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titled
Teacher Beliefs About Scholarship in Education:
A Measure to Inform Professional Development Programming
by
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Submitted to the Graduate Faculty as partial fulfillment of the requirements for the
Doctor of Philosophy Degree in Curriculum and Instruction

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The University of Toledo
May 2015
An Abstract of

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This cross-sectional survey study of 226 public school teachers throughout Ohio presents and revalidates the Teacher Beliefs about Scholarship in Education (TBASE) measure, which includes twenty-four statements about teacher experiences with, attitudes toward, and behaviors regarding both education professors and journals. Rasch modeling of the collected data validates the measure and allows for these statements to be sequenced and grouped into four statistically discernible stages of positive belief development: Personal Interaction, Personal Identification and Increased Autonomy, Professional Identification, and Acceptance of Authority. Additionally, this study uses the TBASE measure to better understand which contexts and sources of exposure to external research in education are associated with higher TBASE scores. To that end, one-tailed independent samples t-tests were used to analyze teacher responses to eighteen additional items about various contexts and secondary sources of education research. A total of ten were found to be statistically significantly associated with increased TBASE scores.
for my husband

***

“Words and numbers are of equal value, for in the cloak of knowledge, one is the warp and the other the woof. It is no more important to count the sands than it is to name the stars. Therefore, let both kingdoms live in peace.”

Norton Juster, *The Phantom Tollbooth*
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Chapter One

Introduction

Statement of Problem

In 2005, the Ohio Department of Education (ODE) adopted the *Standards for Ohio Educators*; and in 2013, it unveiled the new *Ohio Teacher Evaluation System*. Within the next few years, all teachers in the state of Ohio will be evaluated in the same way and to the same standards. In fact, within that evaluation system, fifty percent of a teacher’s overall performance rating is based upon his or her performance relative to the standards (ODE, 2013).

The *Standards for Ohio Educators* (ODE, 2005) includes three major sections: standards for teachers, for principals, and for professional development. All three sections include statements regarding research in education, all of which are included in Appendix A. In brief, teachers are expected to maintain their knowledge of current research in education, principals are expected to engage teachers in doing so, and districts are expected to establish professional development systems that promote and support both efforts. Although some of the statements in these sections might indicate research that is being conducted by the teachers (e.g., “research-supported process”), many others clearly indicate research that is external to the teachers’ practices (e.g., “identify the relevant research”). The use of the word *research* in this way—such that the teacher’s engagement is as a consumer of research rather than a contributor—is highlighted by the use of *action research* (p. 66) to indicate teacher engagement in the process of research, and this distinction is made just once in the entire document.

Among the statements that situate teachers as consumers of research is the
following: “Professional development informs educators about research and ensures that they have the knowledge, skills and dispositions to access and use research in their practice” (ODE, 2005, p. 73). Here, the word dispositions acknowledges some place for the affective domain of teachers in their professional learning. Specifically, it highlights the importance of a teacher’s affective response to research that they themselves did not conduct. But, the statement also raises a question in this regard. What can school districts do to ensure educator dispositions toward such external research? The current body of literature offers little guidance.

Although much has been written about the affective domain of teachers-- most often about their attitudes or beliefs-- a cursory look at this growing body of work reveals just three dominant categories of study: teacher attitudes or beliefs about knowledge and learning, teacher attitudes and belief about their students, and teacher attitudes and beliefs about themselves. A fourth category receives much less attention: teacher attitudes and beliefs about their sources of professional knowledge, like the external research to which the Standards for Ohio Educators refers. Even less attention is paid to the measurement of teachers’ affective response to such an external source. As of June 2013, only three relevant scales have been presented, yielding a total of twenty-three subsequent studies; most of them are current publications, six of them are international studies, and six of them are graduate student works with no subsequent publication. None of them address the question previously raised regarding what school districts can do to ensure teacher dispositions toward external research.

Thus, the primary focus of this study is to present a valid quantitative measure specifically designed to inform professional development programming toward
increasing a teacher’s positive affective response to external research. That measure broadens the scope of the affective response to include education professors, under the assumptions that they conduct the vast majority or education research and that any measure of a teacher’s affective response to external research as a source of professional knowledge should include its authors. (As will be discussed shortly under ‘Definition of Terms,’ external research in education and the education professors who conduct much of it are collectively referred to hereafter as scholarship in education).

The secondary focus of this study is to explore the differences in a teacher’s level of positive response to scholarship in education in connection with his or her perceived level of knowledge of it from different contexts and secondary sources of exposure.

**Rationale**

For decades, scholars have noted the tension between practice and theory in the field of education. Consider the following examples spanning seventy years. In 1938, Dewey writes,

> Hence, the only ground I can see for even a temporary reaction against the standards, aims, and methods of the newer education is the failure of educators who professedly adopt them to be faithful to them in practice (p. 90).

In 1979, Isakson and Ellsworth write,

> Experiences in teaching educational research courses have led the authors to agree that teachers are generally negative toward research and to become more and more convinced that teacher attitude toward educational research is a major contributor to the limited impact that research seems to have on educational practice (1979, p. 12).
And in 2009, Jones and Enriquez write,

As critics of teacher education continuously question how coursework influences practice, many teacher educators argue that examining course content alone is insufficient for determining answers (2009, p. 164).

Clearly, some disconnect between practice and theory persists in education (Broekkamp van Hout-Wolters, 2007; Brown, 1979; Buchman, 1984; Gitlin, Bringhamurst, Burns, Cooley, Myers, Price, Russell, & Tiess, 1992; McEwan & McEwan, 2003; Shumsky & Mukerji, 1962), and as Jones and Enriquez suggest, further study is required.

Thirty-five years ago, when Isakson and Ellsworth identified teacher attitudes as an important factor in the limited impact of theory on practice, they quoted Melvin, who wrote,

Perhaps the greatest single contribution to be made by professors of education research would be that of fostering a positive attitude toward research on the part of students and teachers. This task would [involve] developing a plan which would lead toward positive attitudes (1973, p. 459).

Still, a relative paucity of quantitative research has been conducted regarding the development of such a professional development plan.

Nevertheless, today, in response to legislation, the Ohio department of Education has adopted a set of educator standards and a teacher evaluation system that requires teachers to bring research into their practices (ODE, 2005, 2013). It also requires school administrators to actively participate in helping teachers meet the standards. For example, to address the needs of an underperforming teacher, the Ohio Teacher Evaluation System requires the administrator to “determine additional education or professional
development needed to improve” and to write an improvement a plans that “includes resources and assistance available” (ODE, 2013, p. 13). Should a teacher be determined as failing to meet requirements regarding the use of external research in their practices, a measure of their beliefs about scholarship in education that could also inform steps that might be taken to improve those beliefs may prove useful to school districts. This study provides such a measure as well as a better understanding of how scholarship in education fits into a teacher’s perception about the sources of his or her knowledge.

**Methodological Rationale**

In *Basic Principles of Curriculum and Instruction*, Tyler (1949) suggests studying the learner as a means of determining educational objectives. Among the many methods he lists for accomplishing such a task are questionnaires and tests. The current study applies this thinking to professional development programming for teachers. If the goal of high quality professional development as defined by ODE is to ensure teacher “dispositions to access and use research in their practice” (ODE, 2005, p. 73), then one means of identifying specific objectives toward that end is to investigate teacher beliefs about it through the use of a quantitative measure.

Moreover, quantitative tools like a Likert-type response scale and Rasch (1960, 1980) model analysis of the resulting data allow for variable mapping, which arranges both the survey items and the respondents in a sequence. The items are arranged from least to most likely to elicit agreement from the respondents, and the respondents are arranged from least to most likely to possess the trait being measured. These arrangements allow researchers to discern the development of that trait as expressed by the respondents, who can be seen as being at different stages of development with regard
to the trait. Thus, one well-designed survey administered to an entire faculty can be an efficient means for administrators to learn more about their teachers’ needs. Should the survey items address a teacher’s positive beliefs about scholarship in education, then such information could be used to inform professional development programming toward fostering such beliefs.

Furthermore, The Ohio Teacher Evaluation System (OTES) requires teacher evaluators to collect an abundance of qualitative data from a variety of sources and refers to doing so as “the administrative burden of gathering and organizing evidence” (ODE, 2012, p. 15). Such data sources include formal and informal classroom observations and conferences, document collection, and student and parent interviews. The introduction of a quantitative measure would augment the qualitative data required of administrators when seeking to assess a teacher’s performance relative to the Standards for Ohio Educators.

**Purpose of Study and Research Questions**

The current study has two purposes. The first is to revalidate and present a previously piloted quantitative measure of teacher beliefs about scholarship in education which was specifically designed to address the problem presented here. The second purpose is to extend the use of that measure toward a greater understanding of how scholarship in education fits into a teacher’s perception of his or her sources of professional knowledge. Toward those ends, this study seeks answers to the following research questions:

1. How does the *Teacher Beliefs About Scholarship in Education* (TBASE) survey psychometrically function during the current study as compared to the pilot
study?

a. What are the psychometric properties of the TBASE measure?

b. Do teacher experiences, attitudes, and behaviors regarding education professors and journals work together as a single construct?

c. What stages of positive belief development are indicated by the data?

2. What sources of professional knowledge about research in education are associated with an increase in positive beliefs about scholarship in education as measured by the TBASE survey?

Theoretical Framework

The TBASE measure was developed around a theoretical framework of belief development inspired by Pajares (1992), Tyler (1949) and Dewey (1938). In brief, the theory posits that one’s beliefs develop over time through cycles of experiences, attitudes, and behaviors. A model of this theory is presented in Figure 1.

Pajares (1992) consolidates fifty years of literature on teacher beliefs into sixteen “fundamental assumptions that may be reasonably made when initiating a study of teachers’ educational beliefs” (p. 324). That beliefs are multifaceted and must be inferred through some consideration of linguistic, affective, and behavioral components; that they develop over time but are slow to change—if at all; and that there is some interplay between knowledge accumulation and beliefs are among the ideas Pajares presents (pp. 325-326) that frame the current study. The TBASE measure asks teachers to indicate their relation to statements about experiences, attitudes, and behaviors in order to infer
their beliefs about two potential sources of knowledge--education journals and education professors. (Further discussion of Pajares work appears in chapter two).

As previously stated, the idea of using such a measure to inform professional development programming comes from Tyler (1949). However, his work also informs the theory behind the measure. He writes,

> Education is a process of changing the behavior patterns of people. This is using behavior in the broad sense to include *thinking and feeling as well as overt action* [emphasis added]. When education is viewed in this way, it is clear that educational objectives, then, represent the kinds of changes in behavior that an educational institution seeks to bring about in its students. A study of the learners themselves would seek to identify needed changes in behavior patterns of the students which the educational institution should seek to produce (1949, pp. 5-6).
Although he writes about “students,” the reader need only replace the word with “teachers” to make evident the relevance here; the establishment of professional development objectives in service to a given institution begins with understanding the professionals themselves, specifically their thoughts, feelings, and actions—and the patterns in which they are presented.

Because both thoughts and feelings are internal, unobservable events in contrast to behaviors, for the purposes of the current study, they are jointly referred to as attitudes. This is consistent with Tyler’s own definition: “a tendency to react even though the reaction does not actually take place” (1949, p. 74), and although he uses behavior above to be inclusive of both attitude and action, he later defines it as “overt action” (p. 75). Thus, in this study, behavior is used to refer to actions only. Nevertheless, Tyler suggests some observation of both, and both are included in the TBASE measure.

Unfortunately, neither attitudes nor behaviors are within the power of school districts to provide for teachers by way of encouraging their use of external research in their practice. But, experiences are. That those experiences might influence attitudes and behaviors is clearly argued by Tyler (1949, pp. 75-76), who echoes the writing of Dewey from about a decade earlier. Dewey seems to put all three in motion relative to each other. He writes,

Experience does not go on simply inside a person. It does go on there, for it influences the formation of attitudes of desire and purpose. But this is not the whole of the story. Every genuine experience has an active side which changes in some degree the objective conditions under which experiences are had (Dewey, 1938, p. 39).
In other words, one’s behavior influences any given experience, which influences attitudes.

Thus considering both Tyler and Dewey, a cycle emerges. Over time, “by the cumulation of educational experiences [within this cycle] profound changes are brought about in the learner” (Tyler, 1949, p. 83). This study posits such change is the formation of belief, and in order to infer what someone believes, it is helpful to look at his or her experiences, attitudes, and behaviors.

**Significance of Study**

The primary focus of the study, the revalidation and presentation of the TBASE measure, has some significance for both school administrators and education scholars.

**Of interest to school administrators.** First, it is designed to provide a snapshot measure of the beliefs of the teacher sample; Tyler suggests the practice as a means of getting to know the learner (1949, p. 12-13). Furthermore, several studies have shown the importance of understanding teacher beliefs at the local level (e.g., Opfer, Pedder, & Lavicza, 2011; Jones & Enriquez, 2009; Love & Kruger, 2005; Staub & Stern, 2002; Wright, Horn & Sanders, 1997). Therefore, administrators may find in this study an illustration of how they might initially assess teachers.

Second, the Rasch model analysis of the survey items results in the sequencing of statements about experiences relative to statements about attitudes and behaviors regarding scholarship in education. That sequence may be useful in creating a professional development curriculum designed to “ensure [teacher] dispositions to access and use research in their practice” (ODE, 2005, p. 73). Such a curriculum would be particularly applicable to teachers hired through a process that did not take into account
such disposition.

Third, the difference in the belief measure associated with teachers’ perceptions about their sources of professional knowledge could inform districts when allocating resources in various professional development activities. For example, administrators may be interested to know whether a teacher might be more positively influenced by attending a graduate class or a conference or by increased discussions with colleagues. Such knowledge could be used when developing the required “Improvement Plans” of teachers rated as “Below Expected Growth” as required by the Ohio Teacher Evaluation System (ODE, 2013).

Of interest to education scholars. First, the use of quantitative methods to sequence experiences as part of curriculum development is a potentially meaningful contribution of this study. No other similar study could be found.

Moreover, the TBASE measure includes an equal number of statements about education journals and professors. Both are intertwined in the sequencing of teacher experiences, attitudes, and behaviors that the Rasch analysis provides. Thus, the results are immediately applicable to the development of courses in schools of education.

Third, within the proliferation of studies about teacher beliefs, there is a relative deficit of studies addressing their beliefs about scholarship in education. Thus, this study makes a contribution to a small body of work that --if only for the practical reasons given above--deserves more attention.

Finally, the introduction of a valid measure invites further application to subsequent studies. The secondary focus of this study, to explore the difference in a teacher’s level of positive beliefs about scholarship in education associated with his or
her perceived sources of professional knowledge, is the first such application. Those results could reveal which venues of dissemination are more associated with more positive beliefs about the work of education scholars.

Definition of Terms

A number of terms have already been used that may require some clarification. Some of the terms concern the theoretical framework of belief development (i.e. disposition, belief, experience, attitude, and behavior), some of them more specifically concern the TBASE measure (i.e., research, and scholarship), and at least one concerns the methodology (i.e., Rasch model). For all but the last of these, conventional definitions from a single source, the New Oxford American Dictionary (2011), are used to provide a sort of stability to the study. This approach results in part from the fact that neither the Standards for Ohio Educators (2005) nor its two sources (Cotton, 1995; Danielson, 1996) include a definition of the operative word disposition.

Disposition. Disposition is defined as a person's inherent qualities of mind and character; an inclination or tendency. Although a great deal has been written about disposition in the fields of philosophy, psychology, and education (e.g., Cohen, 1992; Sinatra & Kardashm, 2004; Thornton, 2006), the conventional definition highlights that one’s disposition includes many qualities of mind. This study situates those qualities in the affective domain as proposed by Bloom and his colleagues (Krathwohl, Bloom and Masia, 1964). Also, it is important to note that the Ohio Educator Standards, which introduces the term to the current study, suggests those qualities of mind can be influenced through professional development. Therefore, they are “inherent” in as much as each person has them, but they are subject to change.
**Belief.** Similarly, a great deal has been written about *belief*. Pajares (1992), specifically, attempts to establish a common understanding among researchers by providing sixteen assumptions gleaned from fifty years of literature. None of those assumptions, however, are inconsistent with the conventional definitions: 1) an acceptance that a statement is true or that something exists; something one accepts as true or real; a firmly held opinion or conviction. 2) (belief in) trust, faith, or confidence in someone or something. This study situates *belief* as subordinate to *disposition*. In other words, it is just one of the inherent qualities of mind that compose one’s disposition. This placement is consistent with the philosophy of L.J. Cohen, who emphasizes that “belief is a disposition” (1992, p. 1).

**Experience.** Experience is the practical contact with and observation of facts or events; an event or occurrence that leaves an impression on someone. Dewey describes that impression thusly, “every experience affects for better or worse the attitudes which help decide the quality of further experience, by setting up certain preference and aversion, and making it easier or harder to act for this or that end. Moreover, every experience influences in some degree the objective conditions under which further experiences are had” (1938, p. 37). Here again the role of experience in relation to attitude and behavior suggests the cycle represented in Figure 1 and supports the theoretical framework of the current study.

**Attitude.** Much like *disposition* and *belief*, a great deal has been written about *attitude* (e.g., Fishbein & Ajzen, 1975; Kennedy & Kennedy, 1996; Price, 2012); nevertheless, a conventional definition of *attitude* is being used. An attitude is a settled way of thinking or feeling about someone or something, typically one that is reflected in
a person's behavior. It is important to note that both thinking and feeling are aspects of attitude. Tyler (1949), as previously quoted, uses both words—thinking and feeling—in relation to changing behavior. Thus, the conventional definition supports the use of attitude in constructing the theoretical model from Tyler’s writing.

Behavior. Behavior is the way in which an animal or person acts in response to a particular situation or stimulus. For the purposes of this study, that stimulus includes research. If the desired outcome is to encourage teachers “to access and use research in their practice” (ODE, 2005, p. 73), then ways of accessing and using research are the behaviors that are under consideration. They are observable actions.

Research and external research. Research is the systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions. In education, as in many professional fields, those facts and conclusions are embodied in the literature that is published in education journals. Here, research is used to refer to that published body of work, which represents a store of professional knowledge. External research is used to refer to such publications that did not involve the person accessing it, specifically the participants of this study.

Scholarship. Scholarship is defined conventionally as academic study or achievement; learning of a high level. In this definition, the word study, achievement, and learning imply an agent. Whereas research can be embodied in publication, scholarship requires some additional consideration of the scholar. Thus, research is understood to be one aspect of scholarship, which must include those who are conducting it. In this case, scholarship is used to refer to both educational research, embodied in publication, and the professors of education who conduct it.
By way of summary, the following statement is intended to be consistent with the definitions given thus far: A teacher’s belief about scholarship in education, which is one aspect of his or her disposition toward it, may be inferred through the experiences, attitudes, and behaviors of that teacher relative to education professors and the research they publish.

**Rasch model.** Dawis (1987) provides the following explanation of the Rasch Model:

The Rasch model, one of a group of models originating from item response theory, was initially developed in connection with the construction of ability tests. The model expresses Gutman’s basic ideas in a probabilistic manner, as follows:

(a) Given any item, a person of higher ability should have a higher probability of getting the item right than would a person of lower ability, and (b) given any person, an item of lower difficulty should be solved (gotten right) with a higher probability than would an item of higher difficulty….The Rasch model postulates that item response is a function of two parameters, an item parameter and a person parameter (p. 485).

In the case of the current study, those parameters are about positive beliefs about scholarship in education. In the Rasch model analysis of teacher response to survey items, the items are grouped in sequenced in accordance to the probability that teachers would agree with them, and the teachers are grouped in sequence in accordance to the probability of their agreement to the items.

**Delimitations**

This study includes two notable delimitations. The first is the use of conventional
definitions for the affective terms listed above. Generally speaking, a great deal has been written about the definitions of these terms--some more than others, and although this study does acknowledge and make some use of that body of work, it can not report nor does it aim to establish a consensus within it. The second is the sample. Because the study addresses an issued raised by the Standards for Ohio Educators (2005) and the Ohio Teacher Evaluation System (2013), the sample includes only public school teachers in Ohio. Consequently, the generalizability of the results is limited; however, the study may serve as a protocol for similar studies in other states.

Limitations

This study also has two notable limitations. Participants in the study were asked to respond to a number of survey questions about their experiences, attitudes, and behaviors relative to education journals and professors; they were also asked to assess the various sources of their professional knowledge. Thus, the reliability of the data used to address the research questions previously stated depends upon the veracity of their responses, which can not be reasonably measured within the scope of this study.

The other limitation is a result of the dissemination of the survey and of the response rate. Invitations to participate in the study were sent to superintendents of public school districts in Ohio, who were asked to forward the invitation to their teachers. While teachers are likely to read and respond to emails coming from their superintendents, the likelihood that superintendents forward the email is diminished by the volume of correspondence they receive to which they might assign higher priority. Consequently, teachers from many districts of various typologies (e.g., geographic and socioeconomic) are not represented in the results, which limits their generalizability.
Organization of Remaining Chapters

There are four chapters that follow. Chapter 2 is a literature review which presents support for the rationale and theoretical framework of this study, examines studies that present or used previously established measures of teachers’ affective response to research, and that explains the benefit of using the Rasch model. Chapter 3 details the research design, methodology, and data analysis. Chapter 4 presents the study data and results of analysis. Chapter 5 summarizes the findings and offers implications for future research and professional development programming for teachers.
Chapter Two

Literature Review

What follows is a literature review that explores to various degrees the teacher’s relationship with research, the importance of considering the affective domain of adult learners, previous literature on teacher beliefs, literature on previously developed measures of relevance, and two dominant measurement theories.

Addressing the Tension Between Practice and Theory in Education

The charge that “professional development [ought to] inform educators about research and ensure that they have the knowledge, skills and dispositions to access and use research in their practice” (ODE, 2005, p. 73) suggests a consumer relationship between teachers and research, an external fund of professional knowledge. The well-documented, decades-long tension between practice and theory (e.g., Broekkamp van Hout-Wolters, 2007; Brown, 1979; Buchman, 1984; Dewey, 1938; Gitlin et al, 1992; Isakson & Ellsworth, 1979; Jones and Enriquez, 2009; McEwan & McEwan, 2003; Melvin, 1973; Shumsky & Mukerji, 1962) highlights a challenge that is fundamental to this relationship, which might be articulated as “that knowledge is not my knowledge.” What follows is a brief review of five ideas in response to that challenge, the purpose of which is threefold: 1) to show that their conceptions—in 1958, 1973, 1987, 1993, and 1998--span nearly as many decades as the challenge itself, 2) to show that the affective domain of teachers has been consistently considered important to the matter, and 3) to demonstrate the variability in the roles that teachers and education professors might play in possible solutions.

In The Action Research Way of Learning: An Approach to In-service Education,
Shumsky (1958) suggests that teachers might become better consumers of research if educational researchers were to change the means by which they report their findings. He points to “the novelist, the artist, and the actor” as models of those who better excel at “capturing the audience by helping him immerse himself in and empathize with the experience before him,” (p. 59). Moreover, Shumsky posits that if a teacher is to fully appreciate a research report, “he must view research as a personal intimate experience” (p. 62). Therefore, Shumsky promotes action research as a means for teachers to develop for themselves a more empathic stance toward any external research they might encounter. He writes, “any attempt to teach teachers about research, or the methodology of research as a logical subject matter, without exploring the aspects of behavior and feelings will result in a meager harvest” (p. 2). Thus, early conceptions of action research as a means of developing teachers’ professional knowledge emphasized the importance of considering the affective domain of teachers as students of research.

Melvin (1973) seems to concur with Shumsky (1958). In his contribution to *Methods and Techniques of Educational Research*, he writes, “Those who are familiar with research procedures look to research as a continual process of learning. They strive to become better consumers of research while at the same time expressing some interest in conducting ‘action’ research projects” (pp. 455-456). However, fifteen years after Shumsky, Melvin’s work clearly denotes a growing frustration on the part of academics toward teachers. He continues,

One can hardly argue with teachers who expect and demand that educational research...be relevant to their particular situation. It would seem, however, that there is considerable research being conducted and reported that is applicable on
the broad spectrum of education and not peculiar to any one segment of the
educational endeavor….Some means need to be developed to shake the
complacent, lethargic attitude of those who believe educational research has
nothing to offer the regular classroom teacher (p. 456).

Like Shumsky, Melvin focuses attention on the affective domain of teachers as students
of research. In contrast, he focuses on teachers as consumers of external research and
offers eight courses of action that education professors might consider taking. Briefly,
they are as follows: 1) help teachers access relevant research, 2) work with teachers
individually, 3) help teachers develop “common competencies,” 4) “present materials in a
variety of ways,” 5) help teachers with action research, 6) help school administrators in
sharing research, 7) help school boards to engage teachers in action research, and 8)
“offer differentiated research courses” (pp. 457-458). These suggestions, which are
directed toward education professors, emphasize the importance of their role in ensuring
teacher dispositions to access research and highlight the importance of considering
teacher beliefs about the education professors themselves and not just the research they
produce.

In contrast to Shumsky (1958) and Melvin (1973), Schön (1987) presents a
constructionist view of the relationship between teachers and professional knowledge in
which *reflection-in-action* is the means by which teachers build for themselves a reality
and a way of *knowing-in-action*. It is only in a footnote that Schön describes the place of
external research in his model of professional education. He writes,

The knowing-in-action characteristic of competent practitioners in a professional
field is not the same as the professional knowledge taught in the schools; in any
given case, the relationship of the two kinds of knowledge should be treated as an open question. Ordinary knowing-in-action may be an application of research-based professional knowledge taught in the schools, may be overlapping with it, or may have nothing to do with it. Competent professional practitioners often have the capacity to generate new knowing-in-action through reflection-in-action undertaken in the indeterminate zones of practice. The sources of knowing-in-action include this reflection-in-action and are not limited to research produced by university based professional schools (p. 40).

Above this note, he suggests that learning to reflect-in-action involves some consideration of the professional knowledge represented in the canon of published research. During the professional practicum of Schön’s design, students would be expected to acquire the materials by reading, listening, and watching, familiarizing themselves with examples of practice problems matched to the appropriate categories of theory and technique, [and] coaching would consist in observing student performance, detecting errors of application, pointing out correct responses (p. 39).

In other words, the professor works to mediate between what the practicing professional reads and experiences and his or her responses in action. Schön acknowledges that implementing such a model would be paradigmatically problematic (i.e., a blend of both positivist and constructivist notions), especially for the practicing professional (pp. 314-316). In fact, Schön himself suggests in a coda that professional practicums like the one he describes would best occur “in the midst” of one’s career (p. 342). Nevertheless, Schön seems to concur with Shumsky (1958) about the potential for action research--
though he calls it *on-line* research-- to shape the professional’s approach to external research (Schön, 1987, pp. 321-322); and he seems to agree with Melvin (1973) that the education professor or mentor teacher bears a great deal of responsibility for the affective tenor of that experience.

Such active participation of the education professor in shaping teachers’ reception of external research is echoed in Huberman’s (1993) concept of “sustained interactivity.” He reviews six decades of literature on the dissemination and use of scientific knowledge to conclude that the most robust findings and pronounced impacts belong to studies which “involve multiple exchanges between researchers and potential ‘users’ of that research at different phases of the study” (p. 36). He identifies three phases which can be characterized as *before, during,* and *after* the completion of the study protocol. During each phase, the ‘users’ of the research actively participate in making the decisions required of the study. It is, however, on the final phase that Huberman places emphasis, calling it an “ongoing conversation between researchers and practitioners around the import of the study” (p. 37). He delineates seven “interventions and exchanges” that might occur during this conversation, but concludes that they can be stripped down to an understanding that

users are not construed as simply ‘targets’ but as actors who will transform the knowledge base in line with their own representations of the problem. Also, the process of knowledge transfer is seen as a series of transactions, in which study findings are ‘negotiated’ between the two parties (p. 37). Moreover, Huberman suggests that the strongest predictor of such knowledge transfer resulting in local use is the users’ perceived quality and validity of the study, which is
best mediated through “sustained interactivity” (pp. 43-47). Thus, Huberman’s response to the challenge presented by the tension between practice and theory can be viewed as a marriage between Melvin’s (1973) and Schön’s (1987), one in which the education professor (i.e., the researcher) works with the teacher (i.e., the consumer) to shape the research findings into the context of the teacher’s practice.

Another approach which seems to have developed at the same time as Schön’s (1987) and Huberman’s (1993), is the Professional Learning Community (PLC). It is a close approximation of the mid-career practicum that Schön suggests, but it does not rely on the active participation of the researcher. Introduced by DeFour and Eaker (1998) and subsequently revisited by the authors, the PLC is defined as educators committed to working collaboratively in ongoing processes of collective inquiry and action research to achieve better results for the students they serve;...they operate under the assumption that the key to improved learning for students is continuous, job-embedded learning for educators” (DuFour, DuFour, and Eaker, 2008, p. 14).

Here, as in Shumsky (1958) and Schön (1987), professional knowledge is primarily accessed and created through action research. But, the members of a PLC are called upon to “become students of the research base on teaching” (DuFour et al., 2008, p. 187). This must include previously published or external research; however, the responsibility for mediating between that research and their practice rests solely with the members of the PLC; there is no mention of education professors in DuFour et al. (2008). Alternatively, teacher autonomy in processing external research into practice is encouraged. The authors write,
each member of the team has the autonomy to select and implement the instructional strategies he or she believes [emphasis added] will yield the best results….When, however, teachers are presented with clear evidence that particular instructional strategies consistently yield better results for students, they are expected to develop their ability to use those strategies in their classrooms.

This is typically not a problem” (pp. 188-189).

Here, external research includes a bank of instructional strategies from which teachers make their selections based on belief. Those strategies are then tested, with the assumption that the results of their own experimentation would reinforce those beliefs or compel genuine change in them.

All of the five ideas just presented, recognize external research as a fund of professional knowledge for teachers, and all of them suggest the importance of the teachers’ affective response to it. Where they differ is in what role the education professor plays in shaping that response and to what degree the teacher contributes. Figure 2 illustrates these differences. Schön (1987) does not promote external research, but does not deny its place in professional knowledge development, which is mediated through the professor as the teacher’s experiences require. Both Shumsky (1958) and Melvin (1973) promote action research as a way to influence teachers’ affective response to external research; but Melvin focusses more than Shumsky on the role of the professor in promoting external research. Huberman (1993) and DuFour (1998) both require a great deal of teachers in the induction of external research into practice, but DuFour places
Figure 2. Teacher and professor involvement in inducting external research into practice. This shows the relative placement of different approaches over time.

much less emphasis on education professors—they are producers of research, whereas Huberman places both professors and teachers in continuing negotiations as to the importance of the research. In this figure, one might detect a sort of paradigmatic divide between more positivist and more constructivist approaches to the problem. One might also detect the swing of the proverbial pendulum between them. The contribution of these diverse ideas—and of any others that might fit into the figure (e.g., Beattie, 1995; Gitlin et al, 1992; McEwan & McEwan, 2003)—to the current study is an awareness that a measure of teacher beliefs about scholarship in education, which takes into account both education journals and professors, would be applicable to a wide variety of approaches to reducing the tension between practice and theory in education. As long as there are education
professors contributing research to the fund of knowledge provided for teachers, there will be a need to understand what teachers believe about both the professors and the literature they produce.

Starting with the Affective Domain and Teacher Beliefs

Both Dewey (1938) and Tyler (1949) suggest that educating a student begins with gaining some understanding of him or her, and that beginning with his or her own interests and feelings is best. We have come to understand this aspect of the student as the Affective Domain (Krathwohl et al., 1964). So, when considering teachers as “students of the research base” (DuFour et al., 2008, p. 187), to begin with assessing their beliefs about that research is an educational practice supported by time-honored theory. The remainder of this section offers additional support for this methodological approach and an understanding of teacher beliefs in general.

The affective domain. The taxonomists of the affective domain themselves suggest the importance of initially assessing a student’s affective response. They write,

Our “box” [which is the affective domain] must be opened if we are to face reality and take action. It is in this “box” that the most influential controls are to be found. The affective domain contains the forces that determine the nature of an individual’s life and ultimately the life of an entire people. To keep the “box” closed is to deny the existence of the powerful motivational forces that shape the life of each of us (Krathwohl et al., 1964, p. 91).

This logic—that those controls which are “most influential” ought to be considered first—justifies the methodological rationale of the current study. What is more, the same authors call for better measures like the one the current study aims to present. They write,
“We are of the opinion that, as better evaluation instruments are developed, we shall be able to see much more clearly what types of environments and learning experiences produce change” (p. 87). Such is the current purpose.

