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The Illinois Mathematics and Science Academy Research and Dissemination Network Academic Year 2002-03 Final Report to the Smithsonian Institution

Steven R Rogg

THE ILLINOIS MATHEMATICS AND SCIENCE ACADEMY
RESEARCH AND DISSEMINATION NETWORK

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1 EXECUTIVE SUMMARY

This document is a status report on the Illinois Mathematics and Science Academy's (IMSA) Research and Dissemination Network, which is funded as a contract with the Smithsonian Institution. In response to significant recent changes in project organization and activities, this report traces key developments of the project over its ten-year history. The report concludes with a summary of accomplishments during the current 2002-03 academic year.

The project was originally appropriated in 1992 by the U.S. Congress as the *Integrated Curriculum Development Project* to "create an interdisciplinary curriculum model, one duplicable in schools throughout the country using two established high schools as working laboratories; the Illinois Mathematics and Science Academy and the Duke Ellington School for Performing Arts."

Initially, the work was to be overseen by a task force comprised of "representatives of the National Science Foundation, the National Endowment for the Arts, and the National Endowment for the Humanities, the National Gallery of Art and the J.F. Kennedy Center for the Performing Arts." Furthermore, the appropriation required that the Smithsonian Institution's "…Office of the Assistant Secretary for Museums shall work with all participants to establish, within the task force, a working group comprised of arts, math, science, humanities and educational practitioners and convene meetings as needed to construct the curriculum. This working group shall develop action plans, draft proposals, conduct on-site visits, review existing curriculum efforts and supervise on-site pilot activities." The product of this work was to have been "**a curriculum fully combining instruction in the arts and humanities with mathematics and the-sciences**" (bold accent not in the original).

Over the history of the project, however, certain circumstances and events have produced significant changes in both organizational structure and the nature of the work. Some of these include:

Understanding of Integration: As a consequence of the standards movement, professional associations have shifted away from a view of integration as a blending of the disciplines toward the preservation of disciplinary-grounded knowledge (and ways of knowing) applied and taught in integrative ways within- and between both traditional and emerging disciplines.

Understanding of *Curriculum*: Contemporary understanding of educational contexts (i.e. classrooms, schools, and school systems) and exemplary practices demands curricular programs that are strong not only in content and instructional guidance but also well-developed in the assessment of individual and collective learning, providing sustained professional development for educators, and demonstration of viability in diverse organizational contexts (c.f., program and system standards in NRC 1996).

As an outcome of experiences related to this project, including the development of *Mathematical Investigations*, *Integrated Science* and *Problem-Based Learning*, the Illinois Mathematics and Science Academy currently asserts that educative experiences (of which

curriculum is part) should exude the core competency attributes: integrative, inquiry-based, problem-centered, and competency-driven.

Relationships and Purpose: The task force prescribed by the original appropriation simply does not exist. Moreover, as a response to evolving views about curriculum integration (above) the *Duke Ellington School for Performing Arts* and the *Illinois Mathematics and Science Academy* have, for several years, been working independently of one-another. Thus, a single integrated arts and sciences high school curriculum is not an anticipated product of this project. Instead, IMSA is developing curricular models that are intended to be integrative, problem-centered, inquiry-based and competency-driven.

Development Activities: Over the history of this project, the Illinois Mathematics and Science Academy has developed, tested, and disseminated (at a few regional school sites) *Mathematical Investigations* (MI) and *Integrated Science*. Two years ago, *Integrated Science* was replaced by its offspring *Scientific Inquiries* (SI). Documentation is being prepared for both MI and SI with the intent of broad dissemination of these programs.

Dissemination Activities: IMSA hosted what was known as the *Smithsonian Secondary Science Network* (SSSN) during the development of *Integrated Science*. This network of science educators and administrators from regional high schools promoted the development and dissemination of ideas and curricular units. Today, the *Center for the Advancement and Transformation of Teaching and Learning in Mathematics, Science, and Technology* (Center@IMSA) embodies eight IMSA programs serving educators and schools, primarily in Illinois. The current *IMSA Research and Dissemination Network* (IRDN) strives to forge linkages between relevant Center@IMSA programs -their program leaders and the educators and schools they serve-and IMSA's curriculum initiatives, particularly *Scientific Inquiries* and *New System Design*.

Research and Evaluation Activities: Early research on MI and SI was conducted through IMSA's *Office of Research and Evaluation* and the Academy's regular external program review cycle. Between 1998 and 2002, the *Smithsonian Research and Diffusion Network* (SRDN) established an action research program that engaged teachers (from schools served by IMSA programs) in local impact studies. Today, the *IMSA Research and Dissemination Network* (IRDN) engages program leaders along with teachers and administrators in "actionable research" both to inform ongoing curriculum development and implementation, and to assess the impact of program implementation on teacher practice and student learning. For example, a partnership has been established with Drs. Norm and Judith Lederman at the Illinois Institute of Technology for research on the effectiveness of the *Scientific Inquiries* program for promoting student understanding of science and scientific inquiry.

During the 2002-2003 academic year, the IRDN was reconfigured again, this time to migrate from an action research model to one of collaborative inquiry. The intent was to use research and dissemination activities (described in Program Impact Assessment Plans) as a platform for building a viable network-within and beyond IMSA-to affect: (1) strong curriculum, instruction, and assessment design; and (2) a portfolio of credible evidence revealing the nature and utility of the MI and SI programs for affecting relevant and significant educative experiences in the high school setting. Work toward this goal was launched some ten months ago, in mid-September, 2003.

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2 ABOUT THIS REPORT

This report is offered to serve two purposes. First, it is a report of the activities and accomplishments of the current academic year.[1] Second, the report provides context for current and future activities by providing a brief overview of the evolution of the project over a decade of change.

We begin this report with the second purpose in order to present the material in chronological order. The section: "Purposes of the Network and History" provides a short overview of the program years 1992 through 2002. This is followed by a report on activities and accomplishments to date of the current program year.

3 PURPOSES OF THE NETWORK AND HISTORY

Conceived in 1992, and appropriated to the Smithsonian Institution by the U. S. Congress as the *Integrated Curriculum Project*, the current Illinois Mathematics and Science Academy (IMSA) *Research and Dissemination Network* (IRDN) represents a decade of study, practice, and development in the understanding and implementation of integrated curriculum at IMSA. In this section, we present some of the highlights in this evolution. This perspective is useful for understanding changes in our understanding of curricular integration and rationale for changes in project strategies and tactics.

