Exploring a New Pedagogy:
Teaching for Intellectual and Emotional Learning (TIEL)

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The role of teacher educators is to develop the capacity in pre-service teachers for complex teaching that will prepare them to create and teach in "learning communities [that are] humane, intellectually challenging, and pluralistic" (Darling-Hammond, 1997, p. 33). To establish and maintain such learning communities, however, requires knowledge of intellectual and social-emotional processes that are not explicitly taught in teacher preparation programs (Ashton, 1996; Darling-Hammond, 1997; Dill, 1991; Goodlad, 1990; Hill, 2000; Tom, 1997). This article explores the theoretical foundations and practical application of Teaching for Intellectual and Emotional Learning (TIEL®), a pedagogical model that codifies a powerful way of thinking about the intellectual and social-emotional processes that underlie teaching and learning.

TIEL draws from the theory of psychologist J. P. Guilford (1977) and the writings of educational philosopher John Dewey (1964). The TIEL framework connects the five thinking operations described in Guilford's Structure of Intellect (SI) model and the five qualities of character described by Dewey. Guilford's thinking operations include *cognition, memory, evaluation, convergent production,* and *divergent production;* Dewey's qualities of character include *appreciation, mastery, ethical reasoning, empathy,* and *reflection*. Each of these components and their connections will be discussed later in the article within the theoretical foundations section.

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TIEL is a tool that makes practical contributions to the knowledge base of teaching in four important ways. The TIEL model *codifies* fundamental thinking and social-emotional processes; facilitates *communication* about thinking, feeling, and learning in the classroom; provides a guideline for *curriculum* design and implementation that supports complex teaching and learning; and forges *connections* among the teacher educators, the teacher candidate, and P-12 students.

This article is organized in three sections. I begin by offering a rationale for a new pedagogy, and then discuss the theoretical foundations of the TIEL model. Finally I look at contributions to the knowledge base of teaching that includes examples of implementation of the TIEL model. The rationale contextualizes the discussion in the broad sweep of education in the last century and provides a short review of literature that supports the preparation of teachers in the areas of intellectual and social-emotional processes. The theoretical section includes an analysis of the conceptual foundations of the TIEL framework. The final section explains four ways in which TIEL contributes to the knowledge base of teaching and includes examples of how implementation of the TIEL framework affects the roles of teacher educators, teachers, and P-12 students.

Rationale for a New Pedagogy

Historical Perspective

Today's complex educational conditions require a complex pedagogy. An explicit emphasis, however, on thinking skills or social-emotional characteristics that lie at the foundation of complex teaching and learning has rarely been emphasized in American education. The system of education in the United States was designed at the turn of the 20th century to prepare poor citizens and immigrants for socialization and factory work. Notwithstanding notable pockets of progressive innovation initiated by Dewey and others in the 1930s and 1940s, education methodologies relied largely on text-based rote learning. The progressive methods of project work espoused by Dewey that incorporated independent thinking, self-management, and creativity all but disappeared during the Second World War.

After 1950, almost all trace of progressivism was erased, only to be revived in a flurry of educational reform following the launching of Sputnik. During that time, there were significant changes in the development of curriculum that included rigorous content and critical and creative thinking. Yet, these elements of complex teaching and learning disappeared once again in the back-to-basics movement of the 1970s. Thereafter, three waves of school reform swept through the late 1980s

and 1990s. The first wave included new emphasis on coursework and testing mandates; the second addressed improvements in teaching and teacher education; and the third focused on the development and use of more challenging standards (Darling-Hammond, 1997).

During the third phase of the current reform movement, standards were developed at national and state levels that included an emphasis on the teaching and learning of thinking skills. Standards for assessing the effectiveness of teacher education programs developed by the National Council for Accreditation of Teacher Education (NCATE) require that "[teacher] candidates understand and use a variety of teaching strategies that encourage elementary students' development of critical thinking, problem solving, and performance skills" (NCATE, 2000, p.8). The intention of this NCATE standard is to assure that teachers will be prepared to design curriculum and instruction that includes the teaching of thinking based on state standards for P-12 students.

The New York State Standards are an example of P-12 standards that include an emphasis on thinking. The New York State Social Studies Standards include five content categories: History of the United States and New York, World History, Geography, Economics, and Civics. Each begins, "Students will use a variety of intellectual skills to demonstrate their understanding of [each content area]" (New York State Education Department [NYSED], 1996). Standards in math, science, and technology are similarly explicit about the teaching of thinking. The standard for Interdisciplinary Problem Solving states, "Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions" (NYSED, 1996). The descriptions of each of these standards make clear the importance of teaching thinking. Yet, despite extensive reforms and the best efforts of teacher educators, large numbers of teachers are still not adequately prepared to use "empowering" (Darling-Hammond, 1997, p. 33) methodologies that facilitate thinking and result in complex learning.

