Teachers' Domain® Professional Development

WGBH Educational Foundation

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Introduction

WGBH Educational Foundation has developed a set of online professional development courses for K-12 teachers as part of its larger *Teachers' Domain*® (TD) digital library initiative. WGBH's team has a range of educational media skills, including video, interactive, online, and print, along with expertise in curriculum and professional development. We work in collaboration with professional development experts and academics to produce each course. A centerpiece of the WGBH approach is to embed rich media drawn from our productions into the courses to enhance adult learning, and we expect that teachers who learn using rich media are more likely to transfer this experience to their classroom practice—i.e., they learn with the media they'll later use in their teaching.

The *Teachers' Domain Professional Development* (TDPD) courses are an outgrowth of two major streams of work that we have pursued over the past decade:

- **Teachers' Domain:** *Teachers' Domain* is a media-rich digital library for classroom use. It contains collections of video segments, interactives,

images, audio segments, and documents, drawn primarily from WGBH public television productions. Video segments are typically 3-5 minutes in length, often re-edited and re-narrated to match K-12 curricular needs. Some of the materials in TD come from partner organizations, and some are newly produced for the service. Each media resource is supported a "resource page," which presents a background essay that provides the teacher (or upper level student) with context for understanding the content of the resource, discussion questions, and correlation to state and national standards. Lesson plans use many of the resources, modeling best practices and use of rich media in the classroom. Funding for this project has come primarily from the National Science Foundation as part of its National Science Digital Library initiative, allowing us to develop collections in life, physical, and earth and space science, as well as engineering. Additional funding from the Institute for Museum and Library Services and the Open Society Institute allowed us to develop a smaller Civil Rights history collection. *Teachers' Domain* has been available online for free since late 2002 at *www.teachersdomain.org*.

- **Professional Development Video Libraries and Workshops:** With funding from Annenberg/CPB, the NSF, and other sources, WGBH has produced videotape libraries and workshops documenting best practices in science, math, social studies, reading, and foreign language. "Fly-on-the wall," unscripted videos capture teachers from across the country,

bringing to life elements of standards-based teaching practices as well as other specific teaching strategies and methodologies. We also developed supporting print, and later, online guides to use in face-to-face or self-paced professional development sessions or in more formal courses.

Course Model

In 2002, WGBH received funding from a philanthropist to create a series of online professional development courses in science. His intent in giving us the funds was to create a professional development experience, first in elementary science, and later, in middle and high-school science, that would bring teachers up to competency levels in content knowledge and methodology skills. His vision was to excite teachers about science through the power of rich media from public television, so they in turn could do the same with their students. As of September 2005, courses are complete in life science for all three levels, and in physical science at elementary and middle levels. High school physical science will be ready for the market by the end of 2005. The courses are structured in both 8-session, 45-contact hour versions and 2-session, 15 contact hour modular versions. As in all our educational projects, WGBH has worked with outside content developers and advisors to generate the course curricula. In-house staff members oversee all editorial aspects of the courses—conceptualization, organization, voice, tone, and final polishing—and develop and run the production and distribution infrastructure.

Strategy for Educational Improvement

Teachers' Domain Professional Development courses aim to improve the knowledge and skills of individual participants. The elementary and middle-school courses are primarily content-oriented: The goal is for participants to increase their own content knowledge so they can better teach the content knowledge and skills appropriate for their student population. At the same time, we expose participants to a range of explicit methodologies and metagcognitive strategies that they can apply to their own teaching practice. From research and focus groups, we know that many K-6 teachers are generalists and may have inadequate training in science, or if they have studied science more extensively, they may still be teaching outside their area of expertise. In the high school courses, we do not attempt to teach higher-level subject-matter content, but instead allow participants to use self-reflection and inquiry-based learning to examine the content they teach and come to understand new ways to teach it. We encourage participants in all of the courses to consider new approaches and make modest, practical changes to the lessons they teach. We implicitly encourage participants to use the sort of rich media they've experienced in their learning—if not the same digital library resources—with their own students.

Balance of Content and Skills

As mentioned in the previous section, elementary and middle school courses are built by assessing the most critical areas of *subject matter knowledge for teaching* science at those levels. Content developer and advisor input, along with the Science Content Standards (Chapter 6) of the *National Science Education Standards* and national and state credentialing guidelines inform the course content. We then develop content drawing from a range of sources, including rich media and readings, and present it in an activity sequence that also incorporates hands-on activities.