3.1 Origin of the Integrated Curriculum Development Project

The original purpose of the Integrated Curriculum Development Project (ICDP) was to address a national need for an integrated curriculum model at the high school level. Thus, the Smithsonian Institution was appropriated federal funding to "**develop a nationally significant integrated curriculum model**." Two schools, IMSA and the Duke Ellington School for the Arts[2] were specifically identified in the legislation as "working laboratories" for this effort. The text of this original appropriation is reproduced, beginning on page 13 of this document, as Appendix A. - "Integrated Curriculum Project Appropriation." The reader is encouraged to refer to this appendix to understand the origin of the project.

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1 It is convenient to present this discussion in terms of academic year given that the activity cycle begins with the start of school in September and activities (especially reporting) tend to culminate in the summer months. Note, however, that the fiscal year for IMSA begins July 1, while that of the Smithsonian Institution begins September. Federal appropriation to the Smithsonian, and subsequently to IMSA, can occur later still. For this reason, academic year activities are actually funded by carry-over of the Smithsonian Institution's previous fiscal year allocation.

2 See: http://www.imsa.edu/ and http://www.ellingtonschool.org/, respectively.

In addition, it is useful to consider the origin and development of the ICDP in the context of significant concurrent events and curriculum reform initiatives. An abbreviated timeline of these events is provided as Appendix B. (page 15). In particular, those familiar with both the content and intent of the subject-area standards, as well as the circumstances that bought them to national prominence, will recognize dramatic changes over this period in the collective professional thinking about the integration of curriculum. In short, debates over "integrated," "interdisciplinary", "intra-disciplinary", "trans-disciplinary," "thematic" and "discipline-bound" curricular approaches have led to a certain level of consensus as represented more recently in the content area standards documents.

Thus, the past decade saw a refinement of its early hope for a fully (even indistinguishably) integrated arts, mathematics and sciences curriculum. The more recent content area standards, while calling for curricular coherence and integration, also seek to retain tractable disciplinary identity. Additionally, standards argue in favor of integrative approaches to instruction that facilitate transfer of learning to novel contexts (Bransford, Brown et al. 1999).

In short, the decade has seen an abandonment of attempts to fully integrate content areas in favor of revealing and nurturing natural connections among - and within - the disciplines in relevant, authentic, and motivating (problem, project, situational, etc.) platforms. This trend is also reflected in the developmental history of the Integrated Curriculum Development Project. IMSA's Integrated Science program was grounded, by design, in standards with integrative "problem platforms" as context for students' learning experiences.

3.2 Integrated Science and the Smithsonian Secondary Science Network

The initial (1992) appropriation of the first session of the 102nd Congress anticipated "the development of a curriculum fully combining instruction in the arts and humanities with mathematics and the sciences" (Appendix A. page 13). Early on, however, it was understood that work would need to commence first to achieve integration within the disciplines. Initial efforts at IMSA, therefore, focused on integration within the sciences.

Two significant outcomes of this work reached a level of maturation by 1996 through 1998. One important achievement was the design, implementation and evaluation (Figure 1) of the *Integrated Science* program at IMSA. An excellent summary of lessons learned from IMSA's Integrated Science Program was published by IMSA faculty in the journal Educational Leadership (Eggebrecht, Dagenais et al. 1996)[3].

The second significant accomplishment in the early years under Smithsonian Institution support was the development of the IMSA *Secondary Science Network*. This network engaged faculty from as many as eighteen schools from the greater Chicago area in dialog about and co-creation of integrated science curriculum (see Figure 2). Outcomes of network activity included a more developed understanding about the development and implementation of integrated science curriculum and a developed set of Problem Platforms for curricular integration (Figure 3).

[3] See attachment: Eggebrecht, J., Dagenais, R., Dosch, D., Merczak, N. J., Park, M. N., Styer, S. C., et al. (1996). Reconnecting the Sciences. *Educational Leadership*, 4-8..

Figure 1: Evaluation Recommendations for IMSA's Integrated Science Program

The reviewers found that challenges occur in adapting an integrated approach into the actual classrooms, prompting the following recommendations:

- a more student-centered and student-driven classroom approach with less teacher control over topic choice, method of exploration, assessment, laboratory topics, and unit direction.
- greater elaboration in the syllabi to allow students to better understand the goals of the course and problem platforms, what is expected of them (including grading procedures), and learning expectations.
- increased student exploration in the laboratory.
- more effort to explain the importance of individual thinking, PBL, and student-driven philosophies in the IS approach to students uncomfortable with such ideas.
- the gathering and utilization of feedback from IS alumni to assess whether all aspects of basic biology, chemistry, and physics principles are being addressed.
- increased options for student choice of topic direction within the platform.
- increased attention to maintaining a positive classroom atmosphere
- the provision of more varied, yet consistent across class, methods of assessment.
- increased faculty interaction to ensure that all lessons are truly integrative by utilizing other IS team members when an IS teacher is not comfortable with certain science topics within a given platform.
- greater alignment between IS curriculum/pedagogy and current science education reform frameworks, including the National Science Education Standards.
- the allocation of time for peer review of teaching within the IS team.
- the incorporation of more action research projects as a faculty to enhance teaching; utilizing the students in these experiments about learning as partners.

The reviewers concluded by stating that the IS program worth maintaining in a school like IMSA, feeling that it has the potential to serve as a model for other professionals throughout the world.