The Teaching of Thinking

Effective teaching that empowers students and promotes complex learning requires that teachers deeply understand both the intellectual and emotional factors of learning (Ashton, 1996; Darling-Hammond, 1997; Folsom, 2004; Hargreaves, 1997; Hill, 2000). How does one recognize a classroom that evidences understandings of explicit intellectual processes that facilitate thinking and understanding? French and Rhoder (1992) cite explicit characteristics they expect to see in a thinking classroom: active involvement of the learner in constructing meaning;

risk taking rather than conformity; pride in thinking; respect for opinions of others; and curiosity.

Sarason (1982) noted the lack of discussion about thinking and learning among teachers and students. During his visits to hundreds of classrooms, teachers reported that they had not received adequate preparation to discuss or teach thinking within the context of a given curriculum. Others concur that teachers do not have the knowledge needed to consciously and explicitly incorporate intellectual and social-emotional processes into their curriculum and instruction (Ashton, 1996; Darling-Hammond, 1997; Hill, 2000; Marzano, 1993).

While many recognize the importance of thinking, the actual teaching of thinking in the classroom has proven problematic (Goodlad, 1990; Lewis & Smith, 1993; Marzano, 1993; Tomlinson & Callahan, 1992). One difficulty is the confusion that exists about the concept of thinking and the terminology by which it is described. Higher- and lower-order thinking, critical and creative thinking, and problem solving are terms that have a variety of meanings and interpretations (Lewis & Smith, 1993; Resnick, 1987).

Ennis (as cited in Lewis & Smith, 1993), an educator who pioneered the field of critical thinking in the 1950s, emphasized judgment among multiple options in his definition of critical thinking, yet he later combined the concepts of critical thinking, problem-solving and creative thinking to form a new definition: "formulating hypotheses, considering alternative ways of viewing a problem, posing questions, considering possible solutions, and making plans for investigating" (p. 134).

Ultimately, Lewis and Smith (1993) abandoned the use of the overworked and unclear term critical thinking, preferring to use *higher-order thinking*. They include "problem solving, critical thinking, creative thinking, and decision making" (p. 136) in their definition. Confusing the situation further is the converse of the term higher-order thinking, namely lower-order thinking (Resnick, 1987). What requires higher-order thinking for one person may indeed be accomplished by lower-order thinking for someone else who has long since mastered the task (Marzano, 1993). Lewis and Smith (1993) quote Maier's definition of lower-order thinking as "*learned behavior or reproductive thinking*" in contrast with "*reasoning or productive behavior*" (p. 132, emphasis in the original).

While the confusion surrounding the terminology and teaching of thinking has been referred to as a "conceptual swamp" (Cuban, as cited in Lewis & Smith, 1993, p. 131), teacher educators, despite the difficulty, need to understand thinking in order to appropriately address educational standards with their teacher candidates. Without a clear understanding of the fundamental thinking processes that underlie many of the

skills specified in standards, teachers are at a disadvantage in planning curriculum and instruction that teach these skills.

Social-Emotional Aspects of Learning and Teaching

While a great deal has been written about the need to teach thinking, focused attention on the social-emotional aspect of learning and teaching is more recent. Goleman (1995) points out that "unlike IQ, with its nearly one-hundred-year history of research with hundreds of thousands of people, emotional intelligence is a new concept" (p. 34). Even though the subject of emotion was being approached scientifically by Darwin, James, and Freud in the latter part of the 19th century, 20th century cognitive scientists preferred to separate intellect from emotion described as "subjective...elusive and vague" (Damasio, 1999, pp. 38-39). Recently, however, cognitive scientists are recognizing the interconnectedness between thinking and emotion. Damasio's research shows that "emotion is integral to the processes of reasoning and decision making" (p. 41).

Neuroscience is catching up to what educators have intuitively known about thinking and emotional connections. In the 1950s and 1960s, Taba and Elkins (1966) developed curriculum strategies to help "culturally disadvantaged" students with limited educational opportunities "to reshape their mental and emotional functioning and to establish a process for learning to learn" (p. v). In our multicultural world the term "culturally disadvantaged" is no longer used to describe students at risk of failure in an educational setting. The concept of the at-risk learner now includes a wide range of intellectual, social-emotional, socioeconomic, ethnic, cultural, and linguistic diversity.

