that pockets of excellence don't have to remain pockets." According to O'Donnell, teachers "can get what they need from people around the country, around the world, that they might not be able to access within their own district."

Many teachers enjoy the opportunity to become leaders for other teachers (additional discussion about teachers serving as leaders can be found below). They can act as coaches, instructors of online courses, and leaders in their schools and districts. "Teachers truly are effective

leaders and really enjoy being involved in online professional develop-ment," said Planning committee member Barbara Treacy of the Education Development Center in Newton, Massachusetts. "Their colleagues like learning from a colleague. [This] peer-to-peer relationship is very power-ful. It's good face to face, and it works extremely well online."

According to David Zarowin of the Harvard Graduate School of Education, another benefit is that, "in sharp contrast to the typical work-shop, where you sit for three hours and you get a whole bunch of really good ideas, but you are left to your own devices as to how to integrate this into your practice, [courses taken online] are courses where you learn something, you get a little bit, you try it out in the classroom, you reflect on it, and then you develop your practice."

ACCOUNTABILITY

Perhaps, counterintuitively, OTPD offers more opportunity and scope for assessment and accountability of participants than does face-to-face professional development. "There is no hiding under the chair in the back row," said Andee Rubin of TERC in Cambridge, Massachusetts. "It is easy for a facilitator to note whether someone is present, and also the quality of their learning from the very beginning." Similarly, facilitators have more opportunity to bring a person into a discussion who isn't participating.

Usually, a failure to participate is not a major concern, according to workshop participants who have taken online courses. Teachers "are in there posting and posting, and coming back and seeing what the other teachers are saying, and learning from that sharing in the online com-munity," said O'Donnell. "It's very reflective and involving." Because the participants have time to think about an activity or issue and post com-ments or responses, they have ways to communicate that are not possible face to face.

OTPD also offers opportunities for assessment that go beyond what can be done with face-to-face programs. When someone is working at a computer, the software being used can capture all of the information exchanged through a keyboard, mouse, video camera, or microphone. "There are lots and lots of data that are automatically collected in an online workshop because of the technology," said Treacy. "We have to learn how to capture it and how to take the time to look at it. There are incredible opportunities for more assessment and more accountability, as long as we take advantage of it."

"You can see what teachers are doing, where they are going on the web, the amount of time they are spending on something," said O'Donnell. "You can track some of the accountability and outcomes that go along with these forms of professional development."

Remarkably, instructors typically claim to know their online students better than their face-to-face students. "We have heard that over and over again," said Thomas. "It's something that we don't want to lose sight of as we move down the road."

RETENTION

The turnover of K-12 teachers in many parts of the country is a severe challenge both to educational stability and to developing quality programs for professional development. Though virtually no data have been collected on the topic, some workshop participants suggested that online technologies may offer a way to attract new teachers into the profession and retain current teachers—especially in areas of science and mathematics, in which teacher shortages are most severe. "We might have the best staff development program going, but a year or two later, a third or 50 percent of the teachers that have experienced that training are gone," said Thomas. "Online learning would allow us to go back and pick up those new teachers coming in and work with them."

Increasing numbers of young people who are considering becoming teachers are likely already to have experience with new information and communication technologies. If they see teaching as a profession that employs these devices productively, they may be more likely to make a commitment to teaching. "This can be a great tool for getting those younger teachers engaged and feeling that they have support in a lengthier context," said O'Donnell. Or, as Dede pointed out, the lack of modern technologies in the classroom is sure to have a discouraging effect on newer, younger teachers. "We throw away a tremendous amount of talent in young teachers, just as we throw away a tremendous amount of talent in young kids."

Online technologies are not just for new teachers. Teachers at any stage of their careers can benefit from the new ideas and new connections made possible through them. "What I am looking for as a teacher is professional development that is refreshing to my mind, my spirit, my teaching, and my community," said Smith, a teacher with many years in the profession. "I think all of us get to a place in our careers where we feel kind of dull and jaded. We need connections to opportunities to learn and people to learn with that help us feel, 'I'm ready to go. I have something to tell or teach or make available to kids.'"

Because teachers at different points of their careers have different needs and interests, some may see current professional development offerings as a waste of their time. "I notice that many of my colleagues do not take advantage of professional development opportunities because they see it as something that they really don't need or it's not interesting

to them," said National Academies TAC member Robert Willis of Frank W. Ballou High School in Washington, DC. "The benefit of an online program would be that teachers can tailor a program of professional development according to where they are and what they need."

