Analysis of a Statewide K-12 Engineering Program: Learning from the Field

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Engineering Our Future NJ

Statewide initiative based at Stevens to promote engineering in elementary, middle, and high schools in NJ
Goal

Ensure that all NJ children experience exemplary engineering curricula, with a focus on innovation, as a requirement of their elementary, middle, and high school education by 2010.
Key Initiatives

- Professional development
- Policy efforts
- Partnerships and capacity-building
- Promotion
- Research
EOFNJ Approach

Statewide PD and awareness-building effort

Phase 1 – Pilot project (2005-06) to understand student learning of science & engineering concepts and classroom implementation issues

Phase 2 - Scale-Up (2006-08) to reach 2,000 educators through a statewide network, influence policy, promote importance of engineering, continued research

Professional Development

Varied by:

- Content
- Grade level
- Duration
- Classroom support
- Location
Program Curricula

- Engineering is Elementary
- A World in Motion
- Engineering the Future
- Building Math
- Pro/Engineer
- CIESE Online Engineering Projects
Phase 2 Accomplishments

- Over 2,400 NJ teachers trained at end of 2008
- Evidence of positive student learning impact
- Increased awareness among policy makers and educators
- Statewide network of 2-yr, 4-yr, and pre-service institutions
Phase 2 Research Activities

A study to determine the effectiveness of the EOFNJ program:

- Characterize overall program progress on teachers
- Analyze impact on classroom practice and students
- Based on follow-up survey and focus groups
- Case studies with relevant information that may be generalized to other programs
Impact on In-Service Teachers

Percent of teacher participants stating that their EOFNJ PD experience increased their knowledge considerably or moderately in each of the listed areas. (N = 161)
# Instructional Strategies Used

Teacher responses when asked about their use of the listed instructional strategies after having participated in the EOFNJ professional development activities. (N = 156)

<table>
<thead>
<tr>
<th>Instructional Strategy</th>
<th>Answer Options</th>
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<tbody>
<tr>
<td></td>
<td>Increased</td>
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<tr>
<td>Implementing the engineering design process</td>
<td>71%</td>
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<tr>
<td>Integrating math, science, and technology</td>
<td>64%</td>
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<tr>
<td>Telling students about or using new technologies</td>
<td>61%</td>
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<tr>
<td>Assigning projects based on real world problems</td>
<td>58%</td>
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<tr>
<td>Discussing STEM careers with students</td>
<td>45%</td>
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<tr>
<td>Requiring students to make formal presentations of their work</td>
<td>34%</td>
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<tr>
<td>Requiring students to use presentation software (e.g. PowerPoint)</td>
<td>29%</td>
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<tr>
<td>Using the computer to collect and/or analyze data</td>
<td>27%</td>
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<tr>
<td>Using the Internet to collect and/or share data</td>
<td>26%</td>
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<tr>
<td>Using computers to design 3D models</td>
<td>18%</td>
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</tbody>
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## Reported Activities of Teachers

Activities teachers reportedly engaged in as a result of their participation in the EOFNJ Program. (N = 151)

<table>
<thead>
<tr>
<th>Activity</th>
<th>% of Teachers</th>
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<tr>
<td>Shared materials or resources from the professional development activities with other teachers</td>
<td>70%</td>
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<tr>
<td>Recommended EOFNJ professional development activities to other teachers and/or administrators</td>
<td>60%</td>
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<tr>
<td>Implemented a lesson in the classroom that was presented at the professional development session</td>
<td>48%</td>
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<td>Used contacts or experiences from the professional development sessions to obtain new resources for the classroom</td>
<td>27%</td>
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<tr>
<td>Implemented a lesson in the classroom that you developed as part of the professional development session</td>
<td>25%</td>
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<tr>
<td>Read (more) scientific/engineering journal articles</td>
<td>23%</td>
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<tr>
<td>Organized or facilitated in-service workshops for other teachers/school personnel on issues related to the professional development session(s)</td>
<td>13%</td>
</tr>
<tr>
<td>Other</td>
<td>11%</td>
</tr>
</tbody>
</table>
Teacher participants’ perceptions of changes in student behavior and attitudes as a result of the teachers’ participation in the EOFNJ Program. (N = 156)

**Teacher Perceived Changes in Students**

- They are learning more.
- They are more interested in my classes.
- They have more positive attitudes about STEM subjects in general.
- They have become more aware of STEM career options.
- N/A; EOFNJ professional development did not change my teaching.
- They have become more interested in STEM careers.
- They are less intimidated by STEM subjects.
- Other (Please specify)
- There has not been a noticeable change in my students.
Focus Group Feedback

- Two NJ school districts: ES & MS
- Teachers report that engineering design activities meet needs of ALL students
- Increased performance of special needs students
Focus Group Recommendations

- Pilot materials with one or small group of teachers initially
- External PD for all teachers provided in stages
- A common planning period for teachers
- An engineering “buddy”
- Support of other faculty, administrators, and parents
- Plan for the needed materials
Increased Awareness

The greatest benefit of participating in this program:

“Increase in awareness of just what engineering is. The kids had no idea, nor did I, to be perfectly honest, what an engineer actually did until going through this program.”
Questions?

For More Info

www.stevens.edu/ciese/eofnj

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