From the field of social psychology, Haidt (2006, 2012) provides a useful metaphor for understanding the powerful influence of the affective domain. Imagine the cognitive domain as the rider of an elephant, which is the affective domain. The rider is useful to the elephant because of his ability to see further ahead--that is, “we can examine alternative scenarios in our heads” (2012, p. 46), but ultimately the elephant goes where it wants to.

And, most important, the rider acts as the spokesman for the elephant, even though it doesn’t necessarily know what the elephant is really thinking. The rider is skilled at fabricating post hoc explanations for whatever the elephant has just done, and it is good at finding reasons to justify whatever the elephant wants to do next (2012, p. 46).

Haidt later refers to Zajonc (1968) when noting that affect “has primacy both because it happens first (it is part of perception and is therefore extremely fast) and because it is more powerful (it is closely linked to motivation, and therefore it strongly influences behavior). The second process [is] thinking” (2012, p. 56). Therefore, from a social psychological standpoint, any effort to ensure teachers’ use of external research to authentically inform their practice is advised to first consider what those teachers believe about that work and the authors who produce it.

Although Pajares (1992) predates Haidt’s metaphor by twenty years, he seems to make the same point when exploring the literature on teacher beliefs. He writes,
[teachers] hold on to beliefs based on incorrect or incomplete knowledge even after scientifically correct explanations are presented to them…. [they] tend to turn conflicting evidence into support for already held beliefs, using whatever cognitive tricks are necessary, even when their evidence base is totally discredited…. [these] beliefs influence perceptions that influence behaviors that are consistent with, and that reinforce, the original beliefs (p. 317).

In other words, unless some consideration is given to teacher beliefs surrounding external research, any professional development program that makes use of it may not produce change. Thus, the current study presents a measure based on a theoretical understanding of belief development—which takes into consideration a teacher’s experiences, attitudes, and behaviors—to benefit such professional development programming.

**Teacher beliefs.** As previously stated, a great deal has been written about teacher beliefs, and it is outside the scope of the current study to review all the literature. However, Pajares (1992) and Fang (1996) both present reviews of their own that establish a foundational understanding of the importance of addressing them.

Pajares (1992) explores the nature of beliefs as presented in a literature spanning fifty years in order to simplify future research into teacher beliefs, which he believes has been hindered by a lack of consensus. He concludes that measures of belief should be based upon multidifaceted models of beliefs and provides a list of 16 “fundamental assumptions that may be reasonably made when initiating a study of teachers’ educational beliefs” (p. 324). Of particular interest to this study are the following (numbered here as they appear in Pajares’ work):

5. Thought processes may well be precursors to and creators of belief, but the
filtering effect of belief structures ultimately screens, redefines, distorts, or reshapes subsequent thinking and information processing;

7. Beliefs are prioritized according to their connections or relationships to other beliefs or other cognitive and affective structures. Apparent inconsistencies may be explained by exploring the functional connections and centrality of beliefs;

8. Belief substructures, such as educational beliefs, must be understood in terms of their connections not only to each other but also to other, perhaps more central, beliefs in the system;

11. Belief change during adulthood is a relatively rare phenomenon, the most common cause being a conversion from one authority to another or a gestalt shift. Individuals tend to hold on to beliefs based on incorrect or incomplete knowledge, even after scientifically correct explanations are presented to them; and

12. Beliefs are instrumental in defining tasks and selecting the cognitive tools with which to interpret, plan, and make decisions regarding such tasks; hence, they play a critical role in defining behavior and organizing knowledge and information (pp. 325).

These assumptions inform various aspects of the current study and the measure it presents: Teacher Beliefs About Scholarship in Education (TBASE).

Assumption 5 reinforces the point made in the previous section, that it is important to address the affective domain first when hoping to promote change in behavior. Pajares finds that belief affects the thought processes used to process
information. In the current case, those beliefs belong to teachers about external research they are expected to access and use in their practice.

Both assumptions 7 and 8 inform the decision to consider teacher beliefs about education professors concomitantly. Since much of the research that is produced externally to a teacher’s classroom practice is arguably generated by education professors, it is possible that teacher beliefs about that research are connected to more central beliefs about the professors who produce it. Thus, the TBASE measure includes statements about both, and the Rasch model analysis of those statements suggests how the sentiments they express might be intertwined in the minds of the sample participants. (A more in-depth explanation of the analysis can be found in Chapters 3 and 4).

Assumption 11 speaks to the current focus on in-service teachers, who are more likely to have well-established beliefs about classroom practices. State mandates like the one that propels this study might constitute “a conversion from one authority to another or a gestalt shift,” but they do not guarantee success in changing beliefs. As Pajares notes, such change is rare. Thus, exploring means to ensure it would benefit future attempts at change in education.

Assumption 12 links belief with behavior and the organization of information. Inasmuch as accessing and using external research in one’s practice is a behavior that involves the organization of information, this assumption also reinforces the importance of examining teachers’ beliefs about that fund of professional knowledge. It also informs the decision to include statements about teacher behaviors on the TBASE measure. Taken together with assumption 5, the two support the theoretical framework presented in chapter one in which internal (attitudes and experiences) and external (experiences and
behaviors) factors are placed in a cycle. (Note that experiences is considered here as both, which is in line with Dewey as previously cited).

Fang (1996) further explores the connection between teacher beliefs and behaviors, specifically theoretical beliefs and classroom practices. He reviews the literature of four decades and reports two major camps or themes: studies that support the “consistency hypothesis” and studies that support the “inconsistency hypothesis.”

The “consistency hypothesis” states that there is a consistency between teachers’ theoretical beliefs and their practices. This hypothesis supports the assumption of the current study, that influencing a teacher’s beliefs would impact his or her practice. However, Fang notes that the relationship between teachers’ reported beliefs and their actual practices proves to be weak one when considering in-service teachers or when using multiple qualitative measures like observations and interviews (p. 53). He writes, “teachers’ written responses in these studies may reflect what should be done rather than what is actually done in class” (p. 53). He does not report on the use of quantitative measures of teachers’ beliefs.

The “inconsistency hypothesis” states that a teacher’s beliefs and practices are not always aligned. Fang finds a number of explanations for this inconsistency. Among them are “the complexities of classroom life” (p. 53), “a moral vision of teaching that conflicts with the technical theories” (p. 54), and “varying psychological, social and environmental realities of the participants’ respective schools that either created an opportunity for or constrained teachers from implementing their beliefs in their instructional decision making” (p. 54). Fang expands upon the last with,

Because teachers are often faced with making choices among dichotomous
choices….they have to come up with coping strategies, by calling upon the conflicted ‘self’ as a tool of her trade and building a working identity that is constructively ambiguous, in order to combat these pedagogical dilemmas (p. 54).

In other words, teachers often feel compelled to implement conflicting pedagogical theories, typically their own and some other external theory. But, doing so results in a practice that does not demonstrate fidelity to either one—a state that teachers have come to accept and about which Tyack and Cuban (1995) have written extensively. These observations point to the need for school administrators to be aware of the affective development of the teachers they lead as they implement reform.

Fang’s review suggests that consistency between teachers’ theoretical beliefs and classroom practices is preferred, but that inconsistency is more probable. Two general explanations for that inconsistency are given: the inability of qualitative measures to capture practiced beliefs and the extent to which teachers have accepted inconsistency as the norm, which seems to increase with time. Both explanations inform the current study. Firstly, the TBASE is a quantitative measure that, as Pajares (1992, p. 326) suggests, takes into account that beliefs must be inferred in part through teacher behaviors and experiences. In responding to each item, they are not directly reporting on their beliefs about scholarship in education, but on items that suggest the level of positivity of those beliefs. Secondly, the participants of the study are in-service teachers, who Fang reports show more inconsistency. Finally, the design of the TBASE measure and the Rasch Model analysis of the data it produces reveals a sequence—from least to most positive—of teacher experiences, attitudes, and behaviors regarding scholarship in education. It also places teachers along that sequence. Such information could contribute to a better
understanding of how positive teacher beliefs about scholarship in education develop. What’s more, it may inform professional development programming at the local level. If indeed teachers construct and accept “the conflicted self” as the norm, then perhaps that construction can be intercepted by first addressing their beliefs about those ideas that are external to their own, promoting a less conflicted and more authentic self.

Thus, Pajares (1992) and Fang (1996) present ideas about teacher beliefs that inform the current study, not the least of which is their common call for measures that may ultimately be used to examine the impact of teacher beliefs on other variables of importance to stakeholders in education.

**Measuring Teacher Beliefs about Scholarship in Education**

Based upon the “test blueprint” concept presented by Summers (1992), the Teacher Beliefs about Scholarship in Education (TBASE) measure was constructed using matrix of concepts illustrated by Figure 3. It reveals the warp and woof of ideas used to generate the individual belief statements on the measure. Along the top, the theorized model of belief development based on Dewey (1938), Tyler (1949), and Pajares (1992) is represented by experiences, attitudes, and behaviors. Below it, the construct being measured—scholarship in education—is represented by professors and journals. Along the side, four layers of belief are labeled as utility of ideas, value of sources, connection to reality, and sense of authority. These titles are used to organize the remainder of this section, which reviews previously presented measures, the literature that cites them, and the findings of other germane studies. The purpose for doing so is to make plain the connection between the TBASE measure and the literature that precedes it, while justifying its development.
Table 3. Matrix used to generate items on the Teacher Beliefs about Scholarship in Education (TBASE) measure. This is based on the “test blueprint” concept presented in Summers (1992).

<table>
<thead>
<tr>
<th>Expected Response</th>
<th>EXPERIENCES</th>
<th>ATTITUDES</th>
<th>BEHAVIORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Professors</td>
<td>Professors</td>
<td>Professors</td>
</tr>
<tr>
<td>Easy To Agree “utility of ideas”</td>
<td>Journals</td>
<td>Journals</td>
<td>Journals</td>
</tr>
<tr>
<td>Somewhat Easy to Agree “value of sources”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat Difficult To Agree “connection to reality”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficult To Agree “sense of authority”</td>
<td></td>
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</tbody>
</table>

**Experiences, attitudes, and behaviors.** Any measurement of belief should be based upon a multifaceted belief model (Parajes, 1992). The model presented here, built upon the foundational ideas of Dewey (1938) and Tyler (1949), includes experiences, attitudes, and behaviors as they are conventionally defined. Thus, it is through this lens that other measures and findings are reviewed.

**Previously presented measures.** At the outset of this investigation, three other scales were known that are of similar intent to the TBASE measure presented here. The first is the *Attitudes toward Educational Research Scale* (ATERS) presented by Isakson and Ellsworth (1979), the second is the *Teachers Attitudes about Professional Development* scale (TAP) presented by Torff, Sessions, and Byrnes (2005), and the third is the *Educators’ Attitudes Toward Educational Research Scale* (EATERS) presented by Ozturk (2010). Although none of them claim to measure beliefs, nor present a theoretical model from which they are developed, each includes elements of the experience-attitude-behavior model used here. Appendix B presents sample items from each of these scales.
with an indication as to how those items would be characterized by the researcher.

The attitudes toward educational research scale (ATERS). The ATERS (Isakson and Ellsworth, 1979) was developed as part of an experimental design and to provide education professors a means of measuring the effects of research coursework on the attitudes of their students in order to address the limited impact of academic research on teacher practice and improve teacher education. Their sample included undergraduate and graduate students enrolled in an introductory educational research course at Wichita State University during the Fall 1977 and Spring 1978 semesters, but the authors give no indication as to how many participants, if any, were in-service teachers. They do report using a chi-square test of goodness of fit to determine that the instrument produces a non-significant deviation from a normal distribution. They also report an internal consistency reliability coefficient of .92 using original sample of 236. A smaller sample of 31 graduate students was also used to determine a test-retest reliability of .62. Finally, using the completion of a research course as a criterion variable, the authors confirm construct validity using a series of t-tests.

The items to which the participants responded on a 5-point Likert scale of agreement express either attitudes or experiences as defined here. Some items are more easily characterized. For example, “It is not very interesting to read research articles relating to teaching” expresses an experience--an impression based upon practical contact with the reading material, and “Educational research that is not applicable to real-life problems is of little value to educators” expresses an attitude--a settled way of thinking that potentially affects behavior. Other items are more difficult to place. For example, “The efforts of educational researchers help put education on a more scientific basis” is
considered here as a settled way of thinking, but it might also be an impression based in practical contact with or observation. Regardless, it is clear that none of the items in the ATERS express active behaviors that respondents can own. This at once supports the differentiation being made here between attitude and belief and precludes its use in the current study without the addition of such behavior items.

However, the experimental findings reported by Isakson and Ellsworth (1979) support the model of belief development. The pre- and post-test scores of a sample of 31 graduate students--the sample most likely to be in-service teachers as compared to undergraduate students--reveals that the group had come to value more highly the training provided in the research course and that they felt more strongly that the principles and skills learned would be of practical help in the classroom [but still] did not hold favorable attitudes toward research articles and were particularly troubled or confused by the statistical procedures employed in the research (p. 17).

Although the stated implication of this study is that the ATERS can be employed to improve the effectiveness of educational research course offerings, in the case of those 31 graduate students, it also suggests that teacher attitudes about research can be changed through the experiences and behaviors involved in completing a course in an educational research. However, those attitudes that showed change were about using research skills; attitudes regarding the consumption of published research were unchanged by the experience provided in the research course. Thus encouraging teachers to employ research findings in their practice seems to require more than teaching them research methodology.
Teachers’ attitudes about professional development scale (TAP). Torff, Sessions, and Byrnes (2005) also present a related attitude scale; its focus is on the professional development of in-service teachers, which may or may not include the consumption of research. The Teachers’ Attitudes About Professional Development (TAP) scale is a 5-item scale created through a series of three individual studies involving in-service public school teachers on Long Island, New York. The method of responding to each item was not reported. Nevertheless, the authors report using an exploratory factor analysis to reveal that the five items had an internal consistency reliability coefficient of .87 and that 67% of the variance could be accounted for by a single factor. Finally, using scales measuring need for social approval, preference for intellectual challenges, authoritarianism, and teacher self-efficacy as criterion variables, the authors argue that the TAP scale measures a distinguishable construct.

All five items on the scale appear in Appendix B. Like the items that appear in the ATERS, they can be classified as statements of either experiences or attitudes, but none of them express active behaviors that can be owned by the respondents. Again, the identification of this scale as a measurement of attitudes as opposed to beliefs consistently supports the differentiation suggested by Parajes (1992).

Educators’ attitudes toward educational research (EATERS). Ozturk (2010, 2011) reports on the development and revalidation of the Educators’ Attitudes Toward Educational Research Scale (EATERS). His stated intent for the use of the scale is to identify areas of focus toward improving educators’ attitudes through professional development, mentoring programs, and policy decisions. Involved in the development of the measure were 193 in-service teachers enrolled in Masters-level education courses at a
mid-West state university during the 2005-2006 academic year. Exploratory factor analysis was used to settle upon a scale with 29 items that explained 65% of the variance and produced an internal consistency reliability coefficient of .861. Additionally, possible criterion variables were explored--specifically, age, years of experience, number of research courses taken, and intensity of use of sources; but, none were confirmed. A confirmatory study was then conducted (2011) with a sample of 564 PreK-12 in-service educators in a mid-Western city, and all results were successfully replicated.

Unlike the previously mentioned scales, the EATERS does include items about teacher behaviors, all six of which appear in Appendix B. Three of them are intended to measure “whether educators incorporate their own research in their practices,” and three are intended to measure “whether educators invest time and effort in learning about research findings” (Ozturk, 2010, p. 759). Ozturk acknowledges these items as different because they measure behaviors and gives three reasons for their inclusion in an attitudes scale: as a means of representing their “underlying mindset,” to encourage the used of the scale in future research, and in order to “provide evidence for discriminate validity by showing that the scale could differentiate between attitudes and actual practices” (pp. 759-760). In fact, the six items do prove to be statistically discernible components in the measure as predicted. Furthermore, statistically significant correlations were reported between the behavior components and the others characterized by the author as attitudes (and re-characterized here as both experiences and attitudes). He notes that the statistically significant correlations that can be considered high enough indicate relationships that can be anticipated, even though there were no a priori hypotheses about the magnitudes of these
correlations. As an example, the highest correlation (0.379) which is between the component “whether educators believe that research findings are applicable to real life contexts” and the component “whether educators believe that those who keep up with research are better educators” can easily be expected since no one can hold the second belief only when he or she thinks positively about the first (2010, pp. 764-765).

However, Ozturk cautions that “interpretation of relationships among the components can only be made within a theoretical framework” (2010, p. 765; 2011, p. 742), which he leaves for further study. Nevertheless, all of the items—including those expressing experiences, attitudes, and behaviors as defined here—work together as a single, statistically coherent construct. Thus, although the EATERS may be made to fit into one, it was not conceived from a theoretical model of belief development as suggested by Pajares (1992).

**Studies citing the ATERS, TAP, and EATERS.** At the time of this review, there were eight known studies that cite the work of Isakson and Ellsworth (1979) and refer to the ATERS (See Table 1); fifteen that cite Torff, Sessions, and Byrnes (2005) and the TAP scale; and two that cite Ozturk (2010) and the EATERS. Thus, just twenty-three different studies refer to the previously reviewed measures. Ten of these were published within the past five years. Seven are written by graduate students (one masters thesis and six dissertations). Three of them are international studies. What’s more, only seven of the twenty-three studies actually use some version of the measures they cite, while the rest merely refer to the studies that presented them by way of contextualizing or justifying their own work. These numbers demonstrate the relative paucity of American studies that
Table 1

Studies citing the ATERS (Isakson & Ellsworth, 1979), TAP (Torff, Sessions, & Byrnes, 2005), and EATERS (Ozturk, 2010).

<table>
<thead>
<tr>
<th>Scale Cited</th>
<th>Scale Used</th>
<th>Internat'l Study</th>
<th>Graduate Student Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adler (2011)</td>
<td>TAP</td>
<td>--</td>
<td>--</td>
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<tr>
<td>Bateman (2009)</td>
<td>TAP</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Grammatikopoulos, Gregoriadis &amp; Zachopoulou (2013)</td>
<td>TAP</td>
<td>--</td>
<td>Europe*</td>
</tr>
<tr>
<td>Holincheck (2012)</td>
<td>ATERS</td>
<td>ATERS</td>
<td>--</td>
</tr>
<tr>
<td>Holt, Duijln &amp; Boomsma (2010)</td>
<td>TAP</td>
<td>--</td>
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<tr>
<td>Hubschman (1997)</td>
<td>ATERS</td>
<td>ATERS</td>
<td>--</td>
</tr>
<tr>
<td>Hui (2008)</td>
<td>ATERS</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Joram (2007)</td>
<td>ATERS</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Kulmina (2011)</td>
<td>TAP</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>McClure (2007)</td>
<td>TAP</td>
<td>--</td>
<td>Dissertation</td>
</tr>
<tr>
<td>Ozer &amp; Beycioglu (2010)</td>
<td>TAP</td>
<td>TAP</td>
<td>Turkey</td>
</tr>
<tr>
<td>Ozturk (2010)</td>
<td>ATERS</td>
<td>EATERS</td>
<td>--</td>
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<tr>
<td>Ozturk (2011)</td>
<td>ATERS</td>
<td>EATERS</td>
<td>--</td>
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<tr>
<td>Razfar (2012)</td>
<td>TAP</td>
<td>--</td>
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<tr>
<td>Stamou, Humphreys &amp; Schmidt (2006)</td>
<td>ATERS</td>
<td>--</td>
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<tr>
<td>Torff &amp; Byrnes (2010)</td>
<td>TAP</td>
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<td>Torff &amp; Sessions (2008)</td>
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<tr>
<td>Torff &amp; Sessions (2009)</td>
<td>TAP</td>
<td>TAP</td>
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<tr>
<td>Yilmaz &amp; Kilicoglu (2013)</td>
<td>ATERS</td>
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</tbody>
</table>

* Denmark, Finland, Greece, Portugal, Romania, Cyprus

deal with the quantitative measurement of teacher attitudes regarding research in education. And, none of them deal with beliefs as modeled here. Nevertheless, there is some evidence of the experience-attitudes-behavior model of belief development in those studies that make use of the previously presented scales.


Hubschman (1997) uses the scale to measure the attitudes of 99 graduate students enrolled in an educational research class at Florida State University. Whether or not the students were also teachers is not made clear, but given the content of the ATERS items
themselves and the fact that the scale was not altered suggest that they were.

Regardless, the participants were divided into those receiving mentoring email messages from instructors and those receiving neutral email messages. A mentoring email included “one or more of the qualities of establishing trust, offering individualized advice, introducing alternatives, challenging, the mentee, motivating the mentee, or encouraging initiative, [while neutral emails relayed] general information in an impersonal, generalized way” (p. 332). The participants were also divided into introverts and extraverts using the self-scored results of the Hardy Educational Learning Profile.

Using the ATERS and test scores, no statistically significant difference between the groups with regard to attitude or achievement was found. However, the author does report that introverts responded to the instructor emails more often; and among introverts, those who received the mentoring emails performed better on tests.

In addition to this quantitative analysis, Hubschman (1997) conducted a qualitative analysis of an email and course evaluation survey administered at the end of the treatment. One question asked “if the email affected attitudes toward the educational research class” (p. 334). Twenty-nine students mentioned a positive relationship between the two, mentioning “the connectedness to the course, the teacher, and the college. Being able to get research information to and from other students, and finding it easier to ask questions and get advice through email rather than in class were also mentioned” (p. 334).

In the context of the model used here, Hubschman’s study suggests that the particular experience of receiving and responding to mentoring emails from educational research instructors did not significantly impact attitudes about educational research.
Still, the qualitative results, which the author could not organize by treatment group, suggest some relationship between the experiences of the class (e.g., using email to communicate) the attitudes of the students (e.g., feeling connected) and their behaviors (e.g., asking questions and getting advice). So, although the quantitative measure refutes a single link within the proposed belief development cycle regarding scholarship in education, the qualitative results suggests a tangential belief cycle in its entirety.

Holincheck (2012) also uses the *Attitude Toward Educational Research Scale* (ATERS). The focus of her dissertation is to update it so as to broaden its population scope to include in-service teachers who are not currently enrolled in a research course and to include new items that address hypothesized factors affecting the attitudes of that population. Those factors are “experience with research, relevance of research findings to one’s teaching, practicality of application of research findings, school support of use of research findings, accessibility of research to teachers” (p. 39).

To that end, Holincheck (2012) enlisted the help of five experienced teachers with an interest in research to review, augment, and validate a pool of item statements. From the original scale, 45 statements were retained, one of which was split into two statements, and four new statements were added. The modified scale of 50 statements, plus 15 additional survey items about demographic characteristics and exposure to education research, were administered to 474 K-12 teachers in a large suburban school district.

Reliability and validity tests resulted in the scale being reduced to 19 items (p. 58-60), all of which would be characterized as statements about attitudes or experiences in the current study. The ATERS-19 produced a Cronbach’s coefficient alpha of 0.91 and
included three factors accounting for 51.5 percent of the variance in teachers’ attitudes: participation in education research, its perceived value, perceptions of the usefulness of research skills (p. 94). Holincheck (2012) finds activities that expose teachers to education research over extended periods of time are most likely to make a difference in teachers’ attitudes, and thus to teachers’ actions. These activities include the use of education research within graduate education and professional development courses, engagement of teachers in teacher research, and teachers’ own professional reading. Short-term exposures to education research, such as learning about education research findings from an in-service course, or from a peer teacher or an education administrator were not found to make a difference in teachers’ attitude scores (2012, p. 95). Those long-term experiences (e.g., coursework) that show improvement in attitude as measured by the ATERS-19 are much more likely to include related subsequent behaviors (e.g., completing assignments) than the short-term experiences (e.g., conversations with colleagues). Thus, Holincheck’s study supports the viability of a belief measure that includes long-term subsequent behaviors.

One study that makes use of the Teachers’ Attitudes about Professional Development (TAP) scale similarly speaks to the experiences-attitudes-behaviors model of belief development. Among a series of studies lead by Torff, he and Sessions (2009) looked at the effects of socioeconomic status (SES) on TAP scores. The authors note that professional development experiences provided to teachers in high and low SES school districts in New York are different. Generally speaking, teachers in high SES schools have more choice, smaller groups, and more individualized attention afforded to them.
with regards to professional development. In contrast, teachers in low SES schools often have no choice in programming, participate within very large groups of teachers, and get no individualization in instruction. Under these conditions, SES was shown to have an effect on teachers’ attitudes. The authors asked 58 teachers in low SES schools and 103 teachers in high SES schools, receiving a total of 150 responses, and found that the teachers in higher SES school districts have more positive attitudes toward professional development. Although no behavioral component was explicitly considered in the study, it suggests like Holincheck (2012) that the nature of the experience makes a difference in attitude, and like Hubschman (2011) that the difference involves personal connections with instructors.

**Other germane studies.** Evidence of the complete experiences-attitudes-behaviors belief development cycle can also be found in Castle (2006), Brindley (1991), and Gitlin et al (1992). The first two of these are qualitative studies, while the third characterizes itself as an educative study. All of them report on the involvement of teachers in the research process that explicitly includes external research.

Castle (2006) perceives the emergence of a new professional stance among teachers, that of pedagogical researcher, which “reflects a paradigm shift in view from teachers as recipients and consumers of research to teachers as researchers and creators of knowledge” (p. 1095). She reports on the interviews of three female elementary teachers who have been recognized by fellow teachers and university faculty as being “model teachers who do teacher research” (p. 1097). A hermeneutic phenomenological theme analysis of transcripts revealed seven themes.

First, teacher researchers recognize and accept when classroom practices are not
working. Second, they ask questions in an attempt to understand the problem. Third, such teachers “seek out established knowledge from professional literature, books, journals, and from the experiences and knowledge of others including their peers” (p. 1098). Fourth, teacher researchers are secure enough to take the risk of trying new classroom practices that may or may not work. Fifth, teacher research builds confidence; teachers can speak to their own practices and are more able to take autonomous action. Sixth, teacher researchers develop greater understanding of their students’ educational needs. Finally, teacher researchers take action. They share results with others, articulate rationales for practices and pedagogical research, respond to criticism and involve their students in the work of teacher research.

Although not overtly intended by the author, these themes suggest a cycle that leads to the ultimate desired behavior expressed by ODE (2005) -- accessing external research. The teacher experiences of taking positive risks in practice (theme 4) lead to altered teacher attitudes like increased confidence (theme 5), which lead to teacher behaviors like sharing results (theme 6). This in turn affects how teachers react to the experience of failure in the classroom (theme 1). Their secure attitude allows them to accept and question it (themes 1 and 2), which is followed by a new behavior -- seek out answers (theme 3) and take new risks (theme 4). And, the cycle continues.

Similarly, Brindley (1991) interviews six experienced ESL/EFL teachers about their perceptions of the research process and the potential benefits to their professional growth and reports on five themes regarding research questions, challenges faced, skills required, supports needed, and professional benefits.

First, he found that teachers (6/6) generate their research questions from their own
experiences in the classroom by focusing on concrete concerns that may have been
brought to light by a particular incident (1/6). Also, teachers (3/6) often use the research
process in an attempt to validate their own implicit theories. Second, the challenges
teachers face during the research process include focusing the research question (3/6),
interpreting data (4/6), and finding the time to conduct research (6/6). Third, the teachers
also identified requisite skills: data analysis (2/6), academic writing (3/6), and research
planning (2/6). Fourth, teachers value the supports they receive from working
collaboratively (3/6), hands-on workshops on research methods (5/6), institutional
commitment to supporting teacher research (2/6), and accessible literature (6/6). Finally,
teachers benefit from the research experience through positive changes in attitudes and
classroom practices (4/6), improved, systematic thinking (4/6), and increased confidence
(3/6).

Like Castle (2006), Brindley (1991) presents findings supportive of the
experiences-attitudes-behaviors cycle. In this case, teachers reflecting upon the research
experience found themselves having more confident attitudes and altering their classroom
practices. Particularly germane to this study, however, are the themes on which nearly all
the participating teachers agree (4/6 to 6/6). Specifically, that basing their research on
their own practice, participating in hands-on methods workshops, and using accessible
literature all likely contribute to overcoming the obstacle of finding time to conduct
research and altering their classroom practices. Here, the importance of both instructional
decisions (i.e., hands-on workshops) and accessible literature are experiences that are
explicitly connected to improved attitudes and subsequent practice behaviors, all of
which are rooted in a need for practical applicability.
Finally, Gitlin, Bringhurst, Burns, Cooley, Myers, Price, Russell, and Tiess (1992) present the methods and examples of *educative research*, a proposed alternative to quantitative or qualitative research in that the researcher and the participants both play an active role in setting the research agenda and both experiential knowledge and research-based knowledge are valued sources of expertise. Their work is in reaction to a historically established hierarchy that places education researchers as “experts disseminating educational truths” and “teachers as inexpert” (p. 5, pp. 71-76), and it is based upon the belief that “the difference between academics and teachers is created, it is not based on merit, but primarily on the opportunity to engage in certain forms of inquiry” (p. 6).

After a two-year collaboration, the authors present an overview of the educative research process from two points of view, an education professor (and lead author) from the University of Utah and the collective views of seven teachers from the Salt Lake City School District enrolled as a cohort in a Masters of Education program. The overview is presented as a dialogue of seven iterations between the two voices.

First, the professor presented the concept of educative research and assumed enthusiasm on the part of the teachers, whose lack of objection was based on the traditional hierarchy of professor as authority. Of research in general, the teachers write it was viewed as “a necessary evil...to get our degrees. At that point, very few of us imagined that it would have any connection to our teaching practice” (p. 12). Second, the professor required the teachers to write a school history with a goal toward understanding the evolving school culture and possible issues to be addressed. The teachers found this very interesting as they “began to distinguish ‘real’ constraints from the commonly made
assumptions about what is possible” (p. 13) in terms of change. Third, the professor required the teachers to read articles he believed “focused on questions being addressed by the school histories” (p. 13). But, the teachers were “put off by the readings because they did not address ways to solve immediate problems,” although “they helped to put labels on concepts and philosophies that [they] intuitively understood” (p. 13). Fourth, the professor asked the teachers to write personal histories and suggested additional readings. The teachers were at first threatened by having to share their personal histories, but came to value the experience as liberating “because the telling of these stories in many ways placed a value on who [they] were as persons and more specifically as teachers” and continues to reveal “the meaning [their] history has on [their] current situations” (p. 15). They make no mention of the additional readings. Fifth, the professor suggested a dialogical model called Horizontal Evaluation as a means of sharing, comparing and analyzing all of the text the teachers had generated thus far. That process involved observing each other in the classroom. The teachers did so, but because they thought they had no choice--which was not the intention of the professor. Nevertheless, the observations, like the personal histories, were at first threatening but were ultimately valued as “more relevant than the typical observations by principals that [they] had long been forced to endure, [in part because] it would be a way to confront [their] deep sense of isolation” (p. 15). Sixth, the professor required the teachers to read a series of articles that were intended to extend their thinking into issues of race, class, and gender. The teachers understood the intent of the reading assignment but suddenly felt a disconnect with their previous work and did not find the articles helpful. Seventh, the professor asked the teachers to consider all their previous work and to pose research questions
based in their own practices, around which they worked in groups to locate relevant literature in the library. They then put together a plan to collect and analyze their own data toward making presentations to each other. Of the total experience, the teachers write,

The histories we wrote and the observations and dialogues we engaged in were personally revealing and professionally challenging. We had examined and shared our philosophies, intentions, and values. We had discovered contradictions in our practices and beliefs and had risked revealing them to others...For many of us, our questions, our goals, our experience, and our knowledge were taken seriously for the first time, thus strengthening our confidence and our resolve to make the changes we needed. Along with this newly found sense of connection and confidence came a sense of dissatisfaction for some teachers...about not really having a voice within the [Educative Research Process]...It is significant that our first attempt to approach a traditional authority was made within our university program, directed at the very person encouraging such a shift in decision making. Its success had ramifications throughout our lives, and made a significant difference in our relationships with each other” (pp. 17-18).

It is at this point in the overview that the voices converge into one as they describe how the teachers began to set the program agenda and the professor “was no longer solely determining the readings or even leading the discussions” (p. 18).

Uncommon in this work is the inclusion of the teachers’ voices in a description of how their interaction with external research evolves from passive to active. It is an evolution of which the authors reveal specific experiences (e.g., being assigned readings),
attitudes (e.g., being ‘put off’ by the readings) and behaviors (e.g., locating relevant readings) toward an end which the teachers view as more positive. What the teachers make clear is the importance of the professor’s role in that evolution.