Yet, regardless of the circumstances that place a student at risk educationally, there is evidence that the quality of intellectual engagement is closely connected to emotional responses. In their research with underachieving gifted high school students, Kanevsky and Keighley (2003) found that the students wanted choice, challenge, and intellectual complexity in their learning, as well as teachers who cared "about their teaching and their students" (p. 25). The absence of these essential intellectual and social-emotional qualities in their educational experience resulted in academic underachievement, suspension, and dropping out of school.

Levin (as cited in Sanacore, 1994) states that students "are caught in an at-risk context" that includes not only the context from which they come, but the context of a school structure that "does not accommodate their needs" (p. 3). These needs must include, as Kessler (2000) points out, attention to students' "inner lives" (p. xviii) involving connection, compassion, and character. Teachers need a pedagogical model that helps teachers meet both the intellectual and the social-emotional needs of their students.

Theoretical Foundations of the TIEL Model

The TIEL model helps teachers understand the intellectual and social-emotional components that underlie the complex teaching and learning proposed by Dewey, described in many of the standards followed by teacher educators and P-12 teachers, and recognized by educators and scientists interested in the connection between intellect and emotional characteristics. Derived from the work of both Guilford and Dewey, the TIEL model (see Figure 1) is depicted graphically by a color-coded wheel that includes *thinking operations* from Guilford's Structure of Intellect Theory and corresponding social-emotional characteristics described by Dewey as *qualities of character* (see Figure 1). The remainder of this section includes a definition of each component of the TIEL model and an explanation of the relationship between each thinking operation and the corresponding social-emotional characteristic.

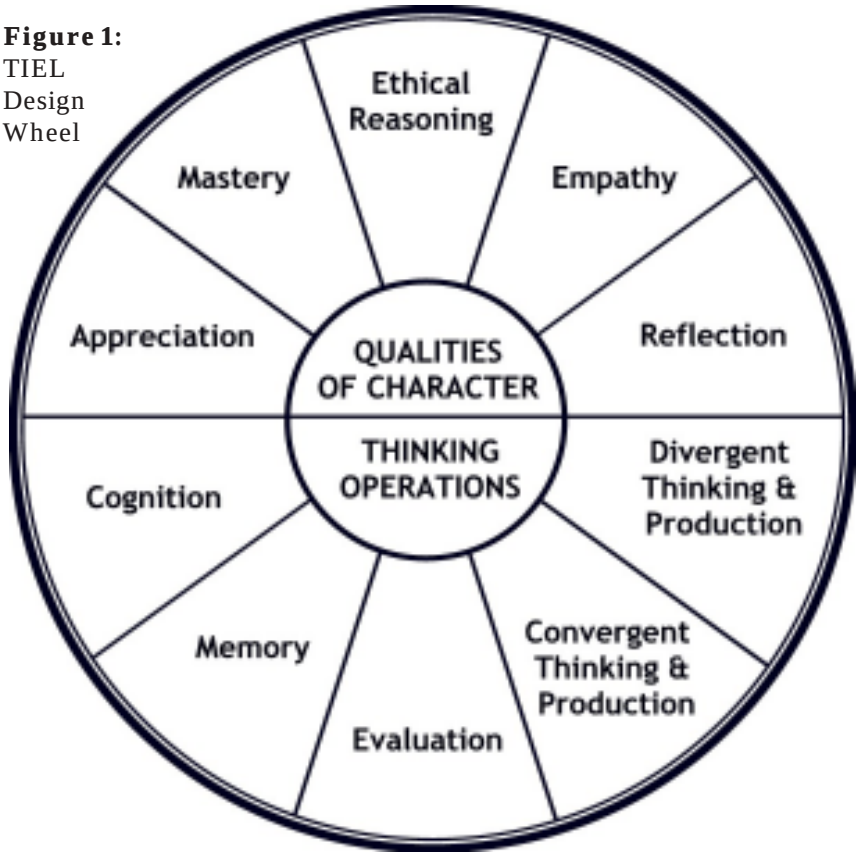

Figure 1: TIEL Design Wheel

Thinking Operations

The Structure of Intellect Theory developed by psychologist Guilford during the 1940s and 1950s is useful in clarifying the terminology of thinking. Guilford's theory greatly expanded the limited view of intelligence at the time to include creativity and a broadened concept of evaluation. The Structure of Intellect is a three-part theory that includes *contents*, *operations*, and *products* (Guilford, 1977).

The TIEL model makes use of the *operations* component of Guilford's theory which describes the various ways in which information is processed. The *operations* component is defined as "the alternative ways in which the organism can process any kind of informational content and develop out of it products that take any form" (Tannenbaum, 1986, p. 126). The five operations described by Guilford form the lower half of the TIEL Design Wheel: *cognition*, *memory*, *evaluation*, *convergent production*, and *divergent production*. The definitions of these five operations are instructive in helping teachers understand the terminology of the thinking processes they want students to develop.

