

National Center for Research on Teacher Learning
College of Education, Michigan State University

**How Teachers Learn
To Engage Students
In Active Learning**



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The educational reform agenda and educational researchers tell us that active engagement in learning is an important goal for our students. Can it really occur? How do teachers engage students in active learning? And, just as importantly, how do teachers learn to help students become actively involved in learning?

The National Center for Research on Teacher Learning (NCRTL)* focuses its research on teacher learning in order to understand how teachers learn to teach subject matter in ways that actively engage students in learning. For centuries educators assumed that student learning consisted of rote memorization of new knowledge--students listened to lectures and read books, their progress measured by their ability to recite what they had heard and read. But research in the past 20 years demonstrates that another form of learning is also important--the learning that occurs when instruction is inquiry-oriented, encouraging learners to actively think about and try out new ideas in light of their prior knowledge, to personally transform the knowledge for their own use, and to apply it in other situations. This shift in understanding a new form of learning has triggered an important new direction in teacher learning.

***The National Center for Research on Teacher Learning (NCRTL)** was founded at Michigan State University's College of Education in 1985 with a grant from the Office of Educational Research and Improvement (OERI), United States Department of Education. Originally named the National Center for Research on Teacher Education (NCRTE), in its first five years the Center examined various approaches to teacher education, including preservice, inservice, alternative route, and induction programs, with the goal of furthering knowledge and understanding of the purpose of teacher education, the character and quality of teacher education, and the role of teacher education in teacher learning. This longitudinal research, known as the Teacher Education and Learning to Teach (TELT) Study, forms the foundation for current NCRTL projects. The Center was renamed in 1991 with new funding from OERI, reflecting the shift in emphasis to teacher learning and the desire to provide leadership in defining this new area of research. The work of the NCRTL is guided by both internal and national advisory boards.

Why is teaching for active engagement in learning important?

In response to criticisms of K-12 education and the education of teachers, educational reformers advocate a kind of classroom discourse that promotes the active engagement with ideas that can lead students to make knowledge their own. Mere regurgitation of facts and figures, without a deep rooting in the reasoning behind such information, is not sufficient for in-depth understanding. Educational reformers want students to learn how to pose questions, construct their own interpretations and ideas, and clarify and elaborate upon the ideas of others. Such skills empower students to acquire a level of understanding that provides them with the flexibility to respond to new situations and serves as the foundation for a lifetime of further learning. Calls for reform in education have come from many directions, notably from business, where there is a growing demand for employees who can be more intellectually engaged in their work while working more effectively with others, setting group goals and planning how best to reach them; allocating and accepting responsibilities; identifying and solving problems--including interpersonal difficulties--as they arise; acquiring skills and information as they need them; and critically reflecting on their own individual and collaborative performance. Educational reformers believe that teaching for active engagement in learning provides students with many of these skills and dispositions that prepare them to competently meet the challenges and changes occurring in the work place.

What are the goals of teaching for active engagement in learning?

One goal of this kind of teaching is to focus classroom activities on reasoning and the evaluation of evidence, thus allowing students the opportunity to develop the ability to formulate and solve problems. Another is to empower students, when confronted with a difficulty, to offer conjectures about just what the problem is and how it might best be approached. A final goal is to enable students to clarify and expand on ideas; to demand, as well as to provide, supporting evidence or reasons for comments and opinions; and to determine whether or not an argument is reasonable and a conclusion well-founded. Each of these goals requires that students talk with one another, as well as in response to the teacher, and that they learn to talk about and reflect upon their own thinking, questioning, negotiating, and problem-solving strategies.

The following two illustrations, taken from research studies conducted by the NCRTL, provide examples of students' active engagement in learning.



Third grade public schools students are debating how fractions should be written and deciding how to show what a particular fraction represents:

Betsy: *working with Jeannie* "How can we have this?" (points to $\frac{4}{2}$, written on the board)

Jeannie: "I don't know."

Betsy: "Four **twoths**?"

Jeannie: "We take something and divide it into two parts...and take**four** of those parts?"

Betsy: "I'm confused."

Jeannie: "Me too."

Sheena: (walks up) "Four **halves**, isn't it?"