Even teachers nearing the end of their careers can benefit greatly, said California TAC member Sandie Gilliam, who serves on the California Mathematics Council.[1] More experienced teachers need help with new approaches to pedagogy and with content that is more suited to today's students, and even experienced teachers can be novices in some areas. Keeping these teachers engaged and working makes it possible to take advantage of their years of experience. "I could retire if I wanted to now," said Gilliam. "I don't want to. . . . So even though you want to work with the younger teachers and the ones who are in the first five years to keep them teaching, think about us, too."

Another group of teachers who can benefit are those who serve as mentors to less experienced teachers in online networks. Workshop participant Barbara Shannon of Westridge School in Pasadena, California, served as an online mentor through a program known as E-Mentoring for Student Success.[2] "It gave me a group of young people, whom I didn't even know, who looked up to me as a mentor and asked me for knowledge," said Shannon. "I went back and told my colleagues about the program, and other people I met. I told my students about the program. They told their parents about the program, . . . and they went back and told the administrators about the program. So now we are looking into online professional development at our school because of what it has done for me."

---

[1] Additional information is available at http://www.urbanedpartnership.org/catalog/providers/133.html.

[2] Additional information is available at http://hub.mspnet.org/index.cfm/showcase_project/project_id-53.

Obstacles to Online Teacher Professional Development

Along with its potential benefits, online teacher professional development (OTPD) has many potential barriers to its implementation and effective use. Workshop participants discussed possible problems posed by inadequacies in a number of areas:

- knowledge about online technologies and programs;
- support from administrators;
- access to technologies;
- time, financial support, and parental support;
- materials;
- support from higher education; and
- teachers' beliefs and practices.

LACK OF KNOWLEDGE

Although most teachers have heard of OTPD, relatively few have experienced it. For example, despite their presence at a workshop on OTPD, fewer than half of the very experienced teachers and teacher leaders in attendance had actually taken an online course or engaged in other forms of online professional development. Many knew that such courses were available, but they did not know where to go online to find them.

According to Lyn Le Countryman and other workshop participants, part of the problem is that they are unaware of any central listing or clearinghouse of online professional development opportunities for teachers.

Websites set up by organizations typically do not link to others with similar offerings. And research findings or assessments of online programs by independent evaluators are rare.

Also, educators rely heavily on peer recommendations and scientific research when making decisions about professional development, surveys have shown. A lack of experience with OTPD therefore limits the likelihood of personal recommendations. And a lack of good scientific research on the quality and impact of online programs may be holding back their adoption. (Scientific research on OTPD is the subject of the next major section.)

Finally, surveys show that educators desire face-to-face interactions in professional development (Wiley, in press). If they are unaware that online approaches often incorporate such interactions as part of blended or hybrid programs, they may be biased against online opportunities and fail to seek them out.

LACK OF SUPPORT FROM ADMINISTRATORS

As important as it is for teachers to know about the potential of online opportunities for professional development, it can be even more important for principals, curriculum supervisors, and other administrators to know about their potential, since they are the ones who usually make the decisions about professional development options and control the funding for them.

However, surveys have shown that many administrators remain skeptical about the merits of OTPD. According to one survey, "administrators typically thought that online channels were very low in terms of effectiveness, and teachers ranked them relatively high. That was the biggest gap in perception," said Leah O'Donnell (Wiley, in press).

Districts also have a tendency to create and retain their own professional development programs. These programs could still employ online technologies, but "if you have a district or administrator who isn't particularly familiar with online channels and is keeping a lot of professional development in-house, it's going to tend to create some of the more traditional face-to-face or workshop situations," O'Donnell said.

One of the best ways of making administrators aware of the potential of online professional development is to have them participate in an online course. Administrators also need evidence of the effectiveness of current offerings if they are to make good decisions.

LACK OF ACCESS TO TECHNOLOGIES

Advocates of OTPD often depict students as fully immersed in a wide range of communications technologies—but that is true of only some students, not all. "My kids are not like those kids," said Deborah Smith of her students in Lansing, Michigan. "They have video and TV at home, and they may have some games and things. But they don't have computers, they don't have cell phones, and they are not engaged in the kinds of things that [some other] kids are."

