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The Technology Mentor Fellowship Program (TMFP) Model for Professional Development and Sustainability of Technology Infusion Initiatives

Jon Denton, Trina Davis, Ben Smith & Arlen Strader
Texas A&M University

Abstract

The ***Technology Mentor Fellowship Program (TMFP) Professional Development Model*** *was designed to match technologically-proficient pre-service teachers with teacher education faculty to apply technology as an instructional tool in K-12 classrooms and college classrooms. Undergraduate student mentors and a web-based resource bank were established to support campus and school-based teacher preparation faculty involved in professional development. The Technology Fellow-faculty dyads collaboratively developed learning objects across a wide range of content areas with the expectation that many of these digital learning objects would be integrated into on-line courses.*

Developing a Rationale for the TMFP Model

This paper provides a description of a model for technology professional development for teacher educators and program outcomes that were made possible by a Preparing Tomorrow's Teachers to use Technology (PT3) grant. The paper concludes with a discussion of the processes employed to sustain worthwhile elements of TMFP. Two surveys were conducted in order to develop a grant application based on current information. One survey determined the status of technology integration in Texas public schools with respect to technology infrastructure and use of that technology infrastructure. A second survey was concurrently carried out with all public and private teacher education programs at institutions of higher education in Texas. This latter activity was designed to determine how and to what degree instructional technology was being incorporated into teacher preparation programs; and whether technology support was being provided to faculty and students. Survey results were analyzed to determine whether our College of Education programs were keeping pace with the advances in technology occurring in K-12 schools; and whether our teacher preparation faculty members were providing the necessary pre-service experiences in technology to teachers entering the profession compared to the other teacher preparation programs across the state. Findings from the public school survey indicated that both teachers and their students were in the initial stages of employing technology at the instructional level in 1998, but with equipment in place and professional development opportunities expanding, much expansion of Internet-aided classroom instruction was expected. We found from the teacher education programs survey that a majority of teacher preparation faculty in Colleges of Education, including our teacher education faculty, was not integrating technology into their field-based teacher preparation programs; nor were they encouraging their teaching candidates to become proficient with technology applications for the classroom, although the candidates often had considerable skills for applying technology.

Applying the findings, we established the following **objectives** for our professional development program. Participating Teacher Education faculty members will:

1. apply digital media in their instruction that supports the National Council for the Accreditation of Teacher Education (NCATE) standards and the International Society for Technology in Education (ISTE); and
2. integrate digital technology into their pre-service teacher preparation and graduate professional development curricula.

Description of Professional Development Model

We operated on an assumption that we could develop a model of professional development that matched technologically-proficient pre-service teachers with teacher education faculty to apply technology as an instructional tool. Because of their facility with technology tools, we recruited undergraduate teaching candidates as student mentors to support teacher preparation faculty members with their journey to integrate technology into their instruction. These teaching candidate "mentors" were matched with teacher education faculty members to form Technology Fellow-Faculty Member dyads. Over an extended period of time (nearly 3 years in a few instances), the dyads collaboratively developed learning objects across a wide range of content areas to achieve the goal that many of these digital learning objects would be integrated into on-line courses. A web-based resource bank was established to organize, share and maintain these resources. The digital artifacts in this resource bank provide evidence of the synergy that was generated by these dyads. These learning objects also provide indirect evidence of substantial technology skills and communication skills these young mentors demonstrated in providing technology support. Through their direct experience with technology instructional development, both the Technology Fellows and their faculty partners gained a greater appreciation of what is possible regarding technology and communication applications for their classrooms.

Steps in Developing TMFP

1. Recruitment of Teacher Education Faculty and Technology Fellows

Extensive processes were developed for recruiting, providing continuous technology skill training, and monitoring the work of technology undergraduate fellows with teacher education faculty. These processes were essential because the key strategy was to match technologically-proficient undergraduate students with teacher education faculty to model technology instructional applications.