Betsy: "Yeah, four halves! Halves are two parts. So..."

Jeannie: "So we need two cookies and cut them each in half, then we have four halves."

"One, two, three, four. Twoths, I mean halves."



University undergraduate historiography students embark on an extended exchange about differing accounts of the same event in two history texts. Here are some excerpts:

Kathy: "I don't think [Fernandez-Armesto] says they were equal. I think he says Spain won."

Professor: "Ok, do you, do you..."

Gary: "I think he says it right here on page 236 when he says..."

David: "I'll take a shot. I think that he was arguing..."

Gary: "Well, I know he says that ... But..."

Kara: "I would argue against that because..."

Gary: "But how's that successful when the Spanish were on the offensive?"

Dick: "But it's not thinking like winning or losing..."

Gary: "I think that's a cop out to say that..."

Professor: "Jump in, Sean."

Sean: "That's what I was thinking too...I mean, why call it the Armada?... [continues argument] ...I don't see it as a Spanish victory."

Professor: "You do not?"

Curt: "...this assumption's ridiculous because...[continues argument]"

Diane: "I have to admit that I agree that the Spanish lost it, but..."

Curt: "What I don't understand is..."

Professor: "They couldn't, it was not a matter of guts, the wind was--"

Kathy: "Why didn't Spain turn around and attack... They had to sail all the way back to Spain and then say, 'Ha-ha, we won'...."

Nine of the 18 students present took part in the discussion. The professor's role was minimal. In fact, he was interrupted by a student when he attempted to interject information into the discussion. Students demonstrated a capacity not only to identify the thesis of a historical account but also the ability to critique its evidential and logical basis.



In each example, whether the learners are third graders or undergraduates, teachers established an environment where reasoning and evaluation were key to problem-solving and classmates engaged each other in meaningful discussion and reflection.

[How do teachers design their pedagogy for active engagement in learning?](#)

In order to design pedagogy for active engagement in learning teachers must pose challenging problems, encourage significant discussion between students about the problem, allow sufficient time for students to wrestle with the problem and work through its multiple facets, and, finally, appropriately intervene at those times when students stray too far from the point or need further explanation or information.

In the third grade mathematics example, the teacher posed a problem and then walked around the room, listening and watching. Most children were working in pairs or threes. A few were working alone. According to the teacher, "During this work period, I try to learn how different children are thinking and how they are interacting with the representation context [problem] I have framed. I ask questions, sometimes playing devil's advocate, sometimes pressing for clarification, explicitness, or depth. Sometimes I encourage them to confer with a classmate. Sometimes I provide a piece--either information or a question--to spark further thinking. This phase of the class period is crucial to the joint development of the representational contexts in which we are working, for it is a primary source of information about what the students are thinking and how they are making sense."

In the university historiography class, the professor carefully combined the elements of his teaching. His selection of texts for the course served double duty: They exemplified different types of histories--specifically, narrative, analytical, social, and political--and they provided contextual information for the case students were researching. Paper assignments were carefully articulated with the evolution of the course content. Early papers were designed to help students construct a thesis and understand how historians substantiate a thesis. The professor held individual conferences with students to give further feedback about their papers and to continue questioning them about the claims made in their papers how they substantiated them. The seminar itself, given its presentation/discussion format, was also an exercise in identifying, constructing, and substantiating theses about past events. Students in the course rarely had the opportunity to be passive, even if they might have preferred to remain so.

To encourage students to become actively involved in all these ways puts difficult demands on teachers. Faced with the problem of managing limited classroom time, which is quickly consumed as students struggle with ideas that may seem simple or obvious to an adult, teachers are often tempted ~~to~~ just give students the answers. While this may be an appropriate move in some circumstances, it may also undermine the development of students' own understandings. If students are to be encouraged to pursue ideas themselves, then teachers must have the ability to identify students who appear to be moving down the wrong path and guide them in a more promising direction without taking over the work from them. And teachers must pay careful attention to students' developing understandings as they emerge during the instructional conversation, where quickly improvised but responsive intervention can have the greatest impact on learning. Teachers must not assume that because students are responding to superficial questions or are working in small groups that are totally teacher-directed, students are engaged in active learning. Instead, teachers are challenged to pose problems that highlight the essence or key understandings in the subject matter and allow students to experience the dilemmas presented by the content. In addition, they must provide students the opportunity to discuss problems with others in ways that illuminate the key points for understanding at an in-depth level.

