2006-991: VDP--A MENTOR-FOCUSED MIDDLE SCHOOL OUTREACH PROGRAM

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VDP--A Mentor-Focused Middle School Outreach Program

Abstract

The Virginia Demonstration Project (VDP) is a science and math outreach program for 7th and 8th grade students. The VDP is funded by the Office of Naval Research and is currently being piloted in the middle schools of Stafford, Spotsylvania, and King George County, Virginia. Scientists and engineers employed at the nearby Naval Surface Warfare Center in Dahlgren, Virginia, work alongside the teachers, and, serving as mentors and role models, use problem-based learning techniques to give a real-world, Navy-flavored realism to the educational experience. The objective of the program is to increase interest among the students in pursuing careers in math, science, and engineering.

Introduction

> *"America's progress has been synonymous with innovation. Thorough grounding in science and mathematics contributes to people's full participation in the professional, civic, and intellectual possibilities available in American society. Corporate growth and economic development, coupled with a higher standard of living, are inextricably tied to technological advancement. To continue to grow, however, the United States needs a technically literate society and an engineering-minded workforce. Unfortunately, these are two key areas in which our education system often fails to meet the mark. The good news is that a solution can be found in our K-12 classrooms."* Douglas et al. (2004)[1].

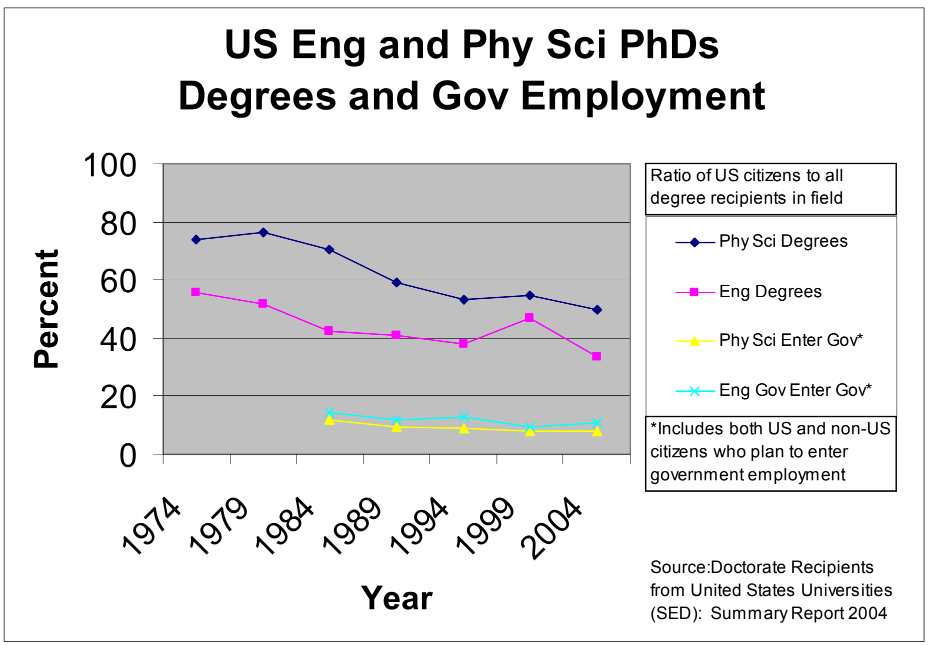
Many studies have confirmed that America's educational system is lacking. Listed under the title "Some Worrisome Indicators" in the Executive Summary of the National Academy of Engineering's (2005)[2] *Rising Above the Gathering Storm*, three particularly compelling statements can be found: 1) "Fewer than one-third of US 4th grade and 8th grade students performed at or above a level called "proficient" in mathematics, 2) "US 12th graders recently performed below the international average for 21 countries on a test of general knowledge in mathematics and science," and 3) "In 1999, only 41% of US 8th grade students received instruction from a mathematics teacher who specialized in mathematics, considerably lower than the international average of 71%." There is clearly ample room for improvement here.

Aside from the educational quality issue, it is revealing to look at the demographics of the students in today's engineering programs. From Douglas et al. (2004) we read that female students comprise only 20% of the engineering undergraduates, compared to 55% of all undergraduates; and for African-Americans, the comparative figures are 5.3 and 10.8%. Of equal concern is the fact that these percentages have been dropping while the overall participation in higher education among these groups has been rising. Engineering is plainly failing to attract a significant number of women and minorities.