In summation, the previously-presented, successfully-vetted measures of attitude support the distinction between attitude and belief suggested by Parajes (1992), that a measure of beliefs must include some consideration of behavior. They do so either by omission of behavior statements (Isakson & Ellsworth, 1979; Torff, Sessions & Byrnes, 2005) or by distinguishing such statements as ancillary (Ozturk, 2010). Nevertheless, studies that make use of the attitude scales present findings that suggest an experience-attitude-behavior cycle is at work when positive change is noted (Holincheck, 2012, Hubschman, 1997; Isakson & Ellsworth, 1979; Torff & Sessions, 2009). The same can be found in more qualitative studies that do not use the scales (Brindley, 1991; Castle, 2006; Gitlin et al, 1992). Thus, the model of belief development used to create the Teacher Beliefs About Scholarship in Education (TBASE) measure presented here helps to explain findings previous to its development.

Scholarship in education: Professors and journals. Thus far, the literature also suggests that the goal of ensuring that teachers have the “dispositions to access and use research in their practice” (ODE, 2005, p. 73) requires more than just teaching them about research methods (Isakson & Ellsworth, 1979). The instruction is best when it is long-term (Holincheck, 2012), hands-on (Brindley, 1991) and involves personal connections (Gitlin et al, 1992; Hubschman, 1997; Torff & Sessions, 2009) free from the constraints of academic hierarchy (Gitlin et al, 1992). Moreover, the literature must be accessible (Brindley, 1991) and applicable to real life contexts (Ozturk, 2010), and the
purpose of accessing the literature should be to help solve classroom-based problems (Brindley, 1991; Castle, 2006; Gitlin et al, 1992). These findings suggest that qualities of both education professors and education journals interact in important ways that ought to be considered when constructing a measure or positive beliefs. Accordingly, this study considers both the producers and the product—the primary sources of research conducted outside of a classroom teacher’s practices—under a single name, scholarship. What follows is a review of the literature in relation to scholarship in education.

Previously presented measures. Of the three measures—the ATERS (Isakson & Ellsworth, 1979), the TAP (Torff, Sessions & Byrnes, 2005), and the EATERS (Ozturk, 2010), only two include items implicating education professors and journals in attitudes toward research.

Of the fifty items on the ATERS (Isakson & Ellsworth, 1979), two of them mention education professors as “professors of education” and “college instructors;” and eight of them imply their inclusion with either “courses” (one item), “educational researchers” (six items), or “those who conduct research” (one item). Likewise, two items directly mention research “journals,” and four items imply their inclusion with “articles.” Thus, 32% of the items on the scale implicate scholarship in education as defined by the current study (See Table 2)

Of the twenty-nine items on the EATERS (Ozturk, 2010), one mentions “professors/researchers,” and one implies their inclusion in “I use every means to update myself about research in my field.” Another two items make direct mention of “academic journals,” and six imply their inclusion with “reports” (five items) and “every means” (same item given above). Thus, 31% of the items on the scale implicate scholarship in
Table 2

**Scale Items Re-categorized by Primary Source and Belief Model Component**

<table>
<thead>
<tr>
<th>Professor Items</th>
<th>Stated</th>
<th>Experiences</th>
<th>Attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- I prefer college instructors in education courses who bring important research findings into their instruction.(^1)</td>
<td>- Professors of education should make greater efforts to encourage positive attitudes toward educational research.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- An understanding of the methods used by educational researchers can help teachers take a more systematic approach to solving educational problems.</td>
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<td>- I have some pertinent questions that I would like educational researchers to pursue.</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>- Courses in educational research are of value to students in education.</td>
<td>- Educational researchers are at the forefront of interesting new developments in education.(^3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Most innovations in education would not have occurred without the efforts of educational researchers.(^4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I feel that educational researchers have discovered information that would be important in my teaching, if I know about it.(^5)</td>
<td>- The efforts of educational researchers help to put education on a more scientific basis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- It is important for public school administrators and teachers to cooperate with those who would conduct research in the schools.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Journal Items</th>
<th>Stated</th>
<th>Experiences</th>
<th>Attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- Schools should subscribe to at least a few educational research journals and make them available to staff.</td>
<td>- Teachers ought to read several journals regularly in order to keep current on what research is going on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I like to read textbooks and articles in education which are well documented with relevant research findings.(^2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- When preparing a new subject area for students, a teacher does not need to read the research articles available on that subject.(^6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Educational research articles are presented at a technical level which I can usually grasp.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Being able to read a research article critically is a valuable skill for teachers to acquire.(^7)</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Isakson and Ellsworth (1979) report a pre-test mean of 3.8 (SD .70) and a post-test mean of 4.1(SD .83) from 44 education graduate students.  
\(^2\) Isakson and Ellsworth (1979) report a pre-test mean of 3.8 (SD .84) and a post-test mean of 3.7(SD 1.11) from 44 education graduate students.  
\(^3\) Holincheck (2012) reports a mean of 3.2 (SD .84) from 474 K-12 teachers.  
\(^4\) Holincheck (2012) reports a mean of 3.24 (SD .91) from 474 K-12 teachers.  
\(^5\) Holincheck (2012) reports a mean of 3.6 (SD .71) from 474 K-12 teachers.  
\(^6\) Holincheck (2012) reports a mean of 3.4 (SD .89) from 474 K-12 teachers.  
\(^7\) Holincheck (2012) reports a mean of 3.8 (SD .78) from 474 K-12 teachers.
Table 3

Scale Items Re-categorized by Primary Source and Belief Model Component

<table>
<thead>
<tr>
<th>Professor Items</th>
<th>Stated</th>
<th>Behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educators’ Attitude Toward Educational Research Scale, Ozturk (2010)</td>
<td>Attitudes</td>
<td></td>
</tr>
<tr>
<td>- Professors/researchers who do research do not really know the conditions in schools.</td>
<td>- I use every means to update myself about research in my field.</td>
<td></td>
</tr>
<tr>
<td>Inclusion Implied</td>
<td>Experiences</td>
<td></td>
</tr>
<tr>
<td>Stated</td>
<td>My school provides me with easy access to academic journals.</td>
<td></td>
</tr>
<tr>
<td>Behaviors</td>
<td>I regularly read academic journals in my field.</td>
<td></td>
</tr>
<tr>
<td>Inclusion Implied</td>
<td>Experiences</td>
<td></td>
</tr>
<tr>
<td>- Research reports present their findings in a confusing manner.</td>
<td>- I would read more research reports if they were easier to understand.</td>
<td></td>
</tr>
<tr>
<td>Attitudes</td>
<td>- Research reports are often too difficult to understand.</td>
<td></td>
</tr>
<tr>
<td>Behaviors</td>
<td>- Research terminology makes research reports too technical.</td>
<td></td>
</tr>
<tr>
<td>- Recommendations made in research reports are not realistic.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inclusion Implied</td>
<td>Behaviors</td>
<td></td>
</tr>
<tr>
<td>- I use every means to update myself about research in my field.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The best evidence that these measures can provide in favor of considering education professors and journals jointly is that fact that both measures include such items and have demonstrated high internal consistency reliabilities coefficients—“the degree to which the items on the scale measure the same thing” (Warner, 2008, p. 851). The ATERS demonstrated an internal reliability of .92 (Isakson & Ellsworth, 1979), and the EATERS demonstrated an internal reliability of .86 (Ozturk, 2010).

**Studies citing the ATERS, TAP, and EATERS.** Of the studies citing these measures that have not been previously reviewed, two present findings that support the notion that experiences with education professors and education journals interact toward positive affective responses from teachers; neither study uses the scale they cite.
First, Spencer-Chapman’s dissertation (2008), a quantitative study of 55 public school teachers’ perceptions of arts integration before and after various professional development experiences, reports that the teachers’ preferred venue for professional development is “coursework (37.5%) followed by planning time (19.6%), coaching (17.9%), team teaching (14.3%), and teacher-to-teacher training (10.7%)” (p. 86). Of these, coursework is the only venue that would likely include exposure to both professors and journals.

Second, Yilmalz and Kilicoglu (2013) report on their qualitative study of 128 teachers in Turkey who responded to open-ended questions about educational research (the authors did not provide the questions asked). Sixty-one teachers with graduate degrees responded to eight questions, and sixty-seven teachers without graduate degrees responded to nine questions.

From the question response data, the authors report 6 themes about educational research, which were validated by two outside qualitative researchers. Briefly put, they are as follows: views about its concepts, who conducts it, its value, its sources, its contribution to teachers’ lives, and learning and employing its methodologies. For each theme within both categories of teachers, the authors provide subcategories, number of respondents, percentages, and representative sample responses. Highlights from that array of data include that 84 percent of the teachers believe that “university faculty” produce most of the educational research (p. 70); 70 percent of teachers view educational research as valuable to teachers (p. 71); and 73 percent of the teachers report that they keep up with educational research findings (p. 73). All of these findings are nearly evenly split between teachers with and without graduate degrees. Although 86 percent of teachers
report that “academic journals” or “professional journals” are their source for educational research findings, teachers without graduate degrees are less likely to refer to “academic journals” (p. 73). Finally, only 17 percent of the teachers responded that “educational research contributes to their professional life in terms of classroom practices,” and all of them have graduate degrees (p. 74). Likewise, only 8 percent of the teachers responded that “educational research stays in theory without actualizing in practice,” and all of them do not have graduate degrees (p. 75). Generally speaking, teachers with graduate degrees- those with potentially more exposure to professors-- access educational research through journals and value it more than teachers without graduate degrees.

**Other germane studies.** Yilmalz and Kilicoglu (2013), refer to two other international studies of interest regarding scholarship in education: Gore and Gitlin (2004) and Shkedi (2010).

Gore and Gitlin (2004) present an international qualitative study involving 85 pre-service and 147 in-service teachers in the United States and Australia (a specific breakdown is not provided). They report on themes gathered by asking each teacher 5 questions: 1) “What is educational research?” 2) “What are its goals?” 3) “Who does educational research?” 4) “Does research address your concerns as teachers?” and 5) “How can research be improved?” (p. 38). The authors report, it is clear that while teachers see academic research as the dominant form of educational research, they overwhelmingly do not value this form of research, particularly as they become more experienced as teachers. … [But,] all groups that participated in the study expressed concerns about the practicality, contextuality, credibility, and accessibility of academic research” (pp. 38-39).
Moreover, they write, “The joint perceptions of academics as ‘out of touch’ and ‘having it easy’, both of which militate against the credibility of researchers, are clearly factors in how teachers perceive research output” (p. 43). While these comments seem to contradict Yilmalz and Kilicoglu (2013) in terms of the value teachers place on education professors and journals, Yimalz and Kilicoglu control for exposure to these primary sources by separating their sample into teacher with and without graduate degrees. In any case, the connection between affective responses toward education professors and education journals is clearly made.

Shkedi (2010) also uses qualitative methods, specifically a case survey of 47 respondents and twelve case studies, to report on Israeli teachers’ attitudes toward research. The five survey categories are “1) what professional literature the teacher reads; 2) what motivates teachers to turn to research literature; 3) what prevents teachers from reading research literature; 4) how teachers react to findings that clash with their opinions, knowledge, and experience, and 5) what constitutes research according to the teachers” (p. 563). In brief, the author finds that 1) teachers read literature they deem to be practical; 2) that most teachers do not read such literature regularly, but do so when required for coursework; 3) that teachers cite irrelevance, lack of time, trust and/or understanding, and unavailability as reasons for not reading research literature; 4) that most teachers reject research findings that do not match their beliefs; and 5) that teachers view research as quantitative, objective, theory driven, and concerned with representative sample populations and generalizability (pp. 564-570).

Among these findings, the specific responses to the second question show that “almost half of the teachers [responding to it] indicated that the formal assignments
within the framework of their studies are what motivate them to read professional literature,” while “only three teachers said they regularly read research literature” of their own accord (p. 566). Shkedi interprets the sum of his findings as suggesting that teachers would be more engaged by and in education research if they had more exposure to qualitative research, the tenets of which address the teachers’ concerns. However, his findings also indicate that coursework is the most motivating means of that exposure. Thus, the qualities of the professor again come into play.

Here, a return to Gitlin et al (1992) helps to explain why perceptions about education professors may be an important part in teachers’ belief about the work that gets published in education journals. One of the tenets of the educative research practices they promote is that both quantitative and qualitative research practices reinforce a self-preserving hierarchy that favors research-based knowledge over experiential knowledge in any measure of expertise. The authors provide a historical evolution of the development of this hierarchy on the field of education (pp. 71-76). They therefore suggest that “teachers and others working at the level of practice are simply resistant to research” (p. 25) because to accept that knowledge is to subjugate their own experience, and “for research to be authentic, the relationship between what is said and the person(s) doing the talking must be made clear” (p. 27). In other words, a connection on a personal level needs to precede any consideration of the knowledge to be shared. Their overview of the educative research in process (previously described) demonstrates how this presumption played itself out over the course of their two-year experience. The seven participating teachers initially understood their work with the professor in terms of the hierarchy (e.g., “While Andrew may not have fitted many of the stereotypical notions of
a university professor, we still viewed him as the authority” (p. 12)), and it wasn’t until “bonds began to form and [they] began to feel understood” (p. 17) that the teachers fully believed that the professor wanted them to steer their work together, or that the teachers felt comfortable enough to “approach [i.e., confront] a traditional authority” (p. 17). Only after that moment did the teachers approach the literature with a “collective identity” (p. 18) which included the professor and did not reinforce the established hierarchy.

In summation, the creation of a construct called scholarship in education is supported by a body of literature that connects teachers’ affective responses toward external research with their responses toward the researchers. That literature is quantitative (Holincheck, 2012; Isakson & Ellsworth, 1979; Spencer-Chapman, 2008) and qualitative (Gore and Gitlin, 2004; Shkedi, 2010; Yilmaz & Kilicoglu, 2013), domestic (Gore & Gitlin, 2004; Holincheck, 2012; Isakson & Ellsworth, 1979; Spencer-Chapman, 2008) and international (Gore & Gitlin, 2004; Shkedi, 2010; Yilmaz & Kilicoglu, 2013). It is experimental (Isakson & Ellsworth, 1979; Spencer-Chapman, 2008) and longitudinal (Gitlin et al, 1992). First, previously vetted measures of attitude toward research have shown that items including both education professors and journals measure a single construct. Beyond that, the literature suggests that the majority of teachers believe education professors produce most of the research in education (Yilmaz & Kilicoglu, 2013) and that they only access such research literature when engaged in coursework (Shkedi, 2010), their prefered means of professional development (Spencer-Chapman, 2008). Nevertheless, teachers perceive academics as ‘out of touch’ with the realities of teaching, which affects how they perceive their research (Gore & Gitlin, 2004). But, teachers with graduate degrees access external research and value it more
(Yilmaz & Kilicoglu, 2013). Also, a personal connection with professors that minimizes the established hierarchy of expertise in education needs to precede any consideration of the knowledge to be shared (Gitlin et al, 1992). Therefore, a measure that includes both education professors and journals in gauging a teacher’s affective response to external research is supported by a breadth of literature.

**Layers of belief.** Figure 3 shows that four layers of belief were used in constructing the TBASE measure. They are *utility of ideas, value of sources, connection to reality,* and *sense of authority.* When applied specifically to *scholarship in education,* the first--utility of ideas--suggests that teachers do use ideas they have gotten from education professors and journals and that these ideas help them to improve (Holincheck, 2012; Joram, 2007). The second--value of sources--suggests that teachers value the sources of those ideas (Holincheck, 2012; Isakson & Ellsworth, 1979; Joram, 2007; Yilmalz & Kilicoglu, 2013). The third--suggests that the most valued sources are those that are rooted in the realities of teaching and speak to real problems that teachers face (Holincheck, 2012; Joram, 2007; Yilmalz & Kilicoglu, 2013). The last--sense of authority--suggests that with scholarship comes a certain authority that is either acknowledged or obtained by teachers (Holincheck, 2012).

**Previously presented measures.** Appendix B indicates how each of the previously reviewed measures of attitude includes items that fall into these themes. However, only the ATERS and the EATERS include items relative to *scholarship in education,* and little can be said of how these items relate to each other because the available item-level descriptive statistics (i.e., mean scores and standard deviations) is limited to just seven of them (See Table 3 footnotes). From the ATERS, Isakson and Ellsworth (1979) present
mean response values for just fourteen of the items on the scale, but just two of those relate to scholarship in education. Additionally, Holincheck (2012) presents descriptive statistics about five scholarship-in-education items from the scale. Ozturk (2010), on the other hand, presents no item-level descriptive statistics for the EATERS.

Nevertheless, an observation can be made of the seven items from the ATERS. Teachers find the items that fit into the value of sources theme easier to agree with than those that fit into the connection to reality theme, which are easier to agree with than those that fit into the sense of authority theme. Specifically, Isakson and Ellsworth (1979) report that “I prefer college instructors in education courses who bring important research findings into their instruction” and “I like to read textbooks and articles in education which are well documented with relevant research findings” both elicited a mean response of 3.8 (p. 14). Similarly, Holincheck (2012) reports that “Being able to read a research article critically is a valuable skill for teachers to acquire” elicited a mean response of 3.8 (p. 61). Granted, these results are separated by decades and come from different samples, so caution must be applied. From Isakson and Ellsworth, the data shows that two items— one about professors and the other about journals— that both indicate a conditional value placed upon these sources elicited the same level of agreement. It is from Holincheck, three decades later, that a fair comparison of items from different themes can be drawn. First, a similar response is elicited from an item that places a value on the written source that warrants possible professional development. Second, the item, “I feel that educational researchers have discovered information that would be important in my teaching, if I know about it,” elicited a mean response of 3.6 (p. 61). Here, a connection to reality of the ideas toward solving possible problems is
suggested, but the mean indicates that it was more difficult for teachers to agree with. Finally, three items that attribute a sense of authority to the sources all elicited teacher responses that were even more difficult to agree with: “When preparing a new subject area for students, a teacher does not need to read the research articles available on that subject” \((M = 3.4)\), “Most innovations in education would not have occurred without the efforts of educational researchers” \((M = 3.4)\), and “Educational researchers are at the forefront of interesting new developments in education” \((M = 3.2)\) (p. 61).

Thus, there exists empirical evidence that teachers agree with some of the themes more readily than others, thereby suggesting layers of belief.

**Studies citing the ATERS, TAP, and EATERS.** The layers are also evident in studies that cite the three scales of attitude toward research.

Joram (2007) employs qualitative methods in her effort to understand what teachers and professors in a mid-Western teacher-education program think about the generalizability and falsifiability of educational research. She presents two written vignettes to a total of 23 participants--seven pre-service teachers, nine in-services teachers, and seven education professors. One vignette was about “educational research whose purpose is to assess the efficacy of an instructional practice,” and the other was about “the ways teachers should use research carried out by others, even when it may be discrepant with their beliefs about best practice” (p. 127). She then interviewed the participants using questions designed to elicit answers about the falsifiability and generalizability of educational research. Interview transcripts were examined for statements of belief and coded using codes that were both developed prior to the interviews and that emerged from them. Seven themes emerged.
Four of the themes are not particularly applicable to the current study. One was about student differences and the need for individualized instruction. A second theme was about the means of falsifying educational knowledge. Another was about the different funds of knowledge (e.g., literacy skills) to which research might contribute. The fourth was about the nature of educational knowledge.

The remaining three themes, however, are of interest. The first of these is about the general use of research. Joram (2007) reports that about 33% of in-service teachers indicated that they would use research findings to acquire new information or points of view and consider changing their thinking or practice. However, 44% said they would use research findings only if they supported their current beliefs. Thus, it is easier for in-service teachers to use research ideas than it is to change their thinking because of them. Secondly, 66% of in-service teachers said that a visiting researcher’s claim that they should change their current practices—as in the second vignette—would have some influence on how they teach. In other words, the potential impact of research findings increases when they are delivered personally within the context of a teacher’s daily practice. Finally, with regard to the generalizability of research findings, 78% of in-service teachers expressed the view that research findings are not generalizable across teaching contexts. These findings support the idea that it is easier for teachers to agree that they use ideas taken from research than it is to agree that those ideas are connected to their realities of teaching, and that somewhere between these levels of agreement land findings revealed through personal interactions with the researcher.

A return to Holincheck (2012) indicates that three of the four layer categories are significant contributors to attitudes toward research. As part of her revision of the
ATERS, she conducted a factor analysis--which was not done by the creators, Isakson and Ellsworth (1979), and reports that just three factors accounted for 51.5% of the variance in attitudes toward education research. She labeled them “participation in research ($M = 3.3$),” “value of research ($M = 3.4$),” and “usefulness of skills ($M = 3.6$)” (p. 62). In each of these categories are items that extend beyond the focus of the current study, but they correspond. “Participation in research” corresponds to sense of authority in that teachers are engaged in the research, which is least likely to elicit teacher agreement. “Value of research” corresponds directly with value of sources. And, “usefulness of skills” corresponds to utility of ideas in that usefulness to teachers is central, which is the most likely to elicit teacher agreement.

Likewise, a return to Yilmalz and Kilicoglu (2013) similarly supports the layers of belief. As previously stated, they report that 86 percent of teachers report that journals are their source for educational research findings, and 70 percent of them view educational research as valuable (p. 71). But, only 17 percent of the teachers, all of whom had graduate degrees, responded that “educational research contributes to their professional life in terms of classroom practices” (p. 74). Again, these findings suggest that it is easier for teachers to agree that they access research than it is for them to agree that they value it, and it is more difficult for them to agree with the idea that the research contributes to their teaching realities.

Thus, as a review of the literature narrows down to consider teachers’ affective responses to education professors and journals, the four layers of belief used in the TBASE measure--both in terms of category and placement--still finds some support.
Other Variables

One means of assessing the validity of a new measure is to look for correlations between the scores it produces and some other variable the literature suggest is related (Warner, 2008). Some of the studies previously mentioned include results on investigations into such correlations; however, as reported by Ozturk (2010, 2011), no variable has been consistently related to attitudes toward education research, or even attitudes toward professional development, which may or may not include education research.

When developing the Teachers’ Attitude About Professional Development (TAP) scale, Torff, Sessions, and Byrnes (2005), looked for correlations between TAP scores and teachers’ “need for social approval,” “need for cognition,” “authoritarianism,” and “teacher self-efficacy” as measured by established scales (pp. 825-826). They subsequently report that “the unobservable construct (attitudes toward PD) is not correlated to other potentially related constructs reported in the literature” (p. 828). Subsequently, Torff and his colleagues (2008, 2009, 2010) continue the search for correlations to gender, age, years of experience, level of education, and grade level with inconsistent but mostly negative results. All of them were explored at least twice (only level of education was not explored a third time), and no correlation was found with gender, age, years of experience, and level of education in two of the three studies they conducted.

Ozer and Beycioglu (2010) and Adler (2011) also make use of the TAP scale. The first is a study of 144 primary teachers in Turkey exploring the relationship between teachers’ attitudes toward professional development and teacher burnout. The authors
report using an adapted TAP scale but provide no particulars about that adaptation. The second is a masters thesis that examines the relationship between fourteen mid-Western teachers’ attitudes toward professional development in vocabulary and the performance of their students. Although neither study explicitly involves teacher interaction with educational scholarship as defined here, the findings are of some interests. Ozer and Beycioglu report that female teachers have more positive attitudes toward professional development, and they are also more exhausted. Additionally, “the results showed that teachers’ attitudes towards professional development were slightly negatively related with depersonalization [as measured by the Maslach Burnout Inventory]. In addition, the study revealed that teachers’ attitudes towards professional development were positively related with personal accomplishment” (p. 4931). Similarly, Adler finds that among teachers who participated in a professional development activity on vocabulary instruction, those students of teachers with more positive attitudes toward professional development showed more growth in their vocabulary scores. These results underscore previously discussed findings: the need for personalization (Gitlin et al, 1992; Hubschman, 1997; Joram, 2007; Shumsky, 1958; Torff & Sessions, 2009) and the need for connection to teachers’ realities with regard to consuming research in education (Gore & Gitlin, 2004; Holincheck, 2012; Joram, 2007; Yilmalz & Kilicoglu, 2013), both of which are incorporated into the TBASE matrix.

Holincheck (2012) also looks for such correlations specifically with teachers’ attitudes toward education research using a revised ATERS (Isakson & Ellsworth, 1979). She reports that demographic variables-- gender, years of experience, subject taught, highest degree, and path to licensure--do not explain differences in teachers’ attitudes.
However, she finds that “elementary teachers had more positive attitudes toward education research than secondary teachers” (p. 95), which is consistent with Torff and Sessions (2009).

Similarly, Ozturk (2010, 2011) reports that attitudes as measured by the *Educators. Attitudes Toward Educational Research Scale* (EATERS) were not substantively related to age, years of experience, or coursework taken. However, he does report a statistically significant relationship between EATERS scores and a variable he calls “intensity of use of three sources” (2010, p. 765; 2011, p. 743), although the correlations are not “high enough to indicate a strong relationship” (2011, p. 443). In both studies, the variable was “the sum of respondent’s self-ratings on a five-point scale from 1 (not at all) to 5 (very much) in terms of the intensity of his/her use of 1) books, 2) academic journals, and 3) Internet sites of well-established institutions/organizations” (2011, p. 743). In neither study, however, is a breakdown of the individual sources provided. Ozturk (2010, 2011) simply concludes that the composite variable does “not exhibit much potential to serve as a criterion variable in the measurement of the dimensions of educators’ attitudes toward educational research, at least when this variable and the dimensions are measured the way presented in this article (2010, p. 766; 2011, p. 743). Thus, the secondary purpose of the current study is to promote a greater understanding of how *scholarship in education* fits into a teacher’s perception of his or her sources of that professional knowledge.

Smylie (1989) writes, “Few attempts have been made...to assess systematically teachers’ perceptions of the wider range of learning sources available to them and the relative efficacy teachers attribute to those sources in providing knowledge and skills
needed in their particular teaching situations” (p. 544). Consequently, he makes use of a national survey of teachers conducted by the National Education Association in 1985, which collected 1,789 responses. Part of the survey asked teachers to assess the effectiveness of 14 sources of learning on a five-point Likert-type scale: 4 definitely effective, 3 more effective than ineffective, 2 more ineffective than effective, 1 definitely ineffective, and 0 not applicable (p. 544). The sources appear in ranked order in Table 4.

Table 4

Descriptive Statistics of Ranked Sources of Teacher Learning from Smylie (1989)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Sources of Learning</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Direct experience as a teacher</td>
<td>1,724</td>
<td>3.91</td>
<td>.30</td>
</tr>
<tr>
<td>2</td>
<td>Consultation with other teachers</td>
<td>1,709</td>
<td>3.47</td>
<td>.61</td>
</tr>
<tr>
<td>3</td>
<td>Study and research pursued on their own</td>
<td>1,588</td>
<td>3.46</td>
<td>.57</td>
</tr>
<tr>
<td>4</td>
<td>Your observation of other teachers</td>
<td>1,652</td>
<td>3.45</td>
<td>.62</td>
</tr>
<tr>
<td>5</td>
<td>Graduate courses in field of specialization</td>
<td>1,475</td>
<td>3.27</td>
<td>.75</td>
</tr>
<tr>
<td>6</td>
<td>Consultation with specialists</td>
<td>1,442</td>
<td>3.19</td>
<td>.77</td>
</tr>
<tr>
<td>7</td>
<td>Undergraduate courses in field of specialization</td>
<td>1,626</td>
<td>3.08</td>
<td>.80</td>
</tr>
<tr>
<td>8</td>
<td>Other professional conferences and workshops</td>
<td>1,613</td>
<td>3.05</td>
<td>.71</td>
</tr>
<tr>
<td>9</td>
<td>Professional journals</td>
<td>1,640</td>
<td>2.99</td>
<td>.67</td>
</tr>
<tr>
<td>10</td>
<td>Graduate college courses education</td>
<td>1,515</td>
<td>2.81</td>
<td>.86</td>
</tr>
<tr>
<td>11</td>
<td>Formal evaluation of your performance</td>
<td>1,677</td>
<td>2.69</td>
<td>.86</td>
</tr>
<tr>
<td>12</td>
<td>Consultation with building-level administrators</td>
<td>1,650</td>
<td>2.68</td>
<td>.84</td>
</tr>
<tr>
<td>13</td>
<td>Undergraduate education courses</td>
<td>1,651</td>
<td>2.57</td>
<td>.87</td>
</tr>
<tr>
<td>14</td>
<td>In-service training provided by your school district</td>
<td>1,644</td>
<td>2.55</td>
<td>.88</td>
</tr>
</tbody>
</table>

Smylie (1989) further reports that these rankings transcend school settings (i.e., urban, suburban, and rural), but statistically significant differences were noted between elementary teachers and subject-specific teachers in secondary schools. He makes no investigation into correlations with demographic variables (i.e., age, sex, years of experience). And, it should be noted that the age of the study precludes any consideration of online sources.
With regards to the rankings themselves, Smylie (1989) proposes that those sources which are “likely to convey knowledge that has direct implications for and application to practice and the promotion of student learning in their specific classroom contexts” (p. 550) are perceived as more effective. Similarly, those sources that provide “strategic knowledge,” defined by Shulman (1986) as that knowledge that “comes into play as the teacher confronts particular situations or problems” (pp. 12-13), are perceived as more effective than sources that provide “propositional or case knowledge” (Smylie, 1989, p. 551). Shulman defines “propositional knowledge” as that which is learned “when we examine the research on teaching and learning and explore its implications for practice” (p. 10). He defines “case knowledge” as “knowledge of specific, well-documented, and richly described events” (p. 11). In other words, the more specific and practical a source of knowledge is to a particular teacher’s lived reality, the more effective he or she perceives that source. This underscores the importance of the utility of ideas and the connection to reality in the matrix of teachers’ beliefs about scholarship in education.

Indeed, the ranking of those sources that can be reasonably connected with scholarship in education are of particular interest to the current study. First, “professional journals” and “graduate college courses in education” are ranked next to each other at 9 and 10 respectively, offering further support to the construct including both professors and journals. But, Smylie (1989) reports a statistically significant difference between them ($p < .01$), and journals are ranked higher, which seems to contradict previous suggestions that put a premium on personal contact with professors in the class setting (Gitlin et al, 1992; Hubschman, 1997; Shkedi, 2010; Spencer-Chapman, 2008; Torff and
Sessions, 2009; Yilmaz and Kilicoglu, 2013). Still, “consultation with specialist,” which may include personal contact with education professors, is ranked higher than both of them at 6. Finally, “study and research pursued on your own” is ranked third. Logically, this source cuts across all four layers in the belief matrix shown in Figure 3. From their own study, teachers are likely to find utility of ideas and value of sources as well as a connection to reality while developing a sense of authority.

Given the following: 1) the inconsistency of findings regarding relationships between teachers’ affective response to professional development in general and education research specifically and other demographic variables, 2) the relative lack of investigation into relationships between those responses and the sources of research knowledge, and 3) the potential for a close connection between a teacher’s belief about scholarship in education and the context or secondary source of such knowledge; further and more updated investigation into possible relationship between the later two is warranted. Chapters 3 and 4 detail the method and the results of the current study toward that end, which is articulated in the second research question: What sources of professional knowledge about research in education are associated with an increase in positive beliefs about scholarship in education as measured by the TBASE survey?

**Classical Test Theory and Item Response Theory**

The previously reviewed scales were constructed within the Classical Test Theory (CTT) framework, whereas the Teachers Belief About Scholarship in Education (TBASE) was constructed within the Item Response Theory (IRT) framework. Thus, some discussion of the two measurement theories is also warranted. The remainder of this literature review presents a very brief comparison of the two and a common model within
Sharkness and DeAngelo (2011) offer a concise conceptual background of the two measurement theories. They explain that both CTT and IRT assume the existence of unobservable latent traits which influence how people respond to tests or survey questions. Thus, such instruments—if carefully constructed—can present a set of questions related to a single underlying dimension, and the test taker’s responses to them can indicate a measure of that trait. Where the two theories fundamentally differ is in their conception of the latent traits themselves. In CTT, the trait is defined by the test or survey. In other words, the test scores are assumed to relate to the latent trait only as it is captured by the set of items to which the test taker responds. In IRT, the trait is assumed to exist as a continuum independent of the items or set of items. Each respondent can be placed somewhere along that continuum, and his or her position on it affects how he or she responds to a given item. Thus, both respondents and items can be placed on the continuum such that the two are probabilistically related. In this case, a test score refers to a test taker’s position that is independent of a particular question or set of questions.

This fundamental difference underlies the comparisons of the two theories made by several different authors including Hambleton and Jones (1993), Embretson (1996), De Champlain (2010), and Magno (2009).

