

## THE MARYLAND EDUCATORS' SUMMER RESEARCH PROGRAM

... building bridges between laboratories and classrooms.

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MESRP is a teacher professional development program that places inservice and preservice teachers in summer internships at government, university, and private laboratories across the state of Maryland to experience authentic research. As both learner and contributor in the research environment, interns gain a wealth of knowledge that promotes inquiry-based learning and gives them the credibility and experience needed to incorporate current content and authentic data into science and mathematics curriculum. During the school year following their internship experiences, interns participate in outreach and professional development activities that provide resources and further learning opportunities for themselves and other educators. These activities facilitate the transfer of attitudes and beliefs about science and mathematics education into classroom practices that engage students in active, investigative learning that will ultimately improve their attitudes, perceptions, and performance in science and mathematics. As the program concludes its third year, it is evident by the existing evaluations that the design and implementation of MESRP has far-reaching potential to significantly impact the future of science and mathematics education. Having been sought as a model for replication on a national scale, MESRP sets the pace in providing a model for summer internships for the enhancement of both teacher preparation and professional development. The continued support of the research laboratories and various funding agencies speaks to the validity of the program and a mutual interest in the enhancement of the teaching and learning of science and mathematics in the state of Maryland.

### Program Summary

The Maryland Educators Summer Research Program (**MESRP**), headquartered in the Center for Science and Mathematics Education at Towson University, provides opportunities for motivated inservice and preservice teachers to experience cutting-edge science and technology through authentic research experiences. This hands-on approach promotes inquiry-based learning and gives teachers the credibility and experience needed to incorporate current content and authentic data into science and mathematics curriculum.

**MESRP** operates on a yearly cycle, beginning in early spring, when eligible inservice and preservice teachers are invited to apply for participation in the program. A selection committee, appointed by **MESRP**, reviews and ranks all applications and makes recommendations for placement according to each candidate's suitability for specific sites. Site Representatives

interview candidates recommended for placement at their sites to determine final approval for intern placement.

During the summer, interns team with mentor scientists for a six- to twelve-week internship to participate in research at government, university, and private laboratories throughout Maryland. As both learner and contributor in the research environment, interns gain a wealth of knowledge that will impact how they view teaching and learning. Whenever possible, inservice and preservice teachers are paired at research sites, enabling experienced teachers to serve as mentors who can provide valuable insights on both classrooms and workplaces to preservice teachers. Likewise, preservice teachers are able to contribute fresh perspectives from their teacher preparation program.

The commitment to learning does not end with the research experience. During the school year following their internship experiences, interns participate in outreach and professional development activities designed to build bridges between laboratories and classrooms, while providing resources and further learning opportunities for themselves and other educators. These activities, which include a Classroom Implementation Project, a Speaking Event, and a Collaborative Activity, facilitate the transfer of attitudes and beliefs about science and mathematics education into classroom practices that engage students in active, investigative learning that will ultimately improve their attitudes, perceptions, and performance in science and mathematics.

*... when it is time (for my students) to enter the public arena outside of the classroom, they will use the voice they have gained in my class to transform the world into a better place.*  
N. Davis '99

## **Program History**

In the summer of 1998, the Maryland Educators' Summer Research Program (**MESRP**) was established to expand upon the foundation of two previous Maryland internship programs for teachers: The Maryland Collaborative for Teacher Preparation (MCTP), a statewide program for the preparation of science and mathematics specialist teachers for the middle schools (1993-present), and The University of Maryland Graduate Fellows (UMGF) program, a research internship program (1992-1998) for outstanding middle and secondary school mathematics and science teachers who had previously completed the Governor's Academy, a summer residence program for teachers that provides professional enhancement in the areas of reform- and standards-based science and mathematics education. Recognizing that the audiences served by these programs could enrich the internship experiences for one another, the Center for Science and Mathematics Education at Towson University sought to pioneer a new model for summer research internships through the establishment of **MESRP**.