Cognition is defined as "discovering, knowing, and understanding" (Guilford, 1977, p. 48). Meeker (1969) defines *cognition* as "immediate discovery, awareness, rediscovery, or recognition of information in various forms; comprehension or understanding" (p. 14). *Memory* is defined as "retention or storage" of information (p. 16). Sternberg (1984) adds to this definition by pointing out the role of memory in making connections between new and old information. *Evaluation* includes "comparing and judging" information (Guilford, 1977, p. 128) or "reaching decisions or making judgments concerning criterion satisfaction" (Meeker, 1969, p. 17). Convergent Production is the focused production of information. *Convergent Production* is a kind of productive thinking in which "only one answer is considered correct" (Guilford, 1977, p. 109) as well as logical and deductive thinking. *Divergent Production*, on the other hand, refers to creative thinking that involves broad production of information, producing "alternative ideas … which satisfy a somewhat general requirement" (p. 92). Divergent production generates information with an "emphasis on variety and quality of output" (Meeker, 1969, p. 20).

Qualities of Character

Similar to Guilford, Dewey also devoted a great deal of time to thinking about thinking. Throughout Dewey's (1938, 1964, 1991) writings, he emphasizes the importance of thinking and intellectual organization. Yet, Dewey found difficulty in the fact that the "different modes of thinking blend insensibly into one another" (Dewey, 1991, p. 6). Dewey was nearing the end of his life when Guilford was developing his theory

of intelligence in the early 1950s. Therefore, Dewey was unable to take advantage of Guilford's theory that organized "modes of thinking" into more manageable categories.

Though he did not have access to Guilford's work, Dewey nevertheless describes a variety of thinking processes that have much in common with the basic definitions found in the *operations* component of the Structure of Intellect Theory. Dewey mentions the intellectual process of observation (Dewey, 1964) that Guilford included in the thinking operation, *Cognition*. Among the factors essential to thinking, Dewey includes "store of experience and facts" (Dewey, 1991, p.30) that corresponds to Guilford's operation, *Memory*. In addition, Dewey was a strong advocate of project-based learning that included the teaching of the self-management skills that Guilford included in the operation *Evaluation*. Believing strongly in the initiative of the learner, Dewey advocated project work that allowed students to experience the self-management skills of decision making, planning, and self-evaluation (Dewey, 1938, 1991; Folsom, 2004; Kilpatrick, 1938). Dewey (1991) also considered the ability to suspend evaluation just as essential to skillful thinking as the ability to evaluate. Other factors that Dewey considered "essential to thought" include "orderliness" and "flexibility" (p. 30), corresponding to Guilford's last two thinking operations, *Convergent Production* and *Divergent Production*.

Dewey, however, went beyond the intellectual aspect of teaching and learning. Dewey (1964) saw education as both "an ethical and psychological problem" (p. 197), and thought there should be a degree of "symmetry among all the intrinsic factors in human experience" (Kliebard, 1995, p. 55). For Dewey it was important that the moral or ethical dimensions of learning were somehow linked to the cognitive. Dewey's definition of the purpose of education is "the training of the powers of intelligence and will with the object to be attained … a certain quality of character" (Dewey, 1964, p. 197). Character, according to Dewey, is a "measurement of mental power" (p. 197). He describes the five qualities of character: "reflection, mastery of truth and laws, love of beauty in nature and in art, strong human sympathy, and unswerving moral rectitude" (pp. 196-197).

Bringing the Cognitive and Moral Dimensions Together

The TIEL model brings together the cognitive aspects of learning from psychology and the moral or social-emotional dimension of learning found in educational philosophy. These two disciplines which help teachers understand the underlying processes of teaching and learning are often considered incompatible (Arcilla, 2002). The TIEL Design Wheel connects components from each discipline in the following ways.

Reflection and Cognition. Dewey links the intellectual activity of observation within the operation of *Cognition to Reflection*, the power to "master and not be mastered by the facts" (Dewey, 1964, p. 197). He warns against the quantitative gathering of facts and information with no regard to the connection and organization of those facts. The connecting and organizing is the product of reflection, or what Dewey calls, "the formative energy of the intelligence" (p. 196). He says, "There cannot be observation in the best sense of the word without reflection, nor can reflection fail to be an effective preparation for observation" (p. 196). Borland (1989) points out, "Thinking requires an object of thought" (p. 178). The linking of cognition to reflection emphasizes the importance of content in relation to process. Process cannot be neglected for content, nor can content be neglected for process.

