A Systematic Approach to Measuring Inquiry in Teacher Education

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Abstract

The purpose of this study is to identify productive reflective/inquiry-based written responses derived from textbooks. Two groups of teacher candidates used different journal types to prompt thinking about textbook content. Levels of inquiry and cognitive complexity were measured using the researchers' Pedagogoical Model of Inquiry and the Mc Daniel's cognitive Complexity Strands (Mc Daniel, 1991). Preliminary findings encourage the important of promoting inquiry-based thinking throughout Teacher Education Programs.

Keywords: teacher education; inquiry; journals; university teaching

Introduction

An important purpose of university-based teacher education programs is to promote inquiry-based learning experiences for teacher candidates. Through these learning experiences the teacher candidates critically contemplate pedagogical practices and effective decisions regarding ethical and social issues related to the classroom. Inquiry is an on-going, active process that is embodied in the comprehensive nature of teaching and learning. Reflection, professional development, professional learning communities, action research, best practices, and assessment are all components of the inquiry process. For this research investigation, reflection as part of the inquiry process was investigated. In simple terms reflection is the process of linking information and events, evaluating them, and using the results to change or enrich classroom events (Bullock & Hawk, 2010). Further, reflection as a component of inquiry is a process of critically examining and refining practice that encompasses personal, pedagogical, societal, and ethical issues (Knowles, Cole, & Presswood, 1994). Systematic inquiry into pedagogy aids a teacher in developing a professional voice to consider current practices and envision new and innovative approaches relevant to curriculum development, teaching and learning (Heinrich, 1992; Reid, 2004).

Focus of Investigation

Inquiry-based reflection about best teaching practices is a developmental process; the contention of this research is that inquiry-based thinking should begin prior to

teacher candidate participation in field-based experiences. These field-based experiences constitute classroom observations, small groups teaching, and culminating in student teaching. The first encounter with inquiry-based thinking is through course text-books and class discussions. Previous research investigations have focused upon teacher candidate reflection from actual field-based experiences. While this practice is important for improving classroom teaching practices, little research exists that describes inquiry practices based upon written discourse regarding teacher candidates' responses to pedagogical textual materials. Textual materials might include course textbooks and research articles that serve to inform as well as curriculum-related materials such as state teacher standards that are the framework for instructional practices. Inquiry-based written discourse regarding textual materials is a means to strengthen awareness of effective teaching practices and habits.

The purpose of this investigation is to identify a systematic inquiry tool that yields the most useful assessment details about how teacher candidates learn to reflect critically after reading and responding to pedagogical textual material. For this investigation, the three authors/researchers drew on a portion of data taken from a pilot investigation using two systematic approaches to measure levels of thinking represented in written reflections. The investigation was conducted over two semesters in a teacher education program. McDaniel's' Cognitive Complexity Strand Scale (MCCSS, McDaniel, 1991) and the Pedagogical Model of Inquiry developed by the researchers were the two instruments used to measure types and levels of reflection in teacher candidates' responses to textual material. Some conclusions were made regarding the effectiveness of each systematic inquiry tool.

Theoretical Framework

Over the last century, significant research has been conducted in the area of teacher inquiry (Buehl & Fives, 2009; Cruickshank, 1987; Dewey, 1933; Knowles, Cole, & Presswood, 1994; Schon, 1983; Van Manen, 1977). As such, it is recognised that inquiry about best practices is related to one's professionalisation. A key component to becoming a professional educator is the ability and willingness to inquire about one's own work (Schon, 1983). Inquiry becomes a key component in teacher education. Of course, no teacher education program can completely prepare its teacher candidates for every possible situation in a classroom; however, the decision-making process can be addressed. In order to make final decisions, when many alternatives exist, a teacher and teacher candidates must re-evaluate those decisions, thus becoming empowered decision-makers (Han, 1995). A concern for teacher education programs is that of preparation. Researchers agree that inquiry is not a natural process and, as such, should be fostered in teacher education programs (Buehl & Fives, 2009; Campoy, 2000; Han, 1995; Hewitt et al., 2003). Inquiry about pedagogy is a developmental process and should be introduced at the onset of a teacher education program as a means for analysing practice. A positive result of introducing such a process early in the teacher education experience is that inquiry-based thinking plays a role in the overall experience of teacher candidates as they question their current conceptions about teaching and learning while possibly replacing their prior beliefs with equitable conceptions of instruction (Webb, 2000).