Teacher education faculty, defined as campus-based faculty and school-based faculty were recruited to participate in the project. Fortunately, this process was an "easy sell" with the recruitment of school-based faculty (teachers who supervise field experiences of teaching candidates) being coordinated through district technology directors who worked with building principals. As the project continued, demand for Technology Fellows outstripped the resources to provide additional fellows. Campus-based faculty members were recruited through personal visits and presentations at faculty meetings of the teacher education faculty by project staff members. Additional recruiting support was garnered as other college department heads encouraged their faculty who taught teacher preparation classes to participate in the program. While not every campus-based faculty member who worked with teacher preparation candidates chose to participate in this program, the response to the program was quite positive, but within the range of what was planned for the project.

Undergraduate technology mentors were initially recruited from the undergraduate classes of educational technology students who were also teacher preparation students. Project staff visited each class to explain the project and benefits for participating as a Technology Fellow, such as,

- paid training ($7.50/hr for 20 hrs of training)[1] to work as technology mentors that includes using web resources, Microsoft productivity tools and coaching on communication and team-building skills before beginning their experience with faculty partners;
- a paid field experience ($7.50/hr for 10 clock hours per week) [1] with an opportunity to continue this experience across ensuing semesters;
- working with an experienced teacher or faculty member on an individual basis to learn about pedagogy and their personal views about teaching; and
- providing technology support to an individual faculty member for integrating technology into their instruction.

This recruitment strategy resulted in 69 Technology Fellows being selected during the first semester of the project, but we expected to recruit 100. At the beginning of year 2 of the project, recruitment efforts were expanded to all teacher preparation classes with disappointing results. Paid advertisements over a local radio station and in the campus paper for Technology Fellows at the beginning of the semester produced telling results. The radio ads produced modest returns for the cost, but the campus paper ad resulted in doubling the number of Technology Fellows within a three-week period. Advertising in the campus newspaper was used throughout the remainder of the project with much success.

2. Faculty Orientation and Technology Mentor Training

Embarking on an effort to teach and support teachers to use technology requires a considerable time commitment for both the professional development provider and the teachers being "developed." Mehlinger (1997) estimates that more than 30 hours of instruction and application experience are needed for adoption of a tool or software application to occur. About a decade ago, Rogers (1995) suggested that helping faculty adopt and integrate technology into their teaching should combine not only individual initiatives, but also top-down mandates, and consensus-building across constituencies of the institution. Yet unless professional development experiences are designed and implemented to provide a close relation between what teachers learn and what occurs in their classrooms and schools, these professional development activities will have small chance of having long term effects or change learner outcomes (Fullan & Stiegelbauer, 1991). Organizational change in instructional technology integration does require sufficient facilities, resources, access, and support, but successful technology integration will only occur if faculty members have sufficient preparation and planning time (Becker, 1994; Clark & Denton 1998; Ennis III & Ennis, 1995-6; Ertmer, 1999; Gilmore, 1995; Hunt & Bohlin, 1993; Lawler, Rossett & Hoffman, 1998; Loucks-Horsley, Hewson, Love & Stiles, 1998; Schrum, 1999; Strudler & Wetzel, 1999; Walker, Ennis-Cole, & Ennis III, 2000; Yildirim, 2000). Supporting this position, Moursund & Bielefeldt (1999) recommend that educational leadership should provide time for planning how to integrate technology into courses; time for evaluating the impact of technology on student learning; and time for experimenting the effects that technology has on teaching and learning processes.

A training schedule consistent with these suggestions in the literature was developed and implemented with participating faculty members and the Technology Fellows. The following tasks were provided to faculty members agreeing to work with Technology Fellows in commencing the just-in-time technology professional development experience.

First month: As a beginning step, schedule a face-to-face meeting with the Technology Fellow at school to acquaint them with your classroom. During this initial session or perhaps in your second session with the Technology Fellow, please complete Profiler (an online tool that compiles self-ratings of technology skills. This tool is available at <http://profiler.hprtec.org/>), and then suggest possible projects after reviewing electronic learning objects available on our website (http://tmfp.coe.tamu.edu/). Before concluding this meeting, establish a calendar for mentoring sessions and outline tasks/projects/due dates for the next two months or remaining weeks in the semester. However, do not hesitate to contact us if this assignment will not work due to scheduling or other reasons.