Empathy and Memory. *Empathy*, or "human sympathy" in Dewey's (1964, p. 197) words, connects with *Memory*, linking new knowledge to previous experiences. Thresholds of empathy naturally vary within each person's life. To feel compassion for another means "one must draw upon one's own capacity … one's own experience" (Jersild, 1955, p. 127). It is through remembering experiences of caring, either in reality, or sometimes vicariously through observing the experiences of others, that we learn to be caring individuals. As we empathize with others, the connecting cues to our own experiences are strengthened and our capacity for empathy increases (Hoffman, 1991).

Moral or Ethical Reasoning and Evaluation. *Ethical Reasoning*, or "moral reasoning" (Dewey, 1964, p. 197), corresponds to the operation of *Evaluation*. The skills of defending choices with sound criteria and setting standards by which to evaluate ourselves are the same basic skills needed in making moral decisions. Moral or ethical decisions, however, also include valuing and having consideration for others. Moral reasoning is described as "being conscious of ourselves struggling to make meanings, to make critical sense of what authoritative others are offering as … real" (Greene, 1995, p. 126).

Mastery and Convergent Production. Dewey's term "mastery of truth and laws" (1964, p. 138) implies an external absolute. Similarly, mastery in learning usually involves an answer or skill expected by someone else other than the learner. *Mastery*, therefore, connects to logical thinking and the problem solving that involves a search for the one right answer (*Convergent Production*). It is important to understand convergent thinking in relation to other processes of thinking because of its prominence in the educational system (Berliner & Biddle, 1995; Brooks & Brooks, 1993; Darling-Hammond, 1997; Dewey, 1938; Gehrke, Knapp, & Sirotnik, 1992; Goodlad, 1984; Meeker, 1995; Resnick, 1987; Sarason,

1982; Smith & O'Day, 1990). Mastery of school skills and subjects is strongly connected to social-emotional well-being. Levine (2002) uses the term "intellectual self-esteem" (p. 206) to describe the importance of the learner having confidence in his or her intellectual abilities. When students lack a feeling of intellectual mastery or if they have intellectual strengths unsupported in school (Noddings, as cited in Kanevsky & Keighley, 2003), they can become "emotional powder kegs" (Levine, 2002, p. 267).

The linear sequential thinking that has dominated society and education since the scientific awakening of the 17th century has been the main process of thinking used in gaining mastery over academic knowledge (Bailey, 1996). While convergent production is still important in mastery of traditional school skills, today's chaotic, information-laden society requires that students develop the ability to search for patterns, make connections, and to sift and select among a glut of disparate data (Bailey, 1996; Rushkoff, 1996). To succeed in such pattern finding, students need thinking abilities beyond those of sequential processing that remain the most influential in our culture (Bailey, 1996).

Appreciation and Divergent Production. *Appreciation* for beauty in arts and nature is related to creative thinking within the operation of *Divergent Production*. Guilford (1977) defined divergent production as "a broad search for alternatives" (p. 93). "Inventing, designing, contriving, composing, and planning" (p. 78) are all activities exhibited by persons showing creativity. Each of these activities includes a search for alternatives. Each involves seeing more in a situation than others have seen before. Developing the traits of creativity that include fluency, flexibility, originality, and elaboration (Guilford, 1968; Williams, 1981), increases one's appreciation for these same characteristics found in the artist or in nature.

Even though the natural and man-made worlds display an endless variety of creative alternatives, creativity has importance beyond art and beauty. Kessler (2000) explains that "creativity replenishes the soul not only through the arts, but also in the way we meet challenges in every domain of the curriculum and of life" (p. 92). The TIEL model, through placing creativity and appreciation in a position of equal importance to other areas of intellectual and social-emotional endeavor, supports bringing creativity out of its current "exile" (Kessler, 2000, p. 92) from the priorities of the educational system.

Hence, what can be derived from the work of both Dewey and Guilford is that teaching and learning must include not only the intellectual components, but the components of moral and/or emotional dimensions as well. Dewey's writings in philosophy and Guilford's work in psychology complement each other in ways that clarify the processes involved in

teaching for intellectual and emotional learning. Dewey's five qualities of character integrated with Guilford's five intellectual operations form a powerful instructional model that can help teachers better understand complex teaching and see new ways of designing learning experiences that "nurture the spirit as well as the mind" (Darling-Hammond, 1997, pp. 5-6).

The TIEL Model: Extending the Knowledge Base of Complex Teaching and Learning

The TIEL model addresses four gaps in the knowledge base of teaching. These four gaps, revealed in the literature, include *codification* of "knowledge underlying and relevant to teaching" (Goodlad, 1990, p.267); *communication* about "learning and thinking" (Sarason, 1982, p. 220); *curriculum* development that is "largely absent, inadequate, primitive" (Goodlad, 1990, p. 267); and the lack of *connection* from teacher education coursework to the P-12 classroom (Darling-Hammond, 1997; Goodlad, 1990; Hollingsworth, 1989).