As the team produces the course, we create opportunities for participants to reflect on their own experience as learners both in and out of the course. Our goal here is for participants to gain insight into their own thought processes about the content, and then apply their insights into examining and *understanding student thinking*. We include several video examples of student interactions and responses for participants to reflect on and then compare to their students. We also include several "lab" activities where participants work with a small group of their own students to explore student thinking.

Course sessions highlight a range of *instructional practices,* including "surfacing" and building on prior knowledge, using effective questioning, making predictions and reconciling prediction and observation, using models,

setting up "fair" experiments, using evidence to defend a position, and integrating technology. Activities are structured so participants can experience these practices as well as view them in action through classroom video examples. Underlying all course content is inquiry-based, constructivist learning and a self-conscious exploration of the metacognitive strategies employed.

Course activities help participants develop *formative assessment* skills, since effective learning depends upon assessment of the learner's status at the beginning of the process and at specific points along the way. The results of formative assessment can help teachers shape and reshape lessons in progress. One irony, given the publishing infrastructure of the online course environment, is that while a facilitator can refocus attention or suggest modifications in assigned work, the course itself is static, unable to change in response to the individual participant's progress with the material.

Classroom management is not a specific focus of the courses, but in reflections and group discussion, participants can consider how they might apply what they have read or have observed in video examples to their own situation.

The multifaceted activities in the course address principles of *universal design for learning*. The content is presented in a range of ways—e.g., video, interactive, hands-on exploration, and reading—giving participants numerous ways to acquire knowledge. They can reflect on and express their understanding in multiple ways as well, such as in discussions, in a more formal

written assignments, in projects, and in their classroom applications. The approach of the course models what we hope participants will go on to use in their classrooms to address the needs of diverse learners.

Primary Methods of Teacher Learning and Distributed Learning Model

The structure of the TDPD courses is based on the assumption that adults, like children, acquire knowledge by building upon what they already know and constructing it in their own way. Accordingly, each course session follows a five-part learning model:

Invitation:

- creates interest in learners in a particular content topic;
- gives learners a clear view of the purpose of the lesson; and
- uncovers each learner's prior knowledge so that he/she is aware of existing understanding.

Exploration:

- provides learners with a common base of information on particular aspects of the topic through hands-on activities, *Teachers' Domain* resources, readings, etc.;
- involves learners actively in the learning process; and
- models one or more metacognitive strategies for learning and understanding that learners will encounter throughout the session.

Explanation:

- provides opportunities for learners to provide and discuss their own explanations of what they explored;
- provides learners with feedback on their explanations through comments from the course facilitator, other participants, or through resources or readings that offer a scientifically valid way of explaining the content; and
- enhances scientific vocabulary for effective communication.

Application:

- provides learners with the opportunity to apply what they've learned earlier in the session to a new instance or to their own experiences, and
- provides learners with the opportunity to see how what they've learned applies to a related situation.

Putting It into Practice:

- reviews the metacognitive strategies and content from the session; and
- provides opportunities for learners to apply metacognitive strategies to their teaching experiences.

Each session of a TDPD course includes a similar set of learning activities as it progresses through the five-part structure outlined about (which is based upon the BSCS 5E Instructional Model (engage, explore, explain, elaborate, evaluate). Participants work through the session page by page. Each page provides one or more of the following:

- instructions for reflection
- TD resources of all five media types
- articles, short essays, and book excerpts in PDF format
- journal writing opportunities
- hands-on activities
- discussion board prompts
- portfolio writing assignments.

In some instances, custom features such as online polling or click-to-reveal hints and answers add additional opportunity for phased interaction with the content.

The courses are designed for an entirely online, asynchronous, facilitated experience, requiring about one week per session, but an individual or a group can also use them self-paced, non-facilitated study. In these scenarios, participant can print out their assignments to submit to appropriate organizations for credit. Except in a pilot run, WGBH has not offered the courses directly, but instead licenses them to a presenting institution, such as an intermediate service agency, a school district, a public television organization, or a university. The presenting institution determines the schedule for completing tasks and the criteria for evaluating performance.

Discussions take place in the *Forum*. Each session includes a discussion about the session's topic and related teaching and learning issues. Prompts peppered throughout the session encourage participants to add to the discussion and to respond to and build on each other's

ideas. In the eight-session versions of the course there is an ongoing discussion concerning the final assignment. The course facilitator or designated contact can post assignment schedules and other pertinent information on an announcements board. Participants can discuss information or ideas they want to share about themselves, their questions, problems, or general thoughts on teaching and learning in a free-form "Passing Notes" board.

