

## **TEACHING AND LEARNING SEMINAR FOR SCIENCE AND MATHEMATICS FACULTY**

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A yearlong seminar for science and mathematics faculty to investigate teaching and learning is in its second year at George Mason University in Fairfax, Virginia. This article describes the seminar and preliminary findings from the first year.

The yearlong seminar is a joint effort of the science, mathematics, and education departments. The purpose of the seminar is to foster a discussion among faculty about effective teaching and learning in order to enhance understanding of research-based teaching and assessment practices. In addition, it is to provide support as faculty reflect on their own teaching and try to develop strategies to reach all students.

### **Seminar design**

#### **Participants**

The seminar was open to all science and mathematics faculty and participation was voluntary. In year one there were ten participants, five males and five females. The participants ranged from second year faculty to veterans of many years, including one department chair. In general, the female faculty members were younger and had less experience at the university level than their more senior male colleagues in the seminar.

#### **Logistics**

The seminar met twice a month from September to May for three-hour sessions. For their participation, faculty members received a \$1000 stipend. They also received approximately one book a month that was tied to seminar topics.

George Mason University is located in the northern Virginia suburbs of Washington, DC. The university has 25,000 students and 850 faculty. Over 100-degree programs are offered from the bachelor to the doctoral level.

### Seminar leader

The seminar discussion leader is a science educator in the Graduate School of Education. She set the agenda, shared research on teaching and learning, and facilitated faculty discussions. She has taught both education courses and chemistry courses at the college level. In the first year of the project, she conducted the seminar in addition to her regular teaching load.

### Seminar topics

In addition to exploring research on new topics each session, the faculty members shared their own experiences in teaching. This sharing was extremely important to participants who seldom had the opportunity to discuss teaching. The seminar topics included:

- multiple intelligences and learning styles,
- cooperative learning in large lectures and small classrooms,
- questioning strategies and wait time research,
- *Third International Mathematics and Science Study* (1996 [1], 1997 [2, 3], 1998 [4]),
- gender equity in the classroom and meeting the special needs of students,
- science and mathematics sections of the *Standards of Learning for Virginia Public Schools* (1995) [5],
- *National Science Education Standards* (1996) [6] and *Curriculum and Evaluation Standards for School Mathematics* (1989) [7],
- inquiry-based laboratory and mathematics activities,
- calculator-based and conferencing technology,
- multiple forms of assessment,
- rubrics and grading, and
- testing and evaluation.

Outside of the seminar the faculty members were expected to try many of the strategies discussed. When they returned to the next seminar, they shared their successes and areas of concern. Group problem solving, sharing, and encouragement soon became the norm. Half way through the year, the faculty members observed each other teaching. Positive examples of strategies discussed in the seminar were shared at the next meeting.

## Findings

### Reasons for attending the seminar

During the first seminar meeting, the faculty shared why they chose to attend the seminar. The two themes that emerged were a desire to:

- Know how to get students interested in learning and in the process improving their basic mathematics and science skills; and
- Expand their knowledge of instructional strategies including learning about models of appropriate practice.

### Seminar evaluation

In an end of course survey the participants were asked four questions:

- What were the most helpful aspects of the seminar for you?
- What were the least helpful aspects of the seminar for you?
- Is the seminar worth offering in the future for other faculty? Why?
- How could the seminar be improved?

**What were the most helpful aspects of the seminar for you?** The four themes that emerged from this question related to meeting other faculty, instructional strategies, new knowledge, and encouragement.

Meeting other faculty. All participants valued getting to know faculty from other departments and sharing expertise. "I found very useful the amount of discussion with colleagues on a wide variety of topics related to teaching."

Instructional strategies. A consistent theme expressed by the faculty was, "learning about different teaching strategies," "being brought up to date," "sharing ideas on teaching methods," and "learning teaching strategies that engage students more (e.g. cooperative learning)."

New knowledge. Three categories of new knowledge were terminology, reform movements, and research. In addition to learning the terminology used in the field of education, they found it especially meaningful to learn the terminology for what they were already doing in their own teaching. In general, the faculty were not familiar with the research base on teaching and learning and had little in depth knowledge of current reforms in science and mathematics education. They knew the existence of the *National Science Education Standards* (1996), *Curriculum and Evaluation Standards for School Mathematics* (1989), *Standards of Learning for Virginia Public Schools* (1995), and *Third International*

*Mathematics and Science Study* (1996, 1997, 1998), but had not had the opportunity to look at the actual reports and documents. Receiving copies of standards, reviewing these documents, and discussing them were a part of building their new knowledge of education reform. Learning about the achievement results of students in the *Third International Mathematics and Science Study* and analyzing the videotapes from the study for effective teaching strategies, provided examples of the complex nature of teaching. Building their knowledge of teaching and reform in education were areas of interest.