## Program Goals

The ultimate goal of the **MESRP** is twofold:

- 1) to enhance teachers' ability to engage students in active, investigative learning that will ultimately improve their attitudes, perceptions, and performance in science and mathematics
- 2) to improve retention of teachers in Maryland schools while providing the opportunity for experienced teachers to serve as mentors offering preservice teachers valuable insights on classroom practices.

## Program Outcomes

- \* provide teachers with authentic research experiences in science and mathematics that can then be transformed into classroom experiences for their students
- \* foster changes in teachers' attitudes and beliefs concerning teaching and learning of science and mathematics
- \* facilitate the development, implementation, and dissemination of inquiry-based lessons that nurture students' curiosity and ability to construct knowledge
- \* construct networks of support among preservice and inservice teachers, and the research facilities to foster mentoring relationships

## Performance Outcomes for Interns

*I always describe my summer experience at the lab as “brain stretching.”*

A. Williams '99

- \* experience science and technology through the eyes of a scientist in an authentic research project that will allow them to
  - expand knowledge of science, mathematics, and technology content,
  - learn about state-of-the-art equipment and techniques,
  - gain valuable resources.
- \* acquire knowledge, skills, and attitudes that will change the way they view and teach science and mathematics.
- \* facilitate the transfer of knowledge and enthusiasm of the research experience into classroom practices by completing a 3-part Outreach Project that extends into the school year following the internship, including a
  - ✓ Classroom Implementation Project (CIP)
  - ✓ Speaking Event
  - ✓ Team or Collaborative Activity

## The Research Internships

Selected government, university, and private research laboratories across the state serve as host institutions for the internships. To date, there have been 20 different participating sites, of which 82% have contributed to the cost of the interns' stipends and a portion of the related administrative and outreach expenses. (For a complete list of participating sites, see *Appendix 1*).

At each site, a representative is designated to collaborate with the **MESRP** coordinator regarding administrative issues. The site representative may be an administrative staff person, a scientist, or the mentor. At larger research facilities, a site representative may initially interview the Intern and work with the staff to identify an appropriate placement. Each intern/intern pair works with a mentor scientist while participating in the assigned research activity. The mentor scientist is the key to a successful summer experience. The mentor must take an **active** role by clearly defining an appropriate research project, providing guidance, training and support, and serving as a role model for the Intern. The mentor must be genuinely interested in science and mathematics education and be willing to assist in meeting the goals of the **MESRP** by

- \* enabling the Intern to complete a meaningful research assignment that is useful to the research site and consistent with the Intern's background and experience,
- \* enriching the Intern's content knowledge and skills in mathematics, science, and technology,
- \* motivating Interns to promote career opportunities in science and scientific literacy among students,
- \* assisting the Intern in developing innovative ideas for the classroom based on the summer research experience.

**MESRP** expects that Interns will be contributing members of a scientific team, and that their exposure to scientists and "real world" science will impact their approach to teaching (see *Appendix 4* for a complete listing of Intern Responsibilities). We hope that their experiences in research will be well-planned in advance, with specific work goals, activities, and outcomes. Projects for teachers should be meaningful, active, and "hands-on" so that teachers can bring the skills, information, and insights they gain from the research experience - as well as a new enthusiasm for science - back to their students.

*It is refreshing to be a part of the scientific process instead of a mere bystander.*

D. Price '01

*(Dr. Seagle) is great to work with. He trusts my decisions and has confidence in my work. That is the best part.*

S. Winner '99

Interns are encouraged to think carefully about their role as a member of a scientific team and how it relates to their role as a teacher. They are asked to look for examples of how to link the research experience to science and mathematics teaching and outreach. Interns are also asked to keep a reflective record of their experiences in a journal.

