

Complex Teaching and Learning: Connecting Teacher Education to Student Performance

Christy Folsom

Despite what are often the best efforts of teacher education programs to prepare teacher candidates for progressive education practices that involve complex teaching, student performance that reveals complex learning and thinking is often missing. It is well documented that teacher education programs have not adequately prepared teacher candidates with the knowledge and skills required for students to show complex learning (Darling-Hammond, 1997; Good, 1990; Goodlad, 1990, 1994; Hollingsworth, 1989; National Commission on Teaching and America's Future, 1996; Tom, 1997).

Darling-Hammond (1997) describes several characteristics of the kind of teaching that leads to complex learning.

Work that is both rigorous and relevant, teach[ing] for high levels of disciplined understanding in content areas, student-based strategies, maintain[ing] a dialectic between students and subjects, [learning] experiences that allow [diverse] students to access ideas in a variety of ways, learner ... breakthroughs in understanding. (p. 12)

Ogle (1997) offers more insight into what constitutes complex learning and complex teaching. In her description of appropriate education for "at-risk students," Ogle describes learning that involves "skills in critical and conceptual thinking," a "thinking curriculum," curriculum in which students "plan, organize, and evaluate their progress," and curriculum that supports the development of "metacognition or the ability to think about their own thinking and learning" (p.2).

Metacognitive discussion, or the discussion of thinking and learning, is an important characteristic of complex teaching and learning. Sarason (1982), however, noticed in his many visits to classrooms that "there was something missing" and that was the "discussion of thinking and learning in the classroom" (p. 220). When Sarason asked the teachers about this missing discussion they replied that nothing in their teacher preparation had prepared them to discuss thinking.

Based on "cross-disciplinary" (Holland, 1995, p. 6) observations and teaching experience in various branches of education, I also recognized the absence. Similar to Sarason's study (1982), my observations revealed that something important was missing in the interactions between teachers and students in most classrooms. Even in schools with exceptional facilities where student projects covered expanses of hallways and classroom walls, the explicit discussion of thinking and learning was missing.

My research addresses this gap within the context of student project work. Project work can be an important strategy of complex teaching that supports the teaching of thinking and discussion of learning. Project work or "the project method," a major component of progressive education (Dewey, 1938; Kilpatrick, 1921) is defined by Kilpatrick as "any unit of purposeful experience, any instance of purposeful activity where the dominating purpose, as an inner urge, (1) fixes the aim of the action, (2) guides its process, and (3) furnishes its drive, its inner motivation" (p. 283).

Yet, often project work entails little more than good intentions and vague directions. An example is one teacher's description of an immigration project he carried out with his third-grade students. He explained, "It [the project] had to have something to do with immigration. It had to depict some scene about immigration ... they could construct what they wanted from cardboard" (Folsom, 2000, p. 293).

Potentially, project work that includes the explicit teaching of the processes of self-organization and infused with metacognitive discussion embodies the characteristics described by Darling-Hammond (1997) and Ogle (1997). Self-organization processes allow students to experience the opportunity to "develop and bring to execution their own ideas" (Dewey, as cited in Kliebard, 1995, p. 69). When teachers explicitly teach self-organization processes they give students the tools to "take an active role in the learning process" (Ogle, p. 2). Such teaching helps students develop the skills needed to take more responsibility for their own learning. Yet, in teacher education a glaring gap in the preparation of teachers for the complexities of project method teaching and metacognitive discussion exists.

Metacognitive discussions emerge from an understanding of intellectual processes. In order to benefit fully from the complexities of learning inherent in project work, students and teachers alike require a deep understanding of the intellectual processes that comprise the infrastructure of such teaching. Dewey (1964) noted,

Only a teacher thoroughly trained in the higher levels of intellectual method and who thus has constantly in his own mind a sense of what adequate and genuine intellectual activity mean, will be likely, in deed, not in mere word, to respect the mental integrity and force of children. (p. 329)

Yet, the pedagogy of project work, specifically the intellectual operations and social-emotional or character traits that can be developed and discussed through project work, has not been adequately taught in teacher education. To extract consciously the full potential of project work as a complex teaching method, teachers must know how to teach students the skills required of the "new problem solver" (Devaney & Sykes, 1988, p. 19).

One of these skills, "successful organization and monitoring of one's own learning" (Devaney & Sykes, 1988, p. 19), involves the skills of decision making, planning, and self-evaluation. Marzano (1993), in his discussion of mental dispositions, states that the processes of decision making, planning, and self-evaluation "render any activity more thoughtful and more effective" (p. 158) and are necessary for higher-order thinking to take place. The intellectual skills involved in self-organization result in transformational learning, defined by Clark (1993) as "learning that produces change. ... [It] produces more far-reaching changes in the learners than does learning in general, and these changes have a significant impact on the learner's subsequent experiences" (p. 47).

Dewey (as cited in Kliebard, 1995) included self-organizational skills in his description of project work at the Chicago Laboratory School. "Children ... were called upon to evaluate their own handiwork on occasion as an apparent culmination of the effort to involve children, not only in the planning stages of their activities, but at their conclusion as well" (p. 63).

The question of when the strategies of complex teaching and learning can effectively be taught was a consideration in my research plan. In a study of teacher concerns, Fuller (1969) outlines three phases of teacher development: preteaching, early teaching phase, and late teaching phase. In a later study, Feiman-Nemser (1983) expands teacher development to include four phases. The first phase, *pretraining*, includes

learning from parents and the years of schooling where impressions and attitudes about teaching and learning are formed. The second phase is *preservice*, or formal teacher preparation, where often little is accomplished in changing the attitudes and beliefs about teaching formed in the first stage (Feiman-Nemser, Fuller; Goodlad, 1990; Hollingsworth, 1989). Third is the “intense and stressful” (Feiman-Nemser, p. 158) first year of teaching or *induction phase*. The final phase, *inservice*, consists of three stages leading toward a sense of mastery in teaching. Practicing teachers with their own classrooms were chosen as research participants because assessments involved student performance. First year teachers were not included, because the “feelings of uncertainty, confusion and insecurity” common to the induction phase and the year-long commitment required would most likely result in an “unwillingness to try new teaching methods” (Burden, as cited in Feiman-Nemser, p. 162).