The same can be said of teachers. While some have access to technologies at school or in their homes, others do not. As Smith said, "We may have cell phones, and we may have a computer at home that is a laptop that the state gave us ten years ago that couldn't do anything like that. But we really need to think hard about the equity issues." Martha Valencia of the Los Angeles Unified School District's Instructional Technology Branch said, "There is really only a 10 to 20 percent access level across the different campuses, from elementary all the way to high school."

Even if teachers have access to computers, those computers don't necessarily work well. Without a technology support person who can provide a quick response to a problem, the frustrations of getting computers and software to function may negate the value of OTPD. "Over the three years that we have been working in schools, there have been fewer and fewer tech support people available, and if they were available, they were no longer very close to the school site," said Linn.

LACK OF TIME, FINANCIAL, AND PARENTAL SUPPORT

On one hand, OTPD has certain economies of scale, in that the same online system can be used by an indefinitely large number of teachers. On the other hand, Chris Dede said, "Most online professional development involves facilitators, the availability of whom may constrain scale."

OTPD is not free. Materials cost money to develop. Schools and districts often need to enter into licensing agreements to use an OTPD program. Licensing agreements have their own set of constraints, thereby limiting teachers' ability to make any changes for classroom use. Hybrid programs, consisting of both online and face-to-face programs, add costs to the online expenses. In general, effective professional development approaches do not fit the profile of a passive online system composed largely of readings and videos. Program developers, online facilitator and mentor training, and custom-designed programs are all costly. Administrators often have to make difficult trade-offs regarding the resources that they decide to devote to traditional and online professional development, according to Barbara Treacy, Leah O'Donnell, and others.

Then again, as several workshop speakers pointed out, schools already

spend substantial amounts on professional development. "A district could spend $7,000 on a single speaker," said Valdine McLean. "Or the district can apply the same amount of money to 21 to 49 people, depending on how they divide it up, providing intense specific content and skills for improved instruction, and then rotate the next set of people, so that each year some of your staff is getting improved."

OTPD also requires that time be made available in teachers' schedules. Administrators sometimes assume that online professional development can be done on teachers' own time away from school, but like any other work-related expectation to be completed outside of contractual time, this expectation is unfair and counterproductive. "Teachers need to be given the same number of opportunities to participate [in online professional development] as they would if it were a face-to-face workshop. Time needs to be devoted to that," said Liz Pape of VHS, Inc., in Maynard, Massachusetts.

A lack of knowledge among parents is another potential barrier. Despite the growing presence of technology in their own lives, many parents continue to believe that education in schools should be delivered entirely by teachers—an attitude that they often extend to teachers' professional development as well. "[Parents] say, 'We want our children to be educated the way we were. We are successful. We want the same thing for our children,'" said William Thomas. "Somehow they don't connect the dots, that a new world is there available to their students" (as well as to their teachers for professional development).

LACK OF MATERIALS

Although the amount of professional development material available online is large and growing, this material does not necessarily cover all needs for all teachers. Some areas of the curriculum, some age groups, and some teacher backgrounds are still not addressed. For example, "there are different needs at the beginning and at the end [of teachers' careers]," said Janet English. "We need to make products that will make them want to use them. If they don't want to use them, it's not a successful product. [And] if it's too complicated to use, it's a poor design."

Developing materials for professional development in science and mathematics also presents challenges, noted Andee Rubin. "If we value the creation of online communities for scientific inquiry, then . . . you must provide students with the ability to create representations that they can think with and use as evidence as part of their scientific community involvement," Rubin said. She noted that many of the tools needed for high-quality, effective online professional development in math and science are not yet widely available.

Materials for online programs also need to be engaging if teachers are to make wide use of them. As English said, "What teachers really want to do at the end of the day is go home, relax a bit, be with their family, get through dinner, get through homework, and try to do something creative to fulfill themselves and have enough energy to go back the next day." One way to ensure the necessary level of engagement, noted participants, is to involve teachers in the development of materials, so that online tools reflect what teachers want and need. An additional way, said workshop participant Cornelius Sullivan of the University of Southern California, is to draw on "some of the basic principles of the entertainment industry." When lessons can be structured in such a way that they are emotionally engaging, Sullivan pointed out, "the audience doesn't forget the lesson or the excitement."

However, Dede also reminded workshop participants that one potential drawback of the content and use of online technologies as they are currently configured is that they can isolate some users just as easily as they can build community among others. Today, for some students, online technologies more often act as a distraction from learning than as a tool for learning. "We have this wonderful engine for learning . . . that typically has junk inside it," said Dede. "We can't control that from within the academic setting. But we can put up a fight by coming up with things ourselves that are engaging and interesting and powerful."