*Being placed in the role of a learner allowed me to truly understand the impact teachers can have on their students.*

N. Davis '99

*My eyes are opening to the "practical application" end of research. Just because you have the answer doesn't mean that people want to hear it (at least not everyone).*

J. VanDeventer '00

*Wow! To have my kids feel this way most of the time would be great!*

S. Markowitz '01

## **Additional Program Elements**

### ***Orientation***

All Interns are required to participate in an orientation program covering program procedures and expectations. This program is scheduled near the end of the school year and prior to the beginning of the internships. (See *Appendix 5* for sample Agenda.)

### ***Mid-Summer Meeting***

This is a one-day meeting scheduled approximately four weeks after the beginning of the internships. It provides an opportunity for Interns to share common experiences, receive instruction and guidance in the preparation of outcomes-based learning activities, and coordinate their plans for outreach activities. (See *Appendix 6* for sample Agenda.)

### ***Presentation Day***

All interns present a formal scientific talk summarizing their summer research experience, including implications and applications for transfer to the classroom. (See *Appendix 7* for sample Agenda.)

## **Outreach**

*If a child is to keep alive his sense of wonder, ... he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement, and mystery of the world we live in.*

Rachel Carson

A major theme of the Maryland Educators' Summer Research Program is "*Building Bridges Between Laboratories and Classrooms.*" Throughout the summer internship, Interns look for ways to transfer the information they learn in the laboratory back into their classroom.

With the approval of their mentor, Interns are encouraged to spend 10% of their weekly internship (4 hours per week) developing outreach ideas and keeping a reflective journal of their experiences that they can use when they return to the classroom.

Following the internship, Interns work individually and in teams to develop creative ways to teach problem solving, critical thinking skills, teamwork, career awareness, communication

skills, and science and mathematics content. These "outreach activities" are designed to transfer experiences from laboratories to the classroom and benefit students as well as other teachers:

**Classroom Implementation Project (CIP)** - The CIP brings some facet of the internship experience (content, technology, concept, procedure, etc.) back into the classroom for use as a teaching tool. The CIP's are developed into complete packages (i.e. units of instruction, performance tasks, etc.) that can be distributed to other Maryland educators for use in their own classrooms.

**Speaking Event** - Interns speak to teachers, administrators, parents, or community members about their summer experience and how it changed the way they view and teach science and mathematics.

**Team or Collaborative Activity** - The goal of this activity is to work with a small group of Interns, teachers, or other professionals in the scientific and/or academic community during the school year following the internship to design and implement a project that promotes positive changes in the way mathematics and science is viewed and taught.

*This internship has provided much "raw material" for me to create meaningful, real-world, in-your-own-backyard sorts of lessons for my learners.*

J. Brown '01

*This internship gave me an up-close look at these people's lives, which I think will make me a more understanding teacher to the kids who come from this lifestyle...Now I can go back and teach my students about reality instead of what I have seen on TV or read in books.*