Douglas et al. (2004) suggests that one of the reasons can be traced back to the K-12 teachers. A survey conducted by the ASEE of 522 K-12 teachers revealed that they saw engineering as being less accessible to their students than teaching, medicine, law, and business. "It's hard, and females and minorities cannot succeed in the engineering world," is the prevailing attitude, the survey concluded. It is difficult to imagine that the teachers are not passing this viewpoint on to their students.

It is revealing to look at how engineering is viewed from the perspective of girls and the people who influence them – teachers, school counselors, parents, peers, and the media. A recent study by the Extraordinary Women Engineers Project (2005)[3] indicates that these groups simply do not understand what a career in engineering involves. Engineering is just not on anyone's career "radar screen." The study concludes that "current engineering messages portray engineering as challenging and stress the importance of superior math and science abilities," whereas high school girls are motivated by enjoying what they do, having a good working environment, making a difference, and having a good income and flexibility on the job. It concludes: "Current messaging about engineering is not aligned with key motivators for students."

The result of this failure to properly prepare and attract large numbers of this Nation's students to engineering and science programs is difficult to deny. The figure below from the National Opinion Research Center's (2005) *Survey of Earned Doctorates*[4] shows that over the past 10 years there has been a 24 percent drop in the number of US citizens earning PhDs in the physical sciences (including computer science) and a 22 percent drop in the number of US citizens earning PhDs in engineering. In addition, and particularly relevant for the program which we will describe here, there has been a history of decline in interest among physical science and engineering PhD graduates in considering the Federal government as a future employer. A number of private sector organizations and government agencies have been asking how long this can continue before the Nation's innovation-driven economy will stall. Numerous reports have chronicled this situation and have offered solutions. See, for example, Brown et al. (2006)[5].



It is encouraging to know that some of these reports have provoked Congressional testimony and calls for action. For example, the National Academy of Engineering's (2005) *Rising Above the Gathering Storm*[2] brought Mr. Norman R. Augustine, retired Chairman and COE of Lockheed Martin Corporation, Dr. P. Roy Vagelos, Retired Chairman and CEO of Merck, and Dr. William

A. Wulf, President of the National Academy of Engineering before the House Science Committee, http://www.house.gov/science/hearings/full05/oct%2020/index.htm. In addition, the National Summit on Competitiveness' (2005) *Investing in U.S. Innovation—Summit Statement*[6] resulted in Senators John Ensign (R-NV) and Joe Lieberman (D-CT) introducing comprehensive bipartisan legislation which would increase public and private funding for research, and fund additional government scholarship, traineeship programs, and innovation initiatives, http://lieberman.senate.gov/newsroom/release.cfm?id=249800.

Fortunately, a consensus appears to be evolving with regard to the attributes that successful programs aimed at increasing interest in pursuing careers in science and engineering should exhibit. Douglas et al. (2004) contains a comprehensive list of what might be considered best practices in K-12 intervention programs. It includes the following:

- *Hands-on learning*--Make K-12 science curriculum less theory-based and more context-based (hands-on), emphasizing the social good of engineering and demonstrating how it is relevant to the real world.
- *Interdisciplinary approach*--Add a technological component to all subjects and lessons, and implement writing guidelines in math and science courses.
- *Standards*--Involve engineering in K-12 lessons that map to state standards for math and science.
- *Use/Improve K-12 Teachers*--Engage more K-12 teachers in outreach efforts and curriculum writing, and increase teacher salaries to attract the best technological minds to teaching.
- *Make Engineers "Cool"*--Outreach to urban schools and females more aggressively, and create more mentors and role models to attract these constituencies.
- *Partnerships*--Create better incentives for all groups to engage in K-12 outreach (especially higher education and industry).

Despite these encouraging signs, Segal and Yochelson (2006)[7] remind us: "Top-down federal spending alone will not win the race for global leadership in science and technology. It will take a hands-on commitment from all involved in the US innovation enterprise to build world-class talent from the bottom up."