Purpose

This research was designed to investigate the effect of teaching teachers to incorporate the teaching of self-organization skills into project-based curriculum design. How will teacher thinking and practice change as they teach their students the self-organization skills of decision-making, planning, and self-evaluation in the context of project work? How will students reflect the learning of their teachers? How will my work as a teacher educator be reflected in student performance?

Method

This qualitative research study included a professional-development intervention involving four teachers teaching at the elementary school level in self-contained classroom settings. The intervention involved teaching strategies, hereafter called the *professional learning process* or *teacher education process*, designed to help the teachers learn to facilitate the self-organization processes of decision making, planning, and self-evaluation with their students. The overall research procedure included teacher selection, baseline assessment, ongoing professional learning process (intervention) with midpoint assessment, and final assessment. I patterned my overall research procedure after the research on student underachievement by Baum, Renzulli, and Hébert (1995). They defined four phases of the intervention procedure: (a) teacher selection, (b) familiarization, (c) treatment, and (d) assessment. Their model of providing an intervention or treatment to help students increase achievement was similar to my goal of helping teachers increase achievement in the complex learning and teaching involved in project work.

I *selected* four teachers from varied backgrounds to participate in the study based on their interest in progressive education, their ability to articulately evaluate the professional-development intervention, and their potential as leaders in their schools willing to take risks. I saw that both Erica and Ted shared these characteristics when I was her student teaching supervisor and Ted was her cooperating teacher. Stacy, the third teacher, demonstrated these characteristics in graduate courses we shared. Brian, who taught in Ted’s school, was selected through a type of “snowball sampling technique” (Bogdan & Biklen, 1992, p. 70) after discussing possible choices with Ted. The four teachers, whose experience ranged from two to eight years, were paired in two Manhattan public schools with diverse student populations. Two of the teachers taught fourth and fifth grades in School #1; the other two taught second and third grades in School #2 (see Figure 1).

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In addition, each of the participating teachers selected three students to take part in the assessment phases of the study. These students were selected based on three criteria. The students reflected a range of academic and organizational abilities; they had various amounts of skill in articulating feelings and thoughts about their learning; and they included those who had success with project work and those who had difficulty. Assessing student performance through interviews and analyzing their projects helped me assess the effectiveness of each teacher’s implementation of self-organization strategies in the classroom and my effectiveness as a teacher educator.

Research Participant	Grade level	School	Years teaching prior to research	Previous Experience
Erica	5th	School #1	2	Left law school to go into teaching Public school, 2 years
Stacy	4th	School #1	3	Preschool, 1 year Middle school, 1 year 3rd grade, 1 year
Ted	3rd	School #2	8	Private educational materials firm Preschool summer program Private school, asst. teacher Public Schools, 8 years
Brian	2nd	School #2	5	Musician Stock exchange trader Public school, 5 years

Figure 1. Characteristics of research participants.

During the *familiarization* phase, I immersed myself in each of the four classrooms becoming acquainted with the students, learning the culture of the class, and assessing each teacher’s practice in relation to teaching self-organization skills. During this time, I conducted a formal baseline assessment with each teacher and the students. This information helped me decide how best to begin the professional learning process.

The research included three *assessments*. The baseline and final assessments provided information about how each teacher changed their thinking and practice over time. The baseline and final assessments included five data gathering instruments: classroom observations (see Table 1), interviews with individual teachers (see Table 2), group interviews with the students from each classroom (see Table 3), analysis of teacher prepared materials to teach self-organization skills (see Table 4), and analysis of student projects (see Table 5). Whereas, the baseline and final assessments involved tape-recorded interviews, the midpoint assessment required written responses to questions developed to elicit personal reflections of the participants and assess the effectiveness of the professional learning process (see Table 6). The midpoint assessment helped in continually tailoring the treatment or professional learning process to the individual teacher’s requirements.

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<p>Evidence of decision making, planning, self-evaluation in classroom work.</p> <ul style="list-style-type: none">• Is there more extensive use of decision making, planning, self-evaluation evident in the teacher's curriculum planning?• Is there evidence of formal student decision making, planning, and self-evaluation through use of decision-making grids, planning worksheets, and self-evaluation worksheets made by teachers?• Are there charts with criteria for projects displayed in the room?• Is there an increase in time spent on pre- and post-project discussions? <p>Evidence of a language of thinking and learning in the classroom.</p> <ul style="list-style-type: none">• Are terms such as criteria, self-evaluation, planning, deciding, decisions, choice being used in the classroom by students and teacher? <p>Evidence of using a theoretical framework (TIEL) to contextualize, discuss, and plan self-organization processes.</p> <ul style="list-style-type: none">• Is the vocabulary of TIEL framework (or an adaptation) used in teacher's conversations and teaching when teaching about decision making, planning, self-evaluation?• Is the vocabulary of TIEL (or an adaptation) used by students in classroom discussions and interviews?• Are charts or posters referring to the framework in the classroom? <p>Evidence of structural and contextual factors to support self-organization processes.</p> <ul style="list-style-type: none">• Is there evidence of research going on?• Is group work evident and used [more often]?• Is there an [increased] atmosphere of creativity in the classroom?• Does the teacher have classroom management routines in place to support autonomy needed for project work• Is the physical space and materials supply sufficient to accommodate project work?
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Table 1. *Sample criteria for classroom observations*