A critical inquiry stance extends one's reflections on future classroom practice and textbook reading. This stance permits the teacher candidate to identify, discuss, and interpret the varying components of an issue (Duesterberg, 1999). More importantly, critical inquiry promotes the teacher candidate to not only search for

knowledge, but to look for a keen understanding of the profession (Jennings & Smith, 2002).

Inquiry and Teacher Education

Defining the term "inquiry about practice" has varied from research investigation to research investigation. While John Dewey (1933) is credited with identifying reflective-based inquiry as an aim of education, Cruickshank (1987) views such thinking as a means to help teacher candidates become more effective classroom practitioners. Teachers and teacher candidates are faced with serious issues every day in the classroom. Such practitioners encompass the results of critical examination of personal, pedagogical, societal and ethical issues regarding classroom decision-making. How one addresses these issues is related to one's active engagement in reflective thinking. Teacher education can no longer just offer effective instructional rhetoric to solve all classroom problems (Campoy, 2000; Schon, 1983; 1987; Van Manen, 1977), but should provide inquiry-based learning opportunities that reflect on problem-solving and decision making. Teacher candidates face disillusionment when their expectations of operating within a technical framework or lesson plan, does not always produce learning (Campoy, 2000; Lortie, 1975; Schon, 1983, 1987).

Inquiry should be a shift from personal connections about classroom situations to decision-making and problem-solving in the classroom to poststructural awareness where the teacher is sceptical about step-by-step procedures to achieve educational outcomes (Campoy, 2000; Cherryholmes, 1988; Knowles, Cole, & Presswood, 1994;). In this research investigation, these inquiry shifts were used to measure levels of inquiry. The teacher begins to inquire, in action (Schon, 1983, 1987), about classroom practices, thus increasing a teacher's understanding about professional issues (Han, 1995) such as moral, ethical, social, and equity related to teaching and the role of the teacher (Knowles, Cole, & Presswood, 1994). In other words, a paradigm shift is needed for teachers and teacher candidates from "how did I teach?" to "how well did my students learn?" (Lasley, 1998; Magestro & Stanford-Blair, 2000). This paradigm shift from an organisation of important ideas about education towards analysing and elaborating about ways to problem-solve is both a reflective process and cognitive-shift from lower levels of cognition towards higher levels of cognition. Inquiry-based reflection elicits higher levels of cognitive complexity.

Mc Daniel's Cognitive Complexity Strand Scale (MCCSS)

Ernest McDaniel (1991) uses the term "cognitive complexity" to describe a thinking process marked less by a progression of logical sequences (i.e., Bloom's Taxonomy, 1956), but more by associative and elaborative processes. Cognitive complexity involves connecting current schema, or the cognitive representation of data, to new situations. The new situation is associated with current schema then elaborated upon to build a new, yet still familiar, schema. From there, a person makes personal, pedagogical, societal, and ethical decisions based on that new schema. McDaniel used this notion of schema to create an evaluation tool for measuring thinking. Whereas previous attempts at measuring levels of thinking only provided a description of the cognitive structures of thinking, (i.e., Bloom's or Barrett's Taxonomy of Reading (Sax, 1997)) McDaniel provides an evaluation tool.

McDaniel's (1991) evaluation tool of cognitive complexity begins with three distinct strands of thinking. The first strand is titled Perception and Definition of the Situation (McDaniel, 1991, p. 51). This strand describes how the individual

represents or encodes the situation. The second strand is Imposition of Organising Structure (McDaniel, 1991, p. 51). This strand describes how the individual organises the structure of particularly important ideas. The third strand is Analysis, Support, and Elaboration (McDaniel, 1991, p. 52). This strand involves the way an individual analyses the situation and supports a position. When individuals encounter a complex situation, or a situation open to interpretation, they employ these three types of thinking in order to make sense of the situation. An important aspect of these strands is that all three are used whether the individual is thinking on lower or higher levels. In addition, "these strands are continua that reflect simplistic cognitive processes at one end and complex cognitive processes at the other" (McDaniel, 1991, p. 51).