LACK OF SUPPORT FROM HIGHER EDUCATION

The instruction that future teachers receive during their undergraduate and graduate years can have a powerful influence on how they teach. Yet colleges and universities have been very slow to adopt the approaches that have so much potential for OTPD.

That's a contradiction, Dede pointed out, since faculty members "are part of a very wide-ranging virtual community of practice that is actively engaged in richly interpreting data. Yet some of the same people who have gone through that transformation in their research lives will blithely march into a lecture with 10-year-old notes, feeling proud of themselves if they have put their syllabus up in PDF form and are using PowerPoint instead of chalk. They don't get it."

The education that future teachers receive in college comes up short in other ways, Smith noted. Even though future science teachers often take many of the same courses as future scientists, "many teachers have felt alienated from science and don't see themselves as valid participants in the scientific community," she said. "The opportunity to engage in the actions, talk, and tools of science is a really important thing to offer teach-

ers. We need to have teachers feel that they are part of the scientific community and see themselves as scientists. How will they model science for children if they aren't?" Many workshop participants agreed that online technologies may provide a means to overcome this gap in experience from higher education by making it possible for teachers to work more closely and directly with scientists and engineers in a number of venues, including research projects and mentoring relationships.

CHANGING TEACHERS' BELIEFS AND PRACTICES

To be effective, online professional development has to change the knowledge, beliefs, and values of teachers. Simply moving ineffective forms of professional development onto the web will do little to effect this transformation. "Simple structural characteristics are not going to change anything," said Louis Gomez. "We need to understand, first, what we want schools to do. Second, we need to understand specifically what sorts of tools might support that."

Changing teachers' practices often requires unlearning past practices as well as learning new practices, said Dede. "It is unlearning fluencies and skills that we have built up over a lifetime, first being a student within a conventional system and then teaching within conventional systems. Unlearning is really hard, because it is not primarily an intellectual activity. It is an emotional activity and a social activity. When you look at unlearning in other parts of life, like unlearning bad eating habits or sedentary exercise habits, where it tends to be effective is putting cohorts of people face to face and having them unlearn together, sharing their success and failures, providing moral support for one another. Can that really happen online? Some of it can happen online for some people. How much of it can happen for teachers is an interesting question."

Also, using online technologies to learn new teaching practices can be difficult, Dede acknowledged. "I have looked at video case studies of teaching—I have actually helped to design some video case studies of teaching. I have watched people wrestle with watching and interpreting and defining video case studies of teaching, and it is hard. It is hard to watch somebody else's practice richly captured and then transfer it into your own strengths, your own material, your own students, and your own context. I do think that it is a good idea, but it is not simple in any sense. It is a very demanding, labor-intensive, and expensive form of pedagogy that has a big grain size associated with it. It's not the kind of thing where you can say, 'I've got a half hour. I'm going to sit down, watch a video, study math teaching, and see if I can pick up some hints on how to manage the discussion between boys and girls.' It is a lot more complicated than that."

"At the end of the day," said Gomez, "[teaching and learning] are about being interpersonally and emotionally connected with the things that you do." Online technologies can foster that connection, but they cannot create a connection all by themselves. "If online is the frosting," said Dede, "how much have you really changed the cake?"

Teacher Leadership

Opportunities for teachers to play leadership roles are strong in online professional development. For example, as Barbara Treacy explained, the EdTech Leaders Online program offered by the Education Development Center is "a teacher leadership model. It's a capacity-building model where we work with any educational organization to help them figure out how to use online learning to meet their goals." An organization's leadership selects staff to be trained to become online professional development instructors, thereby creating a long-term relationship and capacity building in a school district.

For example, in Mississippi, a cohort of 24 online facilitators were trained by EdTech Leaders Online and now are offering online summer courses to teachers who hold emergency certification; 90 percent of these teachers complete the course that also matches their content areas and assigned grade levels.

In the Los Angeles Unified School District, there is a growing opportunity for teachers to receive online professional development. According to Martha Valencia, many of the district's teachers prefer to take the required professional development online; surveys of teachers indicate that this mode is popular because it allows them greater flexibility in their schedules to complete the program and also to avoid long commutes to professional development sites.