<ul style="list-style-type: none">• Describe for me how you facilitate students' decision making, planning, and self-evaluation in project work. What have you tried? What has worked? What has helped you be able to do this?• As a result of the Professional Learning Process (PLP), what changes do you see in yourself as a teacher as you learn to use tools to explicitly facilitate student decision making, planning, and self-evaluation and incorporate these strategies into your teaching?• Following the PLP, what changes do you see in the students or in their products?• Reflect on any differences in your thinking as a result of the changes you see in the students.• How do you see your approach to curriculum development now? Describe how you incorporate the strategies of self-organization into your curriculum planning.• What parts of the professional learning intervention have most changed your thinking?• How has the use of a theoretical framework changed your thinking about students, curriculum, or yourself as a teacher?• What structural or contextual factors (e.g. teacher education, school system, school, classroom, students, parents, community) [have] prevent[ed] you from being able to facilitate decision making, planning, and self-evaluation as much as you would like?• What do you think would help you facilitate the processes of self-organization better?• How has the discussion of thinking theory helped you learn how to facilitate decision making, planning, and self-evaluation with the students?• Do the theoretical framework (TIEL) visuals help you better understand the processes used in curriculum planning? Why? Or Why not?• Do the theoretical framework (TIEL) visuals help the student understand and discuss their thinking?• Why would being able to explain the processes of decision making, planning, and self-evaluation to others be important?

Table 2. *Sample questions for teacher interview*

- Tell me about your project.
- Tell me about project work you have done before in this class.
- Tell me about project work you have done before in other classes.
- How was the earlier project the same as or different from this project?
- Were you pleased with how this project turned out?
- What do you think helped make it successful? Or not so successful?
- Tell me about how you made the decisions about how to do the project. How did your teacher help you decide?
- How did you evaluate your project at the end?
- How did you know it was “good” or “not so good”?
- Do you think having a criteria for evaluation helped you succeed with your project?
- Did you like evaluating your own project/ Why?
- Have you ever evaluated your classmates projects?
- Did you like evaluating your classmates projects? Why?
- Did you plan your project?
- How did planning help you with your project?
- Do you think making decisions, planning, and evaluating your project helped you learn? How? or Why not?
- When you do a project in the future what might you do differently?
- Would you use decision making and planning?
- What suggestions do you have for your teacher as she/he helps other students learn to use these processes you used in creating your project?
- Do the thinking (theoretical framework [TIEL]) charts help you understand decision making, planning, and self-evaluation better?

Table 3. *Sample questions for student interviews*

- Do decision-making process worksheets meet the following criteria? Includes a place to:**
- Describe the decision or problem; list group members or individual
 - List alternatives for the decision or solution
 - List and rate criteria by which to judge the alternatives
- Do planning process worksheets meet the following criteria? Includes a place to:**
- Record the due date and audience
 - List the student-developed criteria by which the project and presentation will be evaluated when the project is finished
 - List the steps to take in development of the project and presentation
 - State the possible problems that you can anticipate as you are working on the project
- Do reflection worksheets used for students’ narrative self-evaluations of project meet the following criteria? Includes a place to:**
- Describe the challenges encountered in researching and developing the project, or to explain what might be done in future projects to assure that there is a challenge involved
 - Evaluate the overall project including what you learned that would be useful in development of another project and presentation, and what you would do differently the next time
- Are teachers and students effectively using teacher-made decision making, planning, and evaluation process worksheets?**
- The teacher is comfortable using the language that refers to thinking processes on the worksheets and TIEL visuals with the students
 - The teacher is able to manage the time and amount of work on process that is appropriate for his/her students
 - The process worksheets are at the appropriate level for students’ abilities

Table 4. *Sample criteria from teacher materials analysis*

<p>Did the overall project and presentation meet the following criteria?</p> <ul style="list-style-type: none">• Included written, speaking, and visual components to be presented to an audience• Presentation and project were well organized• Students had rehearsed and prepared• Students had chosen ways to do the project and presentation that took advantage of the talents and abilities of the group members (or individual)• Students had chosen ways to do the project and presentation that were appropriate to the subject matter as well as the audience• Students were willing to take risks <p>Did the written part of the project meet the following criteria?</p> <ul style="list-style-type: none">• The content contained the specified information and was accurate• The content contained new information for the audience –• The writing was well-organized and clearly written <p>Did the visual part of the project meet the following criteria?</p> <ul style="list-style-type: none">• It was neat, clear, sturdy, and easily understood (i.e, chart, poster, pictures, diagram, 3-dimensional project)• Lines were memorized, costumes and props were creative; it was well rehearsed (if a play or skit)• Students had needed materials ready and organized <p>Did the speaking part of the presentation meet the following criteria?</p> <ul style="list-style-type: none">• Speaking was clear and understandable• Audience questions were evidence that the presentation made the audience think• The students were knowledgeable about their subject by competently answering questions from the audience <p>Were the necessary processes included in the project and presentation by the students?</p> <ul style="list-style-type: none">• Made decisions about their project and presentation using a decision-making rating guide• Made plans for their project and presentation using a plan sheet.• Set criteria for evaluation during the initial part of the planning stage.• Evaluated their project using the criteria set for evaluation.• Reflected on their project by writing a narrative designed by the teacher• Evaluated their classmates through peer evaluation set by the group.
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Table 5. *Sample criteria from student project analysis*

<ol style="list-style-type: none">1. How do you learn? Describe your learning style and processes.2. What have you learned so far this semester? What has helped you learn it?3. How do you feel about yourself as a student and what you are learning?4. Describe how you understand the Professional Learning Process. What elements of the PLP have prevented you from learning as much as you'd like? What changes in the PLP would help you learn better?5. Where do you need to go next for your own development?6. What do we need to do to help each of us make progress? What do I need to do? What do you need to do?7. Why are we doing research on this topic (decision making, planning, and self-evaluation in the context of student projects)?8. Why is the thinking and emotional context of TIEL important?
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Table 6. *Sample questions from midpoint assessment*

The *treatment phase, professional learning or teacher education process*, involved half-day visits each week to each class over two 16-week semesters. Individually tailored to meet each teacher's needs, the professional learning process involved classroom participation and observations, individual meetings with each teacher, and monthly group meetings. All curriculum projects and discussions occurred within the context of the standard curriculum for each class.