[What are the research implications regarding teaching for active engagement in learning?](#)

First, NCRTL research demonstrates that teachers ~~can~~ learn to promote the active learning central to reform initiatives. Despite entrenched beliefs about teaching and learning, teachers' thinking about teaching and their actual teaching can change to meet the demands of this new approach. The processes of teacher learning are themselves quite varied.

"Investigating Mathematics Teaching," an experimental course for practicing teachers, was organized to learn how a collection of materials documenting teaching and learning in a university professor's third grade mathematics class might be useful to teachers interested in thinking about new ways to teach math. These teachers viewed videotapes of mathematics teaching, debated the merits of the methods they observed and, eventually, reflected upon their own classroom practice. One of the class participants describes the starting and ending positions of the class:

Our group began as a collection of individuals who were all interested in examining the teaching of mathematics. Some of us knew each other (three even taught at the same school), and some of us met for the first time at our first session. We all thought that we were simply participating in a ten-week university class. But

what happened in that class over time changed our perceptions and our goals... It is difficult to trace this experience and it varies for different members of the group. But, there is a shared sense that we moved from a set of concerned individual teachers to a collective that seeks and supports a critical but trusting atmosphere in which we pursue an emerging shared vision of mathematics teaching. This vision includes fostering a classroom culture of discourse much like the one we have experienced.

The teachers in this course viewed and discussed videotapes of the third grade mathematics class. At first, the focus was on what was happening in the classroom, such as what representations the teacher used to teach mathematical knowledge and how specific children made sense of problems. Over time, however, the discussion focus shifted from looking just **what** was happening in the videotapes to looking **why** that might be happening. As group members examined discourse in the third grade mathematics classroom they created a classroom culture of discourse within their own class. As their level of understanding of this kind of pedagogy was augmented, the teachers began to "push each other more" to examine and experiment with their own teaching.

Sometimes a change in teaching occurs when teachers have been exposed to dramatic events. The historiography class professor relates the following story about one of his graduate professors when confronted with a question about the value of the paper he had assigned:

He said nothing for a few moments, looking instead at two essays. I had the impression that this was painful to him, but I was unclear why until he began to speak: 'I'm embarrassed that in more than a quarter century of teaching, it has never troubled me to expect students in the survey [course] only to summarize content.'... So began two decades of tinkering with structured essay assignments that promote interpretation of historical evidence.

Second, in order for teachers to teach for active engagement in learning they must possess subject matter knowledge and pedagogical content knowledge that **goes beyond that typically provided** in teacher education. As our NCRTL researcher observes about the university history professor, his "understanding of history as a field of human inquiry represents but half of the knowledge that makes him an unusual pedagogue. He has also thought a great deal about what experiences are likely to help students develop the understandings of history and the doing of history for which he aims. He appreciates that merely reading history and about history is unlikely to enable students to develop such understandings of history and historical inquiry....The historiography course... is the point at which the professor's views of history and historical inquiry intersects with his ideas about learning history and his knowledge of his students. He has modified the idea of the history workshop he experienced as a graduate student to fit the level of intellectual development he believes typical of his undergraduates."

And finally, teachers need **experience** this kind of teaching **themselves** in order to successfully adopt the pedagogy. It was not until the experimental course for practicing teachers provided the opportunity for teachers to engage in conversation about both another's pedagogy and their own pedagogy that the participants were able to understand how to teach for active engagement in learning. As one teacher observed, "Perhaps we were better able to teach and model good discourse only after we had experienced it ourselves."