The Virginia Demonstration Project (VDP)

As if anticipating a need for such a "bottom up" commitment, in 2004, the Office of Naval Research established the Virginia Demonstration Project (VDP) as a part of its Naval Research—Science and Technology for America's Readiness (N-STAR) program. The VDP is a mentor-based, educational outreach program that uses Navy scientists and engineers working alongside teachers in the classroom to increase the level of interest among middle-school children in pursuing careers in science and engineering. This innovative, community-level program, is funded by a Congressional appropriation sponsored by Senator John Warner (R-VA) and uses the scientists and engineers at the Naval Surface Warfare Center, Dahlgren Division, (NSWCDD), as mentors and role models.

In 2005, the first year of the program, it was piloted in the seventh-grade mathematics, and science, classrooms of the six middle schools of the Stafford County (VA) Public School system. The VDP has partnered with the School of Education of the College of William and Mary to develop an academic-year- and summer-camp-based, hands-on, interdisciplinary program. With the inclusion of two additional school systems, a doubling of the number of Stafford County math and science teachers involved, and the expansion to include the additional disciplines of language arts and social studies, the VDP will reach nearly 2000 students this year.

This paper will demonstrate that this program embodies many of the best practices identified in Douglas et al. (2004). Furthermore, the assessments of the program that have been conducted lead the authors to believe that the VDP is a model that works. We believe that it is worthy of implementation not only at other Navy Warfare Centers, but also, with appropriate support from other Federal agencies and the private sector, we believe that serious consideration should be given to its dissemination to the educational community at large.

The VDP from a Navy Workforce Perspective

From a Navy perspective, the essential feature of the Virginia Demonstration Project was to determine whether Naval Warfare Center scientists and engineers could effectively team with teachers in the classroom to stimulate a greater long-term interest among middle school students in science and mathematics. Capitalizing on this interest to encourage additional students to earn degrees in science and engineering is an important issue for the Navy. Large numbers of scientists and engineers are retiring from our Warfare Centers, and fewer junior people are coming in to carry the torch. Compounding the problem is a resource imbalance that is siphoning off funding for basic and applied research.

The VDP addresses the strategic vulnerability that our nation now faces as a result of these generational, educational, and budgetary realities. The program is exploring whether working scientists and engineers with their real-world experiences can help shape positive perceptions about math and science among middle school students. More specifically, the VDP is testing whether we can inspire more young people to see the value and relevancy of a future career in science or engineering by:

- Showing pre-teens and teens that math and science are fascinating, fun, *and* socially relevant;
- Encouraging female and minority students to challenge conventional thinking about their natural aptitudes in math, science, or engineering;
- Providing middle school teachers with opportunities to team teach with practicing scientists and engineers; and
- Leveraging the mentor-rich environment which we still have in our Naval Warfare Centers to help draw new talent into our science and technology work force.

The Origins of the Program

Planning for the program began in September of 2004 with a meeting of representatives of the project's partners--ONR, NSWCDD, the Stafford County Public Schools, the Stafford County

Board of Supervisors, and the School of Education of The College of William and Mary. The College of William and Mary was responsible for three principal activities: 1) the coordination of the working relationships between the students, the teachers, and the Dahlgren scientists and engineers, 2) the development of professional workshops for the teachers and the Dahlgren mentors, and 3) the assessment of the overall performance of the program.

A Steering Committee was organized to guide the day-to-day development of the program. It consisted of representatives from the Office of Naval Research, NSWCDD, the College of William and Mary, and the Stafford County Public Schools. Beginning in October of 2004, these monthly meetings have involved discussions of how to best develop a community consisting of teachers, parents, and counselors that would be supportive of students choosing careers in science and engineering. They have led to the development of co-teaching and curriculum development workshops that bring problem-based learning strategies into the classroom, and the organization of a summer camp program that provides additional enriching challenges and breakout experiments.

During the 2004-2005 academic year, six teams consisting of 343 students and their 12 teachers, two from each of the six middle schools of Stafford County, were involved in the school-year program. From this group, 72 students and twelve teachers were selected to participate in the summer camp program. Attention was given to the selection of students for the summer camp to assure that students not yet demonstrating an interest in science and mathematics were included, as well as students who represented an appropriate level of intellectual, cultural, racial, and economic diversity.