A significant part of the professional learning process was the theoretical framework, Teaching for Intellectual and Emotional Learning (TIEL®). A theoretical framework was needed for the research that would connect the intellectual and emotional aspects of complex teaching and learning and help the teachers understand and teach the components involved in project work. The intellectual processes of critical thinking, setting criteria, decision making, planning, and self-evaluation are central in designing and developing projects. Yet, these self-organization processes do not stand alone. There are other intellectual processes involved, as well as social-emotional characteristics that can be developed when students are taught self-organization skills in the context of project work.

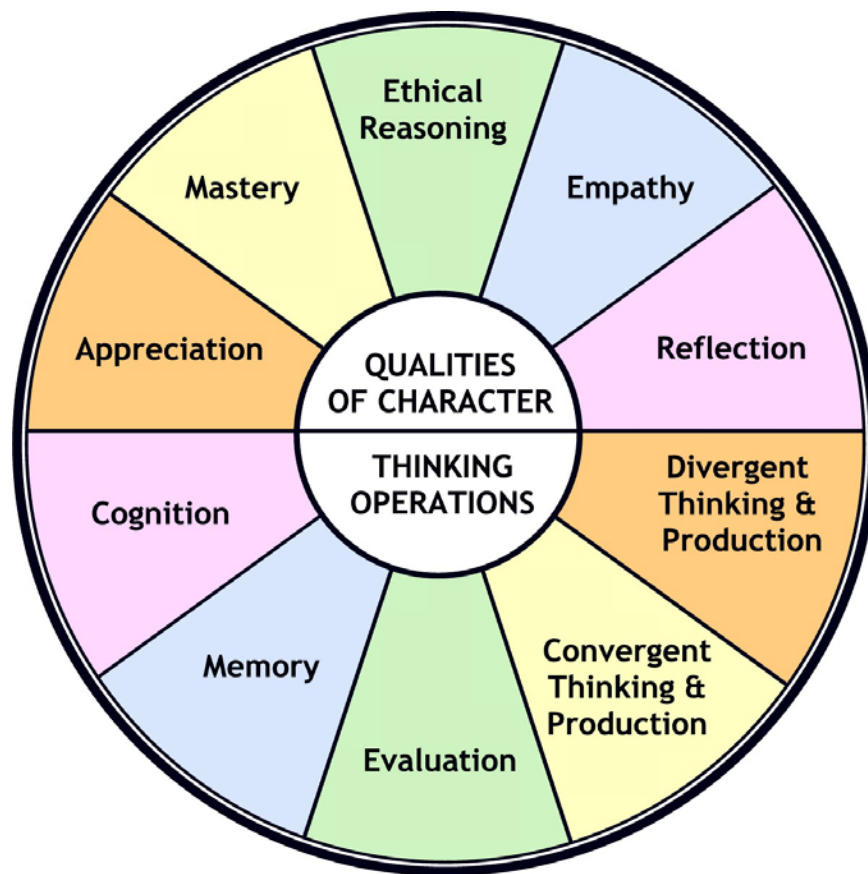


Figure 2. The TIEL Design Wheel.

Drawing from psychologist J. P. Guilford's Structure of Intellect Theory (1977) and philosopher John Dewey's description of qualities of character (1964), I formulated a conceptual framework, the TIEL Design Wheel (see Figure 2; Folsom, 2000), that connects both intellectual and emotional aspects of learning. The upper half of the TIEL Design Wheel consists of five intellectual operations found in Guilford's theory, while the lower half consists of five qualities of character described by Dewey. Placing

these components together provided a visible structure for teaching the complex processes embedded in project work. Color coding the components of the TIEL Design Wheel further assisted the teacher and students in identifying and differentiating the thinking processes involved in complex teaching and learning.

Carefully planned and explicitly taught project work can help students develop the intellectual skills and social emotional characteristics described in the TIEL framework. While this research focuses on decision making, planning, and self-evaluation found within the intellectual operation of *evaluation*, other thinking operations involved in project work are *cognition*, gathering information; *memory*, connecting new information to previously learned knowledge; *convergent production*, logical, organizational thinking; and *divergent production*, creative, flexible thinking (Guilford, 1977). Qualities of character include *reflection*, learning about oneself; *empathy*, learning to care for oneself and others; *ethical reasoning*, acquiring the ethics of fairness, responsibility, and honest effort; *mastery* of basic skills and established knowledge; and *appreciation* for the arts, cultures, and nature (Dewey, 1964).

Results

At the end of the year-long professional learning process or teacher education intervention, there was evidence linking teacher education to teacher learning to student performance. All four teachers were developing project-based curriculum that explicitly included the teaching of decision making, planning, self-evaluation (see Figure 3). The students reflected the learning of their teachers through articulate discussions of their thinking and learning about self-organization skills in the context of their projects. And finally, the teacher and student interviews gave evidence that my work as a teacher educator was clearly connected to student performance. In the following sections, I will discuss how teachers changed their thinking and practice, how students reflected the learning of their teachers, and how my work as a teacher educator was reflected in student performance.

