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SCIENCE EDUCATION

Experts review psychology of science teaching, learning

By Emily Ann Brown

Research in cognitive development in recent years has revealed much about the way children think and learn about science. But there is some disagreement among stakeholders about best instructional practices tied to research, and a new paper argues these arguments have complicated science education at the K-12 level.

Most experts would agree that science interventions are most effective when they are aligned with what current research says about the way students learn.

Indeed, the way science is taught is “inextricably connected to what students learn about the nature of science itself,” according to “Educational Interventions to Advance Children’s Scientific Thinking,” which appears in the journal *Science*.

The good news is “that there’s been a terrific conversion in the last 8 or 10 years between basic cognitive and developmental psychology and science education — each field is learning from the other one,” said David Klahr, lead author and a Walter van Dyke Bingham Professor of Cognitive Development and Education Sciences at Carnegie Mellon University.

Psychologists have been investigating the development of basic cognitive skills that support scientific literacy for more than 50 years, “making it possible to design theoretically grounded educational interventions” that can advance kids’ scientific thinking, the paper said.

In the report, Klahr and his colleagues looked at the issue from a cognitive and developmental psychology standpoint, rather than a science education perspective.

“From our point of view, it’s clear that you can’t understand how to teach unless you understand how children learn,” he said in a statement.

Advancing science instruction

Researchers reviewed literature on the early development of scientific thinking, particularly the Piagetian theory, which suggests that students must “construct” their own knowledge

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DATA QUALITY

Educator data literacy requires systemic effort

By Jean Gossman

Educator preparation and development programs are examining data literacy training as states increasingly rely on their longitudinal data systems and other resources for data-driven decision-making. Now, some experts say teachers currently using data can be a valuable data-education resource.

Data-literacy capacity building and related recommendations were addressed at the recent STATS-DC 2011 conference session, When and Where and By Whom: University Preparation of Educators to Use Data. Attendee findings and related policy recommendations that arose from a data-training session held at the 2010 conference were presented.

Pat Sherrill, an Education Department Office of Planning, Evaluation and Policy Development analyst, said the attendees conveyed that data literacy is critical because schools, districts, and states have overlapping data needs. Moreover, individuals’ data needs must also be considered. Unless states and districts “step further back” and consider others’ data requirements, they can-

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Researchers: Teacher prep must link special, general ed

By Kim Riley

Improved student outcomes — particularly for children with disabilities and for those living in poverty — can be sustained when collaborative programs for teacher preparation at institutions of higher education link special and general education, according to two university researchers.

During the presentation, *How Do We Prepare General Education and Special Education Faculty and Teachers to Collaborate?* at the recent OSEP Project Directors' Conference in Washington, D.C., the researchers pointed out the challenges and strategies related to redesigning teacher education programs.

"Collaborative teacher education is not new," said Marleen Pugach, a professor in the Department of Curriculum and Instruction at the University of Wisconsin-Milwaukee, "and historically, multiple approaches have co-existed."

Pugach explained that collaborative teacher education is a pre-service program redesign based on a common, shared goal of bringing together teacher prep for special and general education in order to improve the quality of instruction for all students, including those with disabilities.

But there are challenges associated with designing such preparation programs at institutions of higher education, she said, including how to:

- Meet multiple standards (national, professional, and state).
- Address state licensure (including the conflicts between K-12 licensure for special education and grade-level licensure for general ed, as well as simultaneously offering multiple certifications).
- Design frameworks for faculty discussion and joint ownership (such as how to move beyond assumptions that this is solely a special ed-related activity).
- Stop misinterpreting dual certification as program redesign.

The end goal for collaborative teacher education, Pugach added, is to focus first on program redesign.

Institutions of higher education should "think about systemic reform for diverse stu-

dents, not just one group of students" when redesigning teacher education, she said. "Engage in a transformation of the general education pre-service curriculum first and then the special ed curriculum. And rethink the roles of general educators and all specialists, including special education teachers."