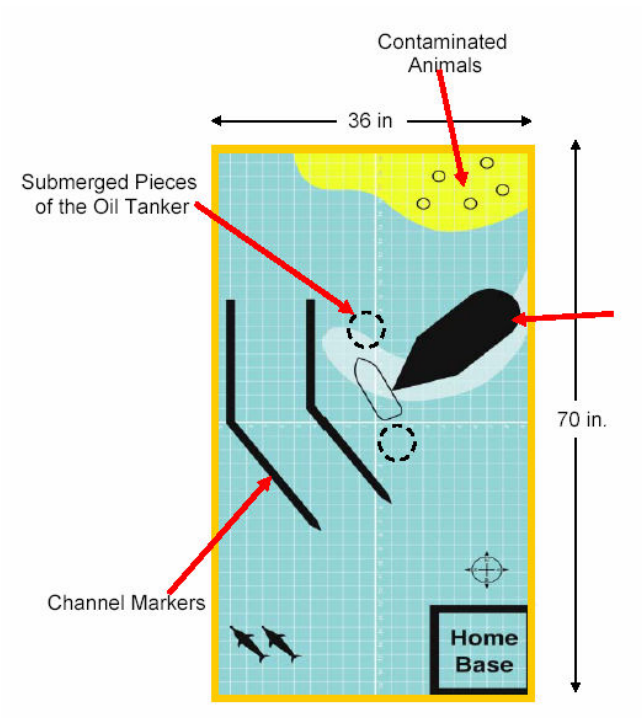
2005 VDP Summer Camp, Naval Surface Warfare Center, Dahlgren, VA

Scientists and engineers were selected from a number of Dahlgren research departments representing a cross-section of science and engineering disciplines to provide mentors for both the academic-year and summer-camp portions of the program. Care was taken in the selection of the mentors to assure that a balance was obtained between the requisite technical skills and the necessary personal skills of the prospective mentors and an awareness of Virginia's Standards of Learning. The intent was to select mentors who exhibited a high prospect of being able to interact with the students and teachers in a collaborative and supportive fashion.

Content of the Academic-Year and Summer-Camp Programs

There were two types of problems used in the VDP: 1) Robotics Challenges requiring the solution of problems having both a societal and Navy focus using LEGO Mindstorms equipment and 2) specially-constructed Breakout Experiments which were used to illustrate specific mathematics and science topics.

The Robotics Challenges used the LEGO Mindstorms kits and the ROBOLAB programming environment and were modeled after the activities of the FIRST LEGO League (FLL), a highly successful program which operates robotics competitions both throughout the US and internationally. In the first year of the project, it was decided to develop a challenge around using robotics in a mine-clearing, rescue, retrieval, and construction operation. The societal connection was provided by the humanitarian aspects of the (then current) news of the tragedy of the tsunami in Southeast Asia which required the location and retrieval of land and sea mines



Grounded Oil Tanker Robotic Challenge

Ball-Drop Experiment

that were scattered by the event. The establishment of a base of operations and the rescue of a damaged submarine and stranded persons at sea were included in the overall challenge. In the second year of the project, seeking a project that was more life-science oriented, we developed the Grounded Oil Tanker Robotics Challenge that involved the containment of marine animal injury resulting from the oil spill from a grounded freighter. This scenario was again inspired by a natural disaster--the recent hurricanes in the Gulf region of the US.

The Breakout Experiments used in the summer-camp program included the Ball Drop, Paintball (which involved high-speed photography), Water Balloon Launch, Electric Gun, Rocket Construction/Launch, Egg Drop, and Alarm System experiments. These experiments where selected based on our desire to provide a selection of projects that would demonstrate a wide variety of science- and physics-based phenomena, involve appropriate math and problem solving tasks, provide team building opportunities, and be of interest and fun to a diverse group of students both with regard to gender and ability. An additional (and important aspect) was that the experiments were to exhibit a close connection to the Virginia Standards of Learning (SOL).

Selection and Training of Teachers and Mentors

All teachers and mentors are volunteers. Since the beginning of the project, we have grown from twelve 7th grade science and math teachers in the Stafford County public school system to 48 science, math, language arts, and civics teachers in Stafford County, 24 teachers in Spotsylvania County, and four teachers in King George County. This brings the total number of students served from 343 to almost 2000 students. The teachers are paid a modest stipend to participate in the academic year and summer camp portions of the program, and the school system is reimbursed for the cost of the substitute teachers who replace the regular faculty on professional development days related to the project.