Change in Teacher Thinking and Practice

Awareness of self-organization opportunities. Becoming conscious of self-organization processes was an important part of the professional learning process. One group meeting was devoted to a discussion of personal decision-making processes. The teachers described their personal projects such as buying a car, finding an apartment, or creating a curriculum unit. This activity helped the teachers develop an awareness of the opportunities for teaching self-organization processes to their students through classroom project work.

Ted, a third-grade teacher and veteran of the group with eight years of experience, was unaware of the potential power embedded in his teaching. While Ted's classroom management and curriculum were laced with choice and process, he was not explicit in teaching the students about their thinking. Ted had a great deal of expertise in the reading and writing process and included projects in his social studies units. While self-organization skills were embedded in the writing process, Ted had no vocabulary for recognizing and bridging those processes to the project work. As a result of the professional learning process, Ted became aware of those processes and how to make them explicit with his students. At the final assessment Ted reported,

We *do* decision making. I just don't think I made enough of the connections. We've been doing decision making all year, like in choosing their jobs. Choosing their desks.

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Choosing their homework partners. Choosing their rug spots. Choosing reading spots. It's all decision making. But I wasn't explicit. I didn't make enough connections from one to the other. I didn't highlight it enough.

	Teaching Practice Baseline Assessment	Professional Learning Process	Teacher Practice Final Assessment	Student Performance Final Assessment
Erica 5th grade	Did not teach decision making, planning, and self-evaluation in context of project work Students not aware of s-o processes	Planning social studies units Development of tools: • decision making • planning • self-evaluation • daily monitoring of project work TIEL vocabulary	Planned 3 social studies projects that included teaching s-o skills Developed tools for teaching s-o processes Able to explicitly articulate planning	Enthusiastically discuss planning calendar Discuss how calendar helps them with due dates Discuss decision-making in context of <i>how</i> to make Mexico presentation Discuss criteria involved in evaluating Mexico projects
Stacy 4th grade	Did not teach s-o skills in context of project work Students not aware of s-o processes	Planning social studies units Development of tools: • decision making • planning • self-evaluation • daily monitoring of project work	Planned four project method social studies units to teach s-o skills Verbally and visually articulated s-o skills Gives responsibility to students	Discuss self-organization skills using metaphor Recognize patterns of s-o skills across projects Discuss using criteria to evaluate
Ted 3rd grade	Project work was ongoing Did not consciously teach s-o skills in context of project work Students not aware of s-o processes	Planning social studies and literature units Development of self-organization tools Ted's planning	Knew he needed to make decision-making opportunities explicit Understands his own need to plan more explicitly Planned 3 projects to teach s-o skills	Identify and describe problems in globe project
Brian 2nd grade	Did not teach in context of project work Students not aware of s-o processes	Planning three projects: 2 art, 1 literature Development of s-o tools	Learns to observe students' more deeply Ability to explicitly talk about thinking Understands importance of naming thinking process Planned 3 projects to teach s-o skills	Discuss choices Transfer use of s-o skills to activities out of school

Figure 3. Summary of change in teacher practice and student performance.

Increased number of curriculum units. Each teacher increased the number of curriculum units that included project work. Teaching self-organization skills requires something to organize, therefore, it was necessary for the teachers to institute project-work where few projects had existed before.

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Erica had participated in the three-month pilot phase of the research a year and a half earlier. Although it was her first year of teaching, Erica did not hesitate to participate since the pilot occurred during the last months of school and involved a relatively short time period. At that time Erica learned to teach decision making, planning, and self-evaluation within the context of one social studies project in her class. Before the pilot, Erica did not consciously teach the skills of self-organization to her students, nor did she use the words decision making, criteria, planning, or self-evaluation. Any discussion of self-organization skills was inexplicit and unplanned. Furthermore, since Erica did not feel prepared to manage student projects, she had not taught a project-based social studies or science unit prior to the pilot.

Erica changed her practice. During the professional learning process, she planned and carried out four major social studies units which all included student projects: School Study (a study of their own school), The United States, Mexico, and South America. For each project, she designed tools to help the students make decisions, plan, and self-evaluate at the conclusion of the project. Throughout the year, as Erica became more sophisticated in designing worksheets and discussing strategies to help the students manage their work, her students became more self-directed and empowered in the classroom. They were taking control of their work. Erica noted that even though both she and the students were at times disappointed when they had difficulties carrying out the processes of self-organization, the students were proud of their increasing self-efficacy. Erica said,

They also felt really proud of what they'd done and powerful in doing it, no matter what happened in all the stuff. They completed something and they went through all these problems and they changed a lot because of it... a lot.

Purposeful planning. The teachers became more purposeful and explicit curriculum planners. Common planning strategies at the beginning of the intervention included a loose consideration of the time to be spent on a particular study and thinking about possible activities the students could do that connected to the topic. As the teachers became conscious of self-organization skills, they became more deliberate in their planning. Teaching self-organization skills required that the teachers needed to look ahead in their own planning in order to guide the students in their planning.

When it came to planning, Ted was a self-proclaimed meanderer. At baseline, Ted's curriculum planning at the beginning of the year involved making "an outline or skeletal sketch of certain topics that I plan to study with them." The curriculum components that he would emphasize in the studies of immigration and communities around the world would depend on "who [the children] are" and "what I feel they need."

While these were important considerations, Ted changed his planning practices. By the end of the professional learning process, Ted's projects were better structured, while still allowing students freedom in their learning. Expressing how his thinking and practice changed, he said, "[Learning about] planning helped me the most." The non-specific approach to curriculum development he described in the baseline interview, gave way to conscious, purposeful methods of curriculum design. In the written midpoint assessment Ted described an important learning moment:

[The discovery] that the final project must emerge first and foremost, which will shape the process and the learning outcomes. What helped me learn it was the drawn-out, meandering quality to my class's immigration study [the previous year].