The *Portfolio* is where participants can save and submit written work and discuss it online (in blog format) with the facilitator. Each session includes approximately two Portfolio *Assignments*, short essays in which participants synthesize and apply what they have learned in the session. Often, one Assignment is content-oriented while the other is about methodology or lesson ideas. The Portfolio also can include *Compare Your Answers*, where participants can write a response to a question and then compare their response to a sample answer provided by the course developers.

An eight-session course includes a final curriculum design project, in which participants develop a set of activities on science topics for students at their level, adapt a lesson they currently teach, or if more ambitious, design a new lesson based on their experiences with content and methodology in this course.

A facilitator's guide gives guidelines for running the Forum discussions and for evaluating written assignments. In the future, we

hope to develop rubrics for assignments and discussions that facilitators or accreditors can use to evaluate participant performance.

Approaches to presenting materials in the courses were developed by our academic advisors and are based upon the literature for professional development and on how people learn, including the works of Loucks-Horsley, Bransford et al, and Black et al.

An outline of our philosophy includes such points as:

- Start by surfacing learners' prior knowledge.
- Use metacognitive strategies that help them monitor their own learning, including
    - Assessing prior knowledge (surfacing the learner's existing understanding before drawing them into learning new subject matter)
    - Making, investigating, and analyzing predictions in terms of investigation results (comparing your predictions with the results to see where they differ, seeking an explanation, making a new prediction)
    - Writing descriptions or making drawings, charts, or concept maps (checking to make sure that you've completed all the required labeling or annotation for the drawing or description; whether your language or diagram communicates what you want to get across in adequate detail; whether a peer can understand what you've recorded)

- Using feedback to monitor your level of understanding (Questions, comments, or comparative answers from peer discussion, the facilitator, or the course itself in Compare Your Answers can provide the impetus to think more clearly about your own understanding of a subject.)
- Finding, using, and analyzing evidence to back up an opinion or a hypothesis (checking whether you have backed up your statement or idea with evidence; deciding whether the evidence makes sense; considering whether you could have come to a different conclusion based on the same evidence or if there is another plausible explanation)

- Provide feedback on their thinking whenever possible.
- Give learners a sufficient bank of knowledge to allow them to use it effectively.
- Challenge learners to increase their level of knowledge, since people learn most when they're "at the edge of confusion."
- Provide opportunities for learners to explain concepts in their own words, since people learn the most when they need to teach or present it to others.
- Use assessment approaches that help learners develop metacognitive strategies for self-assessment, in addition to providing only content-based responses for those who evaluate them.

Type of Infrastructure

TDPD courses use WGBH-developed infrastructure, which allows it to integrate seamlessly with the *Teachers' Domain* digital library. A sign-on brings participants or facilitators into *Teachers' Domain*, where a link to "My Courses" brings them to the list of courses in which they are enrolled. At present, the licensing institution informs TD staff of user enrollment; then the TD staff sets up account privileges. Participants and facilitators (as well as "lurkers" such as evaluators) gain differing levels of access to the course environment, such as the ability to post to certain discussion boards, to view or comment on Portfolio assignments, and to track which assignments have been submitted or commented on (and by whom). To get the most out of the course, participants should have a broadband connection and a recent computer with a standard browser and plug-ins (Flash and QuickTime), because of the embedded video and interactive materials. Otherwise, no special software environment is required.

At present, uploads to the course environment are text-only, which imposes some limits on the kinds of materials that participants can share in discussions or submit as assignments. For instance, while several sessions include diagramming or concept mapping activities, the current environment does not provide a way to upload any electronic representation of these materials. Should funding become available, we will improve this aspect of the service.

We explored using an off-the-shelf LMS such as Blackboard or WebCT, but found the structure of these products did not allow us to fully integrate content, access to rich-media resources, discussions, and Portfolio features. We experimented with porting one course to Blackboard in a potential licensing situation, but the resulting course environment, though providing esentially the same material and activity sequence, was very disjointed. Unfortunately, the trial did not yield much data about how the LMS affected student or facilitator involvement.

Degree of Commitment

Participants are expected to devote about six to eight hours of work per session, spread over one or two weeks. Participation includes working through all activities presented in the session, and in some cases, completing supplementary readings that may add additional time. We encourage a merger of theory and practice, but we do not expect participants to try out a new teaching strategy or content concept as part of an actual classroom lesson while working through a session. A participant may not be covering that content, or may not even be in the classroom while taking the course, and if they are in fact teaching the topic, they may find it difficult to integrate new instructional materials or methods midstream. Very consciously, we include several "lab" activities participants can try out with one student or a small group, or

with student surrogates, and then report back on the results of these activities in discussions.