Source: http://www.imsa.edu/team/re/ESis.html

Figure 2: Secondary Science Network Participating Schools

Belleville West High School, Belleville
Belvidere High School, Belvidere
Francis Parker School, Chicago
Illinois Mathematics and Science Academy
Neuqua Valley High School, Naperville
Niles North High School, Skokie
Plano High School, Plano
Roxana High School, Roxana
Kankakee High School, Kankakee
Lake Zurich High School, Lake Zurich
Manteno High School, Manteno
Morton West High School, Berwyn
Oak Forest High School, Oak Forest
Oak Lawn Community High School, Oak Lawn
Proviso East High School, Maywood
Riverton High School, Riverton
St. Charles High School, St. Charles
York Community High School, Elmhurst

Source: http://www.imsa.edu/edu/intsci/

Figure 3: URL Links to Archival Integrated Science Web Documents

Description	Uniform Resource Locator (URL)
IMSA's Integrated Science Program	http://www.imsa.edu/edu/intsci/imsa/index.html
Secondary Science Network	http://www.imsa.edu/edu/intsci/
Shepard High School IS Study	http://www.imsa.edu/team/re/shepard.html

3.3 Smithsonian Research and Diffusion Network (FY99-02)

Significant changes occurred after the 1998 academic year, not the least of which was a decision at IMSA to replace the Integrated Science program with a new core science program – now called *Scientific Inquiries* (SI). During the redesign process, it was decided to configure SI as a full-year standards-based common experience for all entering sophomore students. A description of the initial design of SI is provided as an attachment.[4]

Virtually simultaneous to the transition of *Integrated Science* to *Scientific Inquiries*, the Academy developed an understanding of "Core Competency" attributes and design principles for programs. In short, all IMSA program leaders were invited to consider the degree to which each program exhibits characteristics associated with the attributes: *competency-driven*, *inquiry-based*, *problem-centered*, and *integrative*. This represents a major change in IMSA's perspective on integrated curriculum; expected to be applied in the ongoing development of the SI curriculum. Again, a document detailing the Core Competency attributes is provided.[5]

A third development, essentially stemming from the two just mentioned, is an Academy-wide initiative called New System of Learning.[6] Here, we see SI as a component of a comprehensive **system** of learning, where all curricular, assessment, instructional, (etc.) elements exhibit (to variable degrees) the core competency attributes. Note that curricular integration is no longer understood as it was in the original *Integrated Curriculum Development Project*. Instead, we are now looking at the attribute "integrative" *in conjunction with* the other attributes (above), and not only within a curricular program (e.g., *Scientific Inquiries*) but throughout the entire learning enterprise or system. The implications of this perspective are being explored with the assistance of Dr. James Pelligrino (c.f., Pellegrino, Chudowsky et al. 2001).[7]

A fourth significant development was the growth of IMSA's programs that serve other schools and/or educators, primarily within Illinois but also in other states and some nations. Recall that the initial years of the *Integrated Curriculum Development Project* produced the *Integrated Science* program and the *Smithsonian Secondary Science Network* (SSSN) (see page 2). It was during this period that the SSSN was discontinued, essentially replaced by the Center@IMSA.[8] This created a need to reconnect "internal IMSA" with its "external" programs. Thus, an action research program, entitled the *Smithsonian Research and Diffusion Network* and led by Dr. Linda Brazdil, was created to assess the impact of IMSA/Center@IMSA programs (IS, PBL, etc.) on teachers, their classrooms, and school programs.

The *Smithsonian Research and Dissemination Network* (SRDN) existed for three years as an action research network. Members of the network were teachers who may have participated in the SSSN or other Center@IMSA programs such as *Mathematical Investigations* (MI) and *Problem-Based Learning* (PBL). Members were provided technical support in conducting and reporting their action research projects. These studies were conducted during the school year and reported to the group and invited guests at annual summer *Network* gatherings. Some (but

[4] See; Torp, L., Dosch, D., Hinterlong, D., & Styer, S. (May 7, 1999). Scientific Inquiries: A New Beginning for Science at IMSA. IMSA.
[5] See attachment: IMSA (April, 2001). Defining IMSA's Core Competency: A Report to the IMSA Community.
[6] Attachment: IMSA (April 2002). IMSA's New System of Learning: Discussion Document.
[7] Attachment: IMSA (December, 2002). Summary of Cognition Seminar.
[8] http://www.imsa.edu/center/

not all) of the studies tested pedagogical methods advocated by IMSA programs. In principle, a primary goal of this model was to use an action research approach as a means to assess IMSA's influence on teachers' practice and school programs. There had been some, albeit limited, success in this regard. Among the most successful studies was that conducted at Hinsdale Central High School. This was a longitudinal study of PBL-oriented biology classes contrasted with traditional classes. Results of this study have been presented at professional meetings and these teachers, with Dr. Brazdil, are preparing a paper for possible publication.

Notwithstanding the benefits for participants and the production of some interesting studies, the actions research model failed to inform the ongoing development of IMSA programs, including SI. It was found that the questions tested and evidence gained by the research projects lacked relevance for the formative and summative evaluation IMSA's work with teachers and schools. In general, the action research studies of effects practices advocated by IMSA programs had only local validity with no "feedback loop" to significantly inform the originating program. Note also that the action research studies were (because of their locus at school sites) unavoidably independent of the significant developments (e.g. Core Competency, New System Design, etc.) taking place at IMSA. Thus, the viability of the action research model for affecting the advancement of IMSA's intervention programs was evidently limited.

IMSA's response to this realization was to reconfigure the Network to directly link research activities to Program Impact Assessment Plans. As a consequence, program leaders became Network members and action research was replaced by "actionable research" tied to program goals. Thus, the 2002-2003 academic year saw dramatic changes as the action research-oriented Smithsonian Research and Diffusion Network was reconfigured to become the current *IMSA Research and Dissemination Network* (IRDN). The plan of work describing this reconfiguration is provided as an attachment.[9]