Articulation. The teachers became more articulate in discussing thinking and learning with their students. Stacy, a fourth-grade teacher, came from a traditional Catholic school education and was the most

traditional teacher of the four. In many ways, she appeared on the surface to fit the description of a teacher whose traditional ideas were affected little by her teacher preparation program (Hollingsworth, 1989). Yet, Stacy quickly expanded her teaching methodologies to include specific decision making, planning, and self-evaluation and developed fluency in discussing the full range of thinking processes with her students. At the final assessment Stacy reported that she had significantly changed her thinking about the strategies of decision making, planning, and self-evaluation. She explained, “I think that I’m seeing it as a more integral part of learning than I did at the outset.”

Making a conscious effort to transfer responsibility to the students, Stacy gave a homework assignment requiring students to set criteria to decide how they would choose a time period to study for their final project. After giving them their assignment, the students replied, “What you’re saying is, “*Why* are you choosing it?” Reinforcing the integration of self-management skills into her assignment she replied, “Exactly. If you’re going to make an important decision about what you’re going to study, then you should have some reasons.”

Stacy was not only verbally articulate, but she provided visual clarity as well. Prior to the professional learning process, Stacy simply *gave* her students instructions for hands-on projects. During the professional learning process, Stacy learned to plan *with* the students. Stacy outlined the plan, the criteria for evaluation, and the research skills with the students on large chart paper. These written references remained attached to the chalkboard throughout the project.

Student observation. The professional learning process helped the teachers observe their students more deeply. As Brian, a second-grade teacher, became conscious of his own thinking, he became aware of the presence or absence of thinking and learning schema in his students. He wondered, “Do they have a ‘way’ of doing thinking—or is it just random?” Using TIEL as a lens for observing his students, Brian developed an understanding of why it is important to explicitly teach self-organization processes. He explained that he was concerned about the gap “between children who unconsciously have a way to plan, evaluate, and do [gather information, etc.], and those who don’t, and the environmental factors that contribute to this.”

Brian’s empathy grew for “those who have not, for whatever reason, developed an internal way to think or make decisions.” He found that students who lacked these internal self-organization skills seemed to lag behind in academic areas. Brian understood that teaching students explicitly about their thinking would allow them more control over their thinking, decrease their confusion, and help them make sense of the world. He said,

You can tell kids who sort of have it [ways to make decisions, plan, self-evaluate], do it without thinking about it. And kids who don’t have it, face everything again for the first time. You’re not looking back to memories and you don’t have any schema of thinking. You don’t have any way to think [about thinking]. If you have it without realizing you have it, well fine, but if you know about it and you can talk about it, to me that always engenders being able to do it better.

Using the TIEL framework. While the research focused on self-organization skills, the TIEL framework helped the teachers see those skills in a larger perspective. Erica was uniquely qualified to comment on the effect of the TIEL framework as part of the professional learning process. When Erica participated in the research pilot project, the TIEL framework was not used to place the self-organization strategies within the context of the framework. I taught her how to incorporate decision making, planning, and self-

evaluation into her curriculum as isolated skills. She was introduced to the theoretical framework with the other teachers during the official research year. In the final interview, I asked her how using the framework affected her learning. She replied,

That [the TIEL framework] makes all the difference. You need to have the framework. I need to have it in order to categorize and sort and scaffold and give myself a framework to go back to. I think it's critical.

Erica also felt the TIEL framework helped address Sarason's (1982) concern by providing a language to facilitate the discussion of thinking and learning.

Student Performance: Reflecting Teacher Learning and Teacher Educator's Work

Student performance reflected the complex learning and teaching of the teachers and the effect of the teacher education intervention. In each classroom students were empowered by the opportunity to make decisions, plan, and evaluate their own projects. The students' discussions revealed increased motivation, more thoughtful projects, and an expanded capacity to discuss their thinking and learning. In the following examples, the metacognitive discussions with students show evidence of the clear connection between teacher learning and student work and the connection between teacher educator and student performance.

Planning and self-evaluation. As projects increased in complexity, Erica needed a better way to help students plan. I suggested to Erica that she teach the students how to use a blank calendar to plan the dates involved in the study about Mexico. The students were enthusiastic about this planning tool that gave them more control over their work. They stated how they liked the calendar, how it helped them divide their time and work, and how it helped them memorize due dates. They even recalled previous projects without the calendar tool and compared the confusion of those experiences with the current project on Mexico. They were convinced that without the calendar they "would have never been done with the Mexico project."

The students were equally articulate in explaining self-evaluation at the end of projects. S— explained how she had evaluated her presentation on Mexico by referring to the criteria that had been set at the beginning of the project. She explained,

I thought very hard of what I would do so that my criteria and evaluation would come out good. When we evaluated we got all the questions and everything to do our scores. And I just kind of like looked at my project and everything for some of the questions and I really thought back about the work that I did. And I think it helped me to know the stuff that I really didn't do well.

Metaphors and Patterns. At the final assessment, discussion of decision making, planning, and self-evaluation permeated project work in Stacy's classroom. The students shared their learning with me using colorful phrases to describe the self-organization processes. One student said that without decision making, planning and evaluating, projects would not come together. It would be like "a snake without a spine." Another student described the green thinking (evaluation) as the "seasick thinking." Referring to all five of the thinking operations, he stated that, "Out of all these, the seasick thinking makes you the most ... SICK!" Another student agreed, "You have to do it over and over and over again." With uncanny

accuracy, these descriptions illustrated the back and forth movement of decision making and evaluating, as well as the often unstable process of planning.

The students also told me that they had noticed patterns in how thinking processes were involved in all their projects. One student commented that “the States project was kind of the same as the other projects because we had to do kind of the same things like plan. We had to look up stuff, like in books and inside the computer and encyclopedias.” Another student saw the similarities in using criteria for peer editing.

