



**The University of Maryland
Baltimore County's GK-12
Teaching Enhancement
Partnership Project**

**Final Evaluation Report
(2002-2005)**

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Introduction

The National Science Foundation's Graduate Teaching Fellows in K-12 Education (GK-12) Program was designed to improve classroom instruction of mathematics and science in the nation's primary and secondary schools. The University of Maryland Baltimore County (UMBC) developed and implemented a GK-12 Program called the Teaching Enhancement Partnership Project (TEPP). Graduate and advanced undergraduate UMBC students partnered with teachers in high-needs middle schools within the Baltimore Metropolitan Area. Science, math, engineering, and technology (STEM) students worked collaboratively with math and science teachers to enhance their instruction with technology and applied activities.

A project evaluation was designed to assess the extent to which TEPP met the following National Science Foundation expectations regarding outcomes.

- 1) Improved communication skills and teaching skills for *fellows*;
- 2) Enriched learning by K-12 *students*;
- 3) Professional development opportunities for K-12 *teachers*;
- 4) Strengthened partnerships between *institutions of higher education* and *local school districts*.

Methodology

Sample

In year three of the project there were a total of 19 UMBC students who participated as TEPP fellows. There were three graduate fellows who returned from year two of the project to participate in its third year. One of these graduate fellows, however, left the program midway through the year. This individual was replaced with another graduate fellow. In addition, there were four undergraduate fellows from year two of the project who became graduate fellows in year three of TEPP – the other remained an undergraduate fellow. There were 19 teachers that participated in TEPP during year three, 16 of whom also participated in year two of the project.

All TEPP fellows and teachers were asked to complete a questionnaire each year of the project. Middle school principals participated in focus groups and completed brief questionnaires in the first two years of the project. Attempts were made to engage fellows' faculty advisors in the project evaluation the last two years of the project. During the first year of the project, middle school students were asked about their attitudes toward math and science and to provide feedback on classroom activities led by the fellows.

Procedures

Questionnaires¹ were used each year as the primary method for data collection. Minor modifications and enhancements were made to this primary methodology each year. Each year's procedures, therefore, are described separately.

Year 3 (Fall 2004 – Spring 2005) Procedures

Questionnaires were administered to TEPP fellows and teachers in the fall of 2004 and the spring of 2005. In the fall and the spring fellows were asked to complete their questionnaires by a Shriver Center program coordinator. Envelopes were provided to ensure confidentiality and the Coordinator left the room while the fellows completed the questionnaires. Fellows had an 89% response rate in the fall and a 95% response rate in the spring. The program coordinator hand-delivered folders containing a cover letter, questionnaire, and return envelope to teachers' schools (placed in individual mail boxes). Of the 19 teachers participating in TEPP, 17 mailed their completed questionnaires to the Program Coordinator during the fall for a response rate of 89%. The same process was used to solicit teacher feedback during the spring semester. Thirteen of the 19 teachers mailed their completed surveys in the spring for a response rate of 68%.

Year 2 (Fall 2003 – Spring 2004) Procedures

Questionnaires were administered to TEPP fellows and teachers in the fall of 2003 and the spring of 2004. In the fall, fellows were invited to a lunch hour meeting during which time they were asked by The Shriver Center's evaluator to discuss TEPP as a group and to complete the questionnaire. Of the 24 fellows participating in TEPP, 16 attended the meeting and completed questionnaires for a response rate of 67%. The evaluator and program coordinator also hand-delivered folders containing a cover letter, questionnaire, and return envelope to teachers' schools (placed in individual mail boxes). Of the 23 teachers participating in TEPP, 16 mailed their completed questionnaires to the evaluator for a response rate of 70%. In the spring, fellows were asked to complete their questionnaires by a Shriver Center program coordinator during exit interviews. Envelopes were provided to ensure confidentiality and the coordinator left the room while the fellows completed the questionnaires. All 23 fellows (one quit after the fall semester) completed surveys for a response rate of 100%. The same process was used to solicit teacher feedback during the spring semester. Fourteen of the 23 teachers mailed their completed surveys for a response rate of 61%.