The teachers and the mentors were provided with training both in approaches to using problem-based learning in classrooms and in technical training sessions. They were trained together in order to build both a confident working relationship and to develop as a team that will implement the curriculum in the schools. Together, the SET (scientist, engineer, and teachers) teams were provided with professional development sessions by the College of William and Mary in the areas of collaborative teaching, curricula development, rubric development, problem-based learning, managing student teams, and ethics in the classroom. The technical training sessions included two days of instructions on the LEGO Mindstorms kits and ROBOLAB software. This is done to develop and expand the robotics and other technology skills (e.g., digital video camera) of the teachers and mentors, to provide a team-building experience, and to support an enhanced working relationship between the teachers and the mentors.

Introductory sessions that dealt with instructional approaches to problem-based learning were combined with sessions that enabled the SET teams to gain foundational skills in using the LEGO Mindstorms materials. Later sessions included training in the use of digital video cameras and in developing iMovie sequences from the video generated by the students. In all the sessions, a collaborative approach was emphasized, and instruction was designed to provide opportunities for the SET teams to talk and work extensively with each other. Instructors embedded opportunities for the SET team members to respond to the content of the professional development sessions. One professional development meeting was held at NSWCDD, which familiarized the teachers with the professional environment of the scientist and engineer mentors. This experience also prepared the teams for planning for the summer camp, since the summer camp was held at the base school of the Center.

S&Es as Role Models and Mentors—The Benefits

DuBois and Karcher (2005)[8] define the three attributes and characteristic practices of a mentor as someone who: (1) possesses greater experience or wisdom than the mentee; (2) offers guidance or instruction intended to facilitate the growth and development of the mentee; and (3) creates an emotional bond between the mentor and the mentee. Many individuals also view a mentor as an individual who supports and encourages individuals to extend their capabilities.

The NSWCDD scientists and engineers (SEs) more than fit this definition; they *are* the definition – the definition of what make the VDP a success. The vital role which they play can specifically be attributed to the establishment of a community support system where every one is invested in the project and the outcomes of students, the creation of a hands-on learning environment where students apply knowledge to real-world challenges and problems, and the utilization of these problems to help students understand and appreciate the work which scientists and engineers do.

In reality, the NSWCDD mentors play three roles: they serve as exemplary individuals working in a Navy setting, colleagues working with the teachers in the classroom, and role models and mentors to the students. Since the community as a whole (students, parents, teachers, school system, and employers) is invested in the program, such mentoring programs are more effective than if only a school-based program was implemented. See Nation et al (2005)[9].

Anecdotal comments, reflecting indirectly on the role of the mentors, support the quantitative indications (see next section) of the success of the program:

- Student: "I would recommend this program for my school system. It teaches kids a lot about programming and other skills that they will need when they grow up in society now a days, and it is just fun!"
- Teacher: "My experience so far have been nothing but positive, these students have taken and learned as much in these two weeks of doing this in variety of areas, as I could possible teach them in 2 years in a classroom…"
- Parent: "The kids talking about being excited about something that they are doing at school is priceless."
- School Administrator: "It is a fantastic opportunity; everything the way it is supposed to be in instruction and education in teaching and learning…"

The Robotic Challenges and the Breakout Experiments provide the foundation on which the student/mentor relationship is built. In addition to being fun for the students, these activities permit the students to gain familiarity with the tools which scientists and engineers use in their work and thus gain an appreciation of what engineers and scientists do. In an educational system in which less than half of the 8th grade math classes are taught by those with specialized mathematics training, the mentors play a vital role in contributing to the building of an environment where students *and teachers* are willing to work together to create a truly collaborative learning community.

Again, anecdotal comments support the value of the activities which take place in such a climate:

- Student: "…I like the way we get to work as teams, I like the way we have somebody there to help us out when we get lost, and I like the way we get to build [robots]."
- Parent: "[The] experience has definitely been profoundly positive, and he has I think realized the real world application by going to Dahlgren, he sees the tools that he is putting in his toolbox as something that he can use further and in the future."

In addition, by the mentors interacting with the students through various projects, students learn to associate the real-life work of SEs with scientific innovation and social relevance. Time Magazine (2006)[10] quotes Stanford President, John Hennessy as saying: "We have [TV] shows about doctors, lawyers, politicians. Where are our role models of scientific innovation?…We need Eddie the Engineer or Sam the Scientist." Hennessy is not alone in calling for such programming to demystify and humanize engineering and to create interest in engineering as a career.