J. Kraft '99

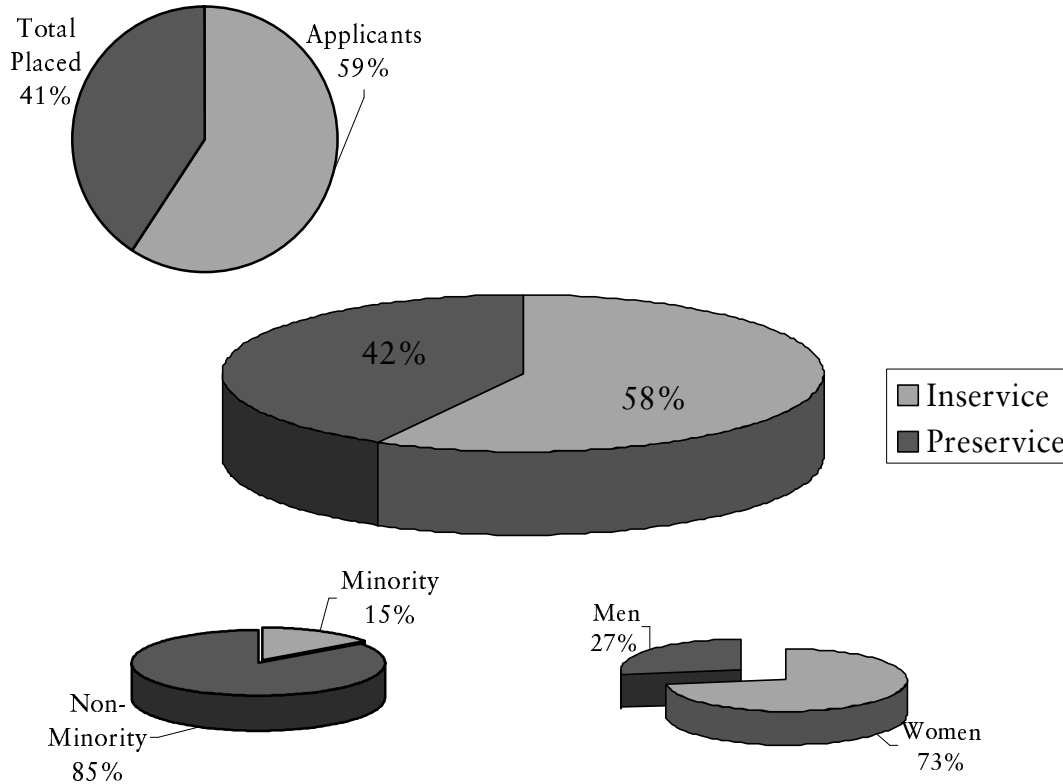
## Program Evaluation and Impact

### DEMOGRAPHICS

Over the course of three program years (1999-2001), **MESRP** has provided internship opportunities to 59 interns (34 inservice; 25 preservice) at 20 different research sites across the state of Maryland (*Appendix I*). Of the interns placed by **MESRP**, 15% were underrepresented minorities and 73% were female, distributed proportionally between preservice and inservice interns. Of the inservice interns, 21% serve a predominantly minority population through teaching in Baltimore City and Prince George's County Public Schools. Of the 59 internship placements, 68% were in pairs, of which 60% were preservice/in-service pairs. There have been a total of 85 applicants, of which 76 were offered placement. A total of 17 candidates withdrew from the program, yielding a placement rate of 69%, with the demographic profile representative of the applicants. All interns placed in a research internship successfully completed the term and requirements of the internship.

Intern demographics are maintained in a database to determine the extent and nature of participation (see *Appendices 2 and 3* for complete listing of interns and demographics), which are summarized by the graph below:

### Overall Intern Demographics



### MONITORING OF PARTICIPATION

During the course of the internship periods, the Program Coordinator has visited each intern/intern pair on-site to monitor progress, assist with program-related issues, and provide guidance in planning for the transfer of the research experience through outreach activities. Interns are required to communicate regularly (at least once each week) during the internship period via an email ListServ, which netted an overall average of 75% rate of use. A review of the ListServ entries and the reflective journals kept by each intern during the research experience has revealed increased understanding of the process and value of authentic research, renewed enthusiasm for using inquiry-based instructional strategies, and a depth of appreciation for the overall quality of the research experience.

*It took a long time (to set up the equipment) and was tedious, but reminded me that science does not occur in a 60-minute class period.* R. Hermann '01

*This experience has reinforced my desire to teach experientially, where students learn curriculum more through the outside environment than sitting down in a classroom.* S. Markowitz '01

In September following each summer internship period, a Presentation Day (see *Appendix 7* for Agendas) has been hosted at Towson University to allow interns an opportunity to present their summer experiences with family, peers, site representatives, mentor scientists, and others from the educational and scientific community. A total of 97% of the interns have participated in the Presentation Day, sharing not only the research activities in which they participated, but also implications and applications for transfer to their own classrooms. (See *Exhibits 1,2, and 3* for Abstract Summaries.) Complete text of the Interns' Abstract Summaries are posted at the MESRP website [www.towson.edu/~smross](http://www.towson.edu/~smross).