Year 1 (Fall 2002 – Spring 2003) Procedures

The principal investigator, a project coordinator, and the evaluator met with principals and teachers throughout the year in an effort to obtain timely feedback on the project. In addition, the evaluator met with school principals during a TEPP Symposium breakout session held in January 2003. The evaluator met with the project staff mid-year to obtain both written and verbal feedback on the project's progress. A total of four questionnaires were developed to gather information from participating teachers, fellows, and middle school students. Baseline student grades and demographic information were collected using a form developed specifically for documenting these data.

¹ Available from The Shriver Center's Director, Michele Wolff, upon request.

Findings

Year 3 (Fall 2004 – Spring 2005)

Fellows' skills improvement. Most fellows reported that TEPP helped them develop job-related skills, including communication and teaching skills.

- The majority of fellows (94%) felt that their participation in TEPP helped them develop job-related skills.
- Many fellows (61%) felt that participating in TEPP helped them formulate a career path.
- Most fellows (94%) were confident in the ability to teach science and math to middle school students as well as teaching inquiry-based science and math (78%) after participating in TEPP. Confidence was high for many fellows (71-88%) prior to participation in TEPP, however.
- All fellows were confident in the ability to communicate with middle school students and most (94%) were confident in the ability to communicate with middle school teachers after participating in TEPP. Many (89%) were also confident in their ability to talk about their own research with people who know little about it. Confidence was high for just as many fellows prior to participation in TEPP, however.

Middle school teachers were also asked to assess fellows' teaching and communication skills. Teacher and fellow assessments of skills were generally consistent.

- Many teachers rated fellows' ability to teach science (61.5%) and math (75%) highly (e.g., somewhat or very able). Relatively fewer teachers viewed fellows' ability to teach inquiry-based science (46%) and math (67%) highly.
- All teachers felt that fellows were either "very" or "somewhat" able to communicate with middle school students and teachers. Sixty one percent of teachers rated fellows' ability to talk about their research with people who know little about it favorably.

In addition, participation in TEPP increased fellows' interest in and understanding of K-12 education issues.

- All fellows reported an increased interest in K-12 education issues after participating in TEPP.
- Fellows' understanding of various K-12 education issues also increased as a result of participating in TEPP. Most fellows (15-18) reported a significant to deep understanding of the following issues after participating in TEPP whereas prior to TEPP few (1-6) reported such understanding.
 - The experience of K-12 teachers within the classroom
 - Constraints teachers face when attempting to change pedagogy or curriculum
 - General issues in K-12 science and mathematics education reform
 - Barriers to improving K-12 science and mathematics education
 - Roles fellows can play to help improve science and mathematics education

- How to create age-appropriate curriculum materials
- How to create curriculum materials aligned with the K-12 standards
- How to contribute to the national discussion of K-12 education reform
- How to participate in future K-12 outreach activities
- Theories of learning
- Approaches to teaching
- Ways to assess student learning
- How to evaluate a program/product

K-12 students' enriched learning. TEPP fellows felt they enriched the middle school students' classroom experiences by offering hands-on activities that connected science and math concepts to their everyday lives. Working with teachers to conduct lab experiments and integrate technology into science and math lessons enhanced student learning. Some fellows also felt they provided important role models for students and helped them learn more about college life. For example, fellows made the following comments.

“I enriched the science experience of students by making science interesting. This was done by making connections between what they experience everyday and the science that happens all the time.”

“Making up fun activities for the students to do. Breaking down the complex and making it simple. Facilitating learning through various teaching styles.”

“The creation of cell model using different household and food products to represent different parts of the cell has given students hands-on activities, creative ways to represent things, i.e., formulate analogies, and increased their interest in science.”

“I was able to enrich the math and science learning experience by the use of technology in the classroom. Students were able to view 3D models of things that they only saw in a textbook. In short, my help was able to bring some life to the math/science learning experience.”

“I created activities with real-world examples to demonstrate how math works and is present in the real world – “shopping game” (some algebraic equations), “can you buy a house” (interest, loans, principle).”

“As the year progresses, more students were willing to bring their questions and concerns to me without being prompted. This gives me the impression that the students have increased their desire to succeed through the presence of a college student/fellow. By relating my math experiences to their curriculum, I feel every student has been given an added motivation to achieve.”