Varying entry points

Linda Blanton, special education professor in the Department of Teaching and Learning at Florida International University in Miami, and coauthor with Pugach on related policy briefs and presentations, described varying entry points for program transformation that could take place at the university or teacher level, including:

- Explore values, similarities, differences, and the different language used across fields. Consider how general educators view special ed content and engage in productive discussions that consider the most productive ways to talk about special ed content or ELL content, for example.
- Use follow-up information from graduates or other teachers about what their challenges are in teaching in today's classrooms.
- Use new preK-12 initiatives such as RTI to discuss how programs should respond.
- Start with the premise that this is not solely about special education. There should be joint leadership and ownership and full parity across special and general education.
- Minimize administrative barriers.
- Integrate the most appropriate strategies for all teachers, not just for special education, but also for ELLs, and do it together.

"This is a singular opportunity that should not be missed," Blanton said, "since reforming teacher education is on the national radar screen and is an essential step in education reform.

"If we don't take this opportunity to define and redefine the roles of general and special educators, in the current policy context," she added, "others will do so."



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Colorado director welcomes focus on student results

By Mark W. Sherman

OSEP Director Melody Musgrove has assured state officials that her campaign to boost student performance is not an attempt to add another layer of oversight.

The agency's efforts will start this fall as part of the next round of verification visits, which have historically been focused on procedural issues.

Musgrove need not tread so carefully, however, according to Ed Steinberg, Colorado's special ed director. On the contrary, he said, he welcomes the shift.

"I came into this [job] really with a sense that we would have from the feds a clearer focus and a clearer mandate around achievement for kids with disabilities," he said.

He has been disappointed, however, to see OSEP continue to dwell on what he calls compliance issues, he said.

For example, the state was rated "needs assistance" this year in part because it missed by one day its duty to resolve a state complaint within 60 days, he said.

"I would rather us be judged by the real important issues here, which are outcomes for kids with disabilities," he said. "We might remain in 'needs assistance' or be in 'needs intervention,' [but] I'd rather be measured on that than measured on some of the, I would say, silly things

that we're measured on [now]."

By the same token, he said, why give a state a "meets requirements" rating if its students have poor test scores or low graduation rates?

"I agree completely with the parents that I think remain frustrated with that," he said. "What does that label mean?"

On a more substantive note, Steinberg said he is proud of the work his agency is doing in remote areas.

"We're really starting to put a focus on looking for willing partners in our rural school districts to do some focused work on their special ed population," he said.

The agency is also trying to improve student literacy, "trying to see what we can do to move that needle, hopefully to get some quick gains that we can sustain," he said.

But again, he remains focused on the federal-state relationship, and how that needs to change.

The problem, he said, is that OSEP's monitoring system is rooted in another era, when children with disabilities were denied equal rights.

Special education "began as a civil rights issue, [where the concern was about] access to education, and there needed to be a focus on compliance back then," he said. "But that focus on compliance has remained constant, while the rest of the world has changed."

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through an inquiry-based approach, and then focused on recent research on how to best teach science to children from preschool to middle school. Moreover, they used existing psychology research to assess practices that more or less advance the discipline of science instruction.

They also investigated some of the controversies involving science education, namely the effectiveness of inquiry-based approaches to learning. The most common argument, they said, involves direct instruction versus "discovery learning."

"Most influential science curriculum publications lean heavily toward inquiry, whereas many researchers from a cognitive science tradition argue that a guided form of explicit instruction is consistent with decades of research on the parameters and structures of the human cognitive system," the paper noted.

In a previous study, however, Klahr and his team found direct instruction as the most effective for helping students learn immediately when they were asked to design experiments and investigate a specific question. In one instance, children worked with a computer-based tutor to determine whether surface texture made a differ-

ence in how far a ball will roll.

In the paper, the team of researchers attempted to clarify some common misconceptions about how students learn, particularly in the early grades.

Research on early cognitive learning reveals that children's thinking processes follow a certain developmental trajectory that doesn't necessarily lead to advanced science learning, experts explained.

"Although very young children have competencies that support aspects of scientific thinking, many children leave school having failed to learn much about science," the report said. "Even for those who go on to advanced careers in science, many years of intense training are necessary to become a 'real' scientist."