Identifying problems. Even when things did not go well with projects, the students were able to use their articulation skills to identify the problem. One of the projects that Ted planned during the professional learning process involved creating a paper-mâché globe. Using atlases, the students researched the continents and attached cut-outs of each continent onto the globes. In the final interview with the students, D— expressed his frustration with the project. He did not feel the pink planning sheet Ted had given them was adequate in helping him through the process of creating the globe. He was currently redoing his globe because it was upside-down with the continents in the wrong place. To him the positioning of the globe was a very random event, over which he had little control. Even though the planning sheet delineated what the students were to do, it did not give D— enough information on how to do it. N— identified the problem as she saw it, “The plan didn’t tell us exactly where everything goes. It just told us the steps. Now put on your pieces. Now paint your globe. Put on your equator.”

Student empowerment. Brian wanted his second-grade students to gain a sense of power and control over what they do. He wanted students to become conscious of their choices and responsible for setting their own criteria. He was well aware of how students who feel powerless affect their environment. The student may not be able to meet classroom or academic or family expectations. He may not meet his own expectations, but, according to Brian, the student “can make you (the teacher) go crazy!” A better way was to help students learn to affect themselves and others more positively by explicitly teaching students how responsible choices are made.

At the final assessment, the second-grade students were aware of choice, planning, and evaluating, and becoming more articulate in explaining these processes. One student commented, “If you can make choices, then you can choose what’s best for you. Like maybe the teacher says you have to read this big book, but it’s too easy for you so you have to pick something yourself.” J—, who often struggled in the interviews, transferred the concept of planning to a context outside of school. She said, “When you take the bus or the train you have to plan what stops you’re gonna get off in and what stops you’re not gonna wait for.”

Conclusion and Recommendations

Just as the teachers Sarason (1982) observed had never been prepared to discuss thinking, the findings indicate that the teachers involved in this research were similarly unprepared to teach “the higher order skills that society is calling on schools to teach” (Devaney & Sykes, 1988, p. 19). Historically, this lack of instruction in the complex teaching involved in the project method is not uncommon. Darling-Hammond (1997) points out that in earlier educational reform movements, teachers lacked the “extensive skill” (p.12) to maintain progressive reforms. While teachers have understood that the intention of using “the project method” is “to make learning relevant,” they lacked the knowledge to “fashion work that was both rigorous as well as relevant” (p. 12). While teachers have long been at a disadvantage in bringing complex learning to life in classrooms, change is possible.

Findings

Teachers. Through the professional learning process that was part of this research, the teachers learned the complex skills needed to teach self-organization processes to students in the context of the project method. The teachers became more conscious curriculum planners, created materials that supported development of self-organization skills in their students, and led articulate discussions of thinking and learning.

Students. Student performance reflected change in teacher practice. Students in grades two through five showed their capacity for complex learning as they developed and discussed their projects. They showed evidence of intellectual engagement as they became more motivated, more organized, and more responsible in monitoring their own learning. Students showed evidence of “transformational learning” (Clark, 1992, p. 47) as they articulately described their thinking in making decisions, planning, and evaluating their projects.

Teacher educator. The findings indicate clear connections from teacher educator to teacher to student. The TIEL Design Wheel provided visible and verbal connections throughout the professional learning process that transferred explicitly from the teacher educator to the teacher to the student. This conceptual framework, outlining components of complex teaching and learning, provided structural support for both teachers and students as they attained “higher levels of intellectual method” (Dewey, 1964, p. 329). The TIEL framework placed self-organization processes within a context of other intellectual processes and social emotional characteristics. It helped teachers and students develop their capacity to observe and reflect, provided a language for discussing thinking, and scaffolded complex learning for the teachers as well as for the students.

Implications

While this year-long study involved only four inservice teachers, the findings have deep implications for teacher education. First, if we are to have teachers who have the competencies to engage students intellectually, teacher educators must include the explicit teaching of intellectual processes in teacher preparation programs through theory, practical example, and discussion. Second, the study carried out with second through fifth grade students indicates that teacher educators must not underestimate the ability of students to deal with complex learning. Teacher educators must become more determined to prepare teachers who can teach in the complex ways that will support students’ capacity to think and understand their thinking. Third, the TIEL Design Wheel provided a strong link from teacher educator to teacher to student. The TIEL conceptual framework must be considered as a potentially “powerful learning opportunit[y] ... [that can] promote complex learning by teachers [and] students” (Feiman-Nemser, 2001, p.1014).

Further Questions

There are many questions to investigate through further research. In the course of teacher education, when can the components of complex teaching and learning be taught most effectively? How can preservice teachers learn and apply the complex processes of decision making, planning, and self-evaluation in the context of project work? Can using the TIEL framework help in “laying a foundation for beginning teaching and preparing novices to learn in and from their practice” (Feiman-Nemser, 2001, p.1016)? Can using the TIEL framework help induction teachers maintain a commitment to complex teaching and

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learning while surviving the first difficult year of teaching and learning to teach? For inservice teachers, can experience be a “pitfall” (Fieman-Nemser & Buchmann, 1985, p. 54) in learning how to teach the strategies of complex teaching and learning?

Currently, I am investigating these questions as I teach Masters Program classes that include preservice, induction, and inservice teachers. Those enrolled in these classes first learn to use the processes of decision making, planning, and self-evaluation explicitly within the context of their own coursework assignments and projects. Next, they learn to design project-based curriculum that includes the teaching of decision making, planning, and self-evaluation to students. The TIEL framework is used throughout to teach thinking processes, scaffold learning, and facilitate metacognitive discussions.