Second and third months of semester: We recommend that you and the Technology Fellow begin with a project such as a web-page (if you do not have a web-page) and/or a Track project using the TrackStar tool (an online resource that organizes websites for an instructional lesson for your class or a presentation at a conference. This tool is available at http://trackstar.4teachers.org/trackstar/index.jsp). It is reasonable that as a team you will plan to develop two or three projects during the coming 6 to 8 weeks in the semester. Also, for project purposes, please approve weekly reports of the Technology Fellow through communicating weekly with the Technology Fellow and share work on tasks as well as discuss strategies for completing the agreed upon tasks.

Fourth through eighth months of project: During the coming semester, you and the Technology Fellow should take stock of tasks completed and needs for integrating technology into your classes. We encourage you to participate in an early Spring Semester seminar with the Technology Fellow on progress and future steps, and then develop a project calendar for the Spring Semester. Finally, remember to continue approving weekly reports of your Technology Fellow and complete an end-of-year Profiler.

These timeline activities for the Technology Fellows and teacher education faculty are consistent with recommendations of a large-scale empirical examination of professional development experiences. Investigators in this study have reported that professional development experiences that emphasize academic subject matter (content), provide opportunities for “hands-on” activities (active learning), are integrated with ongoing classroom operations (coherence), and provide many development experiences for an extended period of time are more likely to produce desired knowledge and skill changes (Garet, Porter, Desimone, Birman & Yoon, 2001). Similarly, recommendations from a national survey on the preparation and qualifications of public school teachers by Lewis, et al., (1999) that collaborative activities for professional development include a common planning time, regularly scheduled meeting times, having a formal mentoring relationship, and networking with other teachers outside a single school are consistent with the timeline activities we employed.

3. Continuing Professional Development of Technology Fellows

Technology skills training experiences were provided to Technology Fellows in the project laboratory containing twenty workstations equipped with Microsoft Office Suite software that included graphics and web development applications. The laboratory was open from 8:00 AM to 5:00 PM Monday through Friday for Technology Fellows' use in developing learning objects for their faculty partners and upgrading their own skills. During year 2, project staff began developing and implementing online professional development lessons for new Technology Fellows that effectively reduced face-to-face training sessions from 20 hours to 2 hours. Formative evaluation of the training experiences (by staff and the project's external evaluators) indicated the online lessons were very effective training tools. The second year of the project also marked the beginning of Intel training for all Technology Fellows by a project staff member. The Intel curriculum was provided in addition to the initial training experiences that were used when the project began.

Objective Attainment

Electronic Management System

An Electronic Management System was developed to track the Technology Fellow assignments; to provide work schedule targets; to provide payroll information; to serve as a repository for electronic learning objects developed by the Faculty-Technology Fellow teams; and to serve as an online communication system for the Technology Fellows, the Project Coordinator, and the Faculty members who worked with the Technology Fellows. The management system uses the Internet to address challenges associated with multiple levels of communications, project management and monitoring of electronic instructional object development. Data presented in the following section were collected, compiled and stored via the Electronic Management System.

Formative Data associated with Objectives

At the conclusion of each semester, **on-campus and school based faculty** completed an on-line, ten item questionnaire to reflect their perceptions about their experiences in the project ranging from 1 (strongly disagree) to 5 (strongly agree). These items provided formative data to project staff about daily operations and curricula offered by the project, but no validity or reliability indices were determined for this scale. The following statements provide brief summaries of faculty perceptions obtained from administering this questionnaire.

1. *Overall, participating in this project was beneficial to me.* On-campus faculty ratings ranged from **3.83 to 5.00** across semesters with the highest ratings occurring during the final project year. For school-based faculty ratings on this item ranged from **4.03 to 4.46** across semesters with the lowest and highest ratings occurring during the final program year.

2. *The project seemed well organized.* On-campus faculty ratings ranged from **3.94 to 4.75** and school-based faculty ratings ranged from **3.83 to 4.19** across semesters with the highest ratings for both faculty groups occurring during the final project year.

3. *The project is focused on important needs and activities*. On-campus faculty ratings ranged from **4.29 to 4.86** across semesters with the highest ratings occurring during the final project year. Although slightly lower, school-based faculty ratings ranged from **4.07 to 4.38** across semesters with the highest rating occurring during the final project year.

4. *The project provided a support network of online resources and personal assistance.* On-campus faculty ratings ranged from **3.54 to 4.33** across semesters with the highest ratings occurring during the final project year, while school-based faculty ratings ranged from **4.00 to 4.28** across semesters with the highest rating occurring during the final program year.