McDaniel created a description of thinking as a means for quantifying students' thinking. This tool for measuring cognitive complexity is able to be generalised to many complex situations. "The scoring rationale is sufficiently general to be applicable to a wide variety of stimulus material. Other investigators may want to select or develop stimulus situations that are open to a variety of interpretations" (McDaniel, 1991, p. 46). In this research investigation, the McDaniel's Cognitive Complexity Strand Scale (MCCSS) was used to measure levels of thinking involved in inquiry.

Pedagogical Model of Inquiry

In addition to this measure from the MCCSS, the researchers also documented varying and recurring themes in the teacher candidates' reflections: personal connections, instructional or teaching connections, or professional issues connections (Campoy, 2000; Knowles, Cole, & Presswood, 1995, Van Manen, 1977). Personal connections were instances where the student recognised and elaborated on a part of the text that was similar to an experience they had as a student or they had seen in their observations in the schools. In pedagogical connections, the student connected a part of the text to their future teaching or made evaluative comments about a type of instruction. Professional issues were connections with the text where the student considered issues outside of the immediate classroom and looked at educational issues that many teachers faced in their profession.

Based on the work of previous researchers (Campoy, 2000; Cherryholmes, 1988; Knowles, Cole, & Presswood, 1994; Lasley, 1998; Magestro & Stanford-Blair, 2000) this paradigm shift from inquiring about oneself to inquiring about issues outside of oneself was blended by the researchers to create a Pedagogical Model of Inquiry to act as a working model to analyse students' written responses. .

As the researchers examined teacher candidates' reflections on pedagogical textual material, they began to create an amalgamation of McDaniel's Cognitive Complexity Strand Scale strands 1 ,2 and 3 (1991), Van Manen's Levels of Reflectivity (1977), Campoy's research (2000) as well as their own interpretations of teacher candidate responses. The Pedagogical Model of Inquiry was developed in order to determine what levels of inquiry-based reflections the teacher candidates created from their readings of pedagogical texts. Reflections moved from personal awareness about pedagogical situations then reached more complex levels of cognition exemplified through decision-making and problem-solving about classroom situations and professional issues. Personal connections were viewed as lower levels of inquiry; instructional or teaching connections moved from one's own personal sphere of experience toward a higher level of inquiry; and professional issues were the highest level of inquiry as it required the teacher

candidate to think beyond what he or she might have experienced personally to issues that influence teaching and learning.

The Pedagogical Model of Inquiry encompasses a cognitive paradigm shift from personal connections to recognition of pedagogical strategies to evaluative decision making and problem-solving about pedagogy related to course textbook readings. Based upon this theoretical amalgamation of Mc Daniels (1991), Van Manen (1977), and Campoy (2000) the Pedagogical Model of Inquiry (PMI) evolved. The following phases represent cognitive shifts from simply organising and recognising important personal connections and instructional methods represented in text toward analysing, supporting and elaborating about pedagogical decision-making and problem-solving.

The following phases represent cognitive shifts from simply organising and recognising important personal connections and pedagogy represented in text, toward analysing, supporting and elaborating about pedagogical decision-making and problem-solving.

- **Introspective Inquiry Phase** – organising and recognising personal experiences about pedagogy

- **Didactic Inquiry Phase** – organising and recognising effective pedagogical practices

- **Evaluative Inquiry Phase** – analysing, supporting and elaborating about decision-making and problem-solving in the classroom

Each subsequent phase represents a move to a higher level of reflection. This move from lower to higher levels of reflection is supported by the work of Van Manen (1977) and Campoy (2000). An account of how these tools, The Pedagogical Model of Inquiry and McDaniel's Cognitive Complexity Strand Scale (1991) were utilised in the current study follows.