First, Hambleton and Jones (1993) are careful to distinguish between a test theory and a test model. They write,

*Test theories provide a general [emphasis added] framework linking observable variables, such as test scores and item scores, to unobservable variables, such as true scores and ability scores….On the other hand, particular test models are*
formulated within the framework of a test theory and *do specify* [emphasis added] in considerable detail the relationships among a set of test theoretic concepts along with a set of assumptions about the concepts and their relationship (p. 39). Thus, any practical comparison of the two theories will necessarily be made within the context of a discussion of models. Both CTT and IRT have engendered a number of models (Embretson, 1996; Hambelton & Jones, 1993). The most common model of CTT is the True Score Model, or Classical Test Model, which simply states that a test taker’s *test score* (X) is the sum of his or her *true score* (T) and the *error score* (E). It can be mathematically expressed as follows:

\[ X = T + E \]

(Hambleton & Jones, 1993; Magno, 2009). The IRT model used in this study is the Rasch Model (or more specifically, the Polytomous Rasch Model), a logit-linear model that uses the person and item total raw scores to estimate linear measures and can be expressed as a log-linear model. For the Polytomous Rasch Model, that expression is as follows:

\[ \log(P_{nij} / P_{n(i-1)}) = B_n - D_i - F_j \]

where

- \( P_{nij} \) is the probability that person \( n \) encountering item \( i \) is observed in [response] category \( j \),
- \( B_n \) is the "ability" measure of person \( n \),
- \( D_i \) is the "difficulty" measure of item \( i \), the point where the highest and lowest [response] categories of the item are equally probable, and
- \( F_j \) is the "calibration" measure of [response] category \( j \) relative to [response] category \( j-1 \), the point where categories \( j-1 \) and \( j \) are equally probable.
relative to the measure of the item. No constraints are placed on the possible values of $F_j$ (Linacre, 2009, p. 29).

So, it is with these models in mind that the following generalizations are gleaned about CTT models and IRT models.

In their comparison of the theories and models, Hambleton and Jones (1993) write,

perhaps the most important distinction between classical and modern test theories it that inherent within item response theory is the property of invariance of both item parameters and ability parameters [i.e., those parameters must adhere to the model being used]. The consequences of this property are a) those parameters that characterize an examinee are independent of the test items from which they are calibrated and b) those parameters that characterize an item are independent of the ability distribution of the set of examinees (p. 43).

In fact, this distinction is mentioned by all other authors reviewed here (De Champlain, 2010; Embretson, 1996; Magno, 2009; Sharkness & DeAngelo, 2011). It effectively means that item and person parameters in CTT are sample dependent, but in IRT they are sample independent. A quick analogy helps to explain why this is an attractive quality for a measurement instrument: a height of a person (a person parameter) as indicated by the marks on a ruler (item parameters) can be compared to the height of any other person (even the same person) as indicated by the same ruler so long as the ruler is appropriate—that is, a ruler with only yard markers would not accurately measure anyone shorter than that. In short, sample dependency of CTT models “reduces their utility” (Hambleton & Jones, 1993, p. 40). Thus, this property is considered an advantage of IRT models.
Hambleton and Jones (1993) also point out, however, that IRT models are more complex than the more commonly used CTT models (as illustrated by the mathematical expressions above); it is more difficult to construct measures that meet the assumptions of a given IRT model than it is to do so using a given CTT model. This shortcoming is also frequently mentioned (De Champlain, 2010; Embretson, 1996; Magno, 2009; Sharkness & DeAngelo, 2011). The mathematical complexity of IRT models, however, often means that they are capable of matching CTT model capabilities (De Champlain, 2010; Embretson, 1996; Hambleton & Jones, 1993; Sharkness & DeAngelo, 2011).

Other points in comparing models within the two theoretical frameworks are not so universally made within the literature reviewed. Some are about test construction; others are about test use. With regard to test construction, both Hamberston and Jones (1993) and De Champlain (2010) point out that CTT models might be favorable because they require smaller sample sizes when developing tests than IRT models; however, this is a point of some controversy (T. Sondergeld, personal communication, August 25, 2014). Nevertheless, the cost of such an advantage is that test makers must be concerned with the degree to which samples are representative of their populations. On the other hand, Embretson (1996) explains that within the CTT framework longer tests are often more reliable, but within the IRT framework shorter tests can be more reliable than longer ones. Also with regards to test construction, both Hambleton and Jones (1993) and De Champlain (2010) highlight the fact that IRT models provide the means to match items to ability levels, which allows for more targeted assessments and the ability “to design a test with particular inherent characteristics for a specific examinee population” (Hambleton & Jones, 1993, p. 44).
With regards to the use of measures, Embretson (1996) makes clear that models with both theoretical frameworks can produce meaningful scale scores, but their meanings are derived differently. Within CTT, “meaningful scale scores are obtained by comparisons of position in a score distribution,” and in IRT, “[they] are obtained by comparisons of distances from various items” (p. 342). However, she adds, “An objection that is often raised to norm-referenced meaning is that scores have no meaning for what the person can actually do,” but “in IRT models, the meaning of the score can be referenced directly to the items [and] if these items are further structured by content, substantive trait level meaning can be derived” (p. 346). This is why IRT models are considered better for tracking growth or improvement (De Champlain, 2010; Hambleton & Jones, 1993).

**Summary**

To conclude, this review of the literature makes several points. First, to address teachers’ dispositions toward locating and using external research in their practice is to address a tension between practice and theory--felt between education practitioners and researchers--that has existed for decades. It is a tension about which much has been written and for which much has been suggested; but, in every instance considered here, the existence of external research as a fund of professional knowledge for teachers is not denied, and the importance of the teacher’s affective response to it has been acknowledged. Second, it is an educationally and psychologically sound practice to investigate what teachers’ believe about external research prior to developing programs meant to enhance their dispositions to use it in practice, and one means of doing so is through the use of a well-designed survey. Third, beliefs in general and teacher beliefs
specifically are complex and multifaceted, and any measure of them should be based on a theoretical framework that allows for that complexity. The measure presented here, which simultaneously considers different layers of teacher experiences, attitudes, and behaviors with regard to external research and its authors, is supported by the body of literature just reviewed. Finally, the use of the Rasch model to develop the Teachers Belief About Scholarship in Education (TBASE) measure allows for a wider application of the measure across and within samples of teachers.
Chapter Three

Methods and Procedures

This study is a cross-sectional survey study of public school teachers in the state of Ohio on their beliefs about scholarship in education as previously defined. This chapter reiterates the purpose and research questions and discusses the research design, methodology, data analysis, and limitations of the study.

Purpose and Research Questions

The current study has two purposes. The first is to revalidate and present a previously piloted quantitative measure of teacher beliefs about scholarship in education. The second is to extend the use of that measure toward a greater understanding of how a teacher’s perception of his or her sources of professional knowledge fits into the development of beliefs about scholarship in education. Toward those ends, this study seeks answers to the following research questions:

1. How does the Teacher Beliefs About Scholarship in Education (TBASE) survey psychometrically function during the current study as compared to the pilot study?
   a. What are the psychometric properties of the TBASE measure?
   b. Do teacher experiences, attitudes, and behaviors regarding education professors and journals work together as a single construct?
   c. What stages of positive belief development are indicated by the data?

2. What sources of professional knowledge about research in education are associated with an increase in positive beliefs about scholarship in education as measured by the TBASE survey?
Research Design

The design of this study fits the definition of cross-sectional survey research.

Creswell (2012) writes,

Survey research designs are procedures in quantitative research in which investigators administer a survey to a sample or the entire population of people to describe the attitudes, opinions, behaviors, or characteristics of the population. In this procedure, survey researchers collect quantitative, numbered data...and statistically analyze the data to describe trends about responses to questions and to test research questions or hypotheses….In a cross-sectional survey design, the research collects data at one point in time... [and they] examine current attitudes, beliefs, opinions, or practices (p. 376-377).

This study used an online survey to collect quantitative data from a sample population of public school teachers in Ohio. Teachers were asked about their experiences, attitudes, and practices relative to education professors and the research they publish in education journals. They were also asked about their perceptions regarding the sources of their professional knowledge. The data collected captures their responses at that moment in time, and it was analyzed in an effort to develop a better understanding of how teachers might come to possess positive beliefs toward educational research they themselves did not conduct but might be expected to employ in their practice.

Methodology

This section describes the process used to develop and pilot the Teachers Belief About Scholarship in Education (TBASE) measure, and the use and extension of that measure during the current study.
**Instrumentation.** The TBASE measure was developed to be used by school administrators or other researchers interested in teachers’ beliefs about research conducted outside of their own practices, typically by professors of education and published in education journals. Such research represents a large body of professional knowledge that Ohio teachers are expected to access and use in their practice (ODE, 2005). Likewise, Ohio public school districts are expected to provide for professional development opportunities that “ensure” teacher dispositions to do so (ODE, 2005). Thus, some measure of teachers’ current beliefs about that body of knowledge could inform the development of those opportunities. Such use of a survey instrument to inform curriculum development is rooted in Tyler’s work (1949).

The process of developing the TBASE measure was deductive. Hinkin (1995) describes deductive scale development as a process during which the researcher “utilizes a classification schema or typology prior to data collection. [He or she may then] utilize a sample of respondents who [are] subject matter experts to provide critical incidents that are subsequently used to develop items” (p. 969). Similarly, Summers (1992) also suggests creating a “test blueprint” prior to item development. The theoretical framework or “schema” or “blueprint” that undergirds the TBASE measure is fully revealed by Figure 4. It was developed from the ideas put forward by Pajares (1992), Tyler (1949) and Dewey (1938) as discussed in Chapters 1 and 2. In brief, the theory posits that one’s beliefs are multifacted and interconnected, and that they develop over time through cycles of experiences, attitudes, and behaviors. In this case, statements about both the product (i.e., education journal articles) and producers (i.e., education professors) of scholarship in education are considered concomitantly; teachers are asked to indicate
their experiences, attitudes, and behaviors regarding both. And, in each of those six areas, some are predicted to be more likely agreed with than others, which is an extension of Summers’s (1992) “blueprint” concept.

The statements themselves were initially developed with the help of a group of graduate students and professors in the field of research and measurement, another professor in the field of education, and the author’s own teaching experience of over 20 years. Generally speaking, the “experience” statements use a perfect indicative verb form (e.g., have given, have relied), which denotes action that has occurred and may continue to occur, and both the “attitude” and “behavior” statements use the present indicative verb form (e.g., help, understand), which indicates action that occurs repeatedly (Walsh, 1972). The statements predicted to be “easy to agree” with acknowledge some utility of the knowledge the sources provide. Statements predicted to be “somewhat easy to agree” indicate some other value of those sources to the respondents. The “somewhat difficult to agree” statements acknowledge some connection between those sources and real situations, and the “difficult to agree” statements acknowledge some authority of or

<table>
<thead>
<tr>
<th>Expected Response</th>
<th>EXPERIENCES</th>
<th>ATTITUDES</th>
<th>BEHAVIORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy To Agree</td>
<td>Professors</td>
<td>Journals</td>
<td>Professors</td>
</tr>
<tr>
<td>1. They have given me ideas about teaching.</td>
<td>2. Education journals have given me ideas about teaching.</td>
<td>3. Education professors help me become a better teacher.</td>
<td>4. Education journals help me become a better teacher.</td>
</tr>
<tr>
<td>Somewhat Easy to Agree</td>
<td>Professors</td>
<td>Journals</td>
<td>Professors</td>
</tr>
<tr>
<td>5. I have enjoyed reading education journals.</td>
<td>6. Education professors are valuable resources for my professional development.</td>
<td>7. Education journals are valuable resources for my professional development.</td>
<td>8. I attend graduate classes in education to learn more about teaching.</td>
</tr>
<tr>
<td>Somewhat Difficult To Agree</td>
<td>Professors</td>
<td>Journals</td>
<td>Professors</td>
</tr>
<tr>
<td>9. I have relied on education professors who were teachers like me.</td>
<td>10. I have relied on education journals for help as a teacher.</td>
<td>11. Education professors understand the realities of teaching.</td>
<td>12. Education journals reflect the realities of teaching.</td>
</tr>
<tr>
<td>Difficult To Agree</td>
<td>Professors</td>
<td>Journals</td>
<td>Professors</td>
</tr>
<tr>
<td>13. I have relied on education journals for help as a teacher.</td>
<td>14. Education professors for help as a teacher.</td>
<td>15. Education professors help me become a better teacher.</td>
<td>16. Education journals help me become a better teacher.</td>
</tr>
</tbody>
</table>

Figure 4. Matrix of items within the theoretical framework of the TBASE measure. Here [n] indicates the order in which the statements appear on the survey.
authorship over those sources of knowledge. All of the statements are positively stated in order to remove the possibility of negative effects associated with reverse scoring, which could include a reduction in scale validity, the introduction of systematic error, and an artificial response factor consisting of all negatively-worded items (Hinkin, 1995). A Rasch model analysis of pilot participants’ responses to these statements, as described below and in Chapter 4, was used to determine their viability.

Participants in both the pilot and current study were asked to consider to what extent each of the statements described above agrees with their own beliefs. They responded to this question using a 4-point Likert-type scale of “strongly disagrees,” “disagrees,” “agrees,” and “strongly agrees.” An even number of scale points was used in order to avoid the inordinate use of the middle response. “This has the further advantage of ensuring that the underlying dimension will be linear or can be made linear” (Dawis, 1987, p. 482).

Along with the twenty-four items on the TBASE measure, the participants in the current study were asked to respond to nineteen additional items. The first asked “In what Ohio public school district do you teach?” Responses to this question were used to examine the sample population representation. The remaining eighteen items shown in Table 5 list possible contexts and sources of exposure to external research in education. This list was generated by the author, two professors of curriculum and instruction, a professor of educational leadership, and a professor of research and measurement in education. The purpose for collecting responses to these items was to initiate the use of the TBASE measure by exploring for associations between sources of exposure to scholarship in education and the development of positive beliefs toward it. In order to
Table 5

*Contexts and Sources of Exposure to Scholarship in Education*

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Undergraduate Classes (in person)</td>
<td>10. Structured Meetings with Colleagues (e.g., Professional Learning Communities, Book Groups)</td>
</tr>
<tr>
<td>2. Undergraduate Classes (online)</td>
<td>11. Informal Meetings with Colleagues (e.g., Lunchtime or Hallway Conversations)</td>
</tr>
<tr>
<td>3. Graduate Classes (in person)</td>
<td>12. Education Journal Articles (you read for a class)</td>
</tr>
<tr>
<td>4. Graduate Classes (online)</td>
<td>13. Education Journal Articles (you did not read for a class)</td>
</tr>
<tr>
<td>5. Discussions with Education Professors (outside of a class)</td>
<td>14. Education Journal Articles (that were given to you)</td>
</tr>
<tr>
<td>6. Discussions with Education Professors (not related to a class)</td>
<td>15. Education Journal Articles (that you found yourself)</td>
</tr>
<tr>
<td>7. In-District Professional Conferences</td>
<td>16. Professional Organization Websites (e.g., National Education Association, Kappa Delta Pi)</td>
</tr>
<tr>
<td>8. Out-of-District Professional Conferences (in person)</td>
<td>17. Educational Government Websites (e.g., ODE, US Department of Education)</td>
</tr>
<tr>
<td>9. Out-of-District Professional Conferences (online)</td>
<td>18. Other (Please specify below)</td>
</tr>
</tbody>
</table>

To collect those responses, participants were presented with the following question, “With regards to research conducted by someone other than yourself, how would you rank each of the following sources in terms of your professional knowledge?” A 5-point scale was then provided:

- The source of NONE of my knowledge about educational research,
- The source of LITTLE of my knowledge about educational research,
- The source of SOME of my knowledge about educational research,
- The source of MOST my knowledge about educational research, and
- The source of ALL my knowledge about educational research.
Using the same 5-point scale for all of the extension items needs additional advice from Dawis (1987), who suggests that simpler formats are better for participants and more scale points are sometimes better for the researcher. This is because once the data are in, one can always combine scale points to reduce their number, but one cannot increase that number after the fact. Also, more scale points can generate more variability in response, a desirable scale characteristic if the response is reliable (p. 482).

Since these items represent an initial exploration into association between beliefs about and exposure to scholarship in education using the TBASE measure, using more scale points and thereby leaving more open the option to use various statistical tests seemed appropriate.

Data collection and participants. This section includes two parts. The first describes the data collection and participants of the TBASE pilot study, and the second does so for the current study.

Pilot study. The TBASE measure was piloted in a Midwestern public school which employs ninety certified educators. This was a convenience sample as it is also the district in which the author is currently employed. According to the Ohio Department of Education (2013), the district is a Type 6, a suburban district with very low student poverty and large student population with a total enrollment of 997. The survey was distributed electronically to all teachers and administrators, who had to print the survey in order to complete and submit it to the author anonymously via internal mail delivery. It presented the twenty-four items previously listed in Figure 4 on a single page including the response scale in grid form (see Appendix C). Twenty-five completed surveys were
returned, a response rate of 28 percent. No demographic information about the respondents was collected.

**Current study.** Data collection for the current study was conducted electronically using snowball sampling over a five week period. Such sampling is an alternative to convenience sampling whereby the researcher asks participants (in this case superintendents) to recommend others (in this case teachers) to participate. “This form of sampling has the advantage of recruiting large numbers of participants” (Cresswell, 2012, p. 146), and potentially increasing the response rate when the initial contact is an employer (Fan & Yan, 2010). Appendix E includes a copy of the email correspondence, and Appendix F includes a printed version of the online survey.

Using addresses provided by the Ohio Educational Directory Lists (ODE, 2013a), an initial email was sent to 555 ($N=614$) public school superintendents across the state, who were given an overview of the study and asked to forward a link to the teachers in their district or to another administrator who might do the same. To facilitate meeting that request, a suggested script for the administrator-to-teacher email was provided, along with the link to the survey.

The link took respondents to the consent letter approved by the University of Toledo Social, Behavioral, and Educational Institutional Review Board. At the bottom of that letter was a link to the online survey. This process allowed for respondents to gather additional information about the study prior to beginning the survey.

The survey was created using Google Forms. It included three essential parts. The first asked teachers to identify the public school district in which they worked; this was the only demographic information collected from the respondents. The second included
the twenty-four items that comprise the TBASE measure, and the third included the eighteen items about sources of exposure to scholarship in education. Items were not numbered, but respondents were given a progress bar at the bottom of the screen. Additionally, the items were spaced so that a minimum amount of scrolling would be required of the respondent (see Appendix E).

At two, three, and four weeks after the initial email was sent to superintendents, additional emails were sent. Each of those emails reflected previous participation of the district to that point. In other words, different emails were sent to superintendents of districts from which responses were already collected than to superintendents of districts from which responses were not (see Appendix C).

At the end of the five week period, a total of 306 responses were collected from forty-four different districts in thirty-five different counties. In terms of the number of school districts contacted, the response rate for the current study is 7.93% ($n = 44$); and in terms of the number of teachers those districts employ, the response rate is 6.67% ($n = 306$). Table 6 provides more information about the response rates. While these response rates may seem low, Fisher (2008) asserts that “contrary to the concerns of many consumers of survey data, response rates often have little to do with the validity or reliability of survey data” (p. 1160). Also, it should be noted that response rates for electronically delivered surveys are typically lower than those of traditional paper surveys (Cook, Heath & Thompson, 2000; Baruch & Holtom, 2008; Fan & Yan, 2010). In fact, Baruch and Holtom (2008) report that the average response rates in the education industry are the lowest among the six major industries in their study (p. 1153). Finally, Table 7 indicates how the current study met recommendations for increasing response
Table 6

Response Rate Data

<table>
<thead>
<tr>
<th>Sample</th>
<th>Population</th>
<th>Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 Teachers</td>
<td>Teachers employed in the responding districts.(^1)</td>
<td>6.67%</td>
</tr>
<tr>
<td>44 Districts</td>
<td>District superintendents contacted via email.(^2)</td>
<td>7.93%</td>
</tr>
<tr>
<td>35 Counties</td>
<td>Counties represented by the districts contacted.(^2)</td>
<td>39.77%</td>
</tr>
</tbody>
</table>


Despite the low response rates, the study sample represents all but one district typology, Type 8: Urban. (One Type 8 district, Columbus City, confirmed receipt of the initial email and requested additional information regarding university approval; but, no respondents came from the district after meeting that request). Table 8 shows the distributions of typologies among districts in the state, the districts in the sample, and the districts outside of the sample frame. Finally, in terms of geography, the responses represent 39.77% \((n = 35)\) of the counties in the State of Ohio, and Figure 5 shows the geographic location of the sample responses, which extends across the state.

Data Analysis

The current study includes the validation and extension of a measure; consequently, a variety of analyses were involved. The validation of the Teacher Beliefs About Scholarship in Education (TBASE) measure was accomplished using Rasch model analysis procedures. The extension of the measure involved examining both descriptive statistics and inferential tests results of one-tailed independent samples \(t\)-tests.
Table 7

Factors Affecting Response Rate of Web Surveys Addressed

<table>
<thead>
<tr>
<th>Web Survey Development Stage</th>
<th>Factors Affecting Response Rate</th>
<th>Recommendations toward Increasing Response Rates Met by Current Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Survey Development</td>
<td>Content of Web Questionnaires</td>
<td>• Sponsored by academic agency.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Salient of topic.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Thirteen minutes or less to complete.</td>
</tr>
<tr>
<td></td>
<td>Presentation of Web Questionnaires</td>
<td>Simply worded items.</td>
</tr>
<tr>
<td>Web Survey Delivery</td>
<td>Sampling Methods</td>
<td>Use of list-based sample.</td>
</tr>
<tr>
<td></td>
<td>Contact Delivery Modes</td>
<td>No clear recommendations were made.</td>
</tr>
<tr>
<td></td>
<td>Designs of Invitations</td>
<td>• Mention of scarcity (i.e., approaching deadlines).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Clearly identified survey task, provided time commitment, avoided attachments, and provided contact information for assistance.</td>
</tr>
<tr>
<td>Web Survey Delivery</td>
<td>The Use of pre-notifications and Reminders</td>
<td>Made multiple contacts.</td>
</tr>
<tr>
<td></td>
<td>Incentives</td>
<td>No clear recommendations were made, but non-financial incentive was offered to Superintendents for encouraging teachers respondents.</td>
</tr>
<tr>
<td>Web Survey Completion</td>
<td>Participation in Web Surveys</td>
<td>Target of an employee population (rather than the general population).</td>
</tr>
<tr>
<td></td>
<td>Theories Examining Participation Decision</td>
<td>No clear recommendations were made.</td>
</tr>
<tr>
<td>Web Survey Return</td>
<td>Survey Software</td>
<td>Survey program supported by different browsers.</td>
</tr>
<tr>
<td></td>
<td>Data Safety</td>
<td>Data is password protected.</td>
</tr>
</tbody>
</table>


**Rasch model analysis.** The WINSTEPS Version 3.68.2 (Linacre, 2009) program was used to conduct a Rasch model analysis of the data for reliability and fit, accuracy of scale, and unidimensionality. Finally, an examination of the Rasch Model output resulted in a discernable, developmental progression of teacher beliefs as articulated by the survey items.

**Reliability and fit.** The first phase of analysis toward validating the TBASE
Table 8

School District Typology Percentages¹

<table>
<thead>
<tr>
<th>ODE 2013 Typology</th>
<th>State Distribution by Districts</th>
<th>Sample Distribution by Districts</th>
<th>Non-coverage Distribution by Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20.4</td>
<td>15.9</td>
<td>33.9</td>
</tr>
<tr>
<td>2</td>
<td>17.6</td>
<td>11.4</td>
<td>16.9</td>
</tr>
<tr>
<td>3</td>
<td>18.2</td>
<td>36.4</td>
<td>16.9</td>
</tr>
<tr>
<td>4</td>
<td>14.6</td>
<td>15.9</td>
<td>10.2</td>
</tr>
<tr>
<td>5</td>
<td>12.6</td>
<td>15.9</td>
<td>11.9</td>
</tr>
<tr>
<td>6</td>
<td>7.6</td>
<td>2.3</td>
<td>6.8</td>
</tr>
<tr>
<td>7</td>
<td>8.0</td>
<td>2.3</td>
<td>1.7</td>
</tr>
<tr>
<td>8</td>
<td>8.8</td>
<td>0</td>
<td>1.7</td>
</tr>
</tbody>
</table>


Typology Descriptors
1 Rural - High Student Poverty & Small Student Population
2 Rural - Average Student Poverty & Very Small Student Population
3 Small Town - Low Student Poverty & Small Student Population
4 Small Town - High Student Poverty & Average Student Population
5 Suburban - Low Student Poverty & Average Student Population
6 Suburban - Very Low Student Poverty & Large Student Population
7 Urban - High Student Poverty & Average Student Population
8 Urban - Very High Student Poverty & Very Large Student Population

measure was an iterative process focused on identifying items and respondents that do not fit among the others. That is, it determined which items do not reliably work with the others to measure the desired construct. It also determined which respondents do not provide reliable responses to the rest of the sample population. To perform this phase, model reliability scores, item correlations and mean square scores, and teacher correlation and mean square scores were examined. Any items and teachers with negative correlations were removed. Those items and teachers with a combination of low correlations and high mean squares were iteratively removed until model reliability scores were maximized.

Rasch analysis output provides two reliability statistics--person reliability and
Figure 5. Map showing location of respondents.

item reliability. Both can be interpreted much like Cronbach’s alpha where, on a 0 to 1 scale, reliability increases as the number approaches 1 (Bond & Fox, 2012; Linacre, 2009). “So ‘high reliability’ (of persons or items) means that there is a high probability that persons (or items) estimated with high measures actually do have higher measures than persons (or items) estimated with low measures” (Linacre, 2009, p. 463). Thus, this statistic speaks to the replicability of the measure performance across samples. Generally,
a reliability of .70 is considered acceptable, .80 is considered good, and .90 is excellent (Duncan, Bode, Lai, & Perera, 2003).

Various fit statistics are also provided by the Rasch analysis output. These statistics are reported as mean squares and indicate the extent to which the items or the persons fit the Rasch model (Bond & Fox, 2012; Linacre, 2009). In both cases, infit (which is sensitive to inlier patterns) and outfit (which is sensitive to outliers) are provided. Both Linacre (2009) and Bond and Fox (2011) provide guidelines for considering fit statistics but caution against an over reliance on such boundaries. Linacre (2009) writes, “there is always a judgment call” (p. 445); and Bond and Fox (2011) write, “fit statistics should be used to assist in the detection of problem item and person performances, not just decide which items should be omitted from a test” (p. 241). To that end, items and persons should be removed if they do not meet the guidelines until the point at which the reliability statistics no longer show improvement (Sondergeld & Johnson, 2014). Table 9 shows the guidelines offered by Linacre (2009, p. 444).

Table 9

Interpretations of Mean Square Fit Statistics (Linacre, 2009)

| >2.0 | Distorts or degrades the measurement system. |
| 1.5 - 2.0 | Unproductive for construction of measurement, but not degrading. |
| 0.5 - 1.5 | Productive for measurement. |
| <0.5 | Less productive for measurement, but not degrading. May produce misleadingly good reliabilities and separations. |

Accuracy of scale. Once the fit of the items and persons to the Rasch model have been adjusted to maximize the reliability, then the accuracy of the response scale is
examined. Several pieces of Rasch analysis output are used to do so.

First, the separation coefficient, which shows “the number of statistically different performance strata that the test can identify in the sample” (Wright, 1996, p. 472), should be considered. This characteristic of the scale is analogous to the number of lines between the inch marks on a ruler—the more there are, the more accurate the measure can be. Separation coefficients of 1.50 are considered acceptable, 2.00 are good, and 3.00 are excellent (Duncan, Bode, Lai, & Perera, 2003). It is this statistic that will be used to theorize the number of stages through which a population might progress as it develops the construct being measured—in the case of this study positive beliefs about scholarship in education. A separation coefficient of 3.00, for example, suggests four stages or strata (Duncan, Bode, Lai, & Perera, 2003). This statistic might also be used to examine the theoretical construct of the measure inasmuch as the sample responses reveal the number of statistically different strata that exist in the items.

Second, the structure of the response categories is examined. In the case of the TBASE measure being presented here, there are four categories—“strongly disagree,” “disagree,” “agree,” and “strongly agree”—which have been assigned values of 1 through 4 respectively for analysis. Data provided by the sample should confirm that the respondents could discern a difference between the response choices and that they are ordered appropriately. The WINSTEPS program provides an output table called the “Summary of Category Structure,” and Linacre (2002) provides eight guidelines by which to judge that output to confirm effectiveness of the scale categories. They are as follows:

Guideline 1: At least 10 observations of each category,
Guideline 2: Regular observation distribution (i.e., the observations do no “roller coaster”),

Guideline 3: Average measures advance monotonically with category,

Guideline 4: OUTFIT mean-squares less than 2.0,

Guideline 5: Step calibrations advance (i.e., increase as the assigned values increase),

Guideline 6: Rating categories imply measures, and measures imply rating categories (40% or more is preferred),

Guideline 7: Step difficulties (between category measures) advance by at least 1.4 logits, and

Guideline 8: Step difficulties (between category measures) advance by less than 5.0 logits.

As with the fit statistics, Linacre (2002) concludes his recommendations with the caveat that the guidelines are intended only as a starting point for evaluating rating scales and that not all guidelines apply to every situation.

**Unidimensionality.** Once the model reliability and the rating scale have been considered, the Rasch model analysis involves an examination of the dimensionality of the measure. That is, does the survey provide data about a single construct? Drouin, Horner, and Sondergeld (2012) write, “There is no agreed upon standard for determining unidimensionality” (p. 547). In fact, Linacre (2009) provides five different guidelines for assessing unidimensionality. One of them is to check that the variance in the data explained by the measure exceeds 50%. But, he notes that there are “plenty of exceptions” (p. 398). Smith (2002) suggests that any assessment of it is a qualitative
judgment that should be made in concert with interpreting the person and item fit.

Drouin, Horner, and Sondergeld (2012) demonstrate that restructuring the construct of the measure and comparing the reliabilities of the new and old constructs can help to make that judgment. This study makes use of Linacre’s variance-explained criteria and the method described by Drouin, Horner, and Sondergeld (2012). That is, the TBASE measure is divided into subscales to see if the reliabilities of one of them exceeds that of the TBASE measure as a whole.

**Developmental stages.** This study posits that the developmental stages detected by a measure can be deduced by considering three Rasch outputs: the person separation coefficient, the person-item variable map, and the items in measure order. First, the person separation coefficient indicates how many developmental stages the instrument can detect in the sample. For example, a coefficient of 3.00 suggests 4 stages (Duncan, Bode, Lai, & Perera, 2003). Second, the person-item variable map provides a visual indication as to what items are pertinent to each stage. Subsequently, the items in measure order can be used to determine possible cut-off measures between each proposed stage. The content of the items can then be interpreted to define the characteristics of each stage.

**Independent samples t-test.** To address the third research question of this study, the one-tailed independent samples t-test was used. The t-test is a common parametric test that compares the means of two independent samples on a continuous variable for statistical difference. The one-tailed t-test is used whenever the question it is meant to address concerns higher levels of the continuous variable among members of one of the samples. It assumes a normal distribution of the continuous variable within each sample.
and a homogeneity of variance between them, although “it has long been established that moderate violations of parametric assumptions have little or no effect on substantive conclusions in most instances” (Garson, 2012, p. 8; also Warner, 2008; Norman, 2010). Nevertheless, normality of each data set was confirmed through visual inspection of histograms (Warner, 2008; Garson, 2012). Levene’s tests for homogeneity of variance, which is “robust in the face of departures from normality” (Garson, 2012) was used to assess if equal variance could be assumed.

For this study, a one-tailed $t$-test was used to determine if teachers who report more exposure to a particular source of knowledge have more positive beliefs. Toward that end, two series of independent samples $t$-tests were conducted. Each set includes 18 separate tests, one for each of the sources of exposure to scholarship in education surveyed. Respondents reported the extent to which they believed each source contributed to their knowledge on a 5-point Likert-type scale: “the source of NONE of my knowledge about educational research (1),” “the source of LITTLE of my knowledge about educational research (2),” “the source of SOME of my knowledge about educational research (3),” “the source of MOST my knowledge about educational research (4),” “the source of ALL my knowledge about educational research (5).” The first series of $t$-tests divided the responses into two independent groups, $NONE$ to $SOME$ (1, 2, 3) and $MOST$ or $ALL$ (4, 5). The second series divided the responses into $LITTLE$ or $NONE$ (1, 2) and $SOME$ to $ALL$ (3, 4, 5). Doing so allowed for use of the $t$-test to examine mean differences at both ends of the response scale without eliminating the middle category, which represents the assumption that the majority of respondents have had some exposure to scholarship in education from all source types listed. As a result of
such groupings, there are some notable differences in sample sizes among the tests; therefore, if homogeneity of variance was not confirmed by Levene’s test, the \( t \)-test were conducted with equal variances not assumed (Hinkle, Wiersma & Jurs, 2003; Warner, 2008). Because multiple \( t \)-tests were conducted in each set, the likelihood of finding false positives in statistical significance or making Type I error increases; therefore, a Bonferroni correction was made for each comparison, which shows significance only under stringent and conservative conditions (Hastie, Tibshirani & Friedman, 2008; Warner, 2008; Seltman, 2014). The alpha level for all \( t \)-tests prior to the Bonferroni correction and for all Levene’s tests was set at .05.

