MIND, BRAIN, AND EDUCATION

School-Based Research

Catherine Glennon[1], Christina Hinton[2], Thomas Callahan[3], and Kurt W. Fischer[2]

Long ago, John Dewey (1899) described a gap between research and practice in education. Over a century later, we are still confronted with this issue. Much research on learning is not embodied in practices in schools, and the practical expertise of teachers rarely informs education research. There is a need to create an infrastructure that integrates research and practice in education.

In the field of medicine, research and practice are joined in teaching hospitals. In these institutions, researchers work alongside doctors to incorporate recent advances in medical research into practice and track results. There is a growing movement in the field of education to create analogous institutions in education called research schools (Chen, 2006; Fischer, 2009; Hinton, 2008; Hinton & Fischer, 2008, 2010; Kuriloff, Richert, Stoudt, & Ravitch, 2009). Research schools are living laboratories where researchers collaborate with practitioners to carry out research, train educators, and disseminate findings.

Researchers at the Harvard Graduate School of Education have created partnerships with a diverse network of public and private schools. This article begins with an introduction to the research school movement. It then focuses on a research school partnership between Harvard Graduate School of Education and St. George's School, an independent college preparatory school in Rhode Island. This partnership has generated fruitful school-based research, and can serve as a model for other research partnerships between universities and schools.

THE RESEARCH SCHOOL MOVEMENT[1]

The research school movement is rooted in the tradition of Dewey's (1899) laboratory school. Dewey (1939) criticized "pure theorizing" (p. 27) detached from practical experience. To ground research in practice, he founded a laboratory school at the University of Chicago. The laboratory school was both a school for children and a laboratory for testing theoretical models. As a laboratory, the school had the same relationship to education and psychology as a teaching hospital has to biology and chemistry—it was a place for putting theory into practice in an experimental setting. Dewey (1899) wrote: "It is a laboratory of applied psychology. That is, it is a place for the study of mind as manifested and developed in the child, and for the search after materials and agencies that seem most likely to fulfill and further the condition of normal growth" (p. 96). Researchers worked with practitioners in the laboratory school to test theory in practice, and use results to shape practice and research directions.

The laboratory school made important contributions to education. Dewey's research at the school greatly influenced his educational theories, and his experience with the school affirmed his belief that research should be intimately connected to practice. As Dewey (1899) expressed, the school "stood for the necessity of considering education both theoretically and practically" (p. 97). Unfortunately, the laboratory school concept did not spread to other schools as Dewey envisioned. Many universities and colleges have schools on campus for the children of faculty and students, but most of those schools are not involved in research and play virtually no role in connecting research and practice. Tyler (1991) explains that:

> Most schools and colleges of education that have elementary or secondary schools have continued to employ their schools as the sites for practice teaching, or superior schools for faculty children and the children of other families nearby, but not as laboratories for the serious study of children's learning. (pp. 1–2)

The research school movement aims to reconnect with Dewey's vision of conducting research in a living school, and extend this work to create an infrastructure that supports sustainable collaboration among researchers and practitioners.

The research school model has three main components: research, training, and dissemination (Fischer, 2009; Hinton & Fischer, 2008, 2010). Researchers collaborate with administrators and teachers to carry out research that is relevant to practice. Researchers and practitioners work together to settle on an area for investigation. They then develop interventions based on research in that area. Teachers implement these interventions, and systematically track results with ongoing support from researchers. Finally, researchers analyze the results, and work with teachers to

[1]Teachers College, Columbia University
[2]Harvard Graduate School of Education
[3]Merck-Horton Center at St. George's School

Address correspondence to Christina Hinton, Harvard Graduate School of Education (HGSE); e-mail: christina_hinton@post.harvard.edu

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use them to shape local practice at the school and to decide upon further research directions.

The research school partnership also provides hands-on training for teachers, administrators, and researchers as they participate in ongoing collaborations that develop their skills at conceptualizing research questions and working on research projects. Teachers learn about recent research on learning and use this knowledge to update their teaching strategies. It is important to help teachers become familiar with recent research because findings from case studies have shown that very few teachers turn to the research literature to expand professional knowledge, solve problems, or meet the requirements of their jobs (Helmsley-Brown & Sharp, 2003; Shkedi, 1998). In addition, teachers in research schools have an opportunity to discuss their practice with their colleagues and learn from one another. Finally, they learn to conduct action research. Action research is a powerful tool because it provides a cyclical, systematic approach to problem-solving that encourages educators to focus on a local problem, use theory to understand the problem, design a solution, take actions, use data to track the effectiveness of their actions, and decide on next steps in their classrooms (Hinchey, 2008; Mills, 2010; Pine, 2009; Zambo, 2011). Administrators learn about recent education research and teachers' current practices at the school. Researchers learn how to ground research in practical questions and develop recommendations based on research that are useful for practitioners.