5. *The activities and strategies in the project facilitated my learning.* On-campus faculty ratings ranged from **3.94 to 4.57** across semesters, while school-based faculty ratings ranged from **3.82 to 4.00** across semesters. Both faculty groups registered their highest ratings during the final project year.

6. *The project was an important resource for me*. On-campus faculty ratings ranged from **4.00 to 4.88** across semesters with the highest ratings occurring during the final project year. Although somewhat lower, school-based faculty ratings ranged from **3.44 to 4.10** across semesters with the highest rating also occurring during the final project year.

7. *The project helped me to learn important skills and knowledge*. On-campus faculty ratings ranged from **3.80 to 4.50** across semesters with the highest ratings occurring during the final project year. At variance with the trend of higher ratings as the project continued for school-based faculty, ratings for this item ranged from **3.70 to 4.07** across semesters with the lowest rating occurring during the final project year and the highest rating occurring during the second project year.

8. *This project has or will impact my work in the classroom.* On-campus faculty ratings ranged from **4.30 to 4.67** across semesters with the highest ratings occurring during the final project year. Similar to the ratings pattern exhibited with item 1, school-based faculty ratings ranged from **4.03 to 4.30** across semesters with the lowest and highest ratings occurring during the final program year.

9. *This project has or will assist me in helping others use technology*. On-campus faculty ratings ranged from **3.75 to 4.44** across semesters with the highest ratings occurring during the final project year. School-based faculty ratings ranged from **3.88 to 4.00** across semesters, with the lowest and highest ratings again occurring during the final program year.

10. *This project has or will assist me in helping others integrate technology into the curriculum, after-school or community program.* On-campus faculty ratings ranged from **3.86 to 4.50** across semesters with the lowest and highest ratings occurring during the final project year. School-based faculty ratings ranged from **3.87 to 3.97** across semesters with the lowest rating occurring during the final program year. Data trends for this item differed from response patterns registered across the preceding items for both faculty groups.

Observations drawn from these item summaries are:

- In general, perceptions about the project participation became increasingly positive as the project continued, with the highest values being registered for 18 of 20 ratings during the final year of the project.
- Higher perception ratings were registered for all 10 items by on-campus faculty during the final year of the project.
- Higher perception ratings were registered for 8 of the 10 items by school-based faculty during the final year of the project.
- The on-campus faculty group registered higher perceptions than school-based faculty across all 10 items.

- The change in perceptions registered for each item was greater for on-campus faculty compared to school-based faculty.

Collecting these data each semester and then adjusting practices given these data enabled project staff to better match the needs of participating faculty with the technology skills provided by the technology fellows. Additional support that the technology fellows did provide valued and needed assistance is provided from the following comments gleaned from faculty at the conclusion of the project from an end-of-project questionnaire.

> "My Technology Fellow has assisted with web-site development and
>
> administering (an) on-line course to students through TTVN [2-way audio, 2-way
>
> video system] and on-campus."
>
> "I have a better understanding of how advanced in technology our pre-service
>
> teachers are which helps me design class activities that can better meet my students' needs in class."
>
> "These students have been very helpful in moving my projects forward."
>
> "This project has provided resource and person power to get many tasks completed well and on time."
>
> "Tech fellows have supported me with the development and production of a WebCT course, a personal web page, and several PowerPoint presentations."
>
> "The TrackStar set up was especially beneficial for not only my students, but to others who used it. Although I had been shown how to set up TrackStar, I still had many questions and was unsure how to get things done. Jennifer helped lighten my load."
>
> "I have learned more about TrackStar and how to utilize lessons that are already in place. I have been able to present good information to the students that I would not have had the time to complete on my own."
>
> "I have been able to develop a usable web page for my classroom."

“I have found new web sites that reinforce what we do in class.”

“I have become more proficient with my use of the computer and have been able to communicate data to teachers, staff and administration more effectively.”

“I have gained an understanding of power point as a mindtool.”

“I have had a positive experience with technology in my classroom.”

“I received projects for students that take time to do myself, so I saved time.”