Limitations

Factors that potentially limit the inferences that can be drawn from a survey study include errors that stem from non-observation--noncoverage, sampling, and nonresponse, and those that stem from the process of observation--measurement. (Dillman, 1991; Cresswell, 2012).

Coverage, sampling, and nonresponse errors arise when the sample population does not adequately represent the target population (Dillman, 1991; Cresswell, 2012). This study targeted public school teachers in Ohio through snowball sampling by contacting superintendents and asking them to distribute the survey to the teachers in their districts. That survey did not collect demographic information about the respondents other than the district in which they teach. Consequently, coverage is limited to those superintendents for whom the Ohio Department of Education listed an email address as of October 23, 2103 (\( n=555; N=614 \)). The sample is further limited to those teachers to whom the survey was forwarded, the total of which can not be accurately calculated.
Finally, coverage can not be reported in terms of demographic information (e.g., males, females, age). However, coverage and response rates can be reported in terms of district typology and geographic location of the respondents. And, as previously reported, all but one typology--urban--has some representation in the sample (See Table 8). Therefore, generalization of results to the entire population is limited.

Dillman (1991) defines measurement error as “the discrepancy between underlying, unobserved variables and the observed survey responses” (p. 228) which may be the result of respondent characteristics, survey characteristics, or question characteristics.

Of the possible respondent characteristics, he mentions ability and motivation; and of them, the current study only addressed respondent motivation, which is clearly related to response rate (Dillman, 1991). By employing superintendents in the sampling process, teachers may have been more likely to respond to the survey request as it came from their employer (Fan & Yan, 2010). Additionally, no demographic information was collected that could be used by superintendents to identify teacher respondents. Superintendents were incentivized to participate with the promise of a district-specific executive summary of the study results, and teachers were further safeguarded by conditionalizing that incentive to districts with at least five respondents.

With regards to the question characteristics, Dillman (1991) mentions phrasing and Creswell (2012) adds type and piloting to considerations that can be made in order to reduce measurement error. All statements included in the survey used in this study were subject to professional review. In terms of type, Creswell (2012) suggests including “personal, attitudinal, and behavioral questions” (p. 385), which closely aligns with the
experiential, attitudinal, and behavioral facets in the theoretical framework of the TBASE measure. Finally, the items on the TBASE measure were piloted and subjected to Rasch model analysis; however, the survey items used to explore associations between beliefs about scholarship and education and sources of professional knowledge were not piloted prior to this study.

Although some guidelines were used in the construction of the survey items (Hinkin, 1995; Summers, 1992; and Cresswell, 2012), the researcher acknowledges that given the topic of study (i.e., teacher beliefs) a more robust and qualitative vetting of the items would likely reduce the chance of measurement error even further in future studies.

Finally, Dillman (1991) mentions the order in which questions are asked and discusses mode as survey-characteristics that might contribute to measurement error. Of the TBASE items included in the survey used in this study, the order is identical to the pilot study. However, the pilot study and the current study delivered the items to the respondents differently. The pilot study emailed the survey to respondents, who then printed a paper copy; the current study collected responses through the web-based survey. Some features of the web-based survey used that were intended to maximize response rate and thereby minimize measurement error include reducing the amount of scrolling required of the respondent and including a progress bar at the bottom of the screen. Nevertheless, some consideration of these difference should be made when comparing results from each administration of the TBASE measure.
Chapter Four

Results

The twofold purpose of this study is to revalidate and extend a previously piloted quantitative measure of teacher beliefs about scholarship in education, and to better understand how teachers’ perceptions about the sources of their professional knowledge relate to those beliefs. This chapter presents the results of the data analysis conducted toward these purposes as defined by the research questions. The revalidation of the TBASE measure was achieved using Rasch modeling. Included in this chapter is a comparison of the analysis conducted using WINSTEPS Version 3.68.2 (Linacre, 2009) during the pilot and current studies. The extension of the measure in consideration of teacher sources of knowledge was achieved by conducting $t$-tests of additional data collected from the respondents using StatCrunch (2014), a web-based data analysis tool. The results of that testing is also included.

Research Question 1

How does the Teacher Beliefs About Scholarship in Education (TBASE) survey psychometrically function during the current study as compared to the pilot study? This question was divided into three smaller ones.

Research Question 1. a. What are the psychometric properties of the TBASE measure?

To address this question, specific results from the Rasch model analysis of the measure conducted during the pilot and current studies are compared. Those results include the model reliability of the measure and the accuracy of its scale as indicated by separation coefficient and the structure of the response categories. They are presented
together in Table 10.

Table 10

*Final Comparison of TBASE Psychometric Properties*

<table>
<thead>
<tr>
<th></th>
<th>Pilot Study</th>
<th>Current Study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model Reliability</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person (Teachers)</td>
<td>.92</td>
<td>.91</td>
</tr>
<tr>
<td>Item (Belief Statements)</td>
<td>.93</td>
<td>.99</td>
</tr>
<tr>
<td><strong>Separation Coefficient</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person</td>
<td>3.34</td>
<td>3.22</td>
</tr>
<tr>
<td>Item</td>
<td>3.53</td>
<td>9.88</td>
</tr>
<tr>
<td><strong>Category Structure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations of Categories (1,2,3,4)</td>
<td>15, 143, 301, 89</td>
<td>430, 1941, 2608, 402</td>
</tr>
<tr>
<td>Observation Distribution (regular or irregular)</td>
<td>regular</td>
<td>regular</td>
</tr>
<tr>
<td>Average Measures of Categories (1,2,3,4)</td>
<td>-1.87, -.64, 1.63, 3.86</td>
<td>-2.38, -.87, .76, 2.71</td>
</tr>
<tr>
<td>OutFit Mean Squares of Categories (1,2,3,4)</td>
<td>.16, .84, .89, 1.17</td>
<td>1.07, .97, 1.02, .96</td>
</tr>
<tr>
<td>Step Calibrations (between 1,2,3,4)</td>
<td>-3.61, -.21, 3.83</td>
<td>-3.16, -.33, 3.49</td>
</tr>
<tr>
<td>Ratings and Measures (Measure to Category)</td>
<td>0%, 67%, 70%, 70%</td>
<td>58%, 60%, 69%, 73%</td>
</tr>
<tr>
<td>(Category to Measure)</td>
<td>0%, 60%, 85%, 42%</td>
<td>21%, 65%, 78%, 26%</td>
</tr>
<tr>
<td>Step Difficulties of Categories (1,2,3,4)</td>
<td>-4.74, -1.92, 1.81, 4.94</td>
<td>-4.30, -1.75, 1.59, 4.61</td>
</tr>
</tbody>
</table>

**Model reliability.** The TBASE measure demonstrated model reliability indices of .92 for persons and .93 for items during the pilot study, and .91 for persons and .99 for items in the current study. All are considered excellent (Duncan, Bode, Lai, & Perera, 2003). To achieve these results, non-fitting persons and items were removed.

During the pilot study, the initial model reliability indices for persons and items were .90 and .93, respectively, and no person or item produced a negative point biserial statistic. Nevertheless, one item and one respondent were removed from the pilot data.
First, item ten was removed because it included a missing word. It read, “One can learn to teach by [reading] education journals,” which is intended to express an extreme attitude about the value of education journals to teachers. Removing the item increased the person reliability to .91, but decreased the item reliability to .92. Nevertheless, it was deemed appropriate to remove the item due to the missing word; the current study returned the removed item to the measure without the missing word error. Its removal resulted in a item fit mean square range of .57 to 2.08, which nearly fits the guidelines set at .50 to 2.00 (Linacre, 2009). One item, “I have submitted writing to an educational journal,” produced an infit of 2.08, an outfit of 2.04, and a point biserial of .58. Although these fit statistics are slightly above the guideline, a judgment was made to retain it because it was theorized to produce an extreme level of agreement and was deemed important to the measure framework (Bond & Fox, 2012; Linacre, 2009).

Person statistics were then considered, and person 21 was removed because his or her responses produced a combination of low point biserial (.25) and high infit and outfit mean squares of 3.20 and 3.17, respectively (Linacre, 2009; Drouin et al, 2012). Those responses were split between “strongly agree” to all statements about education professors and “disagree” to all statements about education journals. Removing this person increased the reliability to .92 and the item reliability remained at .93. His or her removal also resulted in a person fit mean square range of .21 to 2.24, which is outside of the suggested range of .50 to 2.00. One person produced an infit of 2.24, an outfit of 2.18, and a point biserial of .52; however, removal of this person did not change the model reliabilities, and so he or she was retained (Sondergeld & Johnson, 2014).

The removal of this item and person from the pilot study resulted in the final
reliabilities reported in Table 10. The remaining items and persons range in infit and outfit mean squares from .21 to 2.27, which are just beyond the suggested guidelines of .5 to 2.0 (Linacre, 2009). The infit of .21 is considered “less productive for measurement, but not degrading” (p. 444), and the outfit of 2.27 potentially “distorts or degrades the measurement system” (p. 444). Similarly, the point biserial for the remaining items and persons range from .11 to .82, or show “little” to “high” correlation (Hinkle, Wiersma & Jurs, 2003, p. 109). However, items and persons within these ranges may be considered acceptable if not more than one of the three statistics fall outside accepted guidelines and if their removal does not improve the overall reliability (Sondergeld & Johnson, 2014).

During the current study, the initial model reliability indices for persons and items were .91 and .99 respectively. Whereas item fit statistics were considered first during the pilot study, it is appropriate to consider the person fit statistics first here (T. Sondergeld, personal communication, April 14, 2014).

First, however, persons 65, 83, 115, 254, and 266 were all removed prior to starting this process because they appeared to be duplicates in the data showing the exact same timestamp and responses as persons 64, 82, 114, 253, 265. After removing these anomalies, four persons were removed because they produced a zero or negative point biserial correlation. Removing these nine persons decreased the person reliability to .90, but did not change the item reliability from .99.

An additional 71 persons were removed gradually in three stages, each with a narrower fit mean square range, toward the suggested range of .50 to 2.00 (Linacre, 2009). Table 11 represents those iterations. During each, persons were removed if both the infit or the outfit fell outside of the target range, then the model reliabilities were
<table>
<thead>
<tr>
<th>Number of Persons</th>
<th>Target Mean Square Range</th>
<th>Number of Persons Removed</th>
<th>Resulting Model Person Reliability</th>
<th>Resulting Model Item Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>297a</td>
<td>.30 - 3.00</td>
<td>17</td>
<td>.90</td>
<td>.99</td>
</tr>
<tr>
<td>280</td>
<td>.40 - 2.00</td>
<td>30</td>
<td>.91</td>
<td>.99</td>
</tr>
<tr>
<td>250</td>
<td>.45 - 1.85b</td>
<td>24</td>
<td>.91</td>
<td>.99</td>
</tr>
<tr>
<td>226</td>
<td>.50 – 2.00</td>
<td>10c</td>
<td>.91</td>
<td>.99</td>
</tr>
</tbody>
</table>

* After removing 9 persons: 5 duplicates, 3 with negative point biserial correlations, and 1 with a point biserial correlation of zero.

*b This iteration was a conservative measure as it fell well below the 2.00 guideline (Linacre, 2009).

*c As no improvement in reliability was detected these ten persons were retained.

rechecked until no improvement was detected (Sonbergeld & Johnson, 2014).

Upon the removal of an additional 71 persons, the model reliability ceased to improve, so a sample of 226 persons was achieved.

The item fit was then examined. The range of fit mean squares for items was .68 to 2.02, and the point biserial range was .30 to .66. Only one item, “I have worked on research with education professors,” produced an fit mean square exceeding the .5 to 2.0 guideline range (Linacre, 2009). However, it was not removed as two of the three criteria (infit 1.90, outfit 2.02, and pbis .34) are considered acceptable (Sonbergeld and Johnson, 2014). Thus, all 24 items were retained.

The total removal of the 80 persons and no items produced the final reliabilities reported in Table 10. The final fit range for both items and persons was .68 to 2.16, which is still just beyond the suggested guidelines of .50 to 2.00 (Linacre, 2009) but an improvement over the pilot study. The infit of .68 is considered “productive for measurement” (p. 444), and outfit of 2.16 potentially “distorts or degrades the
measurement system” (p. 444). Similarly, the final point biserial range of .03 to .88 for both items and persons shows “little” to “high” correlation (Hinkle, Wiersma & Jurs, 2003, p. 109). However, these ranges are considered acceptable as not more than one of the three statistics (infit, outfit, and point biserial) for any given person or item falls outside acceptable ranges and their removal does not improve the overall reliability (Sonderegeld & Johnson, 2014).

**Accuracy of scale.** The TBASE measure seems to employ an accurate scale. To make such an assessment, several pieces of information were considered (See Table 10). First, the person and item separation coefficients should be 1.5 to be considered acceptable, 2.0 to be considered good, and 3.0 to be considered excellent (Duncan, Bode, Lai, & Perera, 2003). Both the pilot and the current studies produced separation coefficients above 3.0 for both persons and items. Second, each response category—in this case, “strongly disagrees,” “disagrees,” “agrees,” and “strongly agrees”—must be observed at least 10 times in the data (Linacre, 2002), and those observations should have regular distributions. Such is the case for both administrations of the TBASE measure. The observation counts go no lower than 15; and in both cases the distribution of the observations rise and then fall, skewing toward the “agree” side of the scale. Third, the average measures of the response categories should increase monotonically (Linacre, 2002), and the values for the pilot (1.87, -.64, 1.63, 3.86) and for the current study (-2.38, -.87, .76, 2.71) do so. Fourth, the outfit mean squares of the response categories should be lower than 2.0 (Linacre, 2002). The largest mean square for a response category after both TBASE administrations is 1.17. Fifth, similar to the average measures of the response categories, the step calibrations between them increase as they should (Linacre,
2002) for both the pilot (-3.61, -.21, 3.83) and the current study (-3.16, -.33, 3.49).
Likewise, the step difficulties should advance between 1.4 and 5.0 logits (Linacre, 2002).
The smallest advance between categories occurred between 1 (“strongly disagrees”) and
2 (“disagrees”) during the current study for a total of 2.55 logits, and the largest advance
occurred between 2 (“disagrees”) and 3 (“agrees”) during the pilot for a total of 3.73
logits. Finally, the implications of ratings to measures and vice versa should ideally be
above 40% (Linacre, 2002), and it is here that some pause should be taken.

During the pilot administration of the TBASE measure, response categories 2, 3,
and 4 (“disagrees,” “agrees,” and “strongly agrees,” respectively) all performed above the
coherence guideline of 40% (Linacre, 2002). However, category 1 (“strongly disagrees”) was observed just 15 times, and the measure-to-category and the category-to-measure
cohere ce of were both 0%, well below the guideline. Under these conditions, some
investigation into whether or not revising the response scale will improve the
performance of the measure is in order—a step best taken during the pilot (Linacre, 2002;
Bond & Fox, 2012). Therefore, categories 1 (“strongly disagrees”) and 2 (“disagrees”) were combined. Further analysis of the three-point scale possibility, however, lowered
the model reliability scores to $r=.90$ for teachers and $r=.91$ for items. Also, the “Real
Separation” statistic for teachers changed little, from (2.99 to 2.97), still indicating that
the sample population of teachers is composed of four groups. Furthermore, the variance
in the data explained by the measure with a four-point scale (52.0%) decreased with a
three-point scale (49.5%). Consequently, the four-point scale was not collapsed.

During the current study, the response categories all performed above the
guideline of 40% coherence for measure to category, as did two of them, categories 2
(“disagrees”) and 3 (“agrees”) for category to measure. The other two, categories 1 (“strongly disagrees”) and 4 (“strongly agrees”) did not (See Table 10). Again, restructuring the response scale was investigated; this time a two-point scale was created by collapsing the extreme categories (“strongly disagrees” and “strongly agrees”) into their less-extreme counterpoints (“disagrees” and “agrees”). And again, no improvement in the overall performance of the measure was noted. In fact, the model reliability for teachers decreased from \( r = .91 \) to \( r = .85 \); the teacher separation statistic did change somewhat from 3.22 to 2.42, but the variance in the data explained by the measure decreased from 48.3% to 43.0%. Thus, the response scale was not revised, and it can be concluded that-- though not ideal--the implications of ratings to measures and vice versa do not belie the overall functionality of the TBASE measure.

Research Question 1. b. Do teacher experiences, attitudes, and behaviors regarding education professors and journals work together as a single construct?

Rasch model analyst refer to this characteristic as unidimensionality, and it is a subject of some debate (Drouin, Horner & Sondergeld, 2012). To possess it, every item or question on a survey instrument must be about a single concept. But, it can be argued that even a single question has multiple dimensions (Bond & Fox, 2011). So, it is necessary to consider the question from multiple angles.

One way to gauge unidimensionality suggested by Linacre (2009) is to look at the amount of variance in the data that is explained by the measure, and he suggests a simple majority as a guideline. During the pilot administration of the TBASE measure, that criteria was met with 52% of the variance explained by the measure. And, as long as all other indicators suggest that the measure is working, it is reasonable to consider this
dimensionality data as acceptable (G. Stone, personal communication, September 26, 2013). However, the variance explained by the measure during the current study was slightly lower, 48.3%. Therefore, alternate criteria were explored.

One other indicator to consider is the amount of common variance explained among those aspects of the data that are unexplained by the measure, referred to in WINSTEPS as “contrasts.” During both administrations of the TBASE measure the principal contrast clearly divided items about education professors and education journals. During the pilot, this contrast explained 14.1% of the unexplained variance in the data. That percentage was lowered to 11.8% during the current study. However, this was not an unexpected contrast given the theoretical framework used to create the measure. Nevertheless, Linacre (2009) writes, “The vital question is: ‘Is the multi-dimensionality in the data big enough to merit dividing the items into separate tests, or constructing new tests, one for each dimension?’” (p. 403)—a step that Bond and Fox (2011) state should be driven by theory. Therefore, a process used by Drouin, Horner, and Sondergeld (2012), whereby multiple measures are created and compared to the original measure, was employed.

Table 12 shows the comparisons made between the TBASE measure and the two smaller measures suggested by the principal contrast in the unexplained variance. The comparison indicates that the combined measure performs better. It detects a slightly larger number of divisions within the persons tested, with a greater reliability, and with a more desirable infit-outfit range. Similarly, the TBASE measure can also be divided into three smaller subtests, which are also indicated in Table 12. Each includes items that
Table 12

**TBASE Comparison to Subordinate Measures**

<table>
<thead>
<tr>
<th>MEASURE</th>
<th>Person Separation</th>
<th>Person Reliability</th>
<th>Item Separation</th>
<th>Item Reliability</th>
<th>pbis Range</th>
<th>Item Infit-Outfit Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBASE</td>
<td>3.22</td>
<td>.91</td>
<td>9.88</td>
<td>.99</td>
<td>.30 - .68</td>
<td>.68 - 2.02</td>
</tr>
<tr>
<td>Journals Only</td>
<td>2.95</td>
<td>.90</td>
<td>11.42</td>
<td>.99</td>
<td>.38 - .77</td>
<td>.58 - 2.31</td>
</tr>
<tr>
<td>Professors Only</td>
<td>2.75</td>
<td>.88</td>
<td>9.74</td>
<td>.99</td>
<td>.35 - .74</td>
<td>.66 - 2.23</td>
</tr>
<tr>
<td>Experiences Only</td>
<td>2.06</td>
<td>.81</td>
<td>8.49</td>
<td>.99</td>
<td>.52 - 70</td>
<td>.85 - 1.19</td>
</tr>
<tr>
<td>Attitudes Only</td>
<td>1.98</td>
<td>.80</td>
<td>8.98</td>
<td>.99</td>
<td>.53 - .69</td>
<td>.77 - 1.47</td>
</tr>
<tr>
<td>Behaviors Only</td>
<td>1.78</td>
<td>.76</td>
<td>11.56</td>
<td>.99</td>
<td>.46 - .69</td>
<td>.66 - 1.51</td>
</tr>
</tbody>
</table>

focus on one component of the theoretical model of belief development previously discussed--experiences, attitudes, and behaviors. Though some improvement in fit statistics is noted in each, all three show reductions in person separation and reliability when compared to the TBASE measure. Additionally, Drouin et al. (2012) note that “With traditional statistics, it is common to find that tests with the most items on them are the most reliable. This is not necessarily the case when using Rasch measurement methods, as tests with fewer items may be more reliable than those with more items, depending on the item quality and participant targeting” (p. 548). Therefore, it can be concluded that the TBASE measure is more unidimensional or more functional than any subtest its theoretical framework suggests. Furthermore, the primary purpose of this study--to revalidate the TBASE measure--is thus accomplished.

However, more can be said about the theoretical framework with regards to this
question. The model of the theory presented in Figure 1 in Chapter 1 suggests that belief develops over time as experiences influence attitudes, which affect behaviors. An examination of the TBASE items in measure order can reveal whether this pattern--experience, attitudes, behavior--is supported by the data. Figures 6 and 7 show a colorized sequence of belief statements in measure order from the pilot data and the current study respectively. Each figure includes all the items present on that administration of the TBASE measure, and then divides statements about education professors from those about education journals. Color codes and item content are also provided. By looking at these visual displays of the data, it becomes easy to see the experience-attitude-behavior (green-yellow-blue) sequence if it exists.

The data collected during the pilot study (Figure 6) show the theoretical sequence appearing four times within the sequence of all items (they have been indicated and counted in the figure). When considering statements about professors only, the sequence appears three times; and when considering statements about journals only, the sequence appears once. This is supportive of the theoretical model and further supports that the statements about professors and journals continue to support the model when combined. The current study (Figure 7) does not seem to produce such support. The theoretical sequence appears only once within the sequence of all items, and only once in the sequence of items about education professors. It does not appear within the sequence of journal items. Possible reasons for this difference will be discussed in Chapter Five.

**Research Question 1. c. What stages of positive belief development are indicated by the data?**

To address this question, three sources of information are considered: the person
<table>
<thead>
<tr>
<th>Logit Rank</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Education professors have given me ideas about teaching.</td>
</tr>
<tr>
<td>2</td>
<td>I have enjoyed talking to education professors.</td>
</tr>
<tr>
<td>3</td>
<td>Education professors help me become a better teacher.</td>
</tr>
<tr>
<td>4</td>
<td>I currently use teaching ideas I got from education professors.</td>
</tr>
<tr>
<td>5</td>
<td>Education journals have given me ideas about teaching.</td>
</tr>
<tr>
<td>6</td>
<td>I attend graduate classes in education to learn more about teaching.</td>
</tr>
<tr>
<td>7</td>
<td>Educational journals are valuable resources for my professional development.</td>
</tr>
<tr>
<td>8</td>
<td>I have met education professors who were teachers like me.</td>
</tr>
<tr>
<td>9</td>
<td>Education journals help me become a better teacher.</td>
</tr>
<tr>
<td>10</td>
<td>Education professors are valuable resources for my professional development.</td>
</tr>
<tr>
<td>11</td>
<td>I read education journals to learn more about teaching.</td>
</tr>
<tr>
<td>12</td>
<td>I currently use teaching ideas I got from education journals.</td>
</tr>
<tr>
<td>13</td>
<td>I have enjoyed reading education journals.</td>
</tr>
<tr>
<td>14</td>
<td>I have read of situations like mine in education journals.</td>
</tr>
<tr>
<td>15</td>
<td>Education journals reflect the realities of teaching.</td>
</tr>
<tr>
<td>16</td>
<td>I have relied on education journals for help as a teacher.</td>
</tr>
<tr>
<td>17</td>
<td>Education professors understand the realities of teaching.</td>
</tr>
<tr>
<td>18</td>
<td>I have worked on research with education professors.</td>
</tr>
<tr>
<td>19</td>
<td>I have relied on education professors for help as a teacher.</td>
</tr>
<tr>
<td>20</td>
<td>Education professors are master teachers.</td>
</tr>
<tr>
<td>21</td>
<td>I go to education journals to solve problems about teaching.</td>
</tr>
<tr>
<td>22</td>
<td>I go to education professors with problems about teaching.</td>
</tr>
<tr>
<td>23</td>
<td>I have submitted writing to an education journal.</td>
</tr>
</tbody>
</table>

\[ E = \text{Experience}; A = \text{Attitude}; B = \text{Behavior}; P = \text{Professor}; J = \text{Journal} \]

Professors Only

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<th>12</th>
<th>13</th>
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<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
<td>21</td>
</tr>
</tbody>
</table>

Journals Only

| 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 23 |
|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |

Figure 6. Color Coded Sequence of TBASE Items (Pilot Study). This allows for patterns in the item types to be seen. Specifically, the experience (E)-attitude (A)-behavior (B) pattern is of interest as it reflects the theoretical model used to create the TBASE measure.
I have enjoyed talking to education professors.
Education professors have given me ideas about teaching.
I attend graduate classes in education to learn more about teaching.
I currently use teaching ideas I got from education professors.
Education professors help me become a better teacher.
Education journals help me become a better teacher.
I have met education professors who were teachers like me.
Education professors are valuable resources for my professional development.
Educational journals are valuable resources for my professional development.
I have enjoyed reading education journals.
I read education journals to learn more about teaching.
Education journals have given me ideas about teaching.
I currently use teaching ideas I got from education journals.
Education journals reflect the realities of teaching.
I have read of situations like mine in education journals.
Education professors understand the realities of teaching.
I have relied on education professors for help as a teacher.
I have relied on education journals for help as a teacher.
Education professors are master teachers.
I have worked on research with education professors.
I go to education journals to solve problems about teaching.
I go to education professors with problems about teaching.
One can learn to teach by reading education journals.
I have submitted writing to an education journal.

Professors Only

Journals Only

Figure 7. Color Coded Sequence of TBASE Items (Current Study). This allows for patterns in the item types to be seen. Specifically, the experience (E)-attitude (A)-behavior (B) pattern is of interest as it reflects the theoretical model used to create the TBASE measure.
separation coefficient (reported in Table 10), the person-item variable map provided by WINSTEPS (Linacre, 2009), and the content of the items themselves.

The person separation coefficient represents the number of separations between groups that can be detected in the sample based upon their responses to the items on the measure, and each group represents a statistically different performance strata (Wright, 1996). During the pilot administration, the TBASE measure detected 3.34 person separations; during the current study, it detected 3.22 person separations. Thus, in both cases, the respondents could be divided into four groups (Wright & Masters, 2002). It is this number that was used to set the number of developmental stages of positive belief development that the TBASE measure can detect.

Next, the person-item variable maps provided by WINSTEPS (Linacre, 2009) shown in Figures 8 and 9 present the distribution of both persons and items along the same scale during the pilot and current administrations of the TBASE measure respectively. The persons or teachers are organized on the left from top to bottom according to how much of the quality measured by the survey they possess on average. In this case, those teachers at the top have stronger positive beliefs about education scholarship on average. The items or belief statements are organized on the right from top to bottom according to how frequently teachers are likely to agree with them on average. The beliefs at the top are the least likely to be held on average, and the beliefs at the bottom are the most likely on average.

This visual display of the data is often used to determine the appropriateness of the measure for the sample of people (Bond & Fox, 2012). Specifically, the location of the means relative to each other in Figure 8 indicates that the sample of teachers during
### Figure 8. Variable Map of Teachers and Belief Statements (Pilot).

This shows the relative distributions of teachers and belief statements, as well as divisions of the belief statements into stages starting from the bottom.
Figure 9. Variable Map of Teachers and Belief Statements (Current Study). This shows the relative distributions of teachers and belief statements, as well as divisions of the belief statements into stages starting from the bottom.
the pilot found the statements easy to endorse; but in Figure 9, the means appear identical, which indicates that the TBASE measure is well suited to the sample of teachers.

But, it is the right side of the map to which attention is paid when determining the developmental stages detected by the measure. There, the belief statements are clumped and divided by noticeable gaps. This visual display is sometimes used to detect redundant items or gaps in the measure’s ability to assess the underlying construct, but it can also be used to detect the divisions between developmental stages indicated by the content of the items (Bond & Fox, 2012). Starting from the bottom, the “easiest” end of the scale, the number of divisions indicated by the person separation coefficient are indicated with a dotted line within the displayed gaps (See Figures 4.3 and 4.4). The resulting groups of items can then be examined to inductively conclude the nature of each of the four stages.

Finally, Table 13 provides the full text the belief statements to which teachers responded during both administrations of the TBASE measure organized by stage. Within each stage, the statements are listed in logit (log odds unit) order with their logits scores shown in parenthesis. This table can be used for two purposes: to inductively conclude the nature of each stage and to compare the pilot and current results in that regard. Taking into consideration that the pilot did not include one item (One can learn to teach by reading education journals.), 15 of the 23 remaining items held in common are situated within the same stage, constituting a 65% agreement between the two results. Furthermore, a post hoc examination of the logit rank order of those 15 commonly-placed statements reveals a high a correlation ($r=.90$). Of the statements that differ in placement, which have been grayed out, each is just one stage above or below the stage indicated by
Table 13

*TBASE Items by Developmental Stage*

<table>
<thead>
<tr>
<th>Pilot: Stage 1</th>
<th>Current Study: Stage 1</th>
<th>Pilot: Stage 2</th>
<th>Current Study: Stage 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education professors have given me ideas about teaching. (-2.42)</td>
<td>I have enjoyed talking to education professors. (-1.83) +</td>
<td>Education professors help me become a better teacher. (-1.08)</td>
<td>Education journals help me become a better teacher. (-1.03)</td>
</tr>
<tr>
<td>Education professors have given me ideas about teaching. (-1.72)</td>
<td>Education professors help me become a better teacher. (-1.85)</td>
<td>Education journals help me become a better teacher. (-1.03)</td>
<td>Education journals are valuable resources for my professional development. (-.75)</td>
</tr>
<tr>
<td>I currently use teaching ideas I got from education professors. (-1.38) +</td>
<td>I currently use teaching ideas I got from education professors. (-1.67) -</td>
<td>Education professors are valuable resources for my professional development. (-.73)</td>
<td>Educational journals are valuable resources for my professional development. (-.67)</td>
</tr>
<tr>
<td>I attend graduate classes in education to learn more about teaching. (-1.48) +</td>
<td>I attend graduate classes in education to learn more about teaching. (-1.29) -</td>
<td>I have met education professors who were teachers like me. (-.73)</td>
<td>I have enjoyed reading education journals. (-.66)</td>
</tr>
<tr>
<td>I currently use teaching ideas I got from education professors. (-1.38) +</td>
<td>Educational journals are valuable resources for my professional development. (-1.11)</td>
<td>Education journals help me become a better teacher. (-.73)</td>
<td>I read education journals to learn more about teaching. (-.57)</td>
</tr>
<tr>
<td></td>
<td>Education professors are valuable resources for my professional development. (-.55)</td>
<td></td>
<td>Education journals have given me ideas about teaching. (-.38)</td>
</tr>
<tr>
<td></td>
<td>I read education journals to learn more about teaching. (-.37)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 13: *TBASE Items by Developmental Stage* (continued)

<table>
<thead>
<tr>
<th>Pilot: Stage 3</th>
<th>Current Study: Stage 3</th>
<th>Pilot: Stage 4</th>
<th>Current Study: Stage 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education journals reflect the realities of teaching. (.63)</td>
<td>I currently use teaching ideas I got from education journals. (.10) -</td>
<td>Education professors are master teachers. (2.01)</td>
<td>I have relied on education professors for help as a teacher. (.64) -</td>
</tr>
<tr>
<td>I have relied on education journals for help as a teacher. (.79) +</td>
<td>Education journals reflect the realities of teaching. (.16)</td>
<td>I go to education journals to solve problems about teaching. (2.31)</td>
<td>I have relied on education journals for help as a teacher. (.98) -</td>
</tr>
<tr>
<td>Education professors understand the realities of teaching. (.89)</td>
<td>I have read of situations like mine in education journals. (.19) -</td>
<td>I go to education professors with problems about teaching. (2.76)</td>
<td>Education professors are master teachers. (1.06)</td>
</tr>
<tr>
<td>I have worked on research with education professors. (.95) +</td>
<td>Education professors understand the realities of teaching. (.24)</td>
<td>I have submitted writing to an education journal. (3.21)</td>
<td>I have worked on research with education professors. (1.23) -</td>
</tr>
<tr>
<td>I have relied on education professors for help as a teacher. (1.10) +</td>
<td></td>
<td></td>
<td>I go to education journals to solve problems about teaching. (1.28)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I go to education professors with problems about teaching.(1.53)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>One can learn to teach by reading education journals.</em> (2.20)*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I have submitted writing to an education journal. (2.96)</td>
</tr>
</tbody>
</table>

Logit measures appear in parenthesis.  
Grayed boxes show a difference of one stage.  
+ indicates the same statement can be found one stage higher.  
- indicates the same statement can be found one stage lower.  
* Omitted from the pilot study.

the other administration. That is, a statement in stage two of the pilot study results will appear in either stage one or three of the current study results. Thus, if a statement can be found in one stage up (e.g., from stage two to stage three) a “+” has been placed after the logit measure, and a “-” indicates that it can be found one stage below.