Mentorship researchers agree that additional study is necessary: (1) to understand the complexities of mentor relationships and programs, (2) to identify the circumstances under which mentoring efforts make a positive difference, and (3) to produce effective approaches for translating mentorship research into practice. The VDP is part of the growing effort to respond to these needs. Its anticipated expansion to other sites will not only increase the size of the community which benefits from the program, but also add to the understanding of and practice of the mentor/student relationships which are so fundamental to its success.

Program Evaluation

Throughout the first year of the program, guided by Dr. Joe Wholey of the University of Southern California as the program's external evaluator, a considerable effort was devoted to developing a strategic plan containing what he called a "critical few" goals. They are to:

1) Develop, document, and evaluate the N-STAR/VDP process for dissemination throughout the Navy's R&D community,
2) Increase and sustain student interest and achievement in math, science, and technology,
3) Increase and sustain teacher's knowledge, skills, and abilities to develop and implement instructional programming to support achievement of all students in math, science, and technology,
4) Strengthen family and school support for student's (particularly females and minority students) achievement and interests in career paths in math, science, technology, and engineering, and
5) Develop a cadre of scientists and engineers at the Navy Research Enterprise for continuous outreach to secondary schools as a part of their professional responsibilities.

Providing a partial assessment of the attainment of these goals, seven key process and outcome goals were used as the focus of the first year's evaluation of the project. Six of the seven key goals were met, as evidenced by survey questionnaires as well as SET (scientist, engineer, and teacher) teams interviews. The one goal that was not met, that of integrating material into a handbook, was determined to be an on-going goal for the second year of the project.

When asked on an end-of-project survey which used the 1-5 point Likert scale, where "1" corresponded to "Not at All" and "5" corresponded to "To a Great Extent," 83% of the teachers and 75% of the scientists and engineers responded with a 4 or 5 that professional development sessions and training were helpful in meeting project objectives. Similarly, the teachers responded with a 4.32 (SD 0.75) that they received appropriate training prior to the initiation of the program and with a 4.36 (SD 0.49) that the Robotics Challenges were effective in meeting the project objectives. Finally, 100% of the teacher/mentor teams which participated in the summer camp responded with either a 4 or 5 when asked if the Robotics Challenges were effective in meeting the program's goals.

In addition to appropriate training, teachers reported positive responses regarding their students' interest and enthusiasm. In particular, they reported that students gained enthusiasm about the world of science and engineering (4.29; SD 0.68) and that the students' project reports indicated that the program was successful in teaching students more about technology (4.46; SD 0.89), more about problem solving (3.79; SD 1.11), more about math (3.82; SD 1.05), and more about science (3.61; SD 1.25). Most significantly in the context of the overall mission of the program, when asked if participation in the program increased, decreased, or resulted in no change in the student's interest in science or engineering careers, 2 students reported a decrease, 14 indicated no change, and 45 students indicated an increase in interest in pursing science or engineering careers.

To supplement the process and outcome evaluation, a more comprehensive and rigorous assessment of the program is currently being planned with the goal of raising questions about mechanisms for involving diverse groups in the process of constructing and understanding of what the project should do, actually does, and how its accomplishments should be documented. The proposed evaluation tool is an Inclusive Mixed Methods Design based on the principles of the transformative paradigm of research. See Mertens & McLaughlin (2003)[11].

In envisioning the assessment process, a number of questions will need to be addressed including: 1) What is overall quality of the program compared with the competition? 2) Is there a real change in the pedagogy employed by the teachers? 3) Has the attitude of the students changed as a result of their exposure to this program? 4) Does the program represent a model which is suitable for replication and use in other settings? 5) Are their rival explanations for the changes observed?

All stakeholders will be involved in this process including students, teachers, mentors, counselors, and parents, and appropriate use will be made of pre- and post-testing, focus groups, and interest and awareness inventories. Finally, careful attention will be paid to determining the quality of the assessment by means of well-known techniques such as repeated measures, performance-to-criterion, non-treated control groups, and norm-referenced methods.