Ways of Ensuring High Quality Enactment

At present, this is left up to each licensing institution to develop and monitor, although if further evaluation were to be funded, the potential evaluator has proposed ways to ensure fidelity of facilitation, through trainings and monitoring of implementation.

Research and Evaluation

In 2003, WGBH engaged Deborah Muscella of muscella.com to formatively evaluate a pilot version of the first TDPD course, "Teaching Elementary Life Science." The first four sessions of the course were pilot-tested with 16 teachers in April and May of 2003. The last four sessions were tested in October and November 2003. At the time, a key research objective, in addition to determining course quality and impact, was to examine whether the course would be effective for both a more standard, facilitated delivery and a less formal, self-facilitated study-group approach.

The evaluation had five goals:

- Determine if the course enhanced teachers' knowledge of life science;
- Discover if teachers perceive themselves as using inquiry teaching or enhancing their practice of inquiry teaching through their participation in the online course;
- Profile the backgrounds of course participants in science;
- Compare the participation of teachers in a course facilitated by an instructor and a non-facilitated course; and
- Assess teachers' perceptions and experiences in participating in the online course.

To address these questions, Dr. Muscella developed the evaluation protocols outlined below:

	Spring 2003	Fall 2003
Teachers' Knowledge of Life Science	Pre-test Responses to Course Assignments	Pre-test Responses to Course Assignments
Teachers' Perceptions of Their Using Inquiry Teaching	Pre-test Telephone Interview	Pre-test Telephone Interview
Teachers' Background in Science	Pre-Course Questionnaire	N/A
Participation of Facilitated and Non-Facilitated Course Participants	Analysis of Online Conversations Telephone Interviews	Analysis of Online Conversations Telephone Interviews
Teachers' Reported Experiences in Participating in the Online course	Telephone Interviews E-mail between individual teachers and staff	Telephone Interviews E-mail between individual teachers and staff

What follows is a summary of the results from the pilot study, arranged topically:

The Curriculum

- Teachers felt the entire curriculum package, including videos, readings, resources, and Web links, was a powerful tool for learning.
- Complex concepts such as DNA and cell mitosis and meiosis were understandable because video or other media illustrated concepts presented in the readings.
- The media sparked curiosity. After watching a video, teachers read the background essay on its resource page to delve more

deeply into the particular concept portrayed visually or to clarify their thinking.

- Kindergarten teachers were challenged by the material, since it wasn't readily apparent how to implement the content in their classroom, but they persisted because of the compelling nature of the course design.

Teachers' Knowledge and Attitudes about Life Science

- Intellectually challenging content stimulated teachers' learning.
- Despite highly challenging content, teachers felt the course design allowed them to rise to the challenge.
- Teachers who expressed some discomfort with their own knowledge of science showed the most change in their pre- and post-tests.
- Several teachers reported instances of changing their attitude about the science content.

Influence on Teaching

- Being learners of life science content and watching inquiry learning in practice allowed teachers to consider their own teaching without having to immediately change their practice.
- The plot study (an ongoing, hands-on activity) validated the power of observation and the appeal of using such an approach with students.

- The video clips of inquiry classrooms modeled exemplary practice without judgment and enabled teachers to confront real or imagined deficits in their own teaching practice.

Forum Discussions

- After the initial spring sessions, teachers reported that the online forums were not focused enough. WGBH then developed more focused prompts for each discussion instance. As a result, teachers participated more often and produced more substantial posts.
- Some teachers found the requirements for online discussions time-consuming; however, even these teachers found reading the responses of their colleagues helpful in their own learning.

This initial formative evaluation informed further course development, in which we followed the basic approach established for the original pilot course. While no additional formal user evaluation has taken place, early marketing of the courses showed that while intermediate service agencies were eager to offer the courses, the teachers they served were often reluctant to sign up for the full eight-session, 45-contact hour experience. Accordingly, we have developed an alternate version of the four courses completed prior to spring 2005, in which the material is segmented into two-session, 15-contact hour

courses. These are being offered to the market in fall 2005. While sequential, these modular versions do not depend upon each other, although we recommend that a participant be familiar with the content presented in an earlier course before taking a later one in the series. The newer courses will also be offered in both versions.

Looking forward, WGBH is exploring grant opportunities to work with EDC/CCT to evaluate the impact of *Teachers' Domain Professional Developmen*t courses and resources on teacher content knowledge, teachers' ability to use rich media, and ultimately the impact of the resources on student achievement. Another focus would be to examine how the intensity of professional development impacts teacher and student outcomes. Using graduated levels of exposure to professional development course modules, the evaluation would determine how intensive the professional development experience needs to be to show evidence of impact.