Methodology

Participants

The participants in this pilot research investigation were 30 undergraduate students enrolled in a teacher educator preparation program at a university in Texas. The program was structured with a progression of courses taken over three semesters prior to student teaching (Block I, Block II and Block III). This research was conducted using students enrolled in reading methods courses in Block II (N=30). Twelve students were in one section of the class while 18 students were in another section. Two of the course instructors were part of this research team; course curriculum and textbooks were consistent between both classes. Another colleague served as the third co-researcher. All three researchers have used the pedagogical text-book and were familiar with its content. The students enrolled were participants in a traditional, face-to-face class that met for two and a half hours one time per week for 16 weeks.

Instruments Used

All participants were asked to read and respond to nine course textbook chapters using either of two written inquiry methods, the QQR (Questions, Quotes, Reflections) and the QTQR (Questions, Thoughts, Quotes, Reflections), that were developed by the two instructors. The reason for two inquiry methods was simply

that each instructor preferred one type over the other. Both methods had three similar pieces: questions, quotes and reflections. Questions asked that teacher candidates develop questions about the text, preferably those that moved beyond comprehension. Quotes asked that the teacher candidates select one or more quotes from the text and comment about why they chose that quote. Reflections asked that the students respond to the text with any additional thoughts they might have about the reading. In the QTQR, the students were also presented with a Thoughts section. Thoughts represented the students' thoughts about the text.

Since inquiry-based thinking about best teaching practices is a developmental practice, the contention of these researchers is that inquiry-based thinking should begin prior to student participation in field-based experiences. The first encounter with inquiry based thinking is through textual material and class discussions.

McDaniels' Cognitive Complexity Strand Scale

McDaniel's Cognitive Complexity Strand Scale (MCCSS) was one of the systems used to evaluate the levels of cognitive complexity, or levels of inquiry, utilised by the teacher candidates when submitting their written responses to the textbook chapters. The researchers adapted the MCCSS to align the three strands of cognitive complexity to the parts of the written discourse methods. This decision was determined so that the researchers could clearly see the connections between each strand of the MCCSS and the accompanying part of the assignment.

Both the QQR and QTQR included a portion where the students posed questions about the reading. These were to be questions that encouraged discussion, not basic comprehension questions. Because the teacher candidate was looking for problems to discuss in the text and pose as questions, the researchers aligned this part of the assignment with Strand 1 (How does the participant perceive the problem in the text?) in the MCCSS. The Quote section of the assignment required them to self-select what they deemed as meaningful quotes from the text and to provide a written rationale for the quote selection. When completing the Quote section the teacher candidates noticed important ideas written by the author of the text. They also needed to analyse the reason for selecting a particular quote from the text. This required the teacher candidates to analyse the quote in order to truly understand its meaning then to provide support of its importance. Therefore, the Quote section of the assignment aligned with Strand 3 (How does the individual analyse the situation and support a position? Do they move from simple descriptions – restating the text – to explanations with reasons?) of the MCCSS. The researchers wanted to see whether they moved from summarising the quote to explaining or analysing the quote. The choice of quote was not analysed; however, how the teacher candidate responded to the quote and provided support for their quote choice was analysed. The Reflection section and the Thoughts section of the QTQR required students to contemplate the text content. This section was not as structured as the previous sections and, therefore, required them to provide some sense of organisation to their written reflection when making their case. This was where the teacher candidates could present any other interpretations of the text that were not included in the previous sections. This part of the assignment aligned with Strand 2 (How does the individual organise important ideas? Simple structure leads to obvious interpretations.) of the MCCSS.

Each part of the assignment was now aligned with a corresponding part of the MCCSS. The researchers could rate the written responses in each part of the assignment using the corresponding strand from the MCCSS. The three guiding strands from the MCCSS each included five levels of thinking by which to measure

teacher candidates' written reflections. The five levels are as follows: 1) Unilateral Descriptions – a person simplifies the situation and appeals to authority; 2) Simplistic Alternatives – a person identifies conflicts but does not pursue them; 3) Emerging Complexity – a person identifies more than one explanation or perspective; 4) Broad Interpretations – a person uses broad ideas to define and interpret a situation; and 5) Integrated Analysis – a person reconstructs a situation approaches a problem from a new point of view. The first level (1) is the lowest level of cognitive complexity. The fifth level (5) is the highest level of cognitive complexity, or reflection. So each reflection had three scores – one score (1–5) for Questions, one score (1–5) for Quotes and one score (1–5) for Reflections and Thoughts.