This section will explore each of these four areas and provide insight into the effect of implementation of the TIEL model on the roles of teacher educators, teachers, and P-12 students. Examples will be drawn from a year-long study that followed the experiences of four New York City public elementary school teachers who implemented TIEL within the context of project work. As part of the study, the teacher educator/researcher included a professional development component that focused on the *Evaluation* component of the TIEL Model that includes the self-management processes of decision making, planning and self-evaluation within the context of group project work.

This research focus was chosen for three reasons. The higher order thinking processes (Marzano, 1993) included in the *Evaluation* component can be clearly taught through project work. Project work requires the use of all the thinking processes included in the TIEL model that include researching (*Cognition*), making connections (*Memory*), and producing both convergently and divergently (*Convergent Production* and *Divergent Production*). The process of creating a project opens opportunities for reflection, learning empathy, acting ethically, developing appreciation for differences, and developing mastery in learning and working with others.

Using their own curriculum, teachers learned to design project-based learning experiences in which their students participated in the setting of criteria for evaluating their projects, made decisions about, planned, and evaluated their project. The researcher met weekly with each

teacher for a half day to teach and observe the new strategies. A group meeting was held monthly to share strategies. Baseline data was collected at the beginning and at the end of the professional development intervention using classroom observation, teacher and student interviews, and analyses of teacher materials and student project work.

Results of the study revealed that the TIEL framework helped the teachers become aware of and understand the skills of decision making, planning, and self-evaluation within the thinking operation *Evaluation*. TIEL helped clarify these within the context of other thinking processes they wanted students to develop. Teachers learned to discuss thinking with their students, plan more purposefully, and increase project work in their classrooms. Student performance demonstrated the learning connections from the teacher educator/researcher to the teachers to the students in second through fifth grades. Students clearly articulated their thinking, consciously planned their work, and showed increased motivation and empowerment. A more detailed discussion of this research can be found in Folsom, 2004.

Codification

The TIEL Design Wheel codifies a holistic view of the complex adaptive system of teaching and learning. The TIEL framework helped these teachers become aware of and understand the skills of decision-making, planning, and self-evaluation within the thinking operation *Evaluation* and the relationship of evaluative skills to other thinking processes. In a complex adaptive system, forward progress in research and understanding is determined by understanding the hidden order or theory that lies at the foundation of the system (Holland, 1995). While complex adaptive systems rely on theory to bring order, the complex intellectual and social-emotional factors involved in complex teaching and learning have not been codified into a coherent holistic theory (Labaree, 1998).

TIEL codifies a developmental view of teaching and learning that addresses the intellectual and psychosocial aspects of learning (Seifert & Hoffnung, 2000). The TIEL Design Wheel graphically represents and makes accessible to teachers and learners alike basic intellectual and social-emotional processes that "support individual students' development, acquisition of knowledge, and motivation" (NCATE, 2000). In this way, as Goodlad (1990) suggests, TIEL codifies "knowledge underlying and relevant to teaching" (p. 267). Understanding the intellectual components that underlie the terminology of thinking can help teachers create learning activities that promote development of a wide range of thinking processes in students. Understanding thinking processes and social-

emotional characteristics helps teachers plan curriculum and instruction that promotes both intellectual and character development (Tyler, 1949).

Communication

TIEL adds to the knowledge base in the area of communication. In the Folsom (2004) study, TIEL facilitated communication about thinking between the teacher educator/researcher, the four teachers and their second through fifth-grade students. Bringing together terminology of thinking from the fields of philosophy, psychology, and education, TIEL provides an accessible language that helps educators fill the gap in classroom discussions about thinking and learning. By naming thinking and social-emotional processes, the TIEL framework facilitates communication about thinking and learning. Through the use of the TIEL framework, teacher educators, teachers, and learners share a common language and a common responsibility in making the processes of teaching and learning transparent.

The experience of one of the four teachers who participated in implementing TIEL offers insight into the importance of a language that facilitates communication about thinking processes. Prior to the research study, Teacher A participated in the pilot project, a three-month version of the research, learning to teach the self-management skills of decision making, planning, and evaluation skills to her students through project work in social studies. Baseline and final data were collected, as in the later research, through classroom observations, teacher and student interviews, and analysis of teacher-designed materials and student projects.