Teachers who want leadership opportunities have doors open to them through training to become online trainers, online course developers, and part of an online program development both in their own school districts and in some of the many online programs now available nationally. This could become a new step in a teacher career pathway.

The Need for Research on Online Teacher Professional Development

Very little research has been done on the effects of online professional development on teachers or their students. For that matter, not much is known about the impact on teachers of professional development in general. "The reality is that we know very little about what characterizes effective teacher professional development," said Hilda Borko. "If we want to be able to gather the information necessary to guide professional development, we have a big task ahead of us."

Many additional questions remain to be addressed by research on online teacher professional development (OTPD) , workshop participants pointed out. Most broadly, "What is the benefit?" asked Raymond Rose. "Is it only [for] the teachers who are techies? Is it only the teachers who have been doing things for a long time? And what are the benefits . . . to teachers' students? Is it all kids? Is it one kid? Is it only the white kids? You need to be asking those questions and requiring answers," Rose stated.

Another interesting set of questions revolves around how OTPD is structured. For instance, Dede observed, "What is the grain size of meaningful professional development for teachers? Is it ten minutes? . . . Is it two hours? Is it a day, a month?"

Similarly, can all of teacher professional development occur online? Dede said that he thought not, but "Do we know what the proportion is, the blend? No. There are a lot of unanswered questions."

The effect of online professional development on teachers at different points in their careers remains an open issue. "We need to know from

teachers at all levels in the professional continuum what helps if you are a first-year teacher, what helps if you are an accomplished science teacher, what helps if you are a master teacher, and what are the different ways that people can use these resources to enhance their teaching and student learning," said Smith.

Research is also needed on specifically what teachers learn through online professional development. Do they learn mainly content knowledge, values, new perspectives on teaching, or gaining a better understanding of how their students are learning and where they are in the learning continuum? An especially valuable way to address this question (and many others) is to ensure that teachers are full partners in ongoing research programs. "If there was some way . . . to include teachers online as part of scholarly work, it would be a . . . way to keep us experienced teachers feeling like we can still make a difference," said Sandie Gilliam.

One reason why relatively little research has focused on professional development is that such research is "time-consuming and labor intensive," according to Borko. She described a study in which she and her colleagues reviewed videos of teachers who were watching videos of themselves teaching a lesson. The researchers sought to answer several questions: How could teachers become comfortable sharing video? What was the nature of the discussions? How did this discourse change over time? What role did the facilitators play? As reported in an article scheduled to appear in *Teaching and Teacher Education*,[1] it was only after extensive study that the researchers concluded that the teachers were able to engage in highly reflective conversations about the videos and that these conversations became richer and more extensive over time. They also found that the direction provided by a facilitator had an important influence on the conversation. "When a facilitator provides handouts with questions to both guide the watching of a video and also guide the discussions, it was very helpful," Borko said.

However, most studies have not probed deeply into what teachers learn from professional development, whether online or face to face. As Andee Rubin pointed out, "I don't think we have much of the research that we need. Most of the research I have seen is about process, retention, facilitators' roles, schedules, and support from different stakeholders. One difficulty is that standardized tests based on multiple choice and other short-answer problems typically are not sensitive enough to measure changes in content knowledge among either teachers or their students. "It is challenging," noted Marcia Linn, "because the standardized measures

---

[1]The manuscript for this paper is currently available at http://www.colorado.edu/education/staar/.

that are commonly used in No Child Left Behind and other programs are so insensitive to anything other than socioeconomic status."

Also, in many cases, the measures of interest range beyond content knowledge into beliefs and goals. "I would benefit from knowing [how] professional development itself caused or enabled or encouraged changes in teachers' knowledge and dispositions and beliefs and values," said Deborah Smith, "and how that then worked in their classrooms to bring about a different kind of understanding for children." Such measures would be especially valuable at the state level, since they could help meet the demands of accountability with assessments of core objectives in education.

The development of more sophisticated forms of assessment can address some of these challenges, workshop participants noted. For example, Linn stated that measures of such skills as knowledge integration can reveal differences in student performance caused by the professional development their teachers receive. Open-ended inquiry assessment instruments also can measure the ability of teachers to teach inquiry more effectively.

Teachers can provide invaluable input on the development of new forms of assessment. "I think we are learning as we go along what are reasonable assessments both of teacher practice change and student learning change," said Rubin. "Maybe as a community we have some leverage in being able to come up with newer measures that are more sensitive to the kinds of issues that we care about."