Pedagogical Model of Inquiry

The Pedagogical Model of Inquiry (PMI) was also used for evaluating the teacher candidates' reflections to determine which tool more effectively measured teacher candidate responses. The three phases of inquiry, Introspective, Didactic and Evaluative, were not measured in terms of levels of thinking during the initial portion of the pilot study, but were documented according to the number of appearances in the teacher candidates' written discourse. Later in the study, the researchers looked at the PMI in terms of levels of thinking and compared it to the MCCSS for ease of use as well as how well the two measures correlated.

It is important to note when looking at the data that each teacher candidate could respond with a variety of levels within one reflection assignment. Therefore, one reflection might have more than one phase of inquiry present. The researchers used this data to determine percentages of total teacher candidate responses for each level of response.

Inter-rater reliability for both tools in this pilot study was established as the researchers each read one QQR and one QTQR individually then discussed the various ratings of the written discourse. Levels of inquiry were measured using the MCCSS and the types of responses represented in the Pedagogical Model of Inquiry were documented. The ratings were discussed until all three researchers agreed on a final rating of the written discourse. Also discussed was the similarity between the QQR and QTQR in terms of the format in which teacher candidates addressed their reflections of the text. As such, the researchers collapsed the QTQR data for Thoughts and Reflections into one category label. Based on this discussion and continued support of each other through email, Interactive Television and phone conversations, the data was divided and the remaining written discourses were rated.

Results

McDaniel's Cognitive Complexity Strand Scale

First, the researchers identified results pertaining to McDaniels Cognitive Complexity Scale. The results for the two sections of the Block 2 course are presented in Table 1. Teacher candidates' responses were rated for each portion of the QQR and QTQR. Levels 1 and 2 from the MCCSS represented lower levels of thinking while level 3 represented higher levels of thinking.

Table 1: *Results of QQR/QTQR using McDaniels Cognitive Complexity Strand Scale (MCCSS)*

	Strand 1/Questions	Strand 2/Reflections-Thoughts	Strand 3/Quotes
Low Level (1,2)	82%	64%	57%
High Level (3)	18%	36%	43%

In all three strands of the MCCSS, a higher percentage of teacher candidates used lower level thinking in their QQR or QTQR reflections. The biggest discrepancy was in Strand 1, or the Questions portion of the QQR and QTQR, where 82% of the teacher candidates were asking questions aimed at lower levels of thinking and only 18% of the teacher candidates were asking higher level thinking questions. The following are Question reflection samples representative of low level thinking and higher level thinking.

"What are some advantages and disadvantages of the basal reader?" This Question represents low level thinking because the answer to the Question is literally stated in the textbook and represents how the teacher candidate simply organised important ideas to develop the Question. This next example illustrates a Question that represents higher level thinking. "How do I get my students involved in reading assigned books when choice is needed to support classroom motivation?" This Question demonstrates the way the teacher candidate analysed the situation and supported his or her own position.

There was a 14% percentage difference between low and high level Quotes. Following are examples of a low level Quote and a high level Quote. "This tells me that it is important to start teaching students letter sounds at a very young age" represents a low level Quote response because the teacher candidate is organising the important ideas read in the text. While the following Quote represents higher level thinking because the response indicates analysis of the pedagogical situation. "When I am a teacher I need to know the similarities between the reading and writing processes because I will teach reading through writing and writing through reading" The teacher candidate is not only organising textual material, but is analysing what to teach while supporting a position about the value of knowing the similarities between reading and writing.