Dissemination is also a key aspect of the research school model. Researchers and administrators communicate results with the research community through traditional academic routes, such as journal articles like this one and conference presentations. Researchers also work with administrators and teachers to build *usable knowledge* at the school, often through professional development workshops for the wider school community. This work may also be shared with other schools.

HARVARD GRADUATE SCHOOL OF EDUCATION AND ST. GEORGE'S SCHOOL PARTNERSHIP

Researchers from the Harvard Graduate School of Education and educators from St. George's School have created a research school partnership. This work is supported by the Merck-Horton Center for Teaching and Learning at St. George's School. The Center's mission is to support effective teaching and learning through scholarly research, professional development, and innovative educational initiatives. The goals of the Center are well aligned with the research school movement. The first two years of the partnership between Harvard Graduate School of Education and St. George's School have generated productive school-based research.

The initial stages of this research partnership can be characterized as an exchange of cultures among researchers and educators. The educators helped familiarize the researchers with St. George's school culture by sharing information about common pedagogical practices. At the same time, the researchers acquainted the educators with the concepts and methods for a research school by providing examples of their work carried out at a few other research schools. This exchange led to a shared understanding of the context of St. George's School and the goals of a research partnership.

After these initial discussions, the team began to brainstorm potential topics for research at St. George's School. The team eventually chose to explore student engagement for the first phase of research (Connell & Wellborn, 1991; Suárez-Orozco, Suárez-Orozco, & Todorova, 2010). Teachers were enthusiastic about this research topic because they were optimistic that learning more about how to engage their students could enhance their practice. To explore this topic, the team created a questionnaire designed to assess the use of research-based practices for optimizing student engagement. The questions in this survey were co-constructed by researchers and educators based on relevant research and the specific context of St. George's School. Targeted themes included students' overall reflections on engagement, extrinsic and intrinsic motivation, challenge, relevance, autonomy, competence, collaboration, theories of intelligence, metacognition, and formative assessment. The questionnaire was distributed to a random sample of students in all grades.

The researchers and educators engaged in rich discussions of the study's results and considered directions for further analysis. These discussions allowed researchers to tailor their analysis of the results so that it was most useful to the teachers. On the basis of this targeted analysis of the results, researchers developed recommendations for how teachers at St. George's School could expand practices that support student engagement. The recommendations for practice included the following: support student interests, actively involve students, connect academic content with the real world, provide students with choice, nurture social connections, focus on the process of learning by using formative assessment, target the appropriate level of challenge, and teach metacognitive skills. Below we give specific examples of how these recommendations for practice grew out of the study's results.

An important finding from the study that is related to motivation was that students at St. George's are more intrinsically motivated for subjects they are interested in, but more extrinsically motivated for subjects of lesser interest. Students reported being motivated by "doing my best" and "personal growth" for subjects of high interest, which reflect intrinsic motivation. On the other hand, students reported

being motivated by "grades" and "a desire to please my parents and/or teachers" for subjects of lesser interest, which suggest extrinsic motivation.

These results indicated that student interest plays a key role in generating intrinsic motivation. This result is not surprising, of course, but it is important for classroom practice. On the basis of these results, researchers recommended that teachers aim to support student interest and offered two examples of how to implement this recommendation. First, teachers could support student interest by using "hands on" learning techniques that actively involve students (Hidi, 1990; Hidi, Renninger, & Krapp, 1992). This practice may involve activating greater student participation, the use of learning games, or more group activities. Second, teachers could support student interest by making academic content more relevant to the world beyond the classroom. Ways of accomplishing this include discussing real-world applications of the academic content and involving students in activities with the wider community.

Another key finding from the study is that students are more interested and engaged when they feel a sense of autonomy in their work. Students reported in the survey that when given choice in the topic or medium of an assignment, they were "more interested in the work and worked harder." Indeed, having a sense of autonomy supports intrinsic motivation (Ryan & Deci, 2000a, 2000b). However, students reported that they are seldom given choice in their assignments. On the basis of this finding, researchers recommended that teachers afford their students more choice in the content or format of an assignment. Application of this recommendation can range from allowing students to select their own topic for an assignment to providing students with the option of presenting their work in the form of a written paper, a multi-media project, or a class presentation.

This first phase of research on student engagement culminated with a professional development institute at St. George's School, which provided an opportunity to disseminate the research findings to the wider school community. At the institute, researchers presented an overview of the study on student engagement and provided recommendations for practice based on the study's results. Teachers at the institute then worked together to restructure lessons and assignments in accordance with the recommendations.