If funded, EDC/CCT will use an experimental design, randomly assigning teachers to a control group or one of four treatment groups, taking one shorter course module, two modules, three modules, or four modules.

Depending on whether the courses are offered in a facilitated or self-paced manner, EDC/CCT has proposed two approaches to deal with issues of fidelity. In the facilitated approach, they will develop measures of fidelity for the professional development modules and examine the extent to which

professional development facilitators are implementing these activities with fidelity. In the second, they will use non-facilitated versions of the courses, where participants will follow a self-paced usage model, having access to Forum discussions, but no requirements to participate in them. EDC/CCT also will develop indices of fidelity for teacher participation in the *Teachers' Domain* courses and field test these measures with a small separate sample of teachers.

Control teachers will be asked to carry out their instructional activities as they would normally. They will participate in the project during a two-year period for which they are serving as the control. Treatment group teachers will implement module 1 in the first semester of the first academic year; module 2 in the second semester of the first academic year; module 3 in the first semester of the second academic year; and module 4 in the final semester. Treatment group teachers will be asked to respond to instrumentation at various times over the two years, even if they are no longer participating in a *Teachers' Domain* module.

Data will be collected and appropriate instrumentation developed in three primary areas: teacher content knowledge, teachers' use of rich-media resources, and student achievement. We also will obtain general demographic information on the teachers and measure the fidelity of the professional development experience.

To measure changes in teachers' content knowledge over time, EDC/CCT will use two forms of assessment. First, they will draw on Praxis-like items to

assess teacher content knowledge. They will also develop scenarios to place the teacher in the type of authentic situation that they might face in the classroom. Teachers will be asked to diagnose a student's understanding or misconceptions on a particular problem, followed by a sequence of probes to cite evidence for in their determination, to specify questions that she/he might ask to help the student address the misunderstandings, and to define strategies to help remediate the problems. Scoring rubrics will be designed and parallel forms of the scenarios will be constructed for each content domain.

To examine whether teachers' use of rich-media changes over time, EDC/CCT will collect data through teacher surveys and logs of how and how often teachers use media-rich resources. They will construct a brief instrument that asks teachers to record incidents that relate to the use of media resources and will ask them to note how often they access the Internet, the *Teachers' Domain* Web site, their use of other Web-based resources, and the times they use various technologies to enhance their instructional activities. They will ask if the materials are used as a core part of the class or in a more supplementary way. They will also monitor whether teachers are using the resources as add-ons to their existing lessons, for diagnostic purposes, for remediation activities, or for other reasons. They will ask if the materials are being used in whole-class settings, small groups, or among individual students. WGBH will make available navigational data, providing information based on users' registration about the number of assets each teacher accesses, the

number and kinds of videos and other files they download, and other data relevant to their rich media usage.

Student achievement will be measured in a pre-, post- format by using released items from NAEP assessment across differing levels of difficulty. Using the NAEP items also will enable EDC/CCT to compare the performance of the students in the study with that of a nationally normed sample. In addition to the standardized achievement tests that provide indications of impact on student learning, they also will determine the extent to which there is impact on student perceptions of how their teachers' classroom practice is changing. They will administer a brief questionnaire to middle and high school students about their teachers' teaching and their teachers' use of rich media. To account for achievement differences among students and classes they will examine the standardized assessment measures used in each district in the study. To the extent possible, they will standardize across the different tests to create a proxy measure for previous student achievement, which they will use as a covariate to control for the potential differences in achievement or ability level across classes.

Scalability, Cost-Effectiveness, and Sustainability

WGBH's marketing strategy for the *Teachers' Domain* courses features a licensing model through which organizations across the country are authorized to deliver the courses in ways that best fit their unique needs. Through licensing, an organization has maximum

flexibility to determine its own course timing (including start and end dates) and participant mix. And because courses can be delivered on a local or regional basis, staff developers have the opportunity to gather participants during or after the course for other related professional development activities.

Our pricing structure provides quantity discounts for licensing multiple courses to encourage wide distribution and repeat orders. The fee for each type of distributor is based upon the general breadth of educational population served (for example, specific pricing for an individual school differs from pricing to a district). Each distributor is free to set its own prices to the participant, allowing it to meet the organization's particular goals, whether they be mission-oriented or financial.

WGBH expects that eventually, licensing fees will cover the costs of operating and marketing the entire *Teachers' Domain* service. Where possible, local organizations offering the service, including other public television stations, will host proxy servers to reduce direct bandwidth costs. The business plan does not assume that revenues will cover the development of new courses or of new support resources; WGBH will continue to seek grant funding for such activity.

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