Pedagogical Model of Inquiry

For both the QTQR and the QQR, the researchers tallied how many times a response contained the Introspective Inquiry Phase, the Didactic Inquiry Phase and the Evaluative Inquiry Phase of the Pedagogical Model of Inquiry (PMI). One reflection could contain all three levels of inquiry, two levels of inquiry, or simply one level of inquiry.

Table 2: *Results of QQR/QTQR using the Pedagogical Model of Inquiry (PMI)*

	Questions	Quotes	Reflections/Thoughts
Introspective	12%	38%	38%
Didactic	69%	58%	56%
Evaluative	19%	3%	6%

For each section of the QQR and QTQR, the Didactic Phase of the PMI ranked as the highest percentage of teacher candidates' reflections. This pattern indicated that the teacher candidates were asking questions, analysing quotes and reflecting about issues related to their future teaching and instruction more so than making personal connections to the text (Introspective Phase) or attempting to solve problems in the classroom (Evaluative Phase). The results using the PMI also indicated a pattern that most teacher candidates were reflecting on the lower levels of the PMI scale. The Evaluative Phase is the highest level of inquiry or reflection and very few teacher candidates achieved that level. The percentage of responses for Introspective, Didactic and Evaluative Quotes and Reflections indicated a similar percentage pattern response. But the percentage of reflections for Introspective, Didactic and Evaluative Questions differed from the percentage of responses for Quotes and Reflections. According to the results 12% of the Questions rated as Introspective while the Quotes and Reflection/Thoughts were rated 38% Introspective. An inconsistency exists between Question and the Quotes, Reflection/Thoughts reflections.

The Evaluative reflection scores for Questions, Quotes, Reflections/Thoughts were the overall lowest percentages with Questions as 19% Evaluative, Quotes 3% Evaluative and Reflections/Thoughts 6% Evaluative. Results indicated a higher percentage of Evaluative Questions than for Introspective Questions. Whereas, the Didactic Phase percentages remained relatively consistent across Questions, Quotes and Reflections/Thoughts.

Comparison of Both Evaluation Tools

The McDaniels' Cognitive Complexity Strand Scale (MCCSS) and the Pedagogical Model of Inquiry (PMI) both measured levels of thinking. However, the constructs of thinking that informed each tool are different.

The McDaniels Cognitive Complexity Strand Scale (MCCSS) supports recognition of conflicts and problems. In fact, the first strand in the MCCSS states, "The way the problem is perceived and defined". So, the first step in analysing a written response using the MCCSS means that the writer must have identified a problem to consider. Within the parameters of this pilot research investigation, the MCCSS was used as a tool to recognise if conflicts and problems existed between students' prior knowledge and textual material. As such the MCCSS assumes that conflict exists between prior knowledge and textual information. This may not always be the case. The textual material may be new information in which a teacher candidate had no prior knowledge. If there is no prior knowledge that the teacher candidate is aware of, then the textual material is new knowledge. Therefore, a conflict cannot exist. However, if the teacher candidate has personal experiences or prior knowledge about pedagogy that represents a personal school experience that contradicts the textual material, a conflict may exist. The teacher candidate simply may have prior experiences that conflict with the textual material or they may not have enough prior knowledge or experiences in the classroom as a teacher to identify then evaluate a problem.

On the other hand, the Pedagogical Model of Inquiry (PMI) is about inquiry-based reflection or thinking that directly corresponds with inquiry-based reflection about practice. A teacher candidate may agree with the text and then extend thinking about reflecting on a personal connection (Introspective Phase) or about a professional issue (Evaluative Phase). The teacher candidate might also disagree with the textual material because of prior schooling experiences. One major difference between the two tools is the MCCCS inherently filters thinking through

the lens of a conflict or problem while the PMI incorporates these filters as parts of a paradigm shift from personal connection, to pedagogical connections to problem-solving and decision-making about the classroom. The PMI as an inquiry-based model of reflection represents natural progression that begins with personal connections, moves to connections about instructional practices toward awareness of evaluative inquiry of best practices.