As mentioned above, this first phase of work led researchers and educators to identify formative assessment as a powerful technique for promoting student engagement. As a result, the team decided to conduct a second phase of research focused on formative assessment. Researchers and educators used a similar collaborative process for this second phase of research. They worked together to create a questionnaire that assessed teachers' baseline use of formative assessment, which was distributed to a random sample of students in all grades. Researchers then worked with teachers to design a formative assessment intervention in which teachers used ongoing reflection logs with students.

For this intervention, students first worked individually with their teacher to establish learning goals, as well as a series of sub-goals that would help accomplish their more general goals. Both students and teachers then used an ongoing reflection log to track the students' process in achieving each goal. The reflection log allowed students and teachers to identify accomplishments as well as challenges along the way. These reflections were used to shape how students approached their next goal and how teachers supported their students in achieving the goals.

After teachers implemented this intervention, researchers administered a survey to assess students' experience of the intervention. Researchers then analyzed these data. The analysis indicated that the formative assessment intervention at St. George's School increased student engagement and supported metacognitive skills. Students found that receiving continuous feedback fueled their engagement and reported that "it makes me much more engaged when teachers give me good feedback" and "Just keep giving me feedback on my learning and how I can improve. Then I can be motivated on my own." Students recognized that the intervention increased their knowledge of how to learn effectively. This effect is expressed in comments such as, "The reflection log was good in that it helped me realize what was effective and not effective in learning" and "The majority of students just know how to work hard. We don't actually learn. . . . Discovering this is kind of disheartening but at least having the reflection log has given me the ability to see this and hopefully have the time to actually improve this."

Following a similar format to the first phase of work, researchers developed recommendations for teachers based on an analysis of the data. The recommendations for practice were to: use formative assessment, provide clear learning goals, teach metacognitive skills, teach time management skills, encourage students to learn from past work, encourage students to discuss their learning with each other, teach students to subdivide learning goals, differentiate instruction, and provide scaffolding. Below we provide specific examples of how these recommendations for practice grew out of the study's results.

When asked to reflect on the formative assessment intervention, students reported that "Reflections are good, not just for the student but for the teacher as well. It allows teachers to isolate the student's strong points and weak points. There are some things that teachers can't learn about a student just from homework or a quiz." and "I feel like we should have small assessments, like quizzes, more often so we can quickly figure out what we know and don't know." A similar attitude was prevalent among the students who participated in the intervention. Consequently, researchers recommended

that teachers implement formative assessment practices with all their students.

In addition, students found that discussing their learning goals with their classmates was a useful strategy for learning how they learn. The value of peer-to-peer discussions is captured in the following student comments, "Working and having conversations with other students helps me learn and take in the information," "I like to talk about my learning goals with my friends," and "I consult others about their experiences with particular challenges." On the basis of this finding, researchers recommended that teachers encourage students to discuss their learning process with each other.

Students also identified scaffolding as an important practice for supporting their learning as reflected in the following comment from a student, "I like when teachers start in the beginning of the year being very helpful and slowly wean off and allow you to become more independent." On the basis of this finding, researchers recommended that teachers help their students to become independent learners by providing scaffolding.

This second phase of research also culminated with a professional development institute based on this work. At this institute, teachers who participated in the research took a leadership role in sharing what they learned with their colleagues in the wider school community. Teachers also worked in groups to formulate applications of the recommendations to their teaching practice.

REFLECTIONS FROM TEACHERS AT ST. GEORGE'S SCHOOL: QUOTATIONS

This research school collaboration has many benefits. First, it gives us the opportunity to conduct research that is highly relevant to our practice. Since our research explores practical questions in our specific school, we can directly apply the results to our daily practice. The researchers tailor the studies so that they are useful to us, and help us develop concrete ways of adjusting our practice based on findings. Moreover, the research school collaboration creates a more reflective school culture. Our regular meetings with researchers also provide structured time for us to discuss our practice with our colleagues. The research projects also spark interesting conversations with our students. For example, many students began to strike up conversations with us about themselves as learners as a result of our research in metacognition. Overall, the process has definitely had a positive influence on our teaching and helped us think in new ways.

This collaboration between researchers at Harvard Graduate School of Education and educators from St. George's School provides an example of a successful research school partnership. This type of partnership provides a way of integrating research with practice, ensuring that research is relevant to practice and practice is up to date with current research. As the research school movement continues to expand, it can form an infrastructure that integrates research and practice in education.

NOTE

1 This section is adapted from Hinton and Fischer (2010).

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