One possible explanation for the difference, which will be discussed in the next chapter, is the fact that the pilot sample of teachers came from the same school district and therefore represent a less representative sample of the public school teachers in Ohio.  
For that reason and because of the greater item reliability (.99 versus .93), special
emphasis will be placed on the larger sample used for the current study when defining the nature of each stage.

**Stage one: Personal interaction.** During the first stage of development, teachers are exposed to education scholarship through interacting with education professors, perhaps in the context of a graduate class. They may enjoy these interactions and get ideas about teaching from them, and perhaps apply those ideas in their own practice.

The pilot study indicates that the first stage focuses solely on getting ideas about teaching from education professors; the enjoyment of talking to professors, the application of ideas received from them, and the attending of graduate classes toward that end come later in stage two. The three items that constitute this difference (see Table 13, *Current Study, Stage 1*) fall within a range of .57 logits on a 5.63 logit scale during the pilot, and .45 logits on a 4.79 logit scale during the current study. Thus, both samples of teachers placed them nearly equally close together on their respective scales, and just their placement in terms of stage is at odds.

**Stage two: Personal identification and increased autonomy.** The second stage of development begins with increased positive interaction with education professors and is marked by the introduction of education journals as a positive source of scholarship in education. Teachers begin to identify more with education professors and value them as resources for professional development. They also recognize the value and utility in the reading of education journals, and find some enjoyment in doing so; however, they may not relate to the situations they read about or use ideas from them.

Both administrations of the TBASE measure show that statements about education journals dominate this stage; 7 out of 13 statements during the pilot, and 5 out
of 8 during the current study. Because reading is arguably a more autonomous form of learning, an increased level of autonomy in belief development is assumed. In fact, the remaining two of the five items that distinguish stage two of the pilot are about education journals (See Table 13, Current Study, Stage 3). Those two items fall within a range of .36 logits on the pilot scale of 5.63 logits, and .29 logits on the current scale of 4.79 logits. Here, the items of difference are placed equally close together on their respective scales, and only the stage placement is at odds.

**Stage three: Professional identification.** By stage three, teachers have identified with situations written about in education journals and use teaching ideas they have found there. They now see that both education professors and journals have some connection to the realities of teaching they experience.

It is at this stage that the pilot and current studies differ in meaningful ways. First, the three items that appear in this stage during the pilot (See Table 13, Pilot Study, Stage 3) that do not appear until stage four of the current study span .31 logits of a 5.63 logit scale in the pilot results and .59 logits of a 4.79 logit scale in the results of the current study. In other words, they cover twice the distance of the scale in the current study as compared to the pilot. Second, their meaning is clearly distinct from the description given above as they are about reliance upon education professors and journals and conducting research with professors.

**Stage four: Acceptance of authority.** Stage four is marked by an acceptance that education professors write from a position of some authority. Teachers go to and rely upon both education professors and journals to help them solve problems about teaching. They accept that one can learn about teaching from reading journals and may even submit
their own knowledge to that body of work, accepting an *authority* of their own.

The difference in this stage between the pilot and current studies has been largely addressed in the previous section. However, the re-inclusion of a statement that was eliminated from the pilot study should be noted. That statement expresses an extreme attitude that “one can learn to teach by reading education journals,” which is verified by its placement at 2.20 logits on a scale the tops out at 2.96.

**Research Question 2**

What sources of professional knowledge about research in education are associated with an increase in positive beliefs about scholarship in education as measured by the TBASE survey?

The TBASE measure includes items about education professors and journals, two primary sources of teacher knowledge about external research; however, teachers are exposed to those sources in a variety of context and to education scholarship through various secondary sources. Therefore, to address this research question, 18 different sources were presented to teachers along with the TBASE measure (a complete list of those sources is presented in Table 5. Teachers were asked, “With regards to research conducted by someone other than yourself, how would you rank each of the following sources in terms of your professional knowledge?” The response scale given included five points: “the source of NONE of my knowledge about educational research,” “the source of LITTLE of my knowledge about educational research,” “the source of SOME of my knowledge about educational research,” “the source of MOST my knowledge about educational research,” and “the source of ALL my knowledge about educational research.”
Their responses were dichotomized in order to divide them into two groups of teachers for each of the 18 sources, and their TBASE measures were then compared using a series of one-tailed independent samples $t$-tests. Two series of $t$-tests were conducted. During the first series, the teachers were divided into “MOST or ALL” and “NONE to SOME.” During the second, they were divided into “SOME to ALL” and “LITTLE or NONE.” Conducting both series allows for statistical significance to be seen if present on both ends of the response scale without forcing respondents into either end. That is, on the 5-point scale described above, if a teacher selected “MOST” or “ALL,” it is clearly a choice made over “SOME.” Dichotomizing ordinal data in this way resulted in uneven sample sizes, so care was taken to test for the assumptions of normality and homogeneity of variances prior to conducting the $t$-tests. Normality was determined by visual inspection of the histograms (Warner, 2008; Garson, 2012). Homogeneity of variance was determined by conducting a Levene test, and if it could not be confirmed, the $t$-test were conducted with equal variances not assumed (Hinkle, Wiersma & Jurs, 2003; Warner, 2008). Additionally, because multiple $t$-tests were conducted in each set, which increases the likelihood of finding false positives in statistical significance or making Type I errors, a Bonferroni correction—a conservative adjustment—was made to the $p$ values (Hastie, Tibshirani & Friedman, 2008; Warner, 2008; Seltman, 2014). The alpha level for all $t$-tests prior to the Bonferroni correction and for all Levene’s tests was set at .05.

“MOST or ALL” and “NONE to SOME.” Do teachers who report that “MOST or ALL” of their knowledge about educational research comes from the given source have statistically significantly higher TBASE scores than those who report that “NONE
to SOME” of their knowledge comes from that source?

\[ H_0 : \mu_{\text{NoneToSome}} - \mu_{\text{MostOrAll}} \geq 0 \]

\[ H_A : \mu_{\text{NoneToSome}} - \mu_{\text{MostOrAll}} < 0 \]

The results of the \( t \)-tests are presented in Table 14.

Upon visual inspection of the histograms, all of which are included in Appendix G, eight of the eighteen sources were conservatively considered to produce normal distributions of TBASE scores within their respective samples. Among those eight listed in Table 14, only “Discussions with Education Professors Not Related to a Class” failed to demonstrate homogeneity of variance when applying Levene’s Test. Thus, the \( t \)-test for that source was conducted with equal variances not assumed, a procedure that decreases the degrees of freedom and is therefore more conservative (Warner, 2008). All other \( t \)-tests were conducted with pooled variances. The alpha levels were set at .05, and with the Bonferroni correction became .003.

The \( t \)-test results show two sources of significance. First, Ohio public school teachers who reported that “MOST or ALL” of their knowledge about educational research comes from education journal articles they found themselves \((M=1.03, SD=1.54)\) have statistically significantly higher TBASE scores than those teachers who report that “NONE to SOME” of their knowledge comes from that source \((M=-.10, SD=1.19)\); \( t(222)=-4.72, p<.05, \) one-tailed. The effect size is considered medium \((r^2=.09)\) with 9% of the variance in TBASE scores accounted for by the source (Warner, 2008).

Second, Ohio public school teachers who reported that “MOST or ALL” of their knowledge about educational research comes from discussions with education professors not related to a class \((M=1.12, SD=2.35)\) have statistically significantly higher TBASE
Table 14

First Comparison of TBASE Measure across Context and Sources of Exposure

<table>
<thead>
<tr>
<th>Exposure</th>
<th>MOST or ALL</th>
<th>NONE to SOME</th>
<th>Levene’s Test</th>
<th>Independent Samples $t$-Test (one-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>$M$ (SD)</td>
<td>Levene Statistic</td>
<td>$p$</td>
</tr>
<tr>
<td>Education Journal Articles You Found</td>
<td>31</td>
<td>1.03 (1.54)</td>
<td>-.10 (1.19)</td>
<td>.84</td>
</tr>
<tr>
<td>Discussions With Education Professors Not Related To A Class</td>
<td>10</td>
<td>1.12 (2.35)</td>
<td>.00 (1.21)</td>
<td>9.94</td>
</tr>
<tr>
<td>Discussions With Education Professors Outside Of A Class</td>
<td>15</td>
<td>.69 (1.52)</td>
<td>.14 (1.28)</td>
<td>1.38</td>
</tr>
<tr>
<td>Graduate Classes Online</td>
<td>28</td>
<td>.49 (1.47)</td>
<td>.02 (1.27)</td>
<td>.30</td>
</tr>
<tr>
<td>Out-Of-District Professional Conferences In Person</td>
<td>34</td>
<td>.16 (1.43)</td>
<td>.04 (1.28)</td>
<td>.59</td>
</tr>
<tr>
<td>Undergraduate Classes In Person</td>
<td>45</td>
<td>.14 (1.42)</td>
<td>.04 (1.28)</td>
<td>.01</td>
</tr>
<tr>
<td>Structured Meetings With Colleagues</td>
<td>48</td>
<td>-.07 (1.34)</td>
<td>.09 (1.28)</td>
<td>.14</td>
</tr>
<tr>
<td>Informal Meetings With Colleagues</td>
<td>58</td>
<td>-.27 (1.08)</td>
<td>.19 (1.35)</td>
<td>1.03</td>
</tr>
</tbody>
</table>

1 Levene’s test for homogeneity of variance ($F= 9.94, p = .0018$) suggests that the assumption was not met. Variances were not pooled. With pooled variance and after Bonferroni correction, no statistical significance is found, $t (221) = -2.70, p > .05$.

* statistically significant when $\alpha=.003$ after Bonferroni correction using $\alpha=.05$ and the calculator found at http://www.quantitativeskills.com/sisa/calculations/bonfer.htm

ns not significant

scores than those teachers who report that “NONE to SOME” of their knowledge comes from that source ($M=.00, SD=1.21$); $t(7)=-5.74, p<.05$, one-tailed. The effect size is considered large ($r^2=.82$) with 82% of the variance in positive beliefs accounted for by
In the interest of a more direct comparison between these two sources, a post hoc
$t$-test without pooled variances was conducted on the first variable discussed above,
“educational journal articles you found.” It also produced a significant result; $t(36) = \quad$
$-3.92, p = .0002$, one-tailed. The effect size was large ($r^2 = .30$) with 30% of the variance
accounted for by that source.

These conclusions do not, of course, speak to causality; rather, they simply
suggests that more positive beliefs about scholarship in education are associated with the
perception that most of one’s knowledge about educational research comes from finding
journal articles for oneself (versus having them provided) and with talking to education
professors outside of the context of taking a class. Both of these are specific contexts of
the primary sources included in the TBASE measure that suggest a certain agency on the
part of the teacher in seeking such knowledge.

Conversely, the other contexts of the primary sources and the secondary sources
explored did not produce significant results. Thus, the perception that most of one’s
knowledge about education research comes from any one of them can not be associated
with more positive beliefs about scholarship in education. For example, a teacher who
perceives that all or most of his or her knowledge about education research comes from
“structured meetings with colleagues” is not likely to have more positive beliefs about
scholarship in education than a teacher who perceives that just none, little, or some of
their knowledge comes from that source.

“LITTLE or NONE” and “SOME to ALL.” Do teachers who report that
“LITTLE or NONE” of their knowledge about educational research comes from the
given source have statistically significantly lower TBASE scores than those who report that “SOME to ALL” of their knowledge comes from that source?

\[ H_0 : \mu_{\text{LittleOrNone}} - \mu_{\text{SomeToALL}} \geq 0 \]

\[ H_A : \mu_{\text{LittleOrNone}} - \mu_{\text{SomeToALL}} < 0 \]

Visual inspection of the histograms in this set of comparisons eliminated three sources from being analyzed: “undergraduate classes online,” “graduate classes in person,” and “other.” These three were also eliminated from the first set of comparisons, limiting any conclusions that can be drawn about them. Thirteen of the fifteen remaining sources passed Levene’s test for homogeneity of variances. Comparisons made of the two that did not, “education journal articles you found” and “in-district professional conferences,” were conducted with equal variances not assumed. After making a Bonferroni correction to the \( p \)-values, ten source variables produced statistically significant results (see Table 15).

Four of the significant findings revolve around different context of a primary source, education journal articles. Ohio public school teachers who reported that “LITTLE or NONE” of their knowledge about educational research comes from education journal articles they found themselves (\( M=-.54, SD=.97 \)) have statistically significantly lower TBASE scores than those teachers who report that “SOME to ALL” of their knowledge comes from that source (\( M=.56, SD=1.33 \)); \( t(217)=-7.12, p<.05 \), one-tailed. The effect size is considered medium to large (\( r^2=.19 \)) with 19% of the variance in TBASE scores accounted for by the source (Warner, 2008). The results change little if the education journal article was given to them. Those teachers responding “LITTLE or NONE” (\( M=-.36, SD=1.07 \)) have lower TBASE scores than teachers who reported
Table 15

Second Comparison of TBASE Measures across Sources of Exposure

<table>
<thead>
<tr>
<th>Exposure</th>
<th>LITTLE or NONE</th>
<th>SOME to ALL</th>
<th>Levene’s Test</th>
<th>Independent Samples t-Test (one-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M (SD)</td>
<td>n</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Education Journal Articles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>You Found</td>
<td>103</td>
<td>-.54</td>
<td>121</td>
<td>.56</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.97)</td>
<td></td>
<td>(1.33)</td>
</tr>
<tr>
<td></td>
<td>127</td>
<td>-.40</td>
<td>96</td>
<td>.68</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.07)</td>
<td></td>
<td>(1.33)</td>
</tr>
<tr>
<td></td>
<td>113</td>
<td>-.48</td>
<td>111</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.08)</td>
<td></td>
<td>(1.30)</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>-.36</td>
<td>98</td>
<td>.58</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.07)</td>
<td></td>
<td>(1.38)</td>
</tr>
<tr>
<td></td>
<td>113</td>
<td>-.32</td>
<td>102</td>
<td>.51</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.17)</td>
<td></td>
<td>(1.31)</td>
</tr>
<tr>
<td>Discussions With Education</td>
<td>144</td>
<td>-.24</td>
<td>79</td>
<td>.60</td>
</tr>
<tr>
<td>Professors Outside Of A Class</td>
<td></td>
<td>(1.15)</td>
<td></td>
<td>(1.38)</td>
</tr>
<tr>
<td>Professional Organization</td>
<td>119</td>
<td>-.31</td>
<td>106</td>
<td>.48</td>
</tr>
<tr>
<td>Websites</td>
<td></td>
<td>(1.13)</td>
<td></td>
<td>(1.36)</td>
</tr>
<tr>
<td>Undergraduate Classes In Person</td>
<td>51</td>
<td>-.55</td>
<td>173</td>
<td>.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.13)</td>
<td></td>
<td>(1.30)</td>
</tr>
<tr>
<td>Out-Of-District Professional</td>
<td>140</td>
<td>-.15</td>
<td>84</td>
<td>.43</td>
</tr>
<tr>
<td>Conferences Online</td>
<td></td>
<td>(1.21)</td>
<td></td>
<td>(1.38)</td>
</tr>
<tr>
<td>Graduate Classes Online</td>
<td>93</td>
<td>-.22</td>
<td>127</td>
<td>.29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.31)</td>
<td></td>
<td>(1.26)</td>
</tr>
<tr>
<td>Educational Government</td>
<td>91</td>
<td>-.18</td>
<td>133</td>
<td>.27</td>
</tr>
<tr>
<td>Websites</td>
<td></td>
<td>(1.36)</td>
<td></td>
<td>(1.24)</td>
</tr>
<tr>
<td>Structured Meetings With</td>
<td>67</td>
<td>-.20</td>
<td>156</td>
<td>.16</td>
</tr>
<tr>
<td>Colleagues</td>
<td></td>
<td>(1.30)</td>
<td></td>
<td>(1.27)</td>
</tr>
<tr>
<td>Out-Of-District Professional</td>
<td>64</td>
<td>-.14</td>
<td>159</td>
<td>.14</td>
</tr>
<tr>
<td>Conferences In Person</td>
<td></td>
<td>(1.39)</td>
<td></td>
<td>(1.26)</td>
</tr>
<tr>
<td>In-District Professional</td>
<td>86</td>
<td>-.05</td>
<td>139</td>
<td>.14</td>
</tr>
<tr>
<td>Conferences</td>
<td></td>
<td>(1.52)</td>
<td></td>
<td>(1.14)</td>
</tr>
<tr>
<td>Informal Meetings With</td>
<td>51</td>
<td>-.03</td>
<td>174</td>
<td>.10</td>
</tr>
<tr>
<td>Colleagues</td>
<td></td>
<td>(1.34)</td>
<td></td>
<td>(1.29)</td>
</tr>
</tbody>
</table>

¹ Levene’s test for homogeneity of variance (F = 5.12, p = .0246) suggests that the assumption was not met. Variances were not pooled. With pooled variance and after Bonferroni correction, statistical significance was found, t (222) = -6.93, p < .05.
² Levene’s test for homogeneity of variance (F = 3.89, p = .0499) suggests that the assumption was not met. Variances were not pooled. With pooled variance and after Bonferroni correction, no statistical significance is found, t (223) = -1.11, p < .05.
* statistically significant when α=.003 after Bonferroni correction using α=.05 and the calculator found at http://www.quantitativeskills.com/sisa/calculations/bonfer.htm

ns not significant
“SOME to ALL” ($M=.58, SD=1.38$); $t(221)=-5.72$. $p<.05$, one-tailed. The effect size is also medium to large ($r^2=.13$) with 13% of the variance accounted for by the source. Similarly, for “education journal articles you did not read for a class,” teachers responding “LITTLE or NONE” ($M=-.40, SD=.1.07$) have lower TBASE scores than teachers who reported “SOME to ALL” ($M=.68, SD=1.33$); $t(221)=-6.70$. $p<.05$, one-tailed. The effect size is also medium to large ($r^2=.17$) with 17% of the variance accounted for by the source. And, with regard to journal articles that they did read for a class, teachers reporting that “LITTLE or NONE” ($M=-.48, SD=.1.08$) compared to “SOME to ALL” ($M=.59, SD=1.30$) have lower TBASE scores; $t(222)=-6.52$. $p<.05$, one-tailed. Here, the effect size is nearly the same ($r=.16$) with 16% of the variance explained.

Two of the significant findings relate to the other primary source of scholarship in education included in the TBASE measure, education professors. The context differ as to whether or not discussions teachers have with them are related to a class. Ohio public school teachers who reported that “LITTLE or NONE” of their knowledge about educational research comes from discussions with education professors outside of a class ($M=-.32, SD=1.17$) have statistically significantly lower TBASE scores than those teachers who report that “SOME to ALL” of their knowledge comes from that source ($M=.51, SD=1.31$); $t(221)=-5.01$, $p<.05$, one-tailed. The effect size is considered medium ($r^2=.10$) with 10% of the variance in TBASE scores accounted for those discussions. The results are nearly identical for “discussions with education professors not related to a class.” Teachers reporting “LITTLE or NONE” ($M=-.24, SD=1.15$) have significantly lower TBASE scores than those reporting “SOME to ALL” ($M=.60, SD=1.38$); $t(221)=-
4.86, \( p < .05 \), one-tailed with the same effect size and variance explained.

The last four sources producing significant results are not overtly related to one another, but three of them refer to digital experiences and all showed teacher who report “LITTLE to NONE” having lower TBASE scores than those reporting “SOME to ALL.” The first, “professional organization websites (e.g., National Education Association and Kappa Delta Pi),” produced a significant difference between teachers reporting “LITTLE or NONE” (\( M = -0.31, SD = 1.13 \)) and those reporting “SOME to ALL” (\( M = 0.48, SD = 1.36 \)); \( t(223) = -4.75, p < .05 \), one-tailed with a medium effect size \( (r^2 = .09) \) and 9% of the variance explained. Second, “undergraduate classes in person” showed teachers reporting “LITTLE or NONE” (\( M = -0.55, SD = 1.13 \)) having lower TBASE scores than those reporting “SOME to ALL” (\( M = 0.24, SD = 1.30 \)); \( t(222) = -3.95, p < .05 \), one-tailed with a small effect size \( (r^2 = .07) \) and 7% of the variance explained. Third, teachers who report that “LITTLE or NONE” of their knowledge about education research comes from “out-of-district professional conferences online” (\( M = -0.31, SD = 1.13 \)) had statistically significantly lower TBASE scores than teachers reporting “SOME to ALL” (\( M = 0.43, SD = 1.38 \)); \( t(222) = -3.30, p < .05 \), one-tailed with a small effect size \( (r^2 = .05) \) and 5% of the variance explained by that source of exposure. Finally, teachers reporting that “LITTLE or NONE” of their knowledge about education research comes from “graduate classes on line” (\( M = -0.22, SD = 1.31 \)) had statistically significantly lower TBASE scores than teachers reporting “SOME to ALL” (\( M = 0.29, SD = 1.26 \)); \( t(218) = -2.92, p < .05 \), one-tailed with a small effect size \( (r^2 = .04) \) and 4% of the variance explained by that source of exposure.

Again, no causal relationship can be declared; however, lower positive beliefs
among Ohio public school teachers about scholarship in education are associated with the perception of having little to no knowledge of it via the context and sources listed above. Conversely, perceiving that little to no amount of knowledge was obtained from the remaining five sources of exposure studied (see Table 15), has no statistically significant association with more or less positive beliefs. For example, a teacher who perceives that structured meetings with colleagues has contributed little to their knowledge of research in education is not likely to have less positive beliefs about such scholarship when compared to teachers who perceive otherwise.

**More about the TBASE stages of development.** Another approach to this research question employs descriptive statistics. Table 16 displays all eighteen contexts of primary sources and secondary sources explored in this study along with the average TBASE score of the groups “LITTLE or NONE,” “SOME,” and “MOST or ALL.” Next to each average TBASE score is the number of teachers in that group and the placement of that average score within the developmental stages of positive belief development previously discussed. Average TBASE scores that proved to be statistically significantly higher or lower than the other groups have been indicated. This information allows for a number of observations.

First among them, for eleven of the eighteen sources of knowledge the average TBASE score increases as the teachers’ perception of how much that source contributes to their professional knowledge increases. In other words, exposure to these sources over time seems to advance a teacher’s positive beliefs about scholarship in education. The remaining seven sources (undergraduate classes in person, in-district professional conferences, out-of-district professional conferences online, structured and informal
Table 16

Average TBASE Scores by Source of Knowledge

<table>
<thead>
<tr>
<th>Sources of Knowledge</th>
<th>LITTLE to NONE</th>
<th>SOME</th>
<th>MOST or ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M  n TBASE Stage</td>
<td>M  n TBASE Stage</td>
<td>M  n TBASE Stage</td>
</tr>
<tr>
<td>Undergraduate Classes (in person)*</td>
<td>-.55*</td>
<td>51   2</td>
<td>.28  128 3-4</td>
</tr>
<tr>
<td>Undergraduate Classes (on line)</td>
<td>-.05</td>
<td>136  3</td>
<td>.28  73 3-4</td>
</tr>
<tr>
<td>Graduate Classes (in person)</td>
<td>-.35</td>
<td>37   2-3</td>
<td>-.08 103 3</td>
</tr>
<tr>
<td>Graduate Classes (online)*</td>
<td>-.22*</td>
<td>93   2-3</td>
<td>.24  99 3</td>
</tr>
<tr>
<td>Discussions with Education Professors (outside of a class) *</td>
<td>-.32*</td>
<td>121  2-3</td>
<td>.48  87 3-4</td>
</tr>
<tr>
<td>Discussions with Education Professors (not related to a class) **</td>
<td>-.24**</td>
<td>144  2-3</td>
<td>.52  69 3-4</td>
</tr>
<tr>
<td>In-District Professional Conferences</td>
<td>-.05</td>
<td>86   3</td>
<td>.23  108 3</td>
</tr>
<tr>
<td>Out-of-District Professional Conferences (in person)</td>
<td>-.14</td>
<td>64   2-3</td>
<td>.13  125 3</td>
</tr>
<tr>
<td>Out-of-District Professional Conferences (online) *</td>
<td>-.15*</td>
<td>140  2-3</td>
<td>.47  77 3-4</td>
</tr>
<tr>
<td>Structured Meetings with Colleagues (e.g., Professional Learning Communities, Book Groups)</td>
<td>-.20</td>
<td>67   2-3</td>
<td>.27  108 3-4</td>
</tr>
<tr>
<td>Informal Meetings with Colleagues (e.g., Lunchtime or Hallway Conversations)</td>
<td>-.03</td>
<td>51   3</td>
<td>.29  116 3-4</td>
</tr>
<tr>
<td>Education Journal Articles (you read for a class) *</td>
<td>-.48*</td>
<td>113  2</td>
<td>.50  95 3-4</td>
</tr>
<tr>
<td>Education Journal Articles (you did not read for a class) *</td>
<td>-.40*</td>
<td>127  2</td>
<td>.58  81 3-4</td>
</tr>
<tr>
<td>Education Journal Articles (that were given to you) *</td>
<td>-.36*</td>
<td>125  2-3</td>
<td>.53  87 3-4</td>
</tr>
<tr>
<td>Education Journal Articles (that you found yourself) **</td>
<td>-.54**</td>
<td>103  2</td>
<td>.40  90 3-4</td>
</tr>
<tr>
<td>Professional Organization Websites (e.g., National Education Association, Kappa Delta Pi) *</td>
<td>-.31*</td>
<td>119  2-3</td>
<td>.50  92 3-4</td>
</tr>
<tr>
<td>Educational Government Websites (e.g., ODE, US Department of Education)</td>
<td>-.18</td>
<td>91   2-3</td>
<td>.12  108 3</td>
</tr>
<tr>
<td>Other</td>
<td>-.12</td>
<td>83   2-3</td>
<td>.21  52 3</td>
</tr>
</tbody>
</table>

* Statistically significant in one comparison (“LITTLE or NONE” to “SOME to ALL”)
** Statistically significant in both comparisions (“LITTLE or NONE” to “SOME to ALL” and “MOST or ALL” to “NONE to SOME”)

meetings with colleagues, professional organization websites, and other) also seem to promote some advancement of positive beliefs, but that advancement is not so linear. For example, a teacher who perceives that “most or all” of his or her knowledge about education research comes from structured meetings with colleagues is likely at Stage
Three: Professional Identification, but could approach Stage Four: Acceptance of Authority as his or her perception of the knowledge contribution of that source changes to just “some.” However, it is important to again note that this observation in the data does not prove such a causal relationship.

Second, by Stage 3: Professional Identification, teachers on average perceive that at least some of their knowledge about education research comes from all of the sources considered in the study.

Third, the statistically significant findings allow for some additional statements to be made in relation to the stages of developing positive beliefs about scholarship in education. An increase in perception of how much the following sources contribute to a teacher’s knowledge of education research is associated with movement beyond Stage Two: Personal Identification and Increased Autonomy according to their TBASE scores:

1. Undergraduate Classes (in person)
2. Education Journal Articles (you read for a class)
3. Education Journal Articles (you did not read for a class)
4. Education Journal Articles (that you found yourself)

In fact, with regards to education journal articles they found themselves, perceiving that it is the source of all or most of their knowledge about education research places teachers on average at Stage Four: Acceptance of authority.

Similarly, an increase in the perception regarding the contribution of the following sources is associated with movement into Stage 3 and perhaps beyond:

1. Graduate Classes (online)
2. Discussions with Education Professors (outside of a class)
3. Discussions with Education Professors (not related to a class)

4. Out-of-District Professional Conferences (online)

5. Education Journal Articles (that were given to you)

6. Professional Organization Websites

And, perceiving that all or most of his or her knowledge comes from non-class related
discussions with education professors would on average places that teacher at Stage Four.

Although the other sources suggest such movement between the stages, they did
not prove to be statistically significant--noting again that “undergraduate classes online,”
“graduate classes in person,” and “other” were eliminated from the statistical
comparisons made in this study due to failure to meet test assumptions. Nevertheless, the
information that has been presented thus far can begin to inform professional
development programming toward enhancing teachers’ “dispositions to access and use
research in their practice” (ODE, 2005, p. 73) in Ohio public schools.
Chapter Five

Discussion and Recommendations

The following chapter begins with a synopsis of the current study followed by a
discussion of the findings. The implications of those results are then discussed, and
recommendations for future research are given.

Synopsis

In response to the state requirement that each public school district in Ohio
develop a professional development program that “ensures that [teachers] have the
knowledge, skills and dispositions to access and use research in their practice” (ODE,
2005, p. 73), the current cross-sectional survey study sought to revalidate and extend a
new measure designed to help in that endeavor. Built upon the foundational ideas of
Dewey (1938), Tyler (1949), and Pajares (1992), the Teacher Beliefs about Scholarship
in Education (TBASE) measure includes statements about experiences with, attitudes
toward, and behaviors regarding both education professors and journals--two primary
sources of education research for teachers. Teachers were asked on a 4-point scale to
indicate their level of agreement with each statement. Rasch modeling of the resulting
data allowed for these statements to be sequenced and grouped into statistically
discernible stages of positive belief development and for the placement of individual
teachers within that progression. The premise for doing so goes back to Tyler (1949),
who recommends surveying learners prior to developing curricula in order to best meet
their needs.

In addition to validating the TBASE measure, the study sought to extend its use
toward a better understanding of how different contexts and sources of exposure to
external research in education might affect a teacher’s placement along the TBASE measure. To that end, teacher responses to eighteen additional items were collected. Those items provided various contexts and secondary sources of education research and asked teachers to indicate on a 5-point scale how much of their current knowledge comes from each one.

Snowball sampling was employed to distribute the TBASE measure and the additional items to Ohio public school teachers in 555 (N=614) districts throughout the state via their superintendents. A total of 306 (N=4587) responses were received. Rasch model analysis was then conducted to examine the psychometric properties of the TBASE measure, which was revalidated with a final person count of 226, a person reliability of .91, and an item reliability of .99. It was the data from that sample that was used to determine four developmental stages of positive belief development regarding scholarship in education: personal interaction, personal identification and increased autonomy, professional identification, acceptance of authority. From that same sample, a number of teacher groups were created based upon the teachers’ responses to the additional eighteen items in order to conduct a series of independent sample $t$-tests. Of the eighteen contexts and sources of research exposure explored, all but three met the parametric assumptions for such analysis. A total of ten were found to be statistically significantly associated with increased TBASE scores:

1. Undergraduate Classes (in person)
2. Discussions with Education Professors (outside of a class)
3. Discussions with Education Professors (not related to a class)
4. Education Journal Articles (you read for a class)
5. Education Journal Articles (you did not read for a class)
6. Education Journal Articles (that you found yourself)
7. Education Journal Articles (that were given to you)
8. Graduate Classes (online)
9. Out-of-District Professional Conferences (online)

What follows is a more detailed discussion of the results of this study organized by research question.

**Discussion**

Two research questions guided this investigation:

1. How does the *Teacher Beliefs About Scholarship in Education* (TBASE) survey psychometrically function during the current study as compared to the pilot study?

2. What sources of professional knowledge about research in education are associated with an increase in positive beliefs about scholarship in education as measured by the TBASE survey?