“I have been able to present great information to the students in a motivating format that is very interesting and informative for them. As a coach, classroom teacher, science fair coordinator, and parent, I would have great difficulty completing all the projects that we used to present to my students. I have a touch-screen board in my class this year and the lessons Melanie helped to create and find were invaluable to use in presentations to the students on various subjects. In addition, she came to our computer lab to help my students with their science fair projects when we were typing the reports and preparing the information for their project boards.”

Instructional Artifacts resulting from TMFP

A large number of electronic objects (1,043) were created and maintained on the website <http://tmfp.coe.tamu.edu/projects/>. Digital resources were developed across a broad continuum of learners for instruction in mathematics, science, social studies, language arts, history, English, ESL, teacher education, technology, reading, graphics design, fine arts, economics, physical education, special education, French, agriculture, and business education. In addition, five Technology Fellows participated in WebCT training (WebCT is the online system supported by the university) and worked with campus-based faculty in placing components online for the following 13 courses: Professional Leadership Development; Principles of Technological Change; Special Topics: Electronic Media in Agriculture; Advanced Methods in Agricultural Education; Advanced Methods in Distance Education; Teaching Strategies: Patterns of Learning; Special Topics in Integrating Technology into Instruction; Theory of Curriculum and Instruction Research; Educational Psychology; Foundations of Reading Instruction; Applied Behavior Management in the Classroom; Self Directed Experiences with Adolescents; Teaching Skills I. These electronic resources developed across the project and the number of courses with components being placed online indicate participating faculty did integrate technology into their courses with the assistance of Technology Fellows.

Sustainability of Technology Infusion Initiatives

Institutional adaptations of PT3 grant products/processes began during the final year (year 3) of the grant and have continued to shape the college's technology future. Two key elements contributed to institutionalization of PT3 developed resources. First, perseverance paid dividends in communicating the importance of continuing organizational support to faculty members with their technology integration efforts. Second, the good fortune of receiving an award from a foundation of a telecommunications company provided resources for developing an electronic demonstration classroom. Given our perseverance and the foundation award, the following aspects of TMFP have become institutionalized in both pre-service and graduate teacher education professional development programs.

1. ***Technology fellows hired with college funds for tech support to teacher preparation***

Recognition of the value of the TMFP model occurred when the project coordinator was hired half-time by the teacher preparation department. His position included supervising the work of 12 Technology Fellows who have provided continuing support to teacher education faculty with integrating technology in their classes. He also provided leadership in developing (designing the physical facilities, ordering, receiving and setting up the equipment) and directing (establishing a staff, creating a staffing schedule and establishing a scheduling protocol for faculty use of the facility) the classroom of the future. The department's financial support has continued for the following three years after the grant ended.

2. Electronic portfolio system (i-Folio) used by all teacher preparation students

The development and implementation of a skills performance system with faculty involvement was one of our "must do" tasks for the final year of our PT3 grant. We created *i-Folio,* an interactive portfolio documentation tool for pre-service teachers to display products from pre-professional experiences and correlate those artifacts to state and national standards. The teaching candidates placed their work products (responses to assignments) on their own college web sites and then sent a request to their professors to evaluate the products. We realized these products stored in *i-Folio* were professional preparation artifacts of the teaching candidate that reflect on the preparation of the candidate as well as the nature of the experience provided by the teacher preparation program. Interestingly, we made numerous presentations to faculty and college administrators and actually competed with commercial vendors to "win" college and departmental approval in order for this system to be adopted.

The *i-Folio* tool serves as an electronic clearinghouse for student portfolios developed as teaching candidates complete competency demonstrations associated with certification and course requirements. Students maintain their own portfolio web site on a College of Education server that contains the professional artifacts they have produced. This electronic portfolio tool (available at http://i-folios.coe.tamu.edu/) organizes, stores, and provides ready access to electronic artifacts for approximately 4,000 current and former teaching candidates.