While many questions are under investigation, there are a variety of others to consider. What would be the effect on teacher candidates who experienced complex teaching and learning during their K-12 education? How would this “pre-training” (Fieman-Nemser, 1983, p. 151) affect their teacher education process? Can using TIEL as a structural support for understanding thinking processes help cooperating teachers guide student teachers? Can implementation of complex teaching and learning strategies increase student achievement in basic skills across the curriculum? How can teacher education programs be structured to support the teaching of thinking involved in complex teaching and learning?

Referring to the teaching of thinking, Sigel (as cited in French & Rhoder, 1992) said, “The choice of how best to teach thinking faces the educational community and the public. Nothing is more basic or deserving of prompt attention and resolution” (p. 61). Such knowledge and skills are not optional for teachers who will teach increasingly diverse students living in a shrinking world of bewildering choices caused by ever-shifting social, economic, and political landscapes.

The second grader who explained planning in the context of riding a bus can serve as an example for teacher educators. When this young learner became aware of the concept of planning, her bus riding experience changed. Similarly, as teacher educators become aware that new strategies are required to prepare teachers, we must change our ways of teaching to accommodate this new learning. It is incumbent upon all who educate teachers to explicitly include the pedagogy of complex teaching and learning in the “intervention” (Heuwinkel, 2001, p. 180) that is teacher education.

References

- Baum, S. M., Renzulli, J. S., & Hébert, T. P. (1995). Reversing underachievement: Creative productivity as a schematic intervention. *Gifted Child Quarterly*, 39(4), 224-235.
- Bogdan, R., & Biklen, S. (1992). *Qualitative research for education: An introduction to theory and methods*. Boston: Allyn and Bacon.
- Clark, M. C. (1993). Transformational learning. In S. B. Merriam (Ed.), *An update on adult learning theory: No. 57. New directions for adult and continuing education* (pp. 47-56). San Francisco: Jossey-Bass.
- Darling-Hammond, L. (1997). *The right to learn: A blueprint for creating schools that work*. San Francisco: Jossey-Bass.
- Devaney, K., & Sykes, G. (1988). Making the case for professionalism. In A. Lieberman (Ed.), *Building a professional culture in schools* (pp. 3-22). New York: Teachers College Press.
- Dewey, J. (1938). *Experience and education*. New York: Collier Books.
- Dewey, J. (1964). *John Dewey on education: Selected writings* (R. D. Archambault, Ed.). Chicago: University of Chicago Press.

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- Fieman-Nemser, S. (1983). Learning to teach. In L. S. Schulman & G. Sykes (Eds.), *Handbook of teaching and policy* (pp. 150-170). New York: Longman.
- Fieman-Nemser, S. (2001). From preparation to practice: Designing a continuum to strengthen and sustain teaching. *Teachers College Record*, 103(6), 1013-1055.
- Fieman-Nemser, S., & Buchmann, M. (1985). Pitfalls of experience in teacher preparation. *Teachers College Record*, 87(1), 53-65.
- Folsom, C. T. (2000). Managing choice: Helping teachers facilitate decision making, planning, and self-evaluation with students (Doctoral dissertation, Teachers College Columbia University, 2000). *Dissertation Abstracts International*, 62, 1702.
- French, J. N., & Rhoder, C. (1992). *Teaching thinking skills: Theory and practice*. New York: Garland.
- Fuller, F. F. (1969). Concerns of teachers: A developmental conceptualization. *American Educational Research Journal*, 6(2), 207-226.
- Good, T. L. (1990). Building the knowledge base of teaching. In D. D. Dill (Ed.), *What teachers need to know: The knowledge, skills, and values essential to good teaching* (pp. 17-75). San Francisco: Jossey Bass.
- Goodlad, J. I. (1990). *Teachers for our nation's schools*. San Francisco: Jossey-Bass.
- Goodlad, J. I. (1994). *Educational renewal: Better teachers, better schools*. San Francisco: Jossey Bass.
- Guilford, J. P. (1977). *Way Beyond the IQ*. Buffalo, NY: Creative Education Foundation.
- Heuwinkel, M.K. (2001). Learning to assess student understanding: An investigation into the role of program. In J. D. Rainer and E.M. Guyton (eds.) *ATE Teacher Education Yearbook, Vol. IX* (pp. 169-182). Dubuque, IA: Kendall/Hund Publishing.
- Holland, J. H. (1995). *Hidden order: How adaptation builds complexity*. New York: Addison-Wesley.
- Hollingsworth, S. (1989). Prior beliefs and cognitive change in learning to teach. *American Educational Research Journal*, 26(2), 160-189.
- Kilpatrick, W. H. (1921). Dangers and difficulties of the project method and how to overcome them: Introductory statement: Definition of terms. *Teachers College Record* 22(4), 283-288.
- Kliebard, H. M. (1995). *The struggle for the American curriculum: 1893-1958*. New York: Routledge.
- Marzano, R. J. (1993). How classroom teachers approach the teaching of thinking. *Theory into Practice*, 32(3), 154-160.
- National Commission on Teaching and America's Future. (1996, September). *What matters most: Teaching for America's future* (Full report of the commission). New York: Author.
- Ogle, D. M. Ogle. (1997). *Critical issue: Rethinking learning for students at risk*. Retrieved October 28, 2002, from North Central Regional Educational Laboratory Web site: <http://www.ncrel.org/sdrs/areas/issues/students/atrisk/at700.htm>.
- Sarason, S. B. (1982). *The culture of the school and the problem of change*. Boston: Allyn & Bacon.
- Tom, A. R. (1997). *Redesigning teacher education*. Albany, NY: State University of New York Press.

Christy Folsom

Christy Folsom is an Assistant Professor in the Masters Degree Program in Childhood Education at Lehman College, City University of New York, Bronx, New York. Her teaching and research focuses on the intellectual and emotional infrastructure of teaching and learning, project-based learning that includes self-organization skills; transfer of learning from coursework to P-12 classrooms, and change in teacher thinking and practice evidenced in student performance.