The McDaniels' Cognitive Complexity Strand Scale (1991) is a published instrument which has undergone validity and reliability analysis. While the Pedagogical Model of Inquiry has not undergone this extensive type of data collection and analysis, the researchers purport that it has potential for future research and use as an instructional guide for classroom application. Its foundation is strongly linked to literature in the area of reflection and inquiry and it has a conceptual correlation about the complexity of thinking to a valid and reliable instrument, the MCCSS.

When examining both tools as measurements of reflection, results indicated higher percentages of low levels of reflection. Both tools measured lower percentages of higher levels of thinking represented by analysing, supporting and interpreting a pedagogical situation as well as classroom decision-making and problem-solving. The following illustrates how comparing both tools has the potential to measure teacher candidates' reflective responses to textual material.

Introspective and Low Level Thinking Reflection

"Being from a generation where I learned spelling the "old way" I want to make sure that I teach spelling effectively." This is a low level response as measured by the MCCSS. When measured by the PMI, this response is Introspective indicating that the teacher candidate's response emerged from a personal connection to the textual material. It is stated in the text the value of moving from traditional spelling strategies to current research-based spelling strategies. This literal textual understanding represents a personal experience about pedagogy that links personal understanding to material directly stated in the text. Using MCCSS as a measurement tool indicates this response as low level thinking and using the PMI as a measurement tool indicates that the teacher candidate is making personal connections to the text which is at the Introspective Phased therefore low level thinking.

Didactic Low Level Thinking Reflection

"Using a variety of word identification strategies meets the needs of all learners." This response illustrates how the teacher candidate has responded to specific pedagogical text content. According to the MCCSS, this reflection is measured as low level thinking. On the contrary the PMI rating system considered the reflection didactic as it represented recognition of pedagogy based textual content.

Evaluative High Level Thinking Reflection

"I understand how the types of instruction decisions made in the classroom have a high impact on student success. Teachers need to make instructional decisions based on learner needs not on state mandates." This high level thinking response as measured by the MCCSS shows that the teacher candidate analyses the situation and supports a position that is not stated in the text. Using the PMI tool indicates the response is evaluative in nature. The teacher candidate personally understands the value of making pedagogical decisions based on learner needs not state

mandates. This content was not literally stated in the text and therefore the teacher candidate analysed the content and made a decision about the value of learner-centred instruction.

The researchers noted patterns of response when comparing both measurement tools. Low level thinking as measured by the MCCSS was also measured by the PMI as the Introspective Inquiry Phase. The Didactic Inquiry Phase exists only in the PMI measurement tool as middle phase that the MCCSS does not have. While high level is represents in both the MCCSS and the PMI (Evaluative Inquiry Phase). Both measuring tools indicated that lower percentages of teacher candidates represented high level thinking (MCCSS) and evaluative thinking (PMI). Further research is required using the PMI as a measurement tool for reflection and cognitive complexity.

In many ways, the PMI is a more practical instrument to measure inquiry-based reflection. At this point, the PMI has only been used to measure textual reflections of teacher candidates, but this model is adaptable for use with in-service teachers in classroom settings. It is user-friendly in that it is more applicable to education settings. In addition, the PMI does not include Strands to consider as does the MCCSS. The researchers found it time-consuming to evaluate written reflections on the three dimensions of the MCCSS – the Strands and the levels within the Strands. The PMI is built-upon research about teacher reflection and its implementation is meaningful while still easy to conceptualise.

Using Texts to Promote Inquiry and Thinking

A natural avenue to begin inquiry-based reflection about pedagogical practices is via a familiar tool; the textbook. The first exposure to educational practices and issues for teacher candidates is within textual readings and responses to such readings. At this early stage in teacher development, personal experiences are the only prior knowledge that teacher candidates bring to the university classroom. Textbooks provide new ideas, problems and pedagogy. It is these new ideas, problems and pedagogy that lead to first experiences of inquiry-based reflection which may differ, support or conflict with prior knowledge. At this stage in the teacher candidates' learning, the value of inquiry-based reflection needs to be introduced during the onset of a teacher education program.