4 ACTIVITIES AND ACCOMPLISHMENTS OF ACADEMIC YEAR 2002-03

4.1 Structure of the IRDN

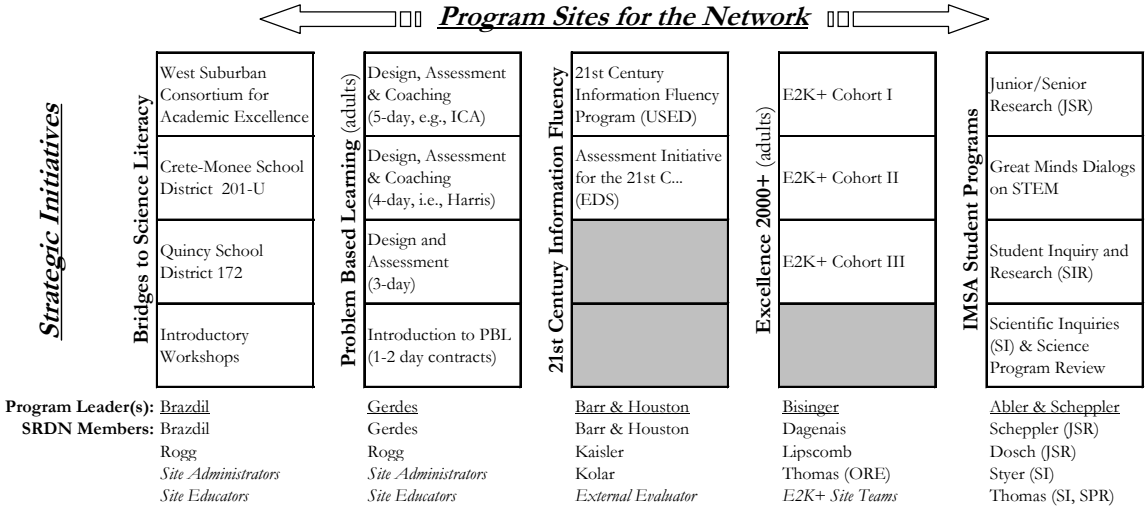
For the readers' convenience, the graphic representation of the current structure of the IRDN is reproduced as Figure 4. It is worth noting that not all Center@IMSA ("external") programs are represented in the IRDN. Membership was intentionally limited to those programs with sufficient potential for influencing middle-level or high school teachers of science.

Those who know these programs, however, will recognize that the criteria had been interpreted extremely generously. The 21st Century Information Fluency program, for example, engages librarians primarily; and the content domain is "the internet" rather than the natural sciences. Likewise, Problem-Based Learning serves teachers in any discipline and

[9] Refer to: Rogg, S. (2002). The Illinois Mathematics and Science Academy's Smithsonian Research and Diffusion Network: 2002-2003 School Year.

grade level. And, the primary target of the E2K+ program is the middle-level child in an after-school setting. In E2K+, teachers are a secondary intervention target.

Figure 4: Current IMSA Research and Dissemination Network Structure



Indeed, the closest match to the IRDN objectives is *Bridges to Science Literacy* (BSL); with its focus on curricula coherence in science. However, it must be acknowledged that there is currently no formal linkage between BSL and internal IMSA programs, particularly SI. The challenge remains to create a functional programmatic bridge linking SI with "external" teachers and schools. Lacking this, a discontinuity exists between the original *Integrated Curriculum Development Project* (see page 13) and the current *IMSA Research and Dissemination Network*. A very recent (June 30, 2003) evaluation of the Center@IMSA program "portfolio" conducted by Study Group, Inc. confirms this:

> **… a discontinuity exists between the original *Integrated Curriculum Development Project* and the current *IMSA Research and Dissemination Network*.**

> We concluded that the current group of programs does not constitute a "portfolio" of initiatives that are part of a single strategy to improve teacher performance and student learning throughout Illinois. Although Center staff tend to categorize programs as "teacher programs" or "student programs," program and promotional materials describe each program separately – and stakeholders view the programs individually.
>
> In our opinion, the programs are not designed or implemented to complement or enhance one another's performance. For example:
>
> - The programs are not connected to each other through content, pedagogy, or intended outcome.

- They do not share participants or settings, such as teachers participating in a series of Center programs or several programs operating in a school or district.

- They are not directed toward the same indicators of improved teacher performance or student learning.

One conclusion that we might draw is that programmatic coherence, both within and between IMSA ("internal") and Center@IMSA ("external"), will be prerequisite for the IRDN to truly become an effective network. This program coherence is, as we have already presented, an anticipated outcome of the New System of Learning initiative.

4.2 Highlights of the 2002-2003 Academic Year

Perhaps a reasonable way to summarize the activities of the 2002-2003 academic year to date is to say that were aimed at fostering connections among and between programs. An overview of the status program activities (mapped to the original work plan) is provided as Figure 5., below. Here, we provide brief descriptions of some highlights beginning with the launch of the IRDN in September and extending through June; the end of the fiscal year.

4.2.1 Launch of the IRDN

The structure of the network was reorganized so that program leaders would have primary ownership of their Program Impact Assessment Plans. The first invitation to consider this shift was presented to program leaders in a memorandum on September 10, 2002.[10] This was followed by a presentation and discussion at a Center@IMSA team meeting held September 26, 2002.[11] Several meetings were held throughout the year with program leaders individually and in task-based groups.

4.2.2 Research Theme: Direct Classroom Observation

Meetings and seminars were held on particular topics, such as classroom observation protocols for assessment impact on instructional practices and classroom environment. Two sessions were held, one in the fall[12] and one in the spring,[13] on observation protocol. Prior to the second session, two program leaders, Ms. Deb Gerdes and Dr. Ray Dagenais, along with the new project coordinator Dr. Steven Rogg, became certified by Horizon Research, Inc. in the widely-used Local Systemic Change Classroom Observation Protocol.

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[10] See attachment: Rogg, S. (September 10, 2002). Interoffice Memorandum re: Smithsonian Research and Dissemination Network.

[11] Rogg, S. (September 26, 2002). IMSA-Smithsonian Partnership: Research and Dissemination Network. Presentation to the Center@IMSA Team (Power Point® slides).

[12] See: Rogg, S. (October 31, 2002). Core Competency Observation. Presentation to the IMSA and Center@IMSA faculty, curriculum and assessment leaders, and administrators (Power Point® slides).

[13] See: Dagenais, R., Gerdes, D., Rogg, S. (April 16, 2003). A Classroom Observation Protocol: You know it when you see it? (Power Point® slides). IMSA.