“Throughout the internship, my partner teacher kept stressing how much we need to engage the kids because if they like a subject, then the more chance of them pursuing it all through college. So in addition to just teaching the kids, [teacher] and I make it a point to talk about higher education and I even gave some of my lessons I learned in high school and college.”

“Showed in labs how math and science work together. Exposed them to different tracks/jobs in these areas. Exposed them to math and science on college level and allowed them to participate in fun labs. Incorporate technology in curriculum. Used channels of interest to allow them to learn new concepts.”

“I provide new laboratory experiments, give a different perspective or approach to lesson plans, and introduced new relevant tidbits in the scientific community.”

“Incorporated Think Pads into science labs that allowed for more interactivity. Showed how to use graphing calculators to help in science.”

All fellows described their impact on student learning when asked what made them the most proud in their Fellowship experience.

“Having kids improve because of my interaction with them makes me proud.”

“The feeling that I made a difference in at least a couple of students that higher education is an achievable and worthy goal to strive for after high school and middle school.”

“Seeing the personal growth in many of the students, who have been promoted to higher classes and now have the necessary motivation to succeed.”

“The impact I had on the students’ overall performance.”

“The impact I have had on kids’ lives. When they want to know about college and start showing signs of wanting to continue their education.”

“There were many students in danger of failing and my one on one lessons with them helped them to understand concepts better, which led to them passing.”

“In my experience seeing students do progressively better. Students who didn’t even know when the next exam was, who now have begun to open a book even if it is while watching tv. They make an effort.”

Teachers’ comments were consistent with the fellows regarding the impact on middle school students. Five teachers said that the TEPP fellow increased students’ motivation to do well in the subjects and in class. Three teachers attributed an increased interest in attending college to the TEPP fellow’s presence in the classroom. One teacher reported that test and benchmark scores of students increased because of the TEPP fellow. Teachers’ perceptions of how TEPP impacted “lower achievers” were particularly remarkable.

“The lower achievers brought up their grades with his encouragement.”

“My TEPP student was able to share ideas and strategies that made more sense to some students, especially the struggling learners.”

“Students who normally wouldn’t perform up to standards became motivated.”

“High engagement – especially of those students most reluctant to join in group activities.”

“Brought high interest to low achievers.”

Teachers’ professional development. Formal and informal teacher feedback in years one and two of the project suggested that teachers did not view TEPP as a professional development opportunity for themselves. They viewed TEPP as an important resource for their students, valuable classroom assistance for themselves, and an opportunity for the fellows to develop professional skills. Given this feedback, teachers were simply asked how participating in TEPP affected them and/or their teaching. Some responses include:

“It has helped me to differentiate my instruction more to meet the needs of all of my students.”

“I am much more comfortable with the TI83 and demonstrating skills.”

“The TEPP program has allowed me to enrich my lessons with technology and diversify my teaching style. My own personal knowledge of technology has been improved dramatically because of the fellow’s willingness to sit with me and develop PowerPoints. His assistance with troubleshooting has proven to be the best learning experience. It was very helpful having an expert in the room with such extensive knowledge.”

“It has enhanced my use of data acquisition labs with the laptop.”

“Broadened my perspective on inclusion of relevancy and supporting students who struggle with certain math problems. Help students connect to why we are learning this math (application to life).”

“Increased my knowledge of mechanical engineering. Increased my knowledge of the graphing calculator.”

“I am more able to be flexible and differentiate for the needs of my students.”

Strengthened university-community partnerships. The Shriver Center provides opportunities for students to connect theory to practice through community-based programs that address critical social needs in the greater Baltimore region. The Shriver Center exemplifies the University’s commitment to producing socially engaged citizens. TEPP provided just such an opportunity for participating fellows.

- All 18 TEPP fellows felt that their participation in TEPP increased their sense of civic responsibility.
- Most fellows (94%) said that their participation in TEPP increased their interest in community issues, increased their commitment to a life of responsible citizenship, and enhanced their understanding of social, economic, and political issues in a local setting.

- Many fellows (61%) felt that participating in TEPP helped make their classroom experience more relevant.
- All 18 TEPP fellows felt that programs like TEPP are important to UMBC's mission.

In the words of the TEPP fellows:

"I have shifted my view about higher education from a self promoting reason to the opportunity to better serve my communities."