Modeling of this kind of teaching, however, may not be sufficient for some prospective teachers. Some of the students in the university historiography class who were planning to become history teachers were unable to imagine using that same kind of teaching in their own future classrooms and, in fact, said they would lecture to high school students. Based on interviews with students, our NCRTL researcher observed, "Despite their belief that they had learned more in the historiography seminar than in any other history course, most students' views of teaching and learning changed little between the beginning of the seminar and one year later. Most believe learning is a reflex of teaching; most say they would lecture to students despite the fact that their own experiences of lectures are overwhelmingly negative.... [T]heir developing understanding of the nature of historical knowledge and inquiry seems largely disconnected from their beliefs about teaching and learning. I was surprised that a learning experience that was as powerful as apparently the seminar was for most students should have provoked so little reflection on learning and teaching.... This suggests that merely addressing prospective teachers' knowledge and understanding of their subject matter may not be sufficient. If prospective teachers are to rethink teaching and learning their subject, their unexamined beliefs

may need to be challenged." In other words, both experienced and prospective teachers must have the opportunity to experience this kind of teaching to reflect upon its meaning for their own pedagogy.

What do the findings from NCRTL research recommend for parents, teachers, and schools?

While the NCRTL has discovered much about how teachers learn about teaching, teaching for students' active engagement in learning, we still need to learn more. In the meantime, we recommend that teachers be encouraged to seek out examples of teaching that require students to construct meanings and create opportunities to discuss these examples with colleagues and with parents. Parents and schools need to be supportive of teachers who are striving to examine their own practice and the nature of students' learning and to adapt their pedagogy to this kind of teaching. While multitudes of workbook activities and stacks of work sheets may indicate that a quantity of school work is being accomplished, this is not necessarily indicative of the quality of learning about subject matter content. Active engagement in learning affords students a greater range of understanding.

Educational reform efforts can be more than rhetoric--with attention to task, vision of a new kind of learning, and conditions that enable teachers to learn to engage in this kind of teaching.

As the university history professor reflects upon his teaching:

At the end of every course, I realize that close and regular engagement with the students has generated new pedagogical ideas--how I might teach the material more effectively, with respect to the standard described earlier. [Advancing the students' intellectual development, as measured by enhanced facility in discrimination, analysis, and synthesis.] And as I become increasingly comfortable with the unpredictability in open-ended (albeit structured) classroom experiences, I am increasingly receptive to the original, sometimes illuminating, insights into the material itself generated by the students. At some point not too long ago, the advantages that can accrue from interactive learning finally outweighed worries about losing control of the class. Now I'm hooked for good.

Endnote

Excerpts from the following NCRTL publications were included in this article:

Ball, D. L. (1990). *Halves, pieces, and twos: Constructing representational contexts in teaching fractions* (Craft Paper 90-2). East Lansing: Michigan State University, National Center for Research on Teacher Learning.

Featherstone, H., Pfeiffer, L., Smith, S. P., Beasley, K., Corbin, D., Derksen, J., Pasek, L., Shank, C., & Shears, M. (April, 1993) *Could you say more about that? A conversation about the development of a group's investigation of mathematics teaching*. (Craft Paper 93-2). East Lansing: Michigan State University, National Center for Research on Teacher Learning.

McDiarmid, G. W. (in press) *Challenging prospective teachers' understandings of history: An examination of a historiography seminar*. East Lansing: Michigan State University, National Center for Research on Teacher Learning.

Vinten-Johansen, P. (in press) *Reflections of a journeyman historian*. East Lansing: Michigan State University, National Center for Research on Teacher Learning.

To Read More About It

Numerous other NCRTL publications are related to the topic of teachers learning to engage students in active learning. You may want to consider some of the following:

Anderson, L. M., Raphael, T. E., Engelert, C. S., & Stevens, D. D. (1997) *Teaching writing with a new instructional model: Variations in teachers' beliefs, instructional practice, and* University, National Center for Research on Teacher Learning.

Ball, D. L. (1988). Unlearning to teach mathematics. *For the Learning of Mathematics* 8(1), 40-48.

Ball, D. L. (1990). Breaking with experience in learning to teach mathematics: The role of preservice methods course. *For the Learning of Mathematics* 10(2), 10-16.

Ball, D. L. (1992) *Implementing the NCTM Standards: Hopes and hurdles* (Issue Paper 92-2). East Lansing: Michigan State University, National Center for Research on Teacher Learning.

Ball, D. L. (1993). With an eye on the mathematical horizon: Dilemmas of teaching elementary school mathematics. *Elementary School Journal* 93(4), 373-397.

