The Landscape of High School Science Curriculum Decision Making

EXECUTIVE SUMMARY

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In 2000, NSF awarded BSCS a Curriculum Implementation and Dissemination Center grant to facilitate the dissemination and implementation of high school science curricula developed with Foundation funding. A major activity of the Center was the establishment and support of the National Academy for Curriculum Leadership (NACL). The major strategy of this effort was to work with district leadership teams seeking to improve their secondary science programs – and particularly their selection, adoption and implementation of textbooks and other instructional materials. The NACL supported these teams through a three-year program.[1]

This study

BSCS asked Inverness Research Associates to undertake a complementary line of work to help it and the field better understand the support that is available for secondary science education and the context within which high school science curricular decisions are made. In 2000 we at Inverness Research administered our first national landscape survey on high school science curricular decision making.[2] It paralleled similar surveys that we had administered for NSF Curriculum Dissemination Projects in elementary and secondary math.[3] Between 2000 and 2005, No Child Left Behind was instituted; funding and staffing challenges deepened, and calls increased for improved high school science programs. Therefore, BSCS asked for and was granted a supplementary grant in 2005 that included provision for replication of the 2000 study.

This report focuses on results from the 2005 survey of a national stratified random sample of school and district leaders. Selected findings from the 2000 study are included to permit a discussion of changes and continuities over the five years. The

[1] Findings from our evaluation of this initiative, "The BSCS National Academy for Curriculum Leadership: Contributions and Lessons Learned" (2006), are available at www.bscs.org and www.inverness-research.org.

[2] On the surveys and throughout this report, we use the term curriculum to refer to curricular or instructional materials rather than to a course of study independent of the materials used to teach it.

[3] Results for the three surveys were presented at an NSF meeting of the Centers in 2002.

report is organized around five broad areas of inquiry related to curricular decision making.

Key findings

1) The current status of high school science curricula

- In general, district and school science leaders in 2005 were largely satisfied with the curricula and instructional materials they were using.
- The majority of instruction continues to be based on textbooks and teacher-generated lessons.
- The impact of the current climate of accountability, including the NCLB act, is reinforcing a tendency to pursue traditional topics and pedagogies.

2) Selection and adoption of high school instructional materials

- Nearly all survey respondents reported that they have a careful and thoughtful process for selecting and adopting instructional materials, and at the same time, almost as many said that the process could be improved.
- The state may filter the range of options, but it is the local schools and individual high school science teachers who have the strongest input into the selection of curricular materials.

3) Factors that shape curriculum decision making, including the criteria local science leaders use in selecting curricula

- Leaders typically consider almost a dozen different design features when they are selecting textbooks and other instructional materials.
- Leaders choose instructional materials in order to meet external accountability demands; at the same time, many want to promote a vision of teaching and learning as represented in the national standards.
- Respondents report that state science standards are currently the most important influences on how high school science textbooks are selected and used. The National Science Education Standards are also cited as an important influence.
- The percentage of science leaders for whom state science standards are a significant influence *tripled* between 2000 and 2005 (from 27% to 83%).
- Design elements that reflect an accessible, inquiry-based program with strong instructional support materials were also cited as being important to both school and district leaders.
- Leaders most often use and value informal and professional contacts, along with professional organizations as resources when they are making curricular decisions.

4) Level of satisfaction of local high school science leaders with their science programs

- The majority of high school science leaders were satisfied or very satisfied not only with their current program and materials, but also with the process by which they choose these materials.
- While their satisfaction levels in 2005 were relatively high, the majority of high school science leaders who responded to our survey said there is a need for new and improved science materials across high school science. They saw the greatest need for new and improved textbooks and instructional materials for students at risk and students who are not bound for college; many also cited the need for better instructional materials for science electives. This was also true in 2000.

5) Interest in changing instructional materials, and mechanisms for change

- There do not appear to be strong signs of significant changes in high school science curriculum in recent years. Nor are there strong signs that significant changes are likely in the near future. Districts reported a lack of consensus about the need for improvement as well as about the nature and direction of any improvement that may be needed.
- Consistent with our other findings, interest is strongest in new textbooks and instructional materials that prepare students to meet the demands of external accountability systems, particularly requirements by their states.
- Only one in three survey respondents reported that their school or district was making a considerable to strong effort to change some instructional materials in 2005. While small, this number is up from one in five in 2000.
- The demand for the kinds of innovative materials produced with NSF-funding is not large. The knowledge of, relative interest in and rating of NSF-funded curricula are low and have not changed much over five years. There remains a minority of schools and districts who are interested in such curricula, but the majority of those who say they are familiar with specific NSF-funded curricula are not positively inclined toward using them in their own districts.
- One factor that helps explain the lack of interest in innovative curricula is the increased difficulty in implementing them. Respondents expressed strong doubts about their capability to find and fund the professional development and other resources needed to support the implementation of a new and challenging curriculum.

Reflections

In the final section of the report, we speculate about the broader lessons to be learned from this study and similar studies and surveys we have conducted for projects seeking to improve K-12 mathematics and science teaching and learning.[4]

Our reflections focus on several ideas that we believe help put the survey results in perspective and provide a framework for a broader interpretation of the results. First, we conclude that only a small minority of districts and high schools are seriously interested in pursuing a strategy of improvement that primarily uses innovative curriculum as a leading-edge strategy. Second, in high school science across the United States, the curriculum that is taught, the processes by which curriculum is selected, and the landscape in which decisions about curriculum are made all appear to be remarkably stable. These results strongly parallel our study of the high school mathematics curriculum,[5] and suggest that high school is a domain where the dynamics of instructional change are not well understood.

There are multiple factors that contribute to the stability of high school science. These overlapping constraints create a kind of curricular gridlock so that significant improvement in curriculum and instruction are not likely to result from a one-dimensional strategy, such as the simple introduction of a new curriculum.

While our survey findings are challenging, we do see some opportunities for curricular-led improvement. There is continuing interest in improving courses that serve traditionally underserved students. And there is continuing interest in strategies that pursue incremental improvements in instruction.

Clearly strong leadership is a sine qua non for an improvement strategy that focuses on curriculum as a leading edge. There are many restoring forces within the system that tend to move the system back to its equilibrium position once it is disturbed by the introduction of a new and challenging curriculum. Hence, the successful implementation of an innovative high school science curriculum requires distributed leadership that is knowledgeable about, committed to, and able to make the case for that curriculum. We would therefore argue that in the future, funders invest in efforts that explore strategies that simultaneously build leadership, develop teacher networks, and use curriculum as a focal point for improving instruction. It is clear that a multi-

[4] See also The NSF Implementation and Dissemination Centers: An Analytic Framework (2001); High School Mathematics Curricular Decision-Making: A National Study Of How Schools And Districts Select And Implement New Curricula (2000); Mathematics Curricular Decision-Making: The National Landscape-Survey Highlights (2004), all on the Inverness Research website. Again, we invite the reader to visit BSCS or Inverness Research for further information about the NACL.

[5] See Challenging The Gridlock: A Study Of High Schools Using Researched-Based Curricula To Improve Mathematics (2005) and High School Mathematics Curricular Decision-Making: A National Study Of How Schools And Districts Select And Implement New Curricula (2000) on the Inverness Research website.

dimensional long-term approach is needed. New curriculum, professional supports, and strong leaders will all be required to move the system beyond current norms and practices.