Encouragement. "Receiving encouragement to try various techniques" to help students learn was part of the collegial support system. As faculty got to know each other, they shared their concerns about teaching. Through group problem solving, they identified alternate strategies, commiserated on existing frustrations, and generally encouraged each other.

**What were the least helpful aspects of the seminar for you?** The scheduled time of the seminar and too many pre-college examples were the two areas that were least helpful.

Scheduled time. The timing of the seminars was problematic for many faculty. Though the seminar time and day of the week was chosen by consensus, there were conflicts as the year progressed with department faculty meetings and field research days. Finding a convenient time to meet will remain a challenge for this type of program.

Pre-college examples. A few faculty members felt that there were too many pre-college examples of teaching strategies. Perhaps there were too many examples, but when the faculty were uncomfortable with an interactive teaching strategy, they often thought of it as a pre-college strategy.

**Is the seminar worth offering in the future for other faculty? Why?** All of the participants except one felt that the seminar should be offered to other faculty members and that one person was uncertain. When responding to why the course should be offered again, one faculty member stated, "There are simply small ways in which one can adopt new strategies that are of great benefit." Another faculty member indicated that participating in the seminar "Opens up thinking to other methods and helps us analyse (sic) our teaching. It makes me think and question what I am doing, approaches I am using and has given me other areas to explore if a certain strategy is not working."

**How could the seminar be improved?** As noted earlier, meeting faculty from other

departments and sharing ideas was one of the most significant parts of the program. It was therefore no surprise that doing even more sharing was their suggestion for improvement.

### **Changes in teaching**

When the faculty met with the Dean of the College of Arts and Sciences and the Dean of the Graduate School of Education after the completion of the seminar, they indicated that the most helpful aspects of the seminar were meeting faculty from other departments and changes in their teaching. In a series of testimonials, even the more hesitant, less risk taking faculty members indicated changes in their teaching. One of the participants stated, "I am a lecturer and I have learned to break up my lectures." Another discussed providing more structure to lectures by providing students with an outline of the lecture and overview at the end of the lecture. One of the faculty, who had tried her first group project and used a rubric to communicate expectations to students, summarized the challenge of teaching by sharing her success with using a new strategy with her students, but her frustration because "grades are still low."

### **Conclusion**

The seminar provided a successful format for faculty members to expand their knowledge of teaching and learning and to receive support as they tried new strategies. From participating in the seminar, all ten faculty members and seminar leader built collegial relationships with faculty members in different departments. The seminar raised the level of awareness among the faculty of the research base and reform movements in education. Reflecting on teaching and doing research on your own practice is a slow process and one that is new to most faculty members.

By knowing about teaching and learning research and applying it in their classes, the faculty will be better able to provide instruction to meet the diverse needs of their students. This will also likely provide future teachers with increased knowledge of science and mathematics and therefore, assist them in providing appropriate learning experiences for children.

Since the university sponsored the seminar, it sends a clear message that teaching is valued as well as research. The second year of the seminar is now in progress. ■

**References**

- [1] *Pursuing Excellence: A Study of U.S. Eighth-Grade Mathematics and Science Teaching, Learning, Curriculum, and Achievement in International Context* (NCES 97-198), U.S. Department of Education, Washington, DC, 1996.
- [2] *Pursuing Excellence: A Study of U.S. Fourth Grade Mathematics and Science Achievement in an International Context* (NCES 97-255), U.S. Department of Education, Washington, DC, 1997.
- [3] *Eighth-Grade Mathematics Lessons: United States, Japan and Germany* [Videotape], U.S. Department of Education, Washington, DC, 1997.
- [4] *Pursuing Excellence: A Study of U.S. Twelfth Grade Mathematics and Science Achievement in an International Context* (NCES 98-049), U.S. Department of Education, Washington, DC, 1998.
- [5] *Standards of Learning for Virginia Public Schools*, Board of Education, Commonwealth of Virginia, Richmond, VA, 1995.
- [6] *National Science Education Standards*, National Research Council, Washington, DC, 1996.
- [7] *Curriculum and Evaluation Standards for School Mathematics*, National Council of Teachers of Mathematics, Reston, VA, 1989.