A major difference occurred between the pilot study and the year-long research. During the pilot, TIEL was not used as an organizing structure or as a language for instruction. Instruction in curriculum design, however, requires clear communication about "knowledge underlying and relevant" (Goodlad, 1990, p. 267) to the processes of teaching and learning. Without the TIEL framework, Teacher A had no larger context in which to place the self-organization processes of decision making, planning, or self-evaluation. According to Goodlad (1990), she had "no taxonomies or hierarchies of knowledge connected to a classification of the teaching decisions in which teachers regularly engage" (p. 267). She was at a disadvantage in not having the same knowledge to guide her own learning as the teacher educator/researcher had in carrying out instruction. This limited communication caused an unequal relationship of "knowing" and restricted a more open and equitable collaboration. At the conclusion of the full research year, Teacher A compared her learning experience with that of the pilot. She reported that using the TIEL framework was important

to contextualize and name the thinking processes enhancing her learning and impacting on the learning outcomes of her students.

Curriculum

TIEL adds to the knowledge base of teaching in the area of curriculum development. The four teachers who participated in the TIEL study had gaps in their knowledge about curriculum that Goodlad describes. According to Goodlad (1990), training in "curriculum development in teacher education is largely absent, inadequate, primitive, or all of these" (p. 267). This situation leaves teacher educators and teacher candidates "to their intuitive and practical interpretations" (p. 267). When knowledge of curriculum development is inadequate teachers are left to depend on "what appears to work…their own experience as students," "well-packaged and marketed" curriculum, or teaching materials dictated by others (p. 268). Teachers, therefore, often do not have the knowledge they need to carry out effective teaching themselves or to bring about knowledgeable curricular change.

The four teachers were unprepared to teach thinking or to design project-based curriculum, both important factors in progressive teaching (Darling-Hammond, 1997; Dewey, 1938, 1964). Even when abundant opportunities for decision making were present in the classroom, teachers were unaware of how to make the transfer from unstructured daily decision making to the more formal decision making required in project work. Where opportunities for decision making in project work were present in one subject, teachers did not transfer the processes of decision making to project work in another subject (Folsom, 2004). Much of their planning consisted of loose amalgams of learning activities with moderate attention to overall instructional goals.

Integrating procedural and metacognitive knowledge into declarative knowledge or subject matter is the essence of curriculum development. Tyler (1949) stated that an objective for a learning activity should have four procedural characteristics: develop thinking, acquire information, develop social attitudes, and develop interests. Yet, without an organizing structure that clarifies what "develop thinking and social attitudes" can mean, connections between intellectual and social-emotional processes are lost and curriculum development remains "inadequate [and] primitive" (Goodlad, 1990, p. 267). TIEL can provide teachers with the tools they need to plan for complex learning that skillfully weaves procedural and metacognitive knowledge into declarative knowledge.

Using the TIEL framework facilitated several changes in how the four teachers planned curriculum. The TIEL Design Wheel helped them "*intellectually* organize their own work" (Dewey, 1964, p. 175; emphasis

in the original) and improve their skills of "purposive planning" (p. 170). Teacher B had many opportunities for choice in his classroom and regularly planned for his students to do project work. As Dewey advocated, these projects provided a need for decision making, planning, and self-evaluation (Kliebard, 1995). Yet, prior to the TIEL research, Teacher B did not explicitly teach students how to make decisions or plan their projects. Using the TIEL framework to design project work, Teacher B greatly improved his ability to plan curriculum and quality hands-on experiences for students.

The TIEL framework also helped the teachers in the study learn to design more balanced curriculum. Following the pilot, Teacher A focused heavily on process to the neglect of important content as she planned project-based curriculum for her fifth-graders. She planned creative projects that helped her students develop an *appreciation* of subject matter and taught self-organization processes, yet she neglected teaching factual information important in the study of content. The TIEL Design Wheel helped her see the importance of balancing learning activities between those that include *Convergent Production* and *Mastery* of subject matter and those that emphasize *Divergent Production* and the development of *Appreciation*.

Implementing TIEL helped the four teachers change their approach to curriculum. Teacher C, who utilized more traditional methods than the other teachers, was afraid to do project work as the research study began. Realizing that opening the curriculum to allow for student choice would require her to give up certain amounts of control in the classroom, she was reluctant to teach project work. Yet, by the end of the research year, Teacher C planned for her students to create projects that ranged from simple poster board collages to dramas that involved writing scripts and designing costumes. Teacher C was impressed with the motivation of her students, commenting, "The kids can be swept up in it … I'm not always dragging them on this heavy sled" (Folsom, 2000, p. 390). Convinced of the value of student empowerment and the experience of working with TIEL, Teacher C changed her practice to consistently include project-based learning in her curriculum development repertoire.