Figure 5: Current Status of Planned AY02-03 Activities

Item	Program	Primary Task or Event	○ = In Progress ● = Complete	Accountability	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03
1	SRDN	Final Report F99	●	Brazdil	1											
2	AltCert	AETS Proposal	●	Rogg	1											
3	AltCert	Report End-of-Year Survey Results	●	Rogg	1											
4	BSL	PIAP Report	●	Brazdil/Rogg	1											
5	SRDN	Budget Revision Approvals for F99, F00, F01, F02	●	Brazdil/Rogg	1	2										
6	SRDN	Request Extension to June 2003 for F00, F01, F02	●	Brazdil/Rogg	1	2										
7	GMD	Complete Science Education Assessment Proceedings	●	Rogg	1	2										
8	SRDN	Plan of Work FY03	●	Rogg	1	2	3									
9	SRDN	Final Report F00	●	~~Brazdil~~/Rogg		2										
10	SRDN	Final Report F01	●	~~Brazdil~~/Rogg		2										
11	SRDN	WWW Site & Message Board Development	○	Rogg/Consultant	1	2	3	4	5	6	7					
12	SRDN	Center@IMSA Research Meeting	●	Rogg			3									
13	21C	RFP for External Evaluator	●	Houston/Rogg			3									
14	JSR	PIAP Design	●	Dosch/Scheppler/Rogg		2	3	4								
15	21C	PIAP Design	●	Houston/Rogg			3	4								
16	SRDN	Proposal for F03 (FY04)	●	Rogg/Smith				4								
17	SRDN	Revise Core Competency Behaviors Questionnaire (CCBQ)	○	Rogg/Team	1	2	3	4	5	6	7					
18	SRDN	Revise Core Competency Observation Tool (CCOT)	○	Rogg/Team	1	2	3	4	5	6	7					
19	~~SRDN~~	~~Network Convening with ISTA~~ (conflict with item 22)	X	~~Rogg~~					~~5~~							
20	BSL	PIAP Design	●	Brazdil/Rogg				4	5	6						
21	PBL	PIAP Design	●	Gerdes/Rogg				4	5	6						
22	IMSA	Linking Cognition and Assessment Seminar	●	Rogg				4	5	6	7	8	9	10	11	12
23	SRDN	PIAP Data Capture & Management	○	Meyer/Rogg	1	2	3	4	5	6	7	8	9	10	11	12
24	SRDN	PIAP Data Collection	○	Program Leaders	1	2	3	4	5	6	7	8	9	10	11	12
25	SRDN	Establish and manage SRDN Resource Library	●	McPherson/Rogg		2	3	4	5	6	7	8	9	10	11	12
26	PBL	PIAP Report	○	Gerdes/Rogg							7	8	9			
27	SRDN	HRI Observation Protocol Training	●	Rogg/Gerdes,Dagenais								8				
28	SRDN	Field Observations	○	Rogg/Team					5	6	7	8	9	10	11	
29	SRDN	Presentations @ NARST & NSTA	●	Rogg/JSR Team									9			
30	IMSA	Institutional Results Report for SRDN Programs	○	Meyer/Rogg										10	11	12
31	SRDN	Annual Convening (date tentative)	X	Rogg											11	
32	SRDN	Request Extension to June-04 for F03	●	Rogg/Smith											11	
33	21C	PIAP Report	○	Houston/Rogg												12
34	BSL	PIAP Report	○	Brazdil/Rogg												12
35	SRDN	Final Report F02	○	Rogg												12

Related Priorities:
+ Develop ORE infrastructure for program data capture, records management, analysis, & reporting.
+ Host SRDN convenings with Great Minds Dialog SMET events (if possible).
+ Develop research partnerships with allied professional associations and universities.

4.2.3 Curriculum Theme: Assessment

Early in the program year was the completion of the proceedings document on assessment in science education.[14] This brought to conclusion a previous Great Minds Dialog (see Figure 4) and also provided current assessment insights to IRDN members. A Portable Document Format™ version this report and the annotated resource links for assessment provided in the document (labeled: "Jumping-Off Points") are to be posted on the IRDN web site (see below).

4.2.4 Research and Dissemination: IRDN WWW Site

The previous years' work plan had called for the creation of an updated web site. Concurrently, IMSA was preparing to update its entire site (http://www.imsa.edu). As a result, the IRDN engaged the same vendor, Gorilla Polymedia (http://www.gorillapolymedia.com), so that site specifications would comply with those being developed for IMSA.

The IRDN site is being developed with content management capacities in order to allow program leaders and other network members to readily post reports and resources.[15] In short, while each member program's home page provides a view of program activities, the IRDN site is designed to provide an "impact" perspective. It is also designed to provide access to shared research references, links, and instruments. A third function is to provide a forum for discussion to advance understanding of program impact assessment and evidence-based claims.

> …while each member program's home page provides a view of program activities, the IRDN site is designed to provide an "impact" perspective.

The new site is currently on IMSA's development server while it is being tested (http://romulus.devnet.imsa.edu:8889/imsa-irdn). We anticipate that it will be migrated to the production server soon at: http://www.imsa.edu/project/IRDN. The next step in the development of the site will be to add Program Impact Assessment Plans and impact reports for each network program.

4.2.5 Resources: IRDN Research Library

This year, research references, standards documents, and reports, including several that had been purchased previously for the SRDN, were organized and cataloged with the collection of the Office of Research and Evaluation (ORE). Relevant books and journals are now available for IRDN members' use in the common area of the ORE office suite. Nearly 600 records are now fully searchable on Worldcat™ ISBN fields using a site license of the popular EndNote™[16] citation manager. The library is now available for the use of Network members for the preparation of impact reports and for sharing research references.[17]

The collection was announced to the IMSA community on May 20, 2003, and an Open House was held to introduce the holdings and demonstrate use of EndNote™. Electronic access to the reference database will be available on the IRDN web site and from IMSA's Information

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[14] See attachment: Scheppler, J., Rogg, S. (editors), (2002). Proceedings document for Science Education in the Twenty-first Century: Pushing the Envelope on Student Assessment. IMSA.

[15] See attachment: Keith, S. (September 27, 2002). IMSA SRDN Project: Web Development Proposal.

[16] http://www.endnote.com/

[17] As an illustration of its utility, the EndNote™ citation manager and IRDN reference library was used also for the writing of this report.

Resource Center (IRC). We thank our secretary, Linda McPherson, IMSA's IRC, and Computing and Network Services (CNS) for their assistance with this project.

4.2.6 New System of Learning

Members of the IRDN, including the Coordinator, participated in an intensive 5-day seminar on assessment led by Dr. Jim Pellegrino (see also section 3.3, Smithsonian Research and Diffusion Network (FY99-02), page 4). A description of the New System of Learning initiative is provided as an attachment.[18] In response to the seminar, the IRDN contributed to a pilot study to test claims about the Scientific Inquiries program. The study included observations of SI classes and an extensive survey of all eight SI teachers. Initial results were reported to the New System of Learning seminar participants.[19]

4.2.7 Fox Valley Problem-Based Learning Initiative

The IRDN contributed to the evaluation design of a proposal to the Grand Victoria Foundation to begin a fourteen-month partnership with three school districts in the Fox Valley region of Illinois.[20] The IRDN will contribute to this initiative by contributing to the development and use of a classroom observation protocol for formative and summative assessment of the project. In preparation for these observations (to develop and calibrate observation protocols), Deb Gerdes, Coordinator for PBL Initiatives, and the coordinator of IRDN observed classes at the Star Lane Center, a fully PBL school in Casper, WY.