**Research question 1.** The performance of the TBASE measure during both administrations—the pilot and the current study—was largely consistent and in compliance with Rasch modelling criteria found in the literature (Bond & Fox, 2012; Drouin, Horner, & Sondergeld, 2012; Hinkle, Wiersma & Jurs, 2003; Linacre, 2002, 2009; Smith, 2002; Sondergeld & Johnson, 2014; Wright, 1996; Wright, Horn, & Sanders, 1997; Wright & Masters, 2002), thereby revalidating it for future use. There were, however, two differences of note between the two administrations.
First, the person separation coefficient for both administrations was essentially the same at just over 3 (see Table 10), which indicates that the measure was able to detect the same number of performance strata within both samples—one from a single district, the other from several districts across the state (Wright & Masters, 2002) and that the sample distributions were similar (Linacre, 2009). But, the item separation coefficients were much different. During the pilot it was 3.53, and during the current study, it was 9.88. Similarly, the item reliabilities differed from .93 to .99 respectively. The larger these numbers get, “the more confidence we can place in the replicability of item placement across the samples” (Bond & Fox, 2012), and their increase can be explained by the increase in the sample size (Linacre, 2009). Thus, it is the data from the larger sample that best informs the developmental stages presented here.

Also, given the relative sizes of the two samples (N = 24, and N = 226), a greater percentage of teachers were removed from the current study to reach those numbers (4% and 26%, respectively). Two points can be made about this. First, having to fit the research data to the Rasch model (e.g., by removing persons and items) is often mentioned as a disadvantage (De Champlain, 2010; Embretson, 1996; Magno, 2009; Sharkness & DeAngelo, 2011), but it allows for the sample independency and increased utility of the measure (De Champlain, 2010; Embretson, 1996; Hambleton & Jones, 1993; Magno, 2009; Sharkness & DeAngelo, 2011). Second, not all measures are well-suited for all people. Recall the example previously given; it would be inappropriate to measure the height of a 33-inch toddler with a ruler showing only yard demarcations. Thus it is important to note that the TBASE measure gauges positive beliefs only; all the items are positively stated and all proposed developmental stages describe positive
responses to education professors and journals. It is possible that some teachers have negative beliefs or a level of positive beliefs that is just below the TBASE items’ ability to measure.

Another comparison made between the two administrations of the TBASE measure for this investigation involved unidimensionality, whether or not the theoretical parts of the measure functioned as a single construct. Those parts included statements representing teacher attitudes, experiences, and behaviors with regard to education professors and journals. The results presented in Table 12 suggest that all of these parts function better together than separately. They offer quantitative evidence that beliefs are multifaceted (Pajares, 1992) and that teacher experiences, attitudes, and behaviors somehow affect one another (Dewey, 1938; Tyler, 1949), which adds to the previously presented quantitative evidence (Brindley, 1991; Castle, 2006; Gitlin et al, 1992; Holincheck, 2012; Hubschman, 1997; Isakson and Ellsworth, 1979; Ozturk, 2010 & 2011; Torff and Sessions, 2009). Likewise, they add to the previously presented evidence that beliefs about education journals are linked to beliefs about education professors (Gitlin et al, 1992; Gore and Gitlin, 2004; Holincheck, 2012; Isakson & Ellsworth, 1979; Ozturk, 2010 and 2011; Shkedi, 2010; Spencer-Chapman, 2008; Yilmalz & Kilicoglu, 2013).

How the different parts--specifically, the experience, attitude, and behavior statements--interacted was a matter of interest as well. The model of belief development developed from Dewey (1938), Tyler (1949), and Pajares (1992) represented in Figure 1 suggests a particular sequence of these parts that seemed more evident in the pilot study results, as revealed by Figures 4.1 and 4.2. Among the observations that could be made
about this difference are that the pilot sample represents a single school district, and that the researcher has been a teacher within that district since 2000. Since beliefs are “acquired through the process of cultural transmission” (Pajares, 1992, p. 325) and the context in which a teacher works affects his or her “intellectual tools, language, perspectives, social practices, and so on that [he or she] has acquired or learned” (Jones & Enriquez, 2009, p. 147), it is possible that the theory of belief development presented here is grounded in a particular context--that of the researcher’s home district. However, it is also possible that the experience, attitudes, and beliefs statements on the TBASE measure interact in ways that are 1) outside of the scope the current study to investigate fully and 2) supportive of the theorized model. Table 17 suggests three possibilities taken from the statewide sample of teachers that suggest interactions that cross both the developmental stages this study proposes and the professor/journal statements it includes. For each sequence, a logical narrative could be constructed. For example, it is possible that a teacher who reads of a situation like hers in an education journal article might come to hold the attitude that the author-- or education professors in general-- understand her reality as a teacher, which would prompt her to look to education journals for help with solving problems in the classroom.

In any case, it is the larger, statewide sample that produces the most reliable sequence of belief statements, that which should be used to reflect upon the theoretical framework used to create them. One means of doing so makes use of the proposed developmental stages of positive beliefs toward scholarship in education that were derived from that sequence. Table 18 lists all of the belief statements from the TBASE measure in logit order. Next to each is the predicted difficulty of agreement (which
Table 17

*Experience-Attitude-Behavior Sequences found in Statewide Sample Data*

<table>
<thead>
<tr>
<th>Experience Statement (logit rank)</th>
<th>Attitude Statement (logit rank)</th>
<th>Behavior Statement (logit rank)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have met education professors who were teachers like me. (7)</td>
<td>Education professors are valuable resources for my professional development. (8)</td>
<td>I read education journals to learn more about teaching. (11)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>I have read of situations like mine in education journals. (15)</td>
<td>Education professors understand the realities of teaching. (16)</td>
<td>I go to education professors with problems about teaching. (22)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Education journals have given me ideas about teaching. (12)</td>
<td>Education journals reflect the realities of teaching. (14)</td>
<td>I go to education journals to solve problems about teaching. (21)&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Note that this sequence is made up of statements that are all in proposed *Stage Two* and include both professor and journal statements.

<sup>b</sup> Note that this sequence is made up of statements that cross *Stages Three and Four* and include both professor and journal statements.

<sup>c</sup> Note that this sequence is made up of statements that cross proposed *Stages Two, Three and Four* and include only journal statement.

Corresponds the numerical reading of the response rating scale and the layers of belief discussed in Chapter 2), and the developmental stage they help to comprise (which indicates the actual difficulty of agreement). There is a 58% agreement between the predicted difficulty and the developmental stage. Nine or 38% of the items are predicted at an agreement difficulty that is just one higher or lower than the actual stage placement. And, only one item, “I currently use teaching ideas I got from education journals,” was considered so much more difficult to agree with than predicted that it is placed two stages above its predicted difficulty.

Another way to interpret this information is by predicted stage. If each level of agreement difficulty is considered a predicted stage, then the following can be said: stage one was predicted with 33% accuracy, stage two was predicted with 67% accuracy, stage three was predicted with 50% accuracy, and stage four was predicted with 100%
Table 18

*Comparison of Predicted and Actual Placement of Belief Statements*

<table>
<thead>
<tr>
<th>Item</th>
<th>Logit Rank</th>
<th>Predicted Difficulty (Stage)</th>
<th>Developmental Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have enjoyed talking to education professors.</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Education professors have given me ideas about teaching.</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>I attend graduate classes in education to learn more about teaching.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I currently use teaching ideas I got from education professors.</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Education professors help me become a better teacher.</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Education journals help me become a better teacher.</td>
<td>6</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I have met education professors who were teachers like me.</td>
<td>7</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Education professors are valuable resources for my professional development.</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Educational journals are valuable resources for my professional development.</td>
<td>9</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>I have enjoyed reading education journals.</td>
<td>10</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>I read education journals to learn more about teaching.</td>
<td>11</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Education journals have given me ideas about teaching.</td>
<td>12</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I currently use teaching ideas I got from education journals.</td>
<td>13</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Education journals reflect the realities of teaching.</td>
<td>14</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>I have read of situations like mine in education journals.</td>
<td>15</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Education professors understand the realities of teaching.</td>
<td>16</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>I have relied on education professors for help as a teacher.</td>
<td>17</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>I have relied on education journals for help as a teacher.</td>
<td>18</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Education professors are master teachers.</td>
<td>19</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>I have worked on research with education professors.</td>
<td>20</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>I go to education journals to solve problems about teaching.</td>
<td>21</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I go to education professors with problems about teaching.</td>
<td>22</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>One can learn to teach by reading education journals.</td>
<td>23</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>I have submitted writing to an education journal.</td>
<td>24</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Predicted Difficulty Numbers
1 = “utility of ideas” statements
2 = “value of sources” statements
3 = “connection to reality” statements
4 = “sense of authority” statements

Development Stage Numbers
1 = “Personal Interaction”
2 = “Personal Identification and Increased Autonomy”
3 = “Professional Identification”
4 = “Acceptance of Authority”

accuracy. Within predicted stage one, 67% of the statements were actually more difficult to agree with, and within stage two, 33% of the statements were actually less difficult to agree with. Of the statements in predicted stage three, 17% were less and 33% were more difficult to agree with. Thus, 67% of the erroneously predicted statements were actually more difficult and 33% were less difficult to agree with.
The failures to predict accurately must be considered a function of the item placement during development. First, the layers of belief within the TBASE framework align with the findings of previous studies (Holincheck, 2012; Isakson & Ellsworth, 1979; Joram, 2007; Yilmalz & Kilicoglu, 2013). Second, all of the items were used. Third, all of the predicted layers were at least 33% accurate. Fourth, the same number of performance strata as predicted layers was statistically discernible in both TBASE administrations. Therefore, a logical conclusion is that a more qualitative vetting of the items such as suggested by Dawis (1987) or Hinkin (1995) would have increased the accuracy of the predictions.

Although the larger sample produced more reliable belief statement sequencing, .99 versus .93 for the pilot study (See Table 10), and thus more reliable information about the developmental stages presented here, all of the differences in the stages have been noted. One in particular, however, seems meaningful. The pilot sample found three items that were ultimately placed in Stage Four: Acceptance of Authority much more related to one another than the larger sample of teachers. Those items are listed again in Table 19 in logit order.

When considering this difference, it is perhaps important to note two facts about the sample of teachers. First, all of the teachers in the pilot sample came from a district labeled by ODE as a “Type 6: Suburban - Very Low Student Poverty & Large Student Population” while 45.5% of the teachers in the statewide sample are in districts with “average” or “high student poverty” (See 3.4). Second, the pilot sample of teachers produced a higher TBASE mean than the larger, statewide sample. This particular finding corroborates that of Torff and Sessions (2009)--that teachers from schools of higher
Table 19

Comparison of Three Stage-Four Items to Pilot Results

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>Pilot Sequence (logit)</th>
<th>Final Sequence (logit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have relied on education journals for help as a teacher. (.79)</td>
<td>I have relied on education professors for help as a teacher. (.64)</td>
<td></td>
</tr>
<tr>
<td>I have worked on research with education professors. (.95)</td>
<td>I have relied on education journals for help as a teacher. (.98)</td>
<td></td>
</tr>
<tr>
<td>I have relied on education professors for help as a teacher. (1.10)</td>
<td>I have worked on research with education professors. (1.23)</td>
<td></td>
</tr>
</tbody>
</table>

| RELATIVE SPAN                                                                 |
| logit span of items .31                                                | logit span of items .59                                                        |
| logit span of scale 5.63                                                | logit span of scale 4.79                                                      |
| percentage of scale 5.5%                                                | percentage of scale 12.3%                                                     |

socioeconomic status (SES) have more positive belief about professional development.

That being noted, the sequence in the pilot sample seems to suggest a much more collegial relationship with scholarship in education. They are more likely to search the published literature themselves and work with education professors than they are to rely on those professors. In contrast, the larger sample is more likely to rely first on the education professors than to work with them. Thus, teachers in the pilot sample own a greater sense of authority than teachers in the larger sample. This could be a function of the more favorable professional development experiences that their SES allows (Torff & Sessions, 2009).

However, it is the professional development experiences of all public school teachers in Ohio and how they might increase positive beliefs about scholarship in education that concerns this study. When compared to the previously reviewed solutions to the practice-theory tension modeled in Figure 2, the sequence of belief statements and
developmental stages presented here suggest a sort swinging pendulum that parallels the historical swing from high professor involvement (Melvin, 1973) to high teacher involvement (DuFour, 1998) and back again to somewhere in the middle (Huberman, 1993). Specifically, Figure 7 visually indicates that the sequence begins with mostly education professor items, moves to mostly education journal items—indicating a more autonomous mode of access, and ends with shorter fluctuations between the two. Thus, generally speaking, addressing teacher beliefs about education professors seems to be required before their beliefs about education journals can be addressed, but the two ultimately interact.

Recall that the charge from the Ohio Department of Education is that teachers “access and use research in their practice (2005, p. 73). To that end, specific TBASE statements become of particular interest. The first of these is statement 6 (as listed in Figure 7), “Education journals help me become a better teacher” (logit -1.03). It is the first statement about education journals to appear in the sequence, and it does so only after five or 42% of the statements about professors have already been sequenced. The second is statement 9, “Educational journals are valuable resources for my professional development” (logit -.67), which begins a string of seven journal statements. Statement 9 differs from statement 6 in that it recognizes the value of the resources as opposed to the occasional helpful idea that might be encountered there. It is also noteworthy that these two journal statements are sequenced before statement 10 “I have enjoyed reading education journals” (logit -.66) because it supports previous findings about the priority teachers place on the utility of ideas (Holincheck, 2012; Joram, 2007). In fact, the first statement about professors to break the string of journal statements is number 16,
“Education professors understand the realities of teaching” (.24 logits), and it is thereafter that the sequence begins to fluctuate between professor and journal statements.

The last two statements of particular interest directly relate to the use of ideas found in journals. They are “I currently use teaching ideas I got from education journals” (logit rank 13 at -.10 logits) and “I go to education journals to solve problems about teaching” (logit rank 21 at 1.28 logits). First, the distance between these items most likely rests upon the intentional use of the journal literature as a professional resource versus the occasional adoption of an idea found there. Second, even before the former case, the majority (7 or 58%) of professor items have already been sequenced (See Figure 7); and before more intentional accessing of the literature occurs, nearly all (11 or 92%) of them have been sequenced.

Given this evidence, it seems logical that some attention needs to be given to the amount and nature of the interactions between classroom teachers and education professors when designing professional development programming that hopes to encourage the use of external research by teachers. Teacher experiences, attitudes, and behaviors with regard to both education journals and professors proves to function as a single construct called here scholarship in education, and within that construct, positive beliefs about education professors seem to serve as prerequisites to positive beliefs about education journals. Of the literature reviewed here, perhaps the closest match to this idea is found in the work of Gitlin et al (1992) on Educative Research, which would be placed in Figure 2 near Huberman’s (1993) Sustained Interactivity. While both of them expressed the need for extended interaction between teachers and education professors or researchers toward encouraging teacher ownership of ideas, only Gitlin et al begin to
approach the use of externally generated ideas found in education journals and the role of the education professor toward that end. They make plain the establishment of the hierarchical structure of the professor-practitioner relationship that needs to be broken down and rebuilt prior to any productive exchange of ideas. The data here supports that need.

**Research question 2.** Recognizing that teachers are exposed to research in education in a variety of ways that may or may not include interactions with education professors, the second research question sought to find relationships between positive beliefs about scholarship in education and some of those other means. To that end both descriptive and inferential statistics about teacher perceptions of 18 contexts or sources were considered.

Unfortunately, three of those sources were eliminated from any parametric analysis for failing to meet the assumption of normal distribution. One these, “graduate classes in person,” is arguably the most common context in which in-service teachers interact with education professors (Shkedi, 2010). In fact, the descriptive statistics provided in Table 16 show that 187 or 83% of the teachers responding to this survey item say it is the source of “some,” “most,” or “all” their knowledge about education research, which exceeds any other source examined. The histograms for this source suggest a spike in the population among teachers in *Stage One: Personal Interaction*, which might have been caused by teacher respondents who were currently taking classes. Another source that was similarly eliminated from analysis was “undergraduate classes online.” The majority of the the teachers responding to it (62%) indicated that it was the source of “none” or “little” of their knowledge about education research. This perhaps not
surprising; the researcher’s own experience with online education did not begin until enrolling in graduate level courses, and this may be the case among teachers in the sample. In any case, the histograms for this source both show two spikes among teacher in that later stages, *Stage Three: Professional Identification* and *Stage Four: Acceptance of Authority*. It is possible that these are cause by respondents who are young in their careers and are still very much influenced by their teacher preparation coursework.

Finally, the source “other” was also eliminated from parametric analysis, and it is difficult to hypothesize about the distributions shown in the histograms. Nevertheless, a complete list of “other” qualifying responses is provided in Appendix H.

Among the sources studied that did meet the parametric assumptions for both sets of $t$-tests performed, five consistently showed no association with change in TBASE scores: “structured meetings with colleagues,” “informal meetings with colleagues,” “out-of-district professional conferences in person,” “in-district professional conferences,” and “educational government websites.” The first three of these are surprising in that they are firmly based within the teacher’s daily context, which is preferred among teachers (DuFour et all, 2008; Gore & Gitlin, 2004; Holincheck, 2012; Joram, 2007; Ozturk, 2010; Yilmalz & Kilicoglu, 2013). It is for this same reason that the third is not surprising, experiences out-of-district are perhaps too far removed from the teacher’s daily experience. The last, “government websites,” can be considered contextualized within the teacher’s experience as they are most likely accessed out of some necessity, but it is more likely that such websites are sources for what must be done versus what could be done.
However, that meeting with colleagues might not compel change in TBASE scores is consistent with the idea that beliefs can be self-perpetuating, that teachers--perhaps even groups of teachers from the same district--will likely relate to scholarship in education in ways that only reaffirm their current beliefs and practices (Haidt, 2006 & 2012; Pajares, 1992). This calls into question the tenet behind Professional Learning Communities (PLC) that teachers will or can self-select research-based literature that might compel changes in their classroom practices (DuFour et al, 2008). Again, it seems some objective party (e.g., education professors) might play an important role in the consumption of external research toward classroom change. All that being said, it should be noted that most teachers recognized these sources as contributors to “some” of their professional knowledge, and that those who did were on average in Stage Three or approaching Stage Four in their development of positive beliefs about scholarship.

In contrast, the two sources that consistently showed statistically significant associations with an increase in TBASE scores across both sets of t-tests are “education journal articles you found” and “discussions with education professors not related to a class.” As previously stated, these suggest a certain agency on the part of the teacher seeking knowledge, in each case with a primary source of scholarship in education. It is therefore more likely that the purpose for accessing these sources is contextualized in the teacher’s classroom experience or need. In any case, both sources are associated with movement from Stage Two: Personal Identification and Increased Autonomy to Stage Four: Acceptance of Authority; however, the majority of teachers in this study report that “little” or “none” of their knowledge comes from these sources.
In fact, of the ten sources found to be statistically associated with change in TBASE scores, eight of them were indicated by the teachers in the sample to be the source of “little” or “none” of their knowledge. Only, “undergraduate classes (in person)” and “graduate classes (online)” were indicated by a majority of teachers as the source of “some” of their knowledge. In the first case, the majority is clear at 57% of the total number of teachers; it is perhaps safe to say that the majority of teachers working in Ohio public schools today have experienced that venue. In the second, the majority is more slight at 45% of the total number of teachers; still, taking online classes to meet professional development requirements is common.

The other eight sources can be characterized as falling into three groups. Two of them involve personal interaction with professors: “discussions with education professors (outside of a class)” and “discussions with education professors (not related to a class).” Both are statistically associated with moving from *Stage Two: Personal Identification and Increased Autonomy* into *Stage Three: Professional Identification*, and the later is also associated with *Stage Four: Acceptance of Authority*. This suggest the sort of progression in relationship between teachers and professors that is detailed in the work of Gitlin et al (1992). Within the context of a class, teachers often put education professors in the position of authority—whether they accept that authority or not; but, the relationship can develop into one in which the teacher recognizes his or her own authority in partnership with the professor’s toward some common educative purpose. That development requires time and opportunities for collaborative work. Perhaps the lack or nature of such experiences contributes to the fact that the majority of teachers do not see them as contributing to their knowledge or research in education.
Four of the eight statistically significant sources that are considered low contributors to such knowledge are specifically about education journal articles. Whether or not they are read for a class, whether teachers found them or they were provided, education journal articles are consistently rated as contributing little or nothing to teachers’ knowledge about educational research despite the fact that they are clearly intended to be a primary source of such knowledge. This finding supports the previous literature that raises the accessibility of journal articles as an important issue, and suggests that it may be that teachers struggle to understand or contextualize the findings presented in the literature into their daily experiences in the classroom (Brindley, 1991; Castle, 2006; Gore & Gitlin, 2004; Hollincheck, 2012; McEwan & McEwan, 2003). The finding also corroborates Smylie (1989) who finds that “professional journals” rank ninth in value on a list of fourteen sources (See Table 1). It makes sense that teachers would not value a source that they believe to contribute little to their knowledge. In fact, Smylie (1989) reveals that “professional journals” ranked lower that “consultation with other teachers,” mirrored here by the finding that teachers indicate “structured [and] informal meetings with colleagues” to be a greater source of their knowledge than journal articles. All this suggests that perhaps an approach similar to Professional Learning Communities (PLC) (DuFour & Eaker, 1998), during which teachers collectively review the literature, might help to raise the level to which journal articles are valued.

However, Smylie (1989) also finds that “study and research pursued on their own” ($M=3.46$) to be nearly equal in value to teachers as “consultation with other teachers” ($M=3.47$). And, among the journal article items in this study, “education journal articles that you found yourself” was the only one statistically association with movement
from *Stage Two* to *Stage Four*--from *increased autonomy* to *acceptance of authority*. Therefore, to both raise the perceived value of journal articles and promote positive beliefs about them, teachers must seek out those articles for themselves, increasing the likelihood of applicability of the research to the teachers’ lived experiences. But, it does not address the issue of accessibility. Perhaps approaches like the PLC could be revisited in order to more specifically address *how* teachers can access the literature or support each other in doing so as opposed to *why*. This sort of an approach is suggested by McEwan and McEwan (2003).

The last two of the eight statistically significant sources that teachers indicate as low contributors to their knowledge about education research refer to digital experiences. Both “out-of-district professional conferences online” and “professional organization websites” are associated with moving from *Stage Two: Professional Identification and Increased Autonomy*, through *Stage Three: Professional Identification*, and into *Stage Four: Acceptance of Authority*. Because they are both online platforms, these sources are typically individual experiences--one teacher, one screen. The digital one-on-oneness of the professional conference may be a substitute for the increased personal attention to which teachers from higher socioeconomic school districts are privileged (Torff & Sessions, 2009). This would explain why teachers might associate more closely with those presenting the research. The searchability of professional websites certainly facilitates locating research that is applicable to a given classroom situation, and that would help to improve positive reactions to the education research as a source of professional knowledge and increase a sense of autonomy. All of these are aspects of moving from *Stage Two* to *Stage Three*. And, it makes sense that such interactions
would lead into an *acceptance of authority*; we readily give credence to sources of information we find helpful. Thus, the digital experiences that did not really exist at the time Smylie (1989) conducted his study might be effectively used toward meeting the current mission of promoting positive beliefs about scholarship in education. But, why these sources are seen as low contributors to teacher knowledge is most likely a matter of time. Both require time away from the classroom and the daily work of teaching, which Holincheck (2012) finds to be conducive to increasing positive attitudes toward research and Brindley (1991) finds to be a challenging for teachers to find.

Whether it is that teachers do not have enough access to these eight sources of knowledge about research in education or they are unable to recognize the extent to which they contribute to their own knowledge is unclear. This study, however, shows that they are associated with increased positive beliefs about scholarship in education and ought to be carefully considered when designing professional development programming intended to do so.

**Implications**

These findings have implications for both education scholars and school district administrators. First, for education scholars, the introduction of a theoretically based, statistically valid measure of teachers beliefs about scholarship in education gives scholars a quantitative means to support an area of study that is most often explored using qualitative methods. Second, that the TBASE measure meets the Rasch model criterion of unidimensionality as it is currently defined in the literature further supports the notion that beliefs may be multifaceted but single constructs. Specifically, this study demonstrated that beliefs--statements of experiences, attitudes, and behaviors--about
education professors and journals function better as construct when considered together than separately. Such a finding speaks to the work of education scholars as publishers of ideas. It highlights the importance of personal connections between education scholars and classroom teachers, which has implications for how local universities and school districts might interact with one another outside of the context of specific academic study. Finally, the sequencing and grouping of TBASE statements into statistically discernible stages of positive belief development about scholarship in education can be directly applied to the development or evaluation of coursework in continuing education for teachers.

Likewise, for school district administrators, the findings can inform decisions about professional development programming for teachers. The Ohio Department of Education has stated that the purpose of such programming is in part to “ensure that [teachers] have the knowledge, skills and dispositions [emphasis added] to access and use research in their practice” (ODE, 2005, p. 73). Toward that end, the promotion of positive beliefs about scholarship in education is a desirable component of that programming. This study suggests how that might be accomplished. First, teachers need opportunities to connect with professors outside of the classroom. Such interactions seem to be a prerequisite for embracing the work they publish in education journals. Second, in-service teachers need continuing support in accessing education journals. That support could come in the form of providing collections or subscriptions in schools and the time to explore them both independently and with colleagues. They may also need assistance with contextualizing research findings into their lived experiences. Third, a wide range of sources can promote the development of positive beliefs, so a diversity of educational
opportunities seems appropriate. Finally, teacher meetings-- whether informal, structured, or as part of out-of-town conferences-- that are intended to promote use of research need to be carefully considered; they may to have no impact on changing beliefs. This is not to suggest that they do not play a vital role in professional development; rather, they may serve best at providing reinforcement and support for the beliefs about scholarship in education that are already established within the group.

**Recommendations**

It is appropriate that the presentation of a new measure be followed by recommendations for its use and for future research.

**Recommendation for use.** The TBASE measure has potential utility within both public schools and post-secondary institutions. Administrators of public school districts can use the measure in at least three ways. First, it can be used to determine the current stages of teachers and which professional development opportunities might be recommended to each toward moving him or her to the next stage. Doing so would help Ohio administrators to contribute quantitative data to those professional growth plans that are required by the Ohio Teacher Evaluation System. It could also inform the grouping of teachers into Professional Learning Communities (PLCs). Second, the TBASE measure can also be used as a pre- and post-assessment in evaluating professional development programming. The Rasch model development of the measure allows for different items representing each stage of positive belief development to be used in the pre-assessment than in the post-assessment. Finally, the measure could inform hiring committees who are interested in candidates who are predisposed to using external research in their practices and want to make quantitative comparisons of equally qualified candidates toward
making hiring decisions. That is, the TBASE measure was designed to be a quantitative complement to an already established process of consideration. In fact, it would be inappropriate to use the TBASE measure in isolation toward making any high stakes decision; rather, it was designed to be used as a formative assessment to help school districts develop and evaluate professional development opportunities. Ultimately, it is a measure of programming quality, not teacher quality.

Postsecondary educators might also find the TBASE measure useful in similar fashion. As its development was inspired by the suggestions of Dewey (1938) and Tyler (1949) that teachers survey their students’ interests as part of curriculum development, the TBASE measure could inform professors of in-service teachers in classes designed to engage them in the consumption of or contribution to the body of professional knowledge found in journal articles. Likewise, the measure could inform the grouping of teachers within the context of the course, or it could be used to evaluate the course as a pre- and post-assessment.

Whatever the case may be, the required software to analyze the data collected from the TBASE measure, is not always available. In its absence, administrators of the measure can refer to the conversion chart presented in Table 5. 4 and the corresponding stages of development provided below it. However, while the conversion chart offers a means to place teachers relative to one another, it does not reveal specific item sequences that may differ from one district to another as seen in the comparisons of the variable tables in Figures 4.3 and 4.4 that show how the pilot sample of one district differed from the study sample across the state. In this regard, expert analysis is recommended and further research is warranted.
Table 20

Conversion Chart of TBASE Scores to Measures Provided by WINSTEPS Version 3.68.2

<table>
<thead>
<tr>
<th>SCORE</th>
<th>MEASURE</th>
<th>S.E.</th>
<th>SCORE</th>
<th>MEASURE</th>
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</table>

Stage One: Personal Interaction – raw scores of 48 to 51
Stage Two: Personal Identification and Increase Autonomy – raw scores of 54 to 58
Stage Three: Professional Identification – raw scores of 61 to 62
Stage Four: Acceptance of Authority – raw scores of 66 to 80

**Recommendations for future research.** The introduction of a new measure inherently suggest new avenues of quantitative research. Studies that might make use of the TBASE measure include those looking for correlations between a teacher’s level of positive beliefs about scholarship in education and his or her demographic profile, characteristics of the district in which he or she teachers, and the performance of his or her students. Because of the abundance of evidence that beliefs are shaped by cultural contexts, such studies are best conducted at the local level. Ideally, these studies would also contribute to a larger set of data that would be used to refine the instrument itself.
Or, they might reveal strong criterion variables that have been hitherto elusive but would minimize the need for the measure altogether. One specific avenue of research suggested within this study involves the possible impact of socioeconomic status on TBASE scores due to the nature of the professional development opportunities that teachers in higher SES districts might have.

Another avenue of future quantitative study could involve pre-service teachers. Such investigation would necessarily require a re-examination of the survey items in order to insure their appropriateness to the pre-service experience. For example, the item “I currently use teaching ideas I got from education journals” might become “I currently include teaching ideas I got from education journals in my portfolio.” The researcher recommends including pre-service teachers in the rewriting of the survey items in order to maximize the accuracy of the item placement within the survey framework.

Beyond additional quantitative studies, however, the current study might also invite qualitative investigations. Specifically, the validity of the TBASE measure could be strengthened by a qualitative study of the items it contains. For example, how would teachers sort the items? How would that arrangement compare to the matrix that was used to develop them? What accounts for those similarities or differences? Also, the model of belief development presented here might be further explored. How would teachers place the items into experience-attitude-behavior sequences? Why are these items connected? And, in all cases, how do these results differ from one cultural context to another? In other words, the Rasch development of the TBASE measure provides a probabilistic understanding of the items it contains, allowing the researcher to discern statistically distinct groupings of those items; but, a qualitative understanding of those probabilities
and groupings would certainly enhance the interpretation and application of the measure. Ultimately, such investigations would serve to either support or refute the theory underpinning the development of measure.

**Re-conceptualization of Survey Theory.** It is appropriate, however, to briefly revisit that theoretical model here. Figure 10 displays an alternative model of belief development—or more specifically, the measurement of such—that might inform future research.

When compared to Figure 1, there are a number of differences to note. First, the representation of time has been renamed “development,” which is intended to imply that the rate of belief development is not necessarily related to the passage of time. This is consistent with the failure of previous studies to show a correlation between teacher years of experience and affective attributes (Ozturk, 2010 & 2011). Second, the passage of time has been shifted such that the center of the figure shows the past and the present is approached toward the outer edges. Doing so allows for representations of the present to necessarily include the past, to indicate the cumulative nature of belief development (Parajes, 1992). Third, because the current study demonstrates the unidimensionality of beliefs when including facets of experience, attitude, and behaviors, all three are still included in the model as part of a whole; however, no further assumption about the precise interplay between them is represented. This is not to refute the suggestions made by Dewey (1938) and Tyler (1949), but to allow for the possibility that belief development might spiral between these facets in a multitude of ways.

New to the figure are the four numbered rings. In both administrations of the TBASE measure, four similar stages of development were statistically discernible. This is
Figure 10. A re-conceptualization of the measurement of belief development based on the findings of the current study. Compare this figure to Figure 1. This figure shows the approximate placement of the four stages of belief development detected by the TBASE measure.

strong evidence that the measure was able to tap into the continuum of a real construct, herein called beliefs about scholarship in education. Recall that Sharkness and DeAngelo (2011) explain that Item Response Theory (IRT) assumes that such unobservable latent traits exists as a continuum independent of the survey items, but that carefully assembled items can tap into an begin to reveal that continuum. That is, no measure could be expected to reveal the continuum uninterrupted. Thus, the best a psychometrician could hope for is the consistent indication of stages as defined by the items. The TBASE measure does so.
In Figure 10, each numbered ring represents one of the four stages of positive belief development detected by the TBASE measure. The first ring represents *Stage One: Personal Interaction*, which was captured by experience and behavior survey items only; the second ring represents *Stage Two* and so on. Each subsequent ring of development necessarily encloses the previous one. Using such a model, a near perfect measure might look like a bull’s-eye; in conjunction with the ideas presented by Dewey (1938) and Tyler (1949), an individual’s belief development would start near the center a spiral through the three facets-- experiences, attitudes, and behaviors-- in a fashion that is perhaps unique to him or her.

This new model could be used by future researchers when developing new belief measures. Members of focus groups could place potential items onto the figure in one of the three areas of belief, and within that area from early to later in developmental time. Perhaps they could even generate items they might perceive to be missing toward creating a more bull’s-eyed distribution of items.