The nature of OTPD itself poses unique assessment challenges. For example, as Peter Bruns asked, how much of it should be staged, using actors and scripts, and how much should be based on the experiences and struggles of real teachers?

However, online technologies also offer radically new approaches to evaluation. "Advances in technology and assessment are opening up a completely different way of thinking about this issue," said Chris Dede. "In my work, we have developed a virtual world in which students learn scientific inquiry. As a by-product of that, we have log files to capture second by second everything the student is doing, where they go, what they access, what they say, what people say to them, what data they collect, and what they post in their online notebooks. We are now using some of the very powerful data mining tools that people have developed in other sectors of society to do two things. One is to give teachers real-time diagnostic feedback on what students are up to. So the next morning, the teacher gets an e-mail that says, 'I know that you have only ten minutes in this class period to work with students individually, so here are four students to work with today, and here is the topic for each of them that is coming out of the data mining where you should focus.' The other thing

. . . is that we don't have to do the summative assessment anymore. If you are able in a sophisticated way to chart what students are learning formatively, that is summative, in the same way that supermarkets don't close any more for three days a year to do inventory. They always know what the inventory is. People are gathering data at the checkout counter about what is disappearing and what is appearing." Online technologies do not solve the problem of assessment for either classroom learning or professional development, Dede said. But they offer creative ways of gathering both formative and summative information that can inform the design of educational programs.

Despite the limitations of previous research on teacher professional development, several important conclusions have emerged that can be applied to both online and more traditional approaches to professional development for teachers, said Borko. First, "teachers can increase their knowledge and change their practice through intensive professional development. Second, . . . strong professional development communities can foster teacher learning. And third, . . . records of practice are powerful tools for teacher learning."

Regarding the first of these conclusions, Borko observed that teacher knowledge can be divided into three broad domains: subject-matter knowledge, knowledge of instructional practices, and understanding of student reasoning. Teachers need to know a subject differently than do other professionals, Borko said, "because their practice of it is different." Teachers also need to understand how to use their knowledge of content in teaching—"things like now that we understand the content, how do we sequence the content." Finally, teachers need to know how students learn—"things like being able to anticipate their efforts and being able to anticipate their alternative conceptions and misconceptions."

The development of strong professional communities can be a critical element in changing the practices of teachers, Borko noted. But community building can be "difficult and time-consuming work," she said. "What some of the research shows is that we have to establish trust. We have to reach a balance between providing a comfortable environment, so that people are comfortable sharing, and also keeping on pushing people—and pushing ourselves—to look critically at our own teaching, to look critically at our own subject-matter knowledge, and to work together to improve practice. And improving practice, as we all know, is not easy."

Finally, research has clearly pointed toward the importance of records of practice as teachers strive to improve. What happens in the classroom must be part of professional development, Borko said. "That does not mean that you have to do professional development in teachers' class-

rooms. What it means is that it's important to bring the classroom into the professional development setting."

A few initial steps have been taken to begin establishing a base of research information on OTPD, often by the organizations that offer materials online today. For example, the Education Development Center is doing a two-year study that will track the impact of professional development on teachers' content knowledge and practices, as well as students' content knowledge. Eduventures is planning to release a research report on professional development in general in fall 2007.

More broadly, the role of teachers in shaping online professional development needs to be a focus of research, according to Bruce Alberts. "One thing we badly need research on, which I don't think has been directly addressed here, is exactly how to give teachers a voice, an appropriate voice, at school district levels, in what professional development they get. I would like to encourage a variety of different approaches in different school districts, associated with some evaluation of how those work. . . . If we can't give teachers a voice in their professional development, I don't think we are going to solve this problem."

In the recent paper *A Research Agenda for Online Teacher Professional Development* (Dede et al., 2006), Dede and his colleagues present a clear vision for the kinds of research questions that need to be addressed. They suggest research strategies, plans, models, and designs that may offer guidelines to funding agencies about where the needs are strongest.

Research is not going to answer all of these questions, workshop participants acknowledged. On the contrary, it is likely to raise as many questions as it answers. But identifying the most pressing questions also should be seen as a major objective of the research community in this realm, particularly if those questions encourage foundations, governments, and other organizations to support and expand research on OTPD.

Next Steps

Even without the results of more comprehensive research on teacher professional development, workshop participants suggested that plenty of steps can be taken to enhance the use and effectiveness of online teacher professional development (OTPD).