"TEPP has motivated me to be more involved with the community and set an example for the younger generations."

"I most certainly developed the skills that will allow me to be a responsible citizen. Bringing my education into the classroom established the link between academic life and society for me."

"The TEPP fellowship...allowed students and fellows to be engaged by connecting academic life to the larger society."

"It (TEPP) afforded me the opportunity to better understand the wants, needs, failures, and successes in the schools of our local communities. This has highlighted to me what needs I can contribute to best."

Year 2 (Fall 2003 – Spring 2004)

The full year two evaluation report may be obtained by contacting The Shriver Center's Director. Key findings from year two are summarized below.

Fellows' skills improvement. A majority of fellows felt that their involvement in TEPP furthered their professional development. With respect to communication and teaching skills specifically, self- and teacher assessments reflect "Very" or "Somewhat" able skills. In terms of developing job-related skills such as communication and leadership, 70% of fellows agreed that this was "Very True" of the TEPP experience. Fellows' abilities in the areas of teaching, communication, and leadership were rated by themselves and teachers as either "Very Able" or "Somewhat Able" (with communication skills rated most highly) both in the fall of 2003 and spring of 2004. The findings, therefore, do not necessarily indicate improvements in these abilities given the relatively high ratings given in both the fall and the spring.

K-12 students' enriched learning. Both teachers and fellows felt that TEPP enriched the educational experiences of their students. Numerous quotes about classroom experiences with the students that support this statement are provided in the full report.

Teachers' professional development. Some teachers felt they learned from their fellow partnership but most did not view TEPP as an opportunity for *their* professional development.

Strengthened university-community partnerships. Many fellows perceived TEPP as furthering UMBC's mission as a national leader in promoting service learning, civic engagement, and community-based service delivery. Consistently, most fellows reported that their TEPP Fellowship was a valuable applied learning experience and increased their commitment to civic engagement. Fellows rated the importance of programs like TEPP in furthering the mission of UMBC. Seventy percent of fellows rated TEPP as "Very Important" to UMBC's mission and another 17% rated TEPP as "Somewhat Important". In addition, Sixty one percent of fellows reported that their fellowship experience increased their sense of civic responsibility. Eighty seven percent of fellows affirmed that the fellowship increased their commitment to a life of responsible citizenship. All fellows indicated that, to some extent, TEPP enhanced their understanding of social, economic, and political issues in a local setting. Nearly 70% of fellows reported that TEPP increased their interest in community issues.

Year 1 (Fall 2002 – Spring 2003)

The full year one evaluation report may be obtained by contacting The Shriver Center's Director. Key findings from year one are summarized below.

Fellows' skills improvement. Very little information about fellows' skills was gathered during the year one evaluation. Two broad questions about the influences of TEPP on fellows' educational experiences and goals were asked. Ninety percent of fellows felt that participating in TEPP contributed positively to their educational experience. Half of the fellows reported that participating in TEPP encouraged them to consider teaching math or science to middle school students as a career. Most of the evaluation's focus in year one was on obtaining middle school student grades in science and math, ascertaining their interest in these subjects, and obtaining their feedback on TEPP activities.

K-12 students' enriched learning. Open-ended question responses indicated that teachers thought TEPP was successful at enriching the classroom via labs, activities, technological support, and student support.

Teachers' professional development. Teachers' responses indicated that participating in TEPP has had modest impact on their professional development and has not enhanced their teaching, per se. The data did suggest, however, that teachers think TEPP has enhanced the broader educational experiences and opportunities available for students, if not their specific instruction skills.

Strengthened university-community partnerships. Partnerships were assessed more indirectly during the first year of TEPP. Teachers and fellows were asked about their satisfaction with the program – most (65%) were "somewhat" satisfied with TEPP in year one. Challenges identified by teachers fell into three main categories: building more time for planning, improve communication among all participants but especially between fellows and teachers, and address the discordant campus schedules (the rhythms of academic life at the university and academic life at the middle schools vary greatly)². A majority of teachers viewed the fellows as knowledgeable but the overall experiences of teachers reflected a 'luck of the draw' in terms of other important fellow characteristics such as teaching ability, communication skills, and

² Discordant campus rhythms remained a challenge throughout the life of the project.

dependability. Fellows identified these challenges: adequately addressing the remedial needs of many students, building in more planning time, and addressing curriculum constraints on TEPP activities.