**Conclusion**

The charge given to public schools by the Ohio Department of Education to provide professional development programming that enhances teachers’ dispositions to use external research in their practice, and the foundational tenet that curriculum development begins with understanding those who would be changed by it, compelled this investigation and the development of a measure of what teachers believe about those ideas. The *Teacher Beliefs About Scholarship in Education* measure recognizes that those beliefs are complex; that they develop over time through some interaction of experiences, attitudes, and behaviors; and that they ought not be divorced from beliefs about the
people who produce those ideas. This investigation quantifiably validates all three of
these statements. It also reveals that positive beliefs about scholarship in education
develops among Ohio public school teachers over the course of four discernible stages
and that a variety of professional development experiences can encourage movement
through them. Generally speaking, Ohio public school teachers—and the districts they
serve—would benefit from ensuring that teachers have regular access to both education
professors and journals outside of and within the context of coursework.
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Appendix A

Statements Including “Research” in the *Standards for Ohio Educators* (2005)

from Standards for Teachers

The research is clear: what matters most is the quality of the teacher we put before every student (p. 13).

[Proficient] teachers demonstrate an understanding of research on human development, learning theory and the brain (p. 16).

[Effective teachers] connect the content and skills of their disciplines to the Ohio academic content standards and are committed to staying abreast of current research and development within their disciplines (p. 19).

[Proficient] teachers identify the relevant research, principles, theories and debates significant to the content they teach (p. 20).

Effective teachers use a variety of research-based instructional strategies that provide challenging and positive learning experiences for all students (p. 26).

[Proficient] teachers use research-based instructional strategies (p. 28).

[Distinguished] teachers evaluate instructional processes in order to ensure a systematic, purposeful, research-supported process for teaching new knowledge or skills (p. 28).

[Distinguished] teachers create professional development opportunities for colleagues to study research-based methodologies and design materials that support students’ individual learning needs (p. 29).

from Standards for Principals

Principals know, understand and share relevant research (p. 40, 46, 48).

Principals support staff in planning and implementing research-based professional development (p. 40, 46, 49).

[Accomplished] principals guide staff in the implementation of research-based instructional practices (p. 47).

[Proficient] principals keep informed about current research and theory on effective schooling (p. 48).

[Proficient] principals share current research and theory on effective curriculum design and instructional strategies (p. 48).

[Accomplished] principals engage staff in identifying and discussing research and theory that support the academic needs of students (p. 48).

[Proficient] principals methodically study research in response to an identified school improvement need (p. 48).

[Distinguished] principals evaluate the applicability of specific instructional reforms, using strategies such as action research or pilot studies (p. 48).

[Accomplished] principals collaborate with staff to research and design professional development initiatives (p. 49).
Educators study the research that support claims made by advocates of a particular approach to instructional improvement or whole school reform (p. 60, 65, 66).

Professional development supports the study, evaluation and integration of relevant and current best practices and research into practice (p. 60, 73).

To ensure that educators perceive the value and relevance of professional development, educators must be involved in analyzing data, research and best practices to determine the focus of professional learning (p. 65).

Educators analyze their practice and examine multiple sources of data and research to determine the focus and content of their professional development plan (p. 65, 66).

In a high quality professional development (HQPD) system....all available sources of data and best practice research are examined as an integral part of the process leading to decisions about professional development (p. 66).

In a HQPD system, stakeholders used educational research to select both the content and the process for professional development (p. 66)

In a HQPD system, educators engage in action research or conduct pilot studies to determine the effectiveness of new approaches (p. 66).

Learning teams may engage in many varied activities, such as curriculum development, action research or study groups (p. 67).

Professional development should provide teachers with specific strategies that research and experience have proven to be effective in increasing student learning and achievement (p. 73).

Professional development informs educators about research and ensures that they have the knowledge, skills and dispositions to access and use research in their practice (p. 73).

Professional development supports the study, evaluation and integration of relevant and current best practices and research into practice (p. 73, 74).

In a HQPD system, educators learn strategies for studying and evaluating relevant current research (p. 74).

In a HQPD system, educators learn strategies to integrate the research into practice (p. 74).
Appendix B

Reorganized Sampling of Items from Previous Scales

From *Attitudes toward Educational Research Scale*, Isakson and Ellsworth (1979)

<table>
<thead>
<tr>
<th>Sample Items Expressing Teacher Experiences</th>
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<tr>
<td><strong>Utility of Ideas</strong></td>
</tr>
<tr>
<td>- A knowledge of research methods can help a teacher detect possible strengths and weaknesses in educational practice.</td>
</tr>
<tr>
<td>- Training in educational research can make a teacher a more effective observer of classroom behavior and problems.</td>
</tr>
<tr>
<td><strong>Value of Sources</strong></td>
</tr>
<tr>
<td>- It is not very interesting to read research articles relating to teaching.</td>
</tr>
<tr>
<td>- I prefer college instructors in education courses who bring important research findings into their instruction.</td>
</tr>
<tr>
<td><strong>Connection to Reality</strong></td>
</tr>
<tr>
<td>- When faced with a teaching problem, a good strategy is to go to the research findings on the problem for help.</td>
</tr>
<tr>
<td>- Practice in developing research hypotheses can be useful to the teacher in coming up with possible solutions to problems faced in the classroom.</td>
</tr>
<tr>
<td><strong>Sense of Authority</strong></td>
</tr>
<tr>
<td>- It is not easy to justify spending class time to carry out educational research.</td>
</tr>
<tr>
<td>- When preparing a new subject area for students, a teacher does not need to read the research articles available on the subject.</td>
</tr>
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<table>
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<th>Sample Items Expressing Teacher Attitudes</th>
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<tr>
<td><strong>Utility of Ideas</strong></td>
</tr>
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<td>- Much educational research seems to be done mainly for the purpose of meeting professional or university requirements.</td>
</tr>
<tr>
<td>- The money spent by federal, state, and local governments to support educational research is not justified by what the research has revealed about education.</td>
</tr>
<tr>
<td><strong>Value of Sources</strong></td>
</tr>
<tr>
<td>- Teachers who keep up-to-date on pertinent research are generally better teachers than those who do not.</td>
</tr>
<tr>
<td>- The efforts of educational researchers help put education on a more scientific basis.</td>
</tr>
<tr>
<td><strong>Connection to Reality</strong></td>
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<td>- It is important for teachers to know how to locate research that addresses itself to questions and problems that may arise in their teaching.</td>
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<tr>
<td>- Educational research that is not applicable to real-life problems is of little value to educators.</td>
</tr>
<tr>
<td><strong>Sense of Authority</strong></td>
</tr>
<tr>
<td>- Educational Researchers are at the forefront of interesting new developments in education.</td>
</tr>
<tr>
<td>- Teachers have a responsibility for participating in the scientific study of education through cooperative research activities.</td>
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</table>

| No Items Actively Express Teacher Behaviors |

Note: Number of Items Presented Here / Number of Items on the Scale = 16/50
From *Teachers’ Attitudes about Professional Development* scale, Torff, Sessions, & Byrnes (2005)

<table>
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<tr>
<td><strong>Utility of Ideas</strong></td>
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<tr>
<td>- Staff development initiatives have not had much impact on my teaching.</td>
</tr>
<tr>
<td><strong>Value of Sources</strong></td>
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<tr>
<td>- I have been enriched by the teacher training events I have attended.</td>
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<table>
<thead>
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<th>Sample Items Expressing Teacher Attitudes</th>
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</thead>
<tbody>
<tr>
<td><strong>Utility of Ideas</strong></td>
</tr>
<tr>
<td>- Professional development workshops often help teachers to develop new teaching techniques.</td>
</tr>
<tr>
<td><strong>Value of Sources</strong></td>
</tr>
<tr>
<td>- Professional development workshops are worth the time they take.</td>
</tr>
<tr>
<td>- If I did not have to attend in-service workshops, I would not.</td>
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<th>No Items Actively Express Teacher Behaviors</th>
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Note: Number of Items Presented Here / Number of Items on the Scale = 5/5
From *Educators’ Attitude Toward Educational Research Scale, Ozturk (2010)*

**Sample Items Expressing Teacher Experiences**

*Utility of Ideas*
- Training in educational research can help educators improve their practice.
- Training in educational research can improve educators’ skills to do research in their fields.

*Value of Sources*
- My school provides me with easy access to academic journals.
- My school administration encourages me to read research.

*Sense of Authority*
- Research reports present their findings in a confusing manner.
- Research reports are often too difficult to understand.

**Sample Items Expressing Teacher Attitudes**

*Utility of Ideas*
- Most educational research findings are not really applicable in schools.
- Training educators in research methods is one way to improve the quality of education in schools.

*Value of Sources*
- Educators who keep up with research in their fields tend to be better educators than those who do not.
- Reading research is an effective means to become a successful educator.

*Connection to Reality*
- Professors/researchers who do research do not really know the conditions in schools.
- Recommendations made in research reports are not realistic.

*Sense of Authority*
- I would read more research reports if they were easier to understand.
- Research terminology makes research reports too technical.

**Sample Items Expressing Teacher Behaviors**

*Value of Sources*
- I use every means to update myself about research in my field.
- I regularly visit professional websites to learn about latest developments in my field.
- I regularly read academic journals in my field.

*Connection to Reality*
- I systematically collect and record data in my classroom.
- I collect my own data in my classroom/school to assess/revise my practice.
- I keep a log for my observations in my classroom/school.

Note: Number of Items Presented Here / Number of Items on the Scale = 20/29
Appendix C

TBASE Survey as Presented in Pilot Study

Teacher Beliefs About Scholarship in Education (TBASE)

*Circle one response next to each statement.*

For the purposes of this survey "scholarship in education" is conducted by "education professors," who report their findings in "education journals."

<table>
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<tr>
<th>To what extent does each statement agree with your own beliefs?</th>
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<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<td>Education journals help me become a better teacher.</td>
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<tr>
<td>Education journals have given me ideas about teaching.</td>
<td>SD D A SA</td>
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<td></td>
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<tr>
<td>I currently use teaching ideas I got from education journals.</td>
<td>SD D A SA</td>
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<tr>
<td>Educational journals are valuable resources for my professional development.</td>
<td>SD D A SA</td>
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<tr>
<td>I have enjoyed reading education journals.</td>
<td>SD D A SA</td>
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<tr>
<td>I read education journals to learn more about teaching.</td>
<td>SD D A SA</td>
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<tr>
<td>Education journals reflect the realities of teaching.</td>
<td>SD D A SA</td>
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</tr>
<tr>
<td>I have read of situations like mine in education journals.</td>
<td>SD D A SA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I go to education journals to solve problems about teaching.</td>
<td>SD D A SA</td>
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<td></td>
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<td></td>
<td></td>
</tr>
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<td>SD D A SA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D

Internal Review Board Approval Letter

To: Leigh Chiarello, Ph.D. and William Miller  
Department of Curriculum and Instruction

From: Barbara K. Chesney, Ph.D., Chair  
Mary Ellen Edwards, Ph.D., Vice Chair  
Walter Edinger, Ph.D., Chair Designee  
Lee Ann Pizzimenti, J.D., Chair Designee

Signed:  
Date: 02/10/14

Subject: IRB # 0000200023  
Protocol Title: Teacher Beliefs about Scholarship in Education: A Measure to Inform Professional Development Programming

The University of Toledo  
Department for Human Research Protections  
Social, Behavioral & Educational Institutional Review Board  
Office of Research, Rm. 2300, University Hall  
2801 West Bancroft Street, Mail Stop 944  
Toledo, Ohio 43606-3390  
Phone: 419-530-2844  
Fax: 419-530-2841  
(FWA00010686)

On 02/10/14, the Amendment listed below was reviewed and approved by the Chair and Chair Designee of the University of Toledo Social Behavioral & Educational Institutional Review Board (IRB) via the expedited process. The Chair and Chair Designee noted that enrollment continues at the approved sites and that signed and dated Consent remains required prior to an individual taking part in this research. This action will be reported to the committee at its next scheduled meeting.

Items Reviewed:
- IRB Application Requesting Expedited Review of Amendment  
  - Increase the number of subjects to 2,000

This Amendment approval is in effect until the expiration date listed below, unless the IRB notifies you otherwise.

Only the most recent IRB approved document(s) and Consent form listed above may be used when enrolling participants in this research project.

Amendment Approval Date: 02/10/14  
Expiration Date: 01/15/15

Number of Subjects Approved: 2,000

Please read the following attachment detailing Principal Investigator responsibilities.
Appendix E

Emails Sent to Superintendents

Dear Superintendent

The University of Toledo invites your teachers to participate in a survey study on Teacher Beliefs About Scholarship in Education (TBASE).

The confidential, 15-minute survey will ask teachers about their experiences, attitudes, and behaviors with regard to research that is published in education journals and the professors that publish it. It will also ask about the sources of their professional knowledge. This information will help the study investigators, Dr. Leigh Chiarello and Bill Miller, map out the developmental stages of teachers’ beliefs about scholarship in education. Locating teachers at each stage could inform professional development and improvement plans designed to provide teachers with the best opportunities to become active agents in educational scholarship—teachers who engage in research-based practices and perhaps contribute to that body of knowledge.

Superintendents of districts with five or more respondents will receive executive summaries of the study findings, including information about their districts relative to the rest of the respondents.

The need for individualized professional development and improvement plans has become a part of Ohio’s Teacher Evaluation System. We believe this study will help both administrators and teachers address that need.

We ask that you or a delegate forward this entire email and the following link to the teachers in your district. Below the signature is a message you can copy and paste into the beginning of your request.

Thank you for your consideration.

Sincerely,

Bill Miller
Doctoral Student
Department of Curriculum and Instruction
University of Toledo

-----------------------------------------------

Teachers,

As you might recall from my previous email, we have been invited by the University of Toledo to participate in a survey study of Ohio public school teachers. I would like to extend a “thank you” to those of you who have already completed the survey. If you have NOT already done so, there is still time to participate in the study. Please take a moment to read their request sent to me and consider taking the survey by going to

tinyurl.com/TBASE-survey

The first pages of the survey also provide more information without requiring your participation.
Dear Superintendent,

Earlier this month, I sent you the following email, and we have received responses from some of your teachers. Thank you very much! As we will be collecting data for two more weeks, we would to extend once again our invitation to participate. For your convenience, a new message appears below the signature which you may paste into your email request to teachers.

Again, thank you for your participation.

---------------------------------------------

The University of Toledo invites your teachers to participate in a survey study on Teacher Beliefs About Scholarship in Education (TBASE).

The confidential, 15-minute survey will ask teachers about their experiences, attitudes, and behaviors with regard to research that is published in education journals and the professors that publish it. It will also ask about the sources of their professional knowledge. This information will help the study investigators, Dr. Leigh Chiarello and Bill Miller, map out the developmental stages of teachers’ beliefs about scholarship in education. Locating teachers at each stage could inform professional development and improvement plans designed to provide teachers with the best opportunities to become active agents in educational scholarship—teachers who engage in research-based practices and perhaps contribute to that body of knowledge.

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Thank you for your continued participation.

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The confidential, 15-minute survey will ask teachers about their experiences, attitudes, and behaviors with regard to research that is published in education journals and the professors that publish it. It will also ask about the sources of their professional knowledge. This information will help the study investigators, Dr. Leigh Chiarello and Bill Miller, map out the developmental stages of teachers’ beliefs about scholarship in education. Locating teachers at each stage could inform professional development and improvement plans designed to provide teachers with the best opportunities to become active agents in educational scholarship—teachers who engage in research-based practices and perhaps contribute to that body of knowledge.

Superintendents of districts with five or more respondents will receive executive summaries of the study findings, including information about their districts relative to the rest of the respondents.

We ask that you or a delegate forward this entire email and the following link to the teachers in your district. Below the signature is a message you can copy and paste into the beginning of your request.

Thank you for your consideration.

Sincerely,
Bill Miller
Doctoral Student
Department of Curriculum and Instruction
University of Toledo

Teachers,

As you might recall from my previous email(s), we have been invited by the University of Toledo to participate in a survey study of Ohio public school teachers. I would like to extend a “thank you” to those of you who have already completed the survey. If you have NOT already done so, there is just one more week during which you can participate in the study. Please take a moment to read their request sent to me and consider taking the survey by going to

tinyurl.com/TBASE-survey

The first pages of the survey also provide more information without requiring your participation.
Appendix F
Online Version of TBASE Survey including Letter of Consent

ADULT RESEARCH SUBJECT - INFORMED CONSENT FORM

Teach Beliefs About Scholarship in Education: A Measure to Inform Professional Development Programming

IRB #: 0000200023
ICF Version Date: 01/16/14

Department of Curriculum and Instruction
Main Campus
2000 Gillham Hall
Toledo, Ohio 43606
(419)530-5371

Principal Investigator: Dr. Leigh Chiarello, Principal Investigator, (419) 530-5213
William Miller, Co-Investigator, (419) 902-8082

Purpose: You are invited to participate in the research project entitled, Teach Beliefs About Scholarship in Education: A Measure to Inform Professional Development Programming, which is being conducted at the University of Toledo under the direction of Dr. Leigh Chiarello and William Miller. The purpose of this study is learn more about how teachers develop positive beliefs about research published in education journals by education professors. We believe that information can help administrators develop better professional development programs.

Description of Procedures: This research study will take place in throughout the state of Ohio as willing teachers respond to one electronic survey that should take about 15 minutes to complete. First, you will be asked to provide your current school district of employment. Second, you will be asked to rate your agreement with statements about teachers’ experiences, attitudes, and behaviors regarding education journals and professors. Finally, you will also be asked to rate various sources of professional knowledge based upon your experience.

Potential Risks: There are minimal risks to participation in this study, including loss of confidentiality.

Potential Benefits: The only direct benefit to you if you participate in this research may be that you will learn about how survey studies are conducted and may learn more about teacher beliefs about scholarship in education. Others may benefit by learning about the results of this research.

Confidentiality: You will not be asked to provide any individually identifiable information, and no one will be able to determine whether or not you participated in the study. There is a very low risk that your confidentiality might be breached.

Voluntary Participation: Your refusal to participate in this study will involve no penalty or loss of benefits to which you are otherwise entitled and will not affect your relationship with The University of Toledo or any of your classes. Only those school districts that employ five or more respondents will receive an executive summary of the study, which will not include any individual responses or scores. In this way, your decision to participate in the study or not will not be disclosed to school administrators. In addition, you may discontinue participation at any time without any penalty or loss of benefits.
Contact Information: Before you decide to accept this invitation to take part in this study, you may ask any questions that you might have. If you have any questions at any time before or after your participation you should contact a member of the research team: Dr. Leigh Chiarelott, Principal Investigator, (419) 530-5213; and William Miller, Co-Investigator, (419) 902-8082.

If you have questions beyond those answered by the research team or your rights as a research subject the Chairperson of the SBE Institutional Review Board may be contacted through the Office of Research on the main campus at (419) 530-2844.

Before you begin the survey, please ask any questions on any aspect of this study that is unclear to you.

YOUR CONSENT

You are making a decision whether or not to participate in this research study. Clicking “BEGIN SURVEY” below indicates that you are 18 or over, have read the information provided above, you have had all your questions answered, and you have decided to take part in this research.

The date you click on “BEGIN SURVEY” to enroll in this study must fall between 02/10/14 and 01/15/15. Also, the approved number of respondents for this study is 2,000.

THE UNIVERSITY OF TOLEDO
SOCIAL, BEHAVIORAL & EDUCATIONAL INSTITUTIONAL REVIEW BOARD

The research project described in this consent has been reviewed and approved by the University of Toledo SBE IRB for the period of time specified below.

SBE IRB #: 0000200023 Number of Subjects: 2,000 Project Start Date: 02/10/14 Project Expiration Date: 01/15/15

BEGIN SURVEY
Teacher Beliefs About Scholarship in Education (TBASE)

Thank you for choosing to participate in our study!

* Required

In what Ohio public school district do you teach? *

To what extent does each statement agree with your own beliefs?

Education journals help me become a better teacher.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

Education journals have given me ideas about teaching.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

I currently use teaching ideas I got from education journals.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees
Teacher Beliefs About Scholarship in Education (TBASE)

To what extent does each statement agree with your own beliefs?

Educational journals are valuable resources for my professional development.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

I have enjoyed reading education journals.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

I read education journals to learn more about teaching.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

12% completed
Teacher Beliefs About Scholarship in Education (TBASE)

To what extent does each statement agree with your own beliefs?

Education journals reflect the realities of teaching.
- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

I have read of situations like mine in education journals.
- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

I go to education journals to solve problems about teaching.
- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

18% completed
Teacher Beliefs About Scholarship in Education (TBASE)

To what extent does each statement agree with your own beliefs?

One can learn to teach by reading education journals.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

I have relied on education journals for help as a teacher.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

I have submitted writing to an education journal.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

25% completed
Teacher Beliefs About Scholarship in Education (TBASE)

To what extent does each statement agree with your own beliefs?

Education professors help me become a better teacher.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

Education professors have given me ideas about teaching.
- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

I currently use teaching ideas I got from education professors.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

31% completed
Teacher Beliefs About Scholarship in Education (TBASE)

To what extent does each statement agree with your own beliefs?

Education professors are valuable resources for my professional development.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

I have enjoyed talking to education professors.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

I attend graduate classes in education to learn more about teaching.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

37% completed
Teacher Beliefs About Scholarship in Education (TBASE)

To what extent does each statement agree with your own beliefs?

Education professors understand the realities of teaching.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

I have met education professors who were teachers like me.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

I go to education professors with problems about teaching.
- Strongly Disagrees
- Disagrees
- Agrees
- Strongly Agrees

43% completed
Teacher Beliefs About Scholarship in Education (TBASE)

To what extent does each statement agree with your own beliefs?

Education professors are master teachers.
- [ ] Strongly Disagrees
- [ ] Disagrees
- [ ] Agrees
- [ ] Strongly Agrees

I have relied on education professors for help as a teacher.
- [ ] Strongly Disagrees
- [ ] Disagrees
- [ ] Agrees
- [ ] Strongly Agrees

I have worked on research with education professors.
- [ ] Strongly Disagrees
- [ ] Disagrees
- [ ] Agrees
- [ ] Strongly Agrees

50% completed
Teacher Beliefs About Scholarship in Education (TBASE)

With regards to research conducted by someone other than yourself, how would you rank each of the following sources in terms of your professional knowledge?

Undergraduate Classes (in person)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

Undergraduate Classes (online)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

56% completed
Teacher Beliefs About Scholarship in Education (TBASE)

With regards to research conducted by someone other than yourself, how would you rank each of the following sources in terms of your professional knowledge?

Graduate Classes (in person)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

Graduate Classes (online)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

62% completed
Teacher Beliefs About Scholarship in Education (TBASE)

With regards to research conducted by someone other than yourself, how would you rank each of the following sources in terms of your professional knowledge?

Discussions with Education Professors (outside of a class)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

Discussions with Education Professors (not related to a class)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research
Teacher Beliefs About Scholarship in Education (TBASE)

With regards to research conducted by someone other than yourself, how would you rank each of the following sources in terms of your professional knowledge?

In-District Professional Conferences
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

Out-of-District Professional Conferences (in person)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

Out-of-District Professional Conferences (online)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

75% completed
Teacher Beliefs About Scholarship in Education (TBASE)

With regards to research conducted by someone other than yourself, how would you rank each of the following sources in terms of your professional knowledge?

Education Journal Articles (you read for a class)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

Education Journal Articles (you did not read for a class)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research
With regards to research conducted by someone other than yourself, how would you rank each of the following sources in terms of your professional knowledge?

### Education Journal Articles (you read for a class)
- The source of **NONE** of my knowledge about educational research
- The source of **LITTLE** of my knowledge about educational research
- The source of **SOME** of my knowledge about educational research
- The source of **MOST** my knowledge about educational research
- The source of **ALL** my knowledge about educational research

### Education Journal Articles (you did not read for a class)
- The source of **NONE** of my knowledge about educational research
- The source of **LITTLE** of my knowledge about educational research
- The source of **SOME** of my knowledge about educational research
- The source of **MOST** my knowledge about educational research
- The source of **ALL** my knowledge about educational research

87% completed
Teacher Beliefs About Scholarship in Education (TBASE)

With regards to research conducted by someone other than yourself, how would you rank each of the following sources in terms of your professional knowledge?

Education Journal Articles (that were given to you)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

Education Journal Articles (that you found yourself)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

93% completed
With regards to research conducted by someone other than yourself, how would you rank each of the following sources in terms of your professional knowledge?

Professional Organization Websites (e.g. National Education Association, Kappa Delta Pi)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

Educational Government Websites (e.g. ODE, US Department of Education)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

Other (Please specify below)
- The source of NONE of my knowledge about educational research
- The source of LITTLE of my knowledge about educational research
- The source of SOME of my knowledge about educational research
- The source of MOST my knowledge about educational research
- The source of ALL my knowledge about educational research

Identify the other source of knowledge you just ranked.

Never submit passwords through Google Forms.
100%: You made it.
Teacher Beliefs About Scholarship in Education (TBASE)

Your responses have been received. Thank You!

This form was created using Google Forms.
Create your own
Appendix G

Histograms of t-Test Groups

Group 1 = NONE to SOME    Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Undergraduate Classes In Person = 1

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<th>Std. err.</th>
<th>Median</th>
<th>Range</th>
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<th>Max</th>
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<td>0.095372434</td>
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Where: Undergraduate Classes In Person = 2

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<th>Variance</th>
<th>Std. dev.</th>
<th>Std. err.</th>
<th>Median</th>
<th>Range</th>
<th>Min</th>
<th>Max</th>
</tr>
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<tr>
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<td>45</td>
<td>0.14133333</td>
<td>2.0069709</td>
<td>1.416676</td>
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<td>-0.03</td>
<td>8.46</td>
<td>-2.46</td>
<td>6</td>
</tr>
</tbody>
</table>
Group 1 = NONE to SOME  
Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Undergraduate Classes Online = 1

<table>
<thead>
<tr>
<th>Column</th>
<th>n</th>
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<th>Variance</th>
<th>Std. dev.</th>
<th>Std. err.</th>
<th>Median</th>
<th>Range</th>
<th>Min</th>
<th>Max</th>
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<td>1.7267021</td>
<td>1.3140404</td>
<td>0.090894073</td>
<td>-0.03</td>
<td>10.05</td>
<td>-4.05</td>
<td>6</td>
</tr>
</tbody>
</table>

Deemed "Not Normally Distributed"

Where: Undergraduate Classes Online = 2

<table>
<thead>
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<th>Column</th>
<th>n</th>
<th>Mean</th>
<th>Variance</th>
<th>Std. dev.</th>
<th>Std. err.</th>
<th>Median</th>
<th>Range</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBASE</td>
<td>9</td>
<td>0.78555556</td>
<td>1.2338528</td>
<td>1.1107893</td>
<td>0.37026309</td>
<td>0.86</td>
<td>3.34</td>
<td>-0.59</td>
<td>2.75</td>
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Deemed "Not Normally Distributed"
Group 1 = NONE to SOME   Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Graduate Classes In Person = 1

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Deemed "Not Normally Distributed"

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Group 1 = NONE to SOME    Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Graduate Classes Online = 1

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Group 1 = NONE to SOME  
Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Discussions With Education Professors Outside Of A Class = 1

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Where: Discussions With Education Professors Outside Of A Class = 2

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Group 1 = NONE to SOME    Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Discussions With Education Professors Not Related To A Class = 1

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![Histogram for Group 1]

Where: Discussions With Education Professors Not Related To A Class = 2

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![Histogram for Group 2]
Group 1 = NONE to SOME    Group 2 = Most or All

**Summary statistics for TBASE MEASURE:**

Where: In-District Professional Conferences = 1

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Deemed "Not Normally Distributed"

Where: In-District Professional Conferences = 2

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Deemed "Not Normally Distributed"
Group 1 = NONE to SOME    Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Out-Of-District Professional Conferences In Person = 1

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Where: Out-Of-District Professional Conferences In Person = 2

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Group 1 = NONE to SOME   Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Out-Of-District Professional Conferences Online = 1

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Where: Out-Of-District Professional Conferences Online = 2

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Deemed "Not Normally Distributed"
Group 1 = NONE to SOME    Group 2 = Most or All

Summary statistics for **TBASE** MEASURE:

Where: Structured Meetings With Colleagues = 1

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Where: Structured Meetings With Colleagues = 2

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Group 1 = NONE to SOME  Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Informal Meetings With Colleagues = 1

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Where: Informal Meetings With Colleagues = 2

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Group 1 = NONE to SOME    Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Education Journal Articles For A Class = 1

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Deemed "Not Normally Distributed"

Where: Education Journal Articles For A Class = 2

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Deemed "Not Normally Distributed"
Group 1 = NONE to SOME    Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Education Journal Articles Not For A Class = 1

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Where: Education Journal Articles Not For A Class = 2

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Deemed “Not Normally Distributed”
Group 1 = NONE to SOME   Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Education Journal Articles Given To You = 1

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Where: Education Journal Articles Given To You = 2

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Deemed "Not Normally Distributed"
Group 1 = NONE to SOME  
Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Education Journal Articles You Found = 1

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Where: Education Journal Articles You Found = 2

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Group 1 = NONE to SOME    Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Professional Organization Websites = 1

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Deemed "Not Normally Distributed"

Where: Professional Organization Websites = 2

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<tr>
<td>TBASE</td>
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Deemed "Not Normally Distributed"
Group 1 = NONE to SOME    Group 2 = Most or All

**Summary statistics for TBASE MEASURE:**

Where: Educational Government Websites = 1

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<tr>
<th>Column</th>
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<th>Mean</th>
<th>Variance</th>
<th>Std. dev.</th>
<th>Std. err.</th>
<th>Median</th>
<th>Range</th>
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<th>Max</th>
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<tbody>
<tr>
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<td>199</td>
<td>-0.01839196</td>
<td>1.5823398</td>
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Where: Educational Government Websites = 2

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<th>Max</th>
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<tr>
<td>TBASE</td>
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<td>0.6804</td>
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Deemed "Not Normally Distributed"
Group 1 = NONE to SOME  Group 2 = Most or All

Summary statistics for TBASE MEASURE:

Where: Other = 1

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Where: Other = 2

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<tbody>
<tr>
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<td>-1.78</td>
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Deemed "Not Normally Distributed"
Group 1 = Little or None  Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

Group by: Undergraduate Classes In Person

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<tr>
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<th>Std. err.</th>
<th>Median</th>
<th>Range</th>
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<td>8.46</td>
<td>-2.46</td>
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</tbody>
</table>

Normal: Mean = -0.55333333, Std. dev. = 1.1344385

Normal: Mean = 0.24127168, Std. dev. = 1.2968484
Group 1 = Little or None   Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

Group by: Undergraduate Classes Online

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<tr>
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<td>-2.05</td>
<td>3.26</td>
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Deemed "Not Normally Distributed"
Group 1 = Little or None  
Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

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<tr>
<td>Group 1</td>
<td>37</td>
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<td>0.93324815</td>
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<td>-2.32</td>
<td>1.32</td>
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<tr>
<td>Group 2</td>
<td>187</td>
<td>0.14545455</td>
<td>1.8231475</td>
<td>1.3502398</td>
<td>0.098739313</td>
<td>0.11</td>
<td>10.05</td>
<td>-4.05</td>
<td>6</td>
</tr>
</tbody>
</table>

Deemed "Not Normally Distributed"
Group 1 = Little or None  
Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

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<th>Std. dev.</th>
<th>Std. err.</th>
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<th>Max</th>
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<tr>
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<td>1.7266249</td>
<td>1.314011</td>
<td>0.13625659</td>
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<td>-4.05</td>
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<tr>
<td>2</td>
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Normal: Mean = -0.21892473, Std. dev. = 1.314011  
Normal: Mean = 0.29275591, Std. dev. = 1.2628374
Group 1 = Little or None       Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

Group by: Discussions With Education Professors Outside Of A Class

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<tr>
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Group 1 = Little or None   Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

Group by: Discussions With Education Professors Not Related To A Class

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Normal: Mean = -0.24326389, Std. dev. = 1.15465

Normal: Mean = 0.59873418, Std. dev. = 1.3759634
Group 1 = Little or None    Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

Group by: In-District Professional Conferences

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Group 1 = Little or None  Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

Group by: Out-Of-District Professional Conferences In Person

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<th>Max</th>
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Group 1 = Little or None      Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:
Group by: Out-Of-District Professional Conferences Online

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</table>
Group 1 = Little or None        Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

Group by: Structured Meetings With Colleagues

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![Histograms for Group 1 and Group 2 showing the distribution of TBASE MEASURE values.](image-url)
Summary statistics for TBASE MEASURE:

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<th>Std. err.</th