PROVIDING TEACHERS, ADMINISTRATORS, AND POLICY MAKERS WITH INFORMATION

According to workshop participants, perhaps the most straightforward step would be to make teachers, administrators, and policy makers aware of what is currently available. If an online listing were available of existing programs, individuals and organizations could easily find and compare options. Even more useful, suggested David Vannier of the National Institutes of Health, would be a Consumer Reports type of guide that describes the features of programs and offers evaluations. Such a guide could include costs, the experiences of previous users, any available research results, and perhaps independent evaluations. An online guide would have many potential users, said Vannier. "It's important for everyone involved to know what [an online professional development] program is, whether that's the teacher taking the course, the administrator who approves the course, the parents whose district is adopting the course, or the students who might be affected." Such a guide would also make it easier to identify gaps in content areas, grades, or ranges of teacher experience.

29

BUILDING SUPPORT AMONG ADMINISTRATORS AND POLICY MAKERS

Administrators and policy makers especially need to be convinced of the value or potential of online professional development. Involving administrators in online communities was suggested by Deborah Smith, who asked, "How can we get principals and administrators into an online professional development program that would help them build a vision that would be shared and collaborative?" "If you can't get past the building principal and the downtown administrator, this is not going to happen. . . . You absolutely need someone who not only values but understands what you are doing."

Beyond administrators, policy makers need to be aware of the potential for online professional development to make a difference in the professional lives of teachers. Barnet Berry asked, "How can teachers, especially our very best teachers across the country, provide a huge important bridge to the policy world to bring their expertise and voice to the deliberations about their profession?"

"We would like policy makers to set up mechanisms to more effectively listen to teachers' voices and choices about online professional development," said California Teacher Advisory Council (TAC) member Juliana Jones, a middle school teacher in Berkeley, California. In particular, if policy makers were able to experience an engaging online course, they would be more likely to provide teachers with the time and resources needed for online learning.

Embracing OTPD means that policy makers and administrators must give up some measure of control over professional development decisions, said Sherri Andrews of the North Carolina School of the Arts in Thomasville. "Administrators have to be able to give up the fact that they want to tell us what we need to do and when we need to do it." Also, the technology is changing so quickly that administrators and policy makers will need to involve teachers in making strategic decisions about the best possible uses of what is available. For example, although the Internet is the source of most online courses today, new technologies, such as immersive learning environments that are now part of online video gaming technologies, may someday supersede today's offerings.

PROVIDING TEACHERS WITH ACCESS TO ONLINE TECHNOLOGIES

Teachers need appropriate, modern tools to take advantage of online programs. Administrators cannot assume that teachers will have the necessary computer equipment and Internet connections at their homes, nor should teachers be expected to engage in online professional development

entirely on their own time and away from school. Technology policies and purchases of computers and networking equipment in schools should take into account the use of that equipment for learning by teachers as well as students.

Federal and state policy makers have an important responsibility to promote equal access to technology. "There is a disparity in those who have technology and those who don't," said National Academies TAC member Ford Morishita of Clackamas High School in Portland, Oregon. "This is going to be absolutely critical, not just for online professional development, but for all use of technology."

Access implies that *all* teachers should be able to use online technologies, not just those with special expertise or training. As noted above, workshop participants agreed that OTPD cannot be just for "techies." In addition, access for all users often must involve captioning or translation of text, which can benefit many teachers and is essential for some. Captioning is also required if federal funds are being spent to develop products. "Captioning helps everybody," said Raymond Rose.

FOSTERING DEVELOPMENT OF GOOD MATERIALS

Teachers need the ability to become more involved and proactive in customizing online learning for their own schools. "I really like trying to keep teachers in the loop as designers, evaluators, and intellectual participants," said Smith. "[But] we have seen a movement away from that in a lot of schools in districts and states, where teachers are told what to teach, what time to teach it, and how much to teach." Even little things can make a difference, Smith noted. On the websites for professional development, there ought to be a suggestion box in which teachers could say, "We really need some professional development on this."

It's important not to let discussions of OTPD get sidetracked into either/or dichotomies, said workshop participant Ellen Hershey of the Stuart Foundation in San Francisco.[1] "It is very important to talk about more high-quality professional development for all teachers," she said. According to Liz Pape, "The purpose of any type of professional development is to try to move teachers and administrators forward as a community of practice to impact the learning of the entire student body." Online programs should be part of a continuum of learning opportunities in schools for students and teachers. "It's not the online program here and the other stuff over there," added Barbara Treacy.