Ball, D. L., McDiarmid, G. W. (1990). The subject matter preparation of teachers. In W. Houston (Ed.), *Handbook of research on teacher education* (pp. 437-449). New York: Macmillan.

Ball, D. L., & Mosenthal, J. H. (1990). *The construction of new forms of teaching: Subject matter knowledge in inservice teacher education* (Research Report 90-8). East Lansing, MI: Michigan State University, National Center for Research on Teacher Learning.

Bird, T. (1991). *Making conversations about teaching and learning in an introductory teacher education course* (Craft Paper 91-2). East Lansing, MI: Michigan State University, National Center for Research on Teacher Learning.

Bird, T., Anderson, L. M., Sullivan, B. A., & Swidler, S. A. (1993). Pedagogical balancing acts: Attempts to influence prospective teachers' beliefs. *Teaching & Teacher Education*, 9(3), 153-267.

Cohen, D. K. (1989). Teaching practice: Plus ça change... In P. W. Jackson (Ed.), *Contributing to educational change: Perspectives on research and practice* (pp. 27-84). Berkeley, CA: McCutchan.

Featherstone, H., Pfeiffer, L., & Smith, S. P. (1992). *Learning in good company: Report on a pilot study*. (Research Report 93-2). East Lansing, MI: Michigan State University, National Center for Research on Teacher Learning.

Feiman-Nemser, S., & Featherstone, H. (Eds.). (1992). *Exploring teaching: Reinventing an introductory course*. New York: Teachers College Press.

Feiman-Nemser, S. (1992). *Helping novices learn to teach: Lessons from an experienced support teacher*. (Research Report 91-6). East Lansing, MI: Michigan State University, National Center for Research on Teacher Learning.

Floden, R. E., & Buchmann, M. (1993). Between Routines and Anarchy: Preparing teachers for uncertainty. In M. Buchmann & R. E. Floden (Eds.), *Detachment and Concern: Conversations in the Philosophy of Teaching and Teacher Education* (pp. 211-221). New York: Teachers College Press.

Kirsner, S. A., & Bethell, S. (1992). *Creating a flexible and responsive learning environment for general mathematics students*. (Research Report 92-7). East Lansing, MI: Michigan State University, National Center for Research on Teacher Learning.

Lappan, G., & Even, R. (1989). *Learning to teach: Constructing meaningful understanding of mathematical content*. (Craft Paper 89-3). East Lansing, MI: Michigan State University, National Center for Research on Teacher Learning.

McCarthy, S. J. (1992). *Teachers' changing conceptions of writing instruction*. (Research Report 92-3). East Lansing, MI: Michigan State University, National Center for Research on Teacher Learning.

McDiarmid, G. W. (1992). *The arts and sciences as preparation for teaching*. (Issue Paper 92-3). East Lansing, MI: Michigan State University, National Center for Research on Teacher Learning.

McDiarmid, G. W., Ball, D. L., & Anderson, C. W. (1989). Why staying one chapter ahead really doesn't work: Subject-specific pedagogy. In M. Reynolds (Ed.), *Knowledge base for beginning teachers* (pp. 193-205). Elmsford, NY: Pergamon Press.

Schram, P., Wilcox, S., Lanier, P., & Lappan, G. (1988). *Changing mathematical conceptions of preservice teachers: A content and pedagogical intervention*. (Research Report 88-4). East Lansing, MI: Michigan State University, National Center for Research on Teacher Learning.

Wilcox, S. K., Schram, P., Lappan, G., & Lanier, P. (1991). *The role of a learning community in changing preservice teachers' knowledge and beliefs about mathematics education*. (Research Report 91-1). East Lansing, MI: Michigan State University, National Center for Research on Teacher Learning.

Wilson, S. M., & Ball, D. L., (1991). *Changing visions and changing practices: Patchworks in learning to teach mathematics for understanding*. (Research Report 91-2). East Lansing, MI: Michigan State University, National Center for Research on Teacher Learning.

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[Materials Available](#)

To further its mission, the NCRTL produces research reports, issue papers, technical series, videotapes, and special reports on contemporary issues in teacher education. For more information about the NCRTL, to receive a brochure, publications lists, or to be placed on a mailing list to receive special reports, please contact:

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