Connections

TIEL brings to the knowledge base of teaching a powerful tool that forges connections from the theory learned in teacher preparation coursework to the practice of teaching in P-12 classrooms. TIEL addresses both the lack of transfer from teacher preparation coursework to the P-12 classroom (Ashton, 1996; Darling-Hammond, 1997; Dill, 1991; Goodlad, 1990; Hill, 2000; Hollingsworth, 1989; Tom, 1997) and the

explicit discussion of thinking and learning that is missing in teacher preparation coursework (Ashton, 1996; Hill, 2000; Sarason, 1982). TIEL helps teacher educators explicitly teach the underlying intellectual and social-emotional processes relevant to curriculum and instruction that P-12 students need to develop. When teachers understand intellectual and social-emotional components, they can plan curriculum that will address development more holistically. When students understand their own thinking and emotions, they become more aware, motivated, and involved learners (Folsom, 2004).

Students from the four classrooms involved in the study used the language and visual representation of the TIEL Design Wheel to discuss the thinking processes they employed to develop their projects (Folsom, 2004). One student made the following observation that reflected the connection from the teacher educator to the teacher to the fifth-grade student. The student said, "*Evaluation* is a bridge between *cognition* and doing." The student did not have the words *content*, *process*, or *product* to express the idea that evaluation contains the processes that link content to a concrete product. Instead, she used the thinking operation *Cognition* to name the concept of content. Since *Cognition* refers to gathering information and research, the student chose a term that clearly represents content or the "stuff" of learning. *Evaluation* includes the skills of analysis, setting criteria, decision making, planning, and assessment that are involved in the processing of content. The action of *doing*, or creating a product, is inherent in the thinking operations, *Convergent Production* and *Divergent Production*. Thus, the student's statement, "*Evaluation* is a bridge between *cognition* and doing," clearly demonstrated her understanding of the concepts underlying the connection from information to a product emerging from that information.

Implications

The TIEL model provides a technology for examining "knowledge underlying and relevant to teaching" (Goodlad, 1990, p. 267). After a comprehensive review of the theoretical literature about thinking, learning, and curriculum development, TIEL emerges as a model that serves to concretize the abstract intellectual and social-emotional components essential to complex teaching and learning. As a consequence of looking at this new pedagogy, the application of the TIEL model suggests an ambitious research agenda at both the university level for teacher preparation and the P-12 classroom level to improve student performance.

If the role of teacher educators is to develop the capacity in preservice teachers for complex teaching, research is necessary to deter-

mine the most effective ways of learning the new skills needed. First, teacher educators must understand the intellectual and social emotional infrastructure of complex teaching and learning and become skilled in conducting the deep metacognitive discussions necessary to make these processes visible to teacher candidates. Second, they must learn how to develop syllabi that include learning experiences through which teacher candidates can experience complex learning. Third, they must learn to teach how to plan curriculum and instruction in explicit ways that address Goodlad's concerns.

Research is now under way to assess the effect of using the TIEL model with teacher candidates within the context of teacher preparation coursework. The purpose of this research is to investigate the connection from coursework to the P-12 classroom and includes both in-service and pre-service teachers enrolled in a masters program in elementary education. The research will follow teacher candidates through coursework in which the TIEL model is implemented and will evaluate the quality of transfer to P-12 classroom.

In addition, studies on the individual components of TIEL are needed. The research with the four teachers cited in this article focused on the self-management processes of decision-making, planning, and self-evaluation found in the *Evaluation* component of the TIEL model. Similar studies on individual components and on the relationships between the intellectual and social emotional components across all grade levels and within a variety of content areas could develop a rich array of applications for the TIEL framework.

Finally, longitudinal studies of the TIEL framework are needed. Darling-Hammond (1997) draws a connection between access to knowledge and the ability "to manage complex forms of teaching" (p. 13). Multi-year studies of teachers who receive instruction using the TIEL framework during their teacher preparation program could help determine the effect that foundational knowledge of intellectual and emotional components has not only on their own teaching, but on their mentoring of student teachers and interns.

Conclusion

Research on the TIEL model, Teaching for Intellectual and Emotional Learning, comes at an appropriate time in educational history. Teacher educators need a theoretical framework that facilitates an understanding of the intellectual and social emotional processes that underlie complex teaching and learning. Such teaching is necessary to prepare teachers who in turn will prepare P-12 students with the thinking

and social emotional skills needed for living in a highly complex society. Grounded in the work of Guilford and Dewey, TIEL provides a language to communicate with teachers about thinking and social emotional learning, offers a practical guideline for curriculum development, and is a way to forge more effective connections between teacher preparation coursework and practice. The TIEL model can assist teacher educators in preparing teachers who will create future "humane [and] intellectually challenging" classrooms (Darling-Hammond, 1997, p. 33).

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