Discussion

The most striking impacts of the TEPP program were its influence on fellows' sense of social responsibility and on middle school students' learning experiences. Students, fellows, and teachers alike attributed increased student interest and performance in science and math to the hands-on, interactive activities that fellows brought to the classroom. This was particularly true for "low achievers". Fellows were also important role models for middle school students in high-needs schools. Some students started to consider college as a viable option – including studying the STEM disciplines - because of the positive influence that fellows had on students while teaching these subjects. Will these TEPP fellows go on to become professors who are more committed to outreach in their local communities? Will these middle school students, and others who have had a GK-12 fellow in their classroom, improve their math and science grades? Will they pursue STEM careers? Only time will tell but the findings from this evaluation suggest that the future holds promise when the hearts and minds of students at all levels are engaged.

Addendum

Some of the feedback elicited from fellows and teachers in 2004-2005 was specific to The Shriver Center's administration of the project. We assume that such feedback is of interest to the staff that was responsible for managing TEPP. Project management information is included in the addendum, however, because it was not of central concern to the National Science Foundation.

How did students learn about TEPP?

The most common ways in which students learned about the TEPP fellowship were:

- (1) e-mail distributed by the department (47%),
- (2) a friend (29%), and
- (3) a former or current fellow (23.5%).

What motivations did fellows and teachers have for participating in TEPP?

The most important factors for participating in TEPP reported by fellows were:

- (1) To improve leadership skills (59%),
- (2) To improve teaching skills (53%), to improve communication skills (53%), to work with kids in the classroom (53%),
- (3) A personal interest in improving K-12 education (47%), and
- (4) A source of funding (41%).

The most important factors for participating in TEPP reported by teachers were:

- (1) A personal interest in enriching education (94%),
- (2) A belief in the importance of partnerships between the university and schools (88%)
- (3) A desire to improve teaching skills (59%)
- (4) An interest in the professional development opportunities provided by TEPP (47%)

What expectations did fellows and teachers have of their role in TEPP?

TEPP fellows entered the program with expectations of providing a supportive role in the classroom (e.g., providing resources, assisting in teaching lessons, assisting students in class, participating in planning lessons) and offering technical consultation (e.g., providing additional expertise, locating materials) to teachers. There was less consensus about the appropriateness of assuming independent teaching roles (e.g., teaching with little or no assistance, creating and presenting original lessons) and more traditional departmental and student teacher roles (e.g., assisting in student reviews, entering student grades, distributing student sheets, attending departmental or faculty meetings, attending in service workshops, attending PTA/PTO meetings).

TEPP teachers had similar expectations of fellows. Teachers thought fellows would support their classroom instruction (e.g., providing resources, assisting in teaching lessons, assisting students in class, participating in planning lessons) and offer technical expertise (e.g., locating materials). Teachers expected more independent teaching, however, than fellows. Like the fellows, there was no consensus among teachers about fellow involvement in more traditional departmental and student teacher roles.

How responsive was staff to the needs of fellows and teachers?

Fellows provided the following feedback about Shriver Center staff.

- 94% of fellows felt that the general organization of TEPP was good or very good
- 94% of fellows felt that staff was good or very good at providing support to solve problems they encountered
- 83% of fellows felt that staff was good or very good at communicating expectations
- 83% of fellows felt that staff was good or very good at providing feedback on how they were doing
- 77% of fellows felt that staff was good or very good at communicating consistently and regularly

Teachers provided the following feedback about Shriver Center staff.

- 92% of teachers felt that the general organization of TEPP was good or very good
- 92% of teachers felt that staff was good or very good at providing support to solve problems they encountered
- 91% of teachers felt that staff was good or very good at communicating expectations

- 83% of teachers felt that staff was good or very good at communicating consistently and regularly
- 80% of teachers felt that staff was good or very good at providing feedback on how they were doing

Based on this positive feedback, and compared to feedback received during year one of the project, The Shriver Center staff improved their management of the project over the course of the three years. Improvements included recruiting better fellow candidates, better preparing teachers and fellows with day-long orientation meetings, more regular communication with teachers and fellows, and providing better support overall to program participants.