The federal government and foundations have an important role to play by supporting the development, evaluation, and revision of OTPD,

---

[1]Additional information is available at http://www.stuartfoundation.org/.

said workshop participant Jean Treiman of the California Subject Matter Projects.[2] Online materials and technologies are changing quickly, and a mix of public and private support can help the developers create better materials and stronger markets. "The tools that are available are paltry by comparison to the visions that exist," said Louis Gomez.

CHANGING TEACHERS' BELIEFS AND PRACTICES

Much more could be done to make teachers aware of the many potential benefits of online professional development. Some teachers may have had poor early experiences with computers, and their skepticism will need to be addressed. Teachers need to learn how to use new technologies both for their own teaching and for professional development, in part to acquaint them with the world in which their students now live. As new people continually enter the profession, online professional development needs to be marketed and promoted.

Standards for OTPD could establish expectations for teachers, schools, districts, and state governments, and to help change attitudes. The Southern Regional Education Board has published "Standards for Online Professional Development" that encompass "E-Learning Context Standards," "E-Learning Process Standards," and "E-Learning Content Standards."[3] For example, the context standard for resources states that "schools and states provide adequate and ongoing funding for the online program as part of the overall professional development plan" and "schools and states provide adequate resources of time, personnel and support systems for online professional development."

INVOLVING TEACHERS AS ACTIVE PARTICIPANTS IN PLANNING AND IMPLEMENTATION

The theme that emerged most strongly from the workshop was the need to have teachers involved in all stages of online professional development, from its design and development to its implementation, assessment, and ongoing revision. According to Bruce Alberts, "we will never have a better education system than we have now unless we change the dynamics of how teachers' voices are heard, at the national level, at the state level, and at the district level."

Teachers have a strong incentive to be involved in this process. Many

---

[2]Additional information is available at http://csmp.ucop.edu/.
[3]Southern Regional Education Board, "Standards for Online Professional Development: Guidelines for Planning and Evaluating Online Professional Development Courses and Programs" http://www.sreb.org/programs/EdTech/toolkit/Standards).

are dissatisfied with current forms of professional development and would welcome an opportunity to shape new approaches. Many are using information technologies more intensively in their classrooms and recognize the potential of online approaches for learning. "If you give teachers a tool that makes their job better, they will do everything to knock down the door and get it," said Janet English. "If you try to take it away, you had better watch out. They want to learn. They want to be the best teachers possible. They want their kids to learn."

Teachers currently have a unique opportunity to gain a new role in decisions about professional development, said California TAC chair Stan Hitomi of the San Ramon Valley Unified School District in Danville. "Looking at the latest reports that have been coming out, this is a very special time. The country's attention has turned to science and math and what needs to be done. It is the work of groups like this one today that will inform policy makers on the type of data that will be important. . . . Teachers are engaged in a dialogue with people who can make a difference." As Valdine McLean put it, "professional development needs to make science teachers exciting, so that they can make their students very excited about science, so that they can come and fill our shoes, so that our nation won't be left behind."

Traditional approaches to professional development need to change. The advent of online learning has presented teachers with a chance to gain a direct voice in the planning and organization of professional development. "In too many districts, it's someone in the central office who decides what it's going to be," said National Academies TAC member Elizabeth Carvellas of Essex High School in Essex Junction, Vermont. "If you involve the teachers, you are going to get the buy-in, and you are going to get what you need for professional development, whether it's online or face-to-face. Please involve the teachers."

References

Dede, C., Jass Ketelhut, D., Whitehouse, P., Breit, L., and McCloskey, E. (2006). *Research Agenda for Online Teacher Professional Development*. Cambridge, MA: Harvard Graduate School of Education.

National Research Council. (2006). *Linking Mandatory Professional Development with High Quality Teaching and Learning*. Proceedings and Transcripts from a Workshop. National Academies Teacher Advisory Council. J.B. Labov and B.E. Schulz, Eds., Center for Education. Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Sykes, G. (1996). Reform of and as professional development. *Phi Delta Kappan, 77*, 465–467.

Wiley, T. (In press). *Performance management in K-12: An evolving perspective on professional development*. (distributed exclusively to Eduventures' membership). Boston, MA: Eduventures, Inc.