Future Activities and Challenges

Interest in this program is rapidly spreading throughout the Navy community. Preliminary discussions have already taken place with the intent of expanding the program to Maryland and Rhode Island, and strong interest in having their own program has also been expressed by California, Alaska, and Hawaii. We are keenly aware that more than just Navy funding will be required and more than the just the participation of Navy scientists and engineers will be required to take the program to the National level. Accordingly, we are beginning to explore how we can work with private industry and other government agencies to secure the necessary funding and to secure the additional number of scientists and engineers which will be needed.

To guide the expansion of this program, a National Advisory Committee has been established to review the VDP's assessment procedures, validate the program for external audiences, and give advice on the attraction of private investment. Three national leaders in elementary and high education have already been nominated and have agreed to serve. The first National Advisory Committee meeting is scheduled for March of this year.

Looking to the future and in the spirit of continuous improvement, new Breakout Experiments will be added to the summer camp based upon the assessments provided by the students, teachers, and mentors. This year, as the focus of their Capstone Design course, four mechanical engineering seniors at Virginia Tech, are revising two of the current Breakout Experiments and are designing two new ones for this year's summer camp.

We are delighted with the enthusiasm shown by the students who have participated in this program. Enthusiasm is evidence of a potential paradigm shift for students, a promising indicator of the possible choice of math, science, or engineering as eventual careers. Likewise, the enthusiasm exhibited by parents and school counselors further enhances the focus on math, science, and engineering as career options. However, we are totally aware that excitement and enthusiasm are one thing, and enrolling and graduating from science and engineering degree programs are another. Providing stimulating opportunities to explore, learn, and use math and science principles as these students move through the educational system, as well as information on the selection of, and encouragement to enroll in, advanced mathematics and physics courses, and, ultimately, information on the choice of a university and on the availability of financial aid must be integrated into this program if we are to attain our long-range goals.

We are also aware that many science and engineering students spend the first part of their studies at community colleges, and we are looking at exploring ways to increase the interest of more community college students in entering four-year engineering and science programs. Finally, as we are all aware, too many talented people, once enrolled, transfer out of science and engineering programs and never obtain their degrees.

There is plenty to be done which goes well beyond the program which we have described here. But we believe (and the evaluations appear to confirm) that we have made an important start at increasing the interest of young people in pursuing careers in science and engineering. We eagerly look forward to the expansion of the program, both in terms of its scope and its dissemination to other sites.

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Appendix

N-STAR
NAVAL RESEARCH – SCIENCE & TECHNOLOGY FOR AMERICA'S READINESS
VIRGINIA DEMONSTRATION PROJECT 2005

Spring 2005
Student Evaluation

First, some general information about you.

Male/female
Race/ethnicity
Math class currently taking
School
Check all of the aspects of the project that I was involved in:
___ Building the robot
___ Programming the robot.
___ Doing the research project.
___ Filming the iMovie
___ Setting up the iMovie in the computer
___ Putting together the display board
___ I attended the Expo.

Before you started the N-STAR project what did you think about the possibility of becoming a scientist or engineer?

Now that you've participated in the N-STAR project in the spring, what do you think about the possibility of becoming a scientist or engineer?

Before you started the N-STAR project what did you think about the jobs that scientists and engineers do for the Navy?

Now that you've participated in the N-STAR project, what do you think about the jobs that scientists and engineers do for the Navy?

What did you like best about participating in the N-STAR project?

What did you like least about participating in the N-STAR project?

What suggestions do you have to improve the N-STAR project?

Additional comments:

Please rate the degree to which the following objectives were met for the N-STAR program.

	Not At all 1	2	3	4	To a great Extent 5
The N-STAR projects that my team worked on were interesting.					
The projects that my team worked on were challenging.					
I learned a lot from the projects.					
The teacher/engineer team in my group was helpful.					
The field trip to Dahlgren was informative.					
I have a good understanding of what scientists and engineers do at Dahlgren.					
The time spent on the N-STAR project was worth the time out of class.					
I learned from doing the de-mining research project.					
Everyone in my group participated in all parts of the project.					
I liked using the iMovie to show the progress of the project.					
I came up with answers to some problems on my own.					
My team worked together to come up with some answers to problems.					
My team had enough time to work on our project.					
My team had enough space to work on our project.					
My team had enough materials to work on our project.					
The project taught me more about math.					
The project taught me more about science.					
The project taught me more about technology.					
The project taught me more about problem solving.					
The project taught me something about de-mining problems in the world.					
The Expo was a good way to end the spring project.					

Thank you !