Indeed, efforts to train young children to develop scientific thinking methods have yielded mixed results, researchers wrote.

"Although there is no evidence that interventions in the first 18 months can accelerate the course of these developmentally primary processes to produce 'baby Einsteins', there is evidence that preschool children can be trained to improve their control of some mental processes that are widely agreed to be important for learning and understanding science (and mathematics)," the paper said.

Education Department

Speece appointed commissioner of National Center for Special Education Research

Institute of Education Sciences Director John Easton announced the appointment of Deborah Speece as commissioner of the National Center for Special Education Research, effective Aug. 23.

Speece is a national leader in special ed research and RTI strategies, known for her studies of the classification and diagnosis of learning disabilities, according to an IES news release.

For the past 27 years, Speece has served on the faculty in the College of Education at the University of Maryland, where she is a professor in the department of special education.

She has also served on NCSER's Technical Working Group for the Evaluation of Response to Intervention Strategies in Elementary Reading and on expert review panels for IES grant applications.

"We are pleased to have such a well-regarded and well-known special education researcher join the IES senior leadership," Easton said.

NCSER is one of the four centers within the IES.

The center sponsors research to expand the knowledge and understanding of the needs of children and youth with disabilities and their families.

NAGB seeks 5 new board members

The Education Department announced it is seeking nominations for five positions on the National Assessment Governing Board, which is responsible for setting policy for the National Assessment of Educational Progress.

NAGB is seeking nominations for positions in the following categories:

- Testing and measurement expert.
- Local board of education member.
- Republican state legislator.
- Non-public school administrator.
- General public representative.

The deadline for nominations is Sept. 30, and the term for each of the five positions is Oct. 1, 2012 to Sept. 30, 2016. Education Secretary Arne Duncan will make the appointments from a list of finalists.

For more information, see www.nagb.org/nominations 2012 or email nagbnominations@ed.gov.

DATA QUALITY

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not begin to build information systems that meet educational needs.

But he said data training is still needed. "We do not know who is teaching teachers how to use data in the classroom," Sherrill said. He noted that there are teachers who use data effectively, and if they are located and their practices documented "we will have a good start" at sharing principles with teacher educators.

Teachers using data effectively for improved student outcomes should be used as a resource by researchers, accreditation agencies, and schools of education on data literacy standards development and implementation, according to Ellen Mandinach, a senior research scientist in the evaluation research program at WestEd.

Integrated approach

Educators need more understanding of how to integrate data use at all levels of the teacher preparation and professional development continuum to determine what training is needed, from undergraduate pre-service students to administrators, she said. "Data aren't going to go away. ... [Data-driven decision-making is not] another passing fad that's going to go away," Mandinach said.

But "until we understand what data-driven decision-making is, it is hard to have a conversation about it" Mandinach said, because "there's no good definition." Moreover, she said data literacy and appropriate training is different for teachers, administrators, information technology

staff, and state education department leaders.

Mandinach observed that educators still do not know which skills comprise data literacy. "It is not just about being data-driven, but also about taking the data and converting it into knowledge [such as] pedagogical data literacy or instructional decision-making. [Data literacy is] taking knowledge of your domain and using the data to make a decision," she said.

To that end, an inventory of data literacy efforts at the state level is needed, including requirements for licensing and certification, Mandinach said. Stakeholders also need a survey of the work on data literacy done by all 1,600 U.S. schools of education, particularly state institutions of higher education "that are putting teachers out there," often in rural schools that lack technical and staff capacity.

Data-driven decision-making "is an emerging field" and consequently lacks a large body of research, Mandinach said. Many projects are case studies or implementation projects, and without more practice to draw upon, it is hard to do rigorous studies to show its impact, she observed, adding that much of the available research on data-driven decision-making is from special education, because those teachers have long been taught and in many cases required to use data to inform their practice.

"I would maintain that most good teachers have been doing this for a long time — it's just that they've been doing it in their head. ... Now there's technology to help support that," Mandinach said.