4.2.8 PBL Symposium

On February 14-15, 2003, the Center@IMSA conducted a symposium at IMSA entitled: "In the service of learning: Getting to the heart of Problem-Based Learning." This was a highly successful and well-attended program. The IRDN contributed to the design and implementation of an assessment plan for the symposium. Proceedings of the symposium are currently being written.[21]

4.2.9 Study of *Scientific Inquiries*

The Coordinator of the IRDN prepared a proposal on behalf of the Science Team for a study of the Scientific Inquiries program in collaboration with Drs. Norm and Judith Lederman of the Illinois Institute of Technology.[22] Norm and Judith are known for their work in curriculum integration and especially studies of teachers and students understandings of the nature of science. The proposal was accepted and this study is already underway. An initial report is to be completed by the Ledermans in August, 2003. The coordinator for the IRDN also contributed to the development of a pre-proposal to the National Science Foundation's Instructional Materials Development program. A full proposal is currently being completed by Dr. Abler (IMSA) and Dr. Lederman.

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[18] See IMSA (April 2002). IMSA's New System of Learning: Discussion Document. and
IMSA (December, 2002). Summary of Cognition Seminar.

[19] Rogg, S. (undated). Science Inquiries Study for the New System of Assessment: Questionnaire Design to Assess Faculty Perspectives of Scientific Inquiries. IMSA. and,
Rogg, S. (January 6, 2003). New System of Assessment: Faculty Perspectives of Scientific Inquiries (compiled responses). IMSA.

[20] See attachment: Gerdes, D., Bodine, C. & Rogg, S. (December 13, 2002). Illinois Mathematics and Science Academy *Fox Valley Problem-Based Learning Initiative*. Submitted to the Grand Victoria Foundation.

[21] IMSA (2003). In the Service of Learning: Getting to the Heart of Problem-Based Learning. PBL Symposium, February 14-15, 2003. IMSA.

[22] Rogg, S. (December 21, 2002). Illinois Mathematics and Science Academy Proposal for Collaborative Study of Scientific Inquiries. IMSA.

4.2.10 Presentation at NSTA

The IRDN coordinator, two members of the Science Team, and the Coordinator of the Granger Center for Student Inquiry presented on the Scientific Inquiries and student inquiry programs at the annual meeting of the National Science Teachers Association in Philadelphia, Pennsylvania. The presentation was well received and several requests for presentation materials were honored.[23]

4.2.11 Connections to Other Networks

As a means to connect to science teachers throughout Illinois, the Coordinator of the IRDN accepted the role of "Key Leader" for the Illinois Science Teachers Association (ISTA) collaboration with the National Science Teachers Association (NSTA) "Building a Presence for Science" network initiative. The linkage to this network has informed the IRDN about developments both in Illinois and nationally. It also provides a venue for easy dissemination to Illinois teachers, especially as its goal is to establish a Point of Contact in every school.

Likewise, the IRDN continues to support the membership of IMSA in the Triangle Coalition for Mathematics, Science, and Technology Education. Memberships are also supported for the National Science Teachers Association, School Science and Mathematics (SSMA), and the National Staff Development Council (NSDC).

[23] Rogg, S, Dosch, D., Scheppler, S., Styer, S. (2003). Proposal: NARST Session at NSTA National Convention. Philadelphia, Pennsylvania – March 27-30, 2003. IMSA. and,
Rogg, S, Dosch, D., Scheppler, S., Styer, S. (March, 2003). Authentic Inquiry: What is Possible in the Real Science Classroom? NARST Session at NSTA National Convention. Philadelphia, Pennsylvania (Power Point® slides). IMSA.

5 APPENDICES

Appendix A. Integrated Curriculum Project Appropriation

Source: 102nd Congress, 1st Session, House of Representatives Report no. 102-116. Department of the Interior and Related Agencies Appropriations Bill, 1992. p. 127-128.

crease of $70,000, including an increase of $50,000 for crew for the new research vessel (1.25 FTE's). There is a decrease of $120,000 to global change research, which reduces the increase for support by one-half ($70,000) and applies the lapse rate to three new positions.

For the Smithsonian Environmental Research Center, there is a net decrease of $220,000, including a reduction of $200,000 to land acquisition, leaving an increase of $300,000 for the highest priority parcels. There is also a reduction of $60,000, for the lapse rate for four new positions, and an increase of $40,000 for two of the infrastructure positions needed at the Center. The Committee recommends an increase of $50,000 for the National Zoological Park, to add two of the seven positions cut from the original request of the Zoo. For International environmental science, there is a decrease of $75,000 for deleting one technican position, and applying the lapse rate to two other new positions. Finally, there is a decrease of $200,000 to major scientific instrumentation, based on prior years' carryover amounts.

Museums.—A decrease of $1,103,000 is recommended for museums. For the Assistant Secretary's office, there is a net increase of $220,000 which includes a decrease of $30,000 as a result of applying the lapse rate to two new positions. An increase of $250,000 is provided within the Office of the Assistant Secretary for the creation of a task force to achieve the development of a curriculum fully combining instruction in the arts and humanities with mathematics and the sciences.

It is the opinion of the Committee that amid the present concern for America's educational competitiveness, the importance of including the arts and humanities in educational curricula should not be lost. The Committee supports the notion that the arts and humanities can be used to as an effective tool to communicate difficult mathematical and scientific concepts to children in a clear and coherent manner. At present, an integrated curriculum model is not available. There exists the opportunity to use two high schools, one emphasizing math and science and the other the performing and fine arts, as working laboratories to pioneer a connected discipline curriculum model.

Given the Smithsonian's diverse range of expertise, the Committee feels that the Smithsonian Institution is in a unique position to offer its significant resources and expertise to this project as well as to coordinate the contributions of other nationally recognized cultural institutions and education professionals to develop a nationally significant integrated curriculum model.