*This summer has renewed my sense of wonder.*

C. Harvey '99

*I have learned more in the past 8 weeks about the environment than I have in all of my biology classes.*

E. Greene '01

*I am definitely a changed person from the beginning of the internship. I understand field research more, and (Dr. Forester) can see my improvements... I have really grown as a person and have learned so much science.*

A. Bassolino '01

#### FOLLOW-UP

The Internship Coordinator has maintained on-going communication with all interns via written correspondence (email and post) and phone calls to monitor progress on outreach activities. The listserv has remained active through the end of the academic year following each internship period to continue sharing of information relevant to the improvement of science and mathematics education.

Classroom Implementation Projects have been collected from each intern/intern pair (See *Appendix 8* for Classroom Implementation Projects) as well as documentation for the Speaking Events and Collaborative Activities (see *Appendices 9 and 10*). In both 1999 and 2000 program years, two Interns withdrew from the **MESRP** following the internship period. Of the remaining Interns, 45% from 1999 and 70 % from 2000 completed all Outreach requirements, with the rates of completion for preservice and inservice Interns being equivalent. (Note: a larger portion of the 1999 Interns – 65% - completed the all but one piece of the Outreach.) For **MESRP '01**, 100% of the Interns have submitted drafts of their Classroom Implementation Projects, establishing a trend for increasing success in the completion of Outreach requirements.

Inservice interns who complete all outreach requirements are eligible to receive six Continuing Professional Development credits through the Maryland State Department of Education and receive documentation to be submitted by their Local Employing Agency. Preservice Interns who complete all Outreach requirements receive a Certificate of Completion to indicate their fulfillment of an internship experience (required for all MCTP students).

## Implications for Additional Evaluation

Intern attitudes and practices toward teaching and learning of science and mathematics, as well as classroom practices were evaluated prior to the internship period by way of survey. These surveys will be compared to post-surveys administered within six weeks of the completion of the Outreach Requirements. The results of the analysis of data from the pre- and post-surveys, augmented by the study of the weekly e-mail journal entries, will examine changes in attitudes and perceptions about science and mathematics education, as well as changes in classroom activities, including teaching style, instructional strategies, and use of science, mathematics, and technology in the classroom.

Interns' professional activities will be monitored both during and beyond their commitment to **MESRP** by way of ongoing communication and survey to determine the extent of the outreach and dissemination of information and resources resulting from participation in **MESRP**. Retention rates will also be monitored for comparison to retention rates of teachers participating in other models of professional development.

All classroom implementation projects will be made available through the MESRP website [www.towson.edu/~smross](http://www.towson.edu/~smross), which will be maintained by a Webmaster and monitored for quality of the information by the Project Director and the Coordinator. Criteria for evaluation will include scientific accuracy, age-appropriate content, and pedagogy.

The current budget does not afford an independent, external evaluation; however, additional funding is being sought to allow for such an evaluation.

## Conclusion

As the program concludes its third year, it is evident by the existing evaluations that the design and implementation of **MESRP** has far-reaching potential to significantly impact the future of science and mathematics education. Having already been sought as a model for replication on a national scale by the Department of Energy in cooperation with the National Science Foundation (DOE PreService Teacher Institute - <http://www.scied.science.doe.gov/scied/PST/about.htm>), **MESRP** sets the pace in providing a model for summer internships for the enhancement of both teacher preparation and professional development.

The continued support of the research laboratories in both financial and human resources, combined with fiscal support from the funding agencies, speaks to the validity of the program and a mutual interest in the enhancement of the teaching and learning of science and mathematics in the state of Maryland.

*I can't believe that the internship is over... now I have completed something that I never in my life imagined I would do.*

A. Bassolino '01

*Overall this was an incredible experience... one that I will never forget.*

N. Friedland '00

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