3. Electronic management system has served as an impetus for the development of the eEmpowerment Zone, an Internet platform for professional development

The logistical challenges were considered so daunting for tracking 100 or more Technology Fellows at a time that an **Electronic Management System** (available at: http://tmfp.coe.tamu.edu/**)** was developed during project start-up. The utility of this program became evident during the first year of the project, and we soon realized that the idea of an electronic tool to help manage large numbers of clients could be applied to the **eEmpowerment Zone (eZone)** an on-line professional development system http://empowermentzone.tamu.edu/ and to the *i-Folio* system when it was developed. The eZone is a comprehensive, web-based e-learning and professional development system that was designed to provide instructional modules, and integrated resources and tools that support various stages of teaching and learning. By providing integrated resources like the My eAssessment Center, ePortfolio Center, and Resource Media Center, various stakeholder groups (adult learners, instructors, university supervisors, and mentors) can submit and evaluate portfolio artifacts and resources, criterion referenced and authentic assessment results, and classroom observations. Community members can also engage in just in time online discussions and seminars

4. ***Prototypical pedagogy lessons led to a full online secondary teacher certification program****.*

As the project continued, turnover among Technology Fellows diminished and we think a key reason for this stability was the addition of the *eZone* lessons. We directed much attention to establishing clear directions and providing more extensive training for the Technology Fellows. As time passed, 20 hours of repetitive face-to-face small classes with beginning Technology Fellows were replaced with carefully designed on-line tutorial lessons. These lessons worked so well in preparing the Technology Fellows we decided to develop an alternative certification program for secondary science and mathematics (grades 8-12) that has three features setting it apart from other alternative certification programs offered in Texas. First, the pedagogy content is delivered completely on-line. The **On-line Curriculum** consists of 35 online modules with major topics identified for Pedagogy and Professional Responsibilities in grades 8-12. These instructional modules have been developed to engage the candidate with issues identified as necessary for a beginning teacher by the Texas Board of Educator Certification. These online modules are accessed from the *eZone* platform. Second, an introductory **Field Based Experience** is provided that consists of a 40 clock-hour supervised teaching field observation experience in a secondary school during the initial phase of the program. Third, the final program component is a paid **internship** where candidates are supported by a trained mentor and a university supervisor who guide, observe, and provide constructive feedback to the interns during their year-long development as a beginning teacher. Ongoing supports offered in this program include continuing communications and the ePortfolio resource (a variant of the i-Folio) provided via the eZone, and the continuing availability of mentor teacher advice for former program participants continuing to teach in the position that they held during their internship experience.

5. On-line Master of Education program

Among the campus-based faculty who placed course components online during the project are four faculty members who are collaborating with colleagues in developing and offering a 36-semester hour **Master of Education (M.Ed.) in Curriculum and Instruction** via Distance Education. Twelve on-line courses are currently being phased into the scheduled course offerings to enable educators in schools who cannot come to campus for classes, an opportunity to complete this graduate program from the convenience of their homes on their own schedule. Because we are increasing the flexibility about how and when courses are offered, this degree may be earned through residential courses, or a combination of residential and distance courses, or on-line courses entirely.

Concluding Thoughts

In the final PT3 report to the U.S. Department of Education we posited that the impact of TMFP could be favorably judged given the number of teacher educators who were prepared, and who used their on-line electronic resources during the project; as well as the extensive number of electronic learning objects and instructional resources developed by the Technology Fellow-Teacher Educator dyads. Further, we touted the probable **success** of the TMFP model with professional development being delivered by an undergraduate student, **if** the technology development activities were tailored to the faculty member's individual needs and project assignments and arranged to fit her time schedule. We closed the final report with the optimistic generalization, that the key to a successful TMFP type professional development experience is to establish a dyad (faculty member and technology fellow) that opens communication channels quickly with the dyad members establishing regular meeting times to collaborate and share ideas, techniques and project products.

Now, three years post PT3, it seems the most enduring aspect of TMFP were commitments to change among participating faculty who have continued to develop online instructional resources and have placed entire programs online. Second, program elements , such as, i-Folio and eZone, that were developed to resolve particular challenges we were experiencing during the grant, have been adopted widely across the college to support new applications in preparing tomorrow's teachers. These electronic "inventions" have provided a PT3 legacy for us, but the original intent of the project to prepare teacher educators to integrate technology has been the most important TMFP benchmark that we have strived to attain.

Note 1. Funding to support the Technology Fellows was provided by the grant, Preparing Tomorrow's Teachers to use Technology (P342A-990311) from the United States Department of Education from September 1999 through December 2002.

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