The mission of the task force is to create an interdisciplinary curriculum model, one duplicable in schools throughout the country, using two established high schools as working laboratories; the Illinois Mathematics and Science Academy and the Duke Ellington School for the Performing Arts. Representatives of the National Science Foundation, the National Endowment for the Arts, and the National Endowment for the Humanities, the National Gallery of Art and the J.F. Kennedy Center for the Performing Arts, shall serve on the task force and shall advise and assist as appropriate. The task force shall use the resources of their different disciplines to identify resource people, underwrite various action proposals and provide guidance in the curriculum effort.

The Office of the Assistant Secretary for Museums shall work with all participants to establish, within the task force, a working group comprised of arts, math, science, humanities and educational practitioners and convene meetings as needed to construct the curriculum. This working group shall develop action plans, draft proposals, conduct on-site visits, review existing curriculum efforts and supervise on-site pilot activities.

The Smithsonian Institution, the National Gallery of Art and the John F. Kennedy Center shall make available, to the fullest extent possible, their rich variety of cultural and intellectual resources including expert personnel, research and artifacts.

The task force is encouraged to solicit additional funds from foundations and other agencies to assist in this effort. The task force shall submit to the Committee an interim report on its progress and a schedule for further work no later than May 1, 1992.

A net increase of $840,000 is recommended for the National Museum of Natural History, including an increase of $315,000 for Amazonian biological diversity programs. These funds are for construction of a small office and laboratory building on the campus of INPA, the host institution in Brazil for the Biological Dynamics of Forest Fragmentation project. In addition, funds will be used to support ongoing projects in taxonomy and ecology of forest tree species and ornithological field work. There is also an increase of $250,000, to provide the Smithsonian with seed money to develop, circulate among relevant Federal agencies for comment, and submit to Congress a plan for the establishment of a clearinghouse for information about biological diversity, by May 1, 1992. The plan should include the appropriate role for existing biodiversity inventory programs (e.g., the network of State natural heritage programs) and the role of Federal agencies in implementing the plan. The Smithsonian should also determine the feasibility of including information on international as well as domestic biological resources. There is a decrease of $150,000 from deleting one position from the human ecological history program, deleting the fellowship funds, and applying the increased lapse rate. There is also a decrease of $75,000 from applying the lapse rate to seven new positions for the collections information system.

A decrease of $30,000 is recommended for the National Air and Space Museum, from applying the lapse rate to three new positions. For the National Museum of American History, the Committee recommends a net increase of $1,015,000, including a decrease of $35,000 for applying the lapse rate to three new positions. There is an increase of $800,000 for one new position and collections storage space at Fullerton ($175,000); and four new positions and supplies for collections accountability ($125,000). An increase of $500,000 is included for the Jazz Masterworks program, for the Jazz Masterworks orchestra, acquiring and preserving rare jazz materials, and gathering and making available life stories. Finally, there is an increase of $250,000 for the Museum studies program with the Duke Ellington School of the Arts.

For the National Museum of the American Indian, the Committee recommends an appropriation of $10,324,000, a slight increase over 1991, but a decrease of $3,638,000 from the budget estimate,

Appendix B. Some Relevant Curriculum Reform Events

Year	Science Curriculum Milestones
1983	A Nation at Risk published
1984	
1985	Project 2061 established ↘**Illinois Mathematics and Science Academy founded**
1986	
1987	
1988	
1989	Project 2061 Science for All Americans
1990	
1991	↘U.S. Congress appropriates Smithsonian Institution ***Integrated Curriculum Project***[24]
1992	
1993	Project 2061 Benchmarks for Science Literacy ↘IMSA enrolls 36 students in pilot ***Integrated Science*** program.
1994	***Goals 2000 Educate America Act*** ↘IMSA enrolls students in three sections (~22 ea.) of ***Integrated Science***.
1995	Third International Mathematics and Science Study
1996	NRC National Science Education Standards
1997	ISBE: Illinois Learning Standards Project 2061 Resources for Science Literacy-PD ↘***IMSA Integrated Science Partnership***: Transforming Science Teaching and Learning
1998	↘IMSA Learning Standards Project 2061 Blueprints for Reform ↘Yager, R. E.: The Integrated Science Program at the Illinois Mathematics and Science Academy
1999	Third International Mathematics and Science Benchmark Study (TIMSS-R) Project 2061 Middle Grades Science Curriculum Evaluation NRC: How People Learn ↘ IMSA's ***Smithsonian Research and Diffusion Network*** launches focus on action research. ↘IMSA ***Scientific Inquiries*** concept paper approved by Board of Trustees.
2000	NRC: Inquiry and the National Science Education Standards National "Glenn" Commission Before It's Too Late Project 2061 Atlas for Science Literacy & Designs for Science Literacy ↘IMSA/Project 2061 partnership formalized, ***IMSA 2061*** begins.
2001	Project 2061 Textbook Publisher's Conference NRC Knowing What Students Know NRC Classroom Assessment and the National Science Education Standards
2002	***No Child Left Behind Act*** NRC Learning and Understanding ↘ ***IMSA Research and Dissemination Network*** aligns focus to collaborative inquiry.
2003	Curriculum debates continue twenty years after A Nation at Risk ↘***IMSA Research and Dissemination Network*** proposes collaborative inquiry & assessment.

[24] This was the origin of the Illinois Mathematics and Science Academy's *Integrated Science* (IS) program. Original description is found in the 102nd Congress, 1st session, House Report no. 102-116.

Appendix C. Dissemination Activities for IMSA's Integrated Science Program

Dosch, D. and S. Styer. (1996). An Integrated Science Program for Secondary Schools. Paper presented at the National Science Teachers Association Western Area Convention, Phoenix, AZ.

Dosch, D., Eggebrecht, J., and Styer, S. (1997). Transforming Science Teaching and Learning. Aurora, IL: Illinois Mathematics and Science Academy. [On-line]. Available: http://www.imsa.edu/edu/intsci/

Dosch, D., Eggebrecht, J., Merczak, N., Park, M., Styer, S., and Workman, D. (1996). Comparative study of Integrated Science student performance. Paper presented at the Annual Meeting of the Illinois Science Teachers Association, Springfield, IL.