Textual readings are an on-going, necessary component of a teacher education program. These readings provide theoretical and instructional frameworks that are applied during classroom observations, classroom lesson plan implementation and student teaching. Providing teacher candidates with a reflective means to engage with a textbook to introduce the phases of reflections is vital to prepare future teachers. This investigation is a first step to illustrate the need of incorporating reflective pedagogical experiences at every stage of a teacher education programs while accessing textual materials simultaneously with classroom applications.

Teacher Candidates and Inquiry-based Reflection

The results of this pilot research investigation suggest that teacher candidates are capable of high levels of inquiry-based thinking. Both McDaniels' Cognitive Complexity Strand Scale and the Pedagogical Model of Inquiry indicate this need. However, only a small portion of the teacher candidates moved to those highest levels of reflection. Most teacher candidates' reflections simplified situations presented in the text or identified only one conflict, but did not suggest solutions to

that conflict. These lower level reflections were also focused on personal connections and pedagogical issues.

One explanation for the teacher candidates' difficulty in achieving higher levels of inquiry-based reflection is that they were still in the beginning stages of a teacher education program. The teacher candidates had very limited, if any, field observations or teaching experiences. They had little "real" classroom experience. Therefore, the teacher candidates were only able to draw from their own personal experiences of the classroom and of learning in conjunction with the text. While it is best for teacher candidates to have as many field-experiences as possible before student teaching, it is still imperative that they develop their art of reflection with textual materials.

Conclusion

This pilot investigation was the beginning of an exploration into teacher candidates' written inquiry with text-based experiences. Questions arose about how to promote and evaluate these inquiry-based reflections. Inquiry-based reflection incorporates varying levels of cognitive complexity or different types of thinking. Inquiry-based reflection is a developmental process that is vital to provide avenues for teacher candidates to take knowledge and skills learned in teacher educator programs and apply them in their own classrooms.

Several other questions emerged from this investigation. This pilot study suggested a connection between low level thinking (MCCSS) and the Introspective Inquiry Phase (PMI) responses. The Didactic Phase was not clearly represented as a component of the MCCSS tool; however, a high percentage of teacher candidate responses were at the Didactic Phase and indicated a move from low level thinking to higher level thinking. The Didactic Phase of the PMI provides scaffolding needed to reach higher levels of thinking or the Evaluative Phase of the PMI. Further research is needed to explore this pattern of response because an effective teacher must think critically or at an evaluative level to support classroom decision-making and problem-solving.

Even when the QQR and QQTR were collapsed to represent one method of written discourse it is clear that the teacher candidates were asking a higher percentage of didactic questions about the textual material. The answers to the questions were directly found in the text. Unfortunately, this indicates a disconnection between reflective questioning and textual meaning. Possible reasons for this weakness in comprehension are lack of application from text to classroom experiences or ineffective comprehension strategies.

The teacher candidate responses showed that a higher percentage of Questions, Quotes and Reflections were Didactic or pedagogical in nature. The paradigm shift is linear in nature. Reflection shifts from lower phases to higher phases. But, each time a new idea, problem or pedagogical issues is encountered a shift back to lower level thinking is part of the developmental process. This explains why the percentages varied between phases and written discourse reflections (QQT/R).

Teacher Education Program Application

The researchers suggest discussing the Pedagogical Model of Inquiry (PMI) with teacher candidates, and then provide opportunities for them to self-assess their written reflections to text along with field-based teaching. As it is often difficult for

teacher education programs to increase field experiences before student teaching, conversations with teacher candidates about the PMI as they reflect on written text may be a possibility for developing high levels of thinking and prepare them for field-based teaching.

The Pedagogical Model of Inquiry is a more purposeful, systematic approach to measuring inquiry-based reflection as a means to promote teacher candidates' higher level thinking and reflection about pedagogical textual materials. John Dewey (1933) first introduced the notion that inquiry is a driving force associated with reflective thinking. His notions about inquiry continue to guide research today. Researchers, school administrators and university-level educators are still trying to unlock ways to provide meaningful experiences for teachers to reflect upon practice. Continuing Dewey's work regarding reflection begins with teacher candidates and teacher education programs. This research introduced the textbook as a means for promoting inquiry-based reflection while extending Dewey's work into the 21st Century.

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