Dosch, D., Styer, S., and Eggebrecht, J. (1997). The Smithsonian Secondary Science Network. Paper persented at the Annual Meeting of the Illinois Science Teachers Association, Springfield, IL.

Dosch, D., Styer, S., Dagenais, R., Eggebrecht, J., Merczak, N., Park, M., and Workman, D. (1996). Developing Scientific Capacity in All Learners: Integrated Science and the Science Content Standards. Spectrum, Illinois Science Teachers Association, 22:22-25.

Eggebrecht, J. (1997). Integrated Science at the Illinois Mathematics and Science Academy. Paper presented at the Annual Meeting of the American Association for the Advancement of Science, Seattle, WA.

Eggebrecht, J. and Dosch, D. (1996). Integration of Science in the Secondary School. Paper presented at the National School Curriculum Institute Conference on Restructuring Secondary Schools, Phoenix, AZ.

Eggebrecht, J. and Dosch, D. (1998). The Smithsonian Secondary Science Network, Technology and Teacher Education Annual, 906-910, 1998.

Eggebrecht, J., Dagenais, R., Dosch, D., Merczak, N., Park, M., Styer, S., and Workman, D. (1996). Reconnecting the sciences. Educational Leadership, 53, 4-8.

Eggebrecht, J., Dagenais, R., Dosch, D., Merczak, N., Park, M., Styer, S., and Workman, D. (1996). An Integrated Science Program for Secondary Schools. Paper presented at the 11th National Science, Technology and Society Meeting, Washington, D.C.

Eggebrecht, J., Dagenais, R., Dosch, D., Merczak, N., Park, M., Styer, S., and Workman, D. (1996). An Integrated Science Program for Secondary Schools. Paper presented at the Annual Meeting of Project Connect, Normal, IL.

Eggebrecht, J., Dosch, D., Pennington, M., Ramirez, M., Styer, S., Wallmuth, J. and Workman, D. (1998). Integrating Secondary School Science. Submitted to School Science and Mathematics.

Appendix D. List of Attachments

1. Eggebrecht, J., Dagenais, R., Dosch, D., Merczak, N. J., Park, M. N., Styer, S. C., et al. (1996). Reconnecting the Sciences. *Educational Leadership*, 4-8.

2. Torp, L., Dosch, D., Hinterlong, D., & Styer, S. (May 7, 1999). Scientific Inquiries: A New Beginning for Science at IMSA. IMSA.

3. IMSA (undated). Science Course Information Sheet for Scientific Inquiries.

4. IMSA (undated). Scientific Inquiries Program Framework.

5. IMSA (April, 2001). Defining IMSA's Core Competency: A Report to the IMSA Community.

6. IMSA (April 2002). IMSA's New System of Learning: Discussion Document.

7. IMSA (December, 2002). Summary of Cognition Seminar.

8. Rogg, S. (2002). The Illinois Mathematics and Science Academy's Smithsonian Research and Diffusion Network: 2002-2003 School Year.[25]

9. Rogg, S. (September 10, 2002). Interoffice Memorandum re: Smithsonian Research and Dissemination Network.[26]

10. Rogg, S. (September 12, 2002). Core Competency Observation Tool, V. 1.0: Status Report.

11. Rogg, S. (September 26, 2002). IMSA-Smithsonian Partnership: Research and Dissemination Network. Presentation to the Center@IMSA Team (Power Point® slides).

12. Enright, T. (undated). Smithsonian Teachers' Night: A nationwide celebration of the power of museums to enhance learning. Smithsonian Institution.

13. Rogg, S. (October 31, 2002). Core Competency Observation. Presentation to the IMSA and Center@IMSA faculty, curriculum and assessment leaders, and administrators (Power Point® slides).

14. North Central Regional Education Laboratory (NCREL) (undated). A Proposed Evaluation of the 21st Century Information Fluency Program at the Illinois Mathematics and Science Academy.

15. Keith, S. (September 27, 2002). IMSA SRDN Project: Web Development Proposal.

[25] Note: The name was later changed to the *IMSA Research and Dissemination Network* (IRDN) in order to comply with the standing agreement and to better represent the reconfiguration of the project.
[26] Ibid.

16. Gerdes, D., Bodine, C. & Rogg, S. (December 13, 2002). Illinois Mathematics and Science Academy *Fox Valley Problem-Based Learning Initiative*. Submitted to the Grand Victoria Foundation.

17. Rogg, S. (December 21, 2002). Illinois Mathematics and Science Academy Proposal for Collaborative Study of Scientific Inquiries. IMSA.

18. Rogg, S. (undated). Science Inquiries Study for the New System of Assessment: Questionnaire Design to Assess Faculty Perspectives of Scientific Inquiries. IMSA.

19. Rogg, S. (January 6, 2003). New System of Assessment: Faculty Perspectives of Scientific Inquiries (compiled responses). IMSA.

20. Rogg, S, Dosch, D., Scheppler, S., Styer, S. (2003). Proposal: NARST Session at NSTA National Convention. Philadelphia, Pennsylvania – March 27-30, 2003. IMSA.

21. Rogg, S, Dosch, D., Scheppler, S., Styer, S. (March, 2003). Authentic Inquiry: What is Possible in the Real Science Classroom? NARST Session at NSTA National Convention. Philadelphia, Pennsylvania (Power Point® slides). IMSA.

22. Dagenais, R., Gerdes, D., Rogg, S. (April 16, 2003). A Classroom Observation Protocol: You know it when you see it? (Power Point® slides). IMSA.

23. Scheppler, J., Rogg, S. (editors), (2002). Proceedings document for Science Education in the Twenty-first Century: Pushing the Envelope on Student Assessment. IMSA.

24. IMSA (2003). In the Service of Learning: Getting to the Heart of Problem-Based Learning. PBL Symposium, February 14-15, 2003. IMSA.

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Bransford, J., A. L. Brown, et al. (1999). How people learn : brain, mind, experience, and school. Washington, D.C., National Academy Press.

Eggebrecht, J., R. Dagenais, et al. (1996). "Reconnecting the Sciences." Educational Leadership: 4-8.

NRC (1996). National Science Education Standards : observe, interact, change, learn. Washington, DC, National Academy Press.

Pellegrino, J. W., N. Chudowsky, et al. (2001). Knowing what students know : the science and design of educational assessment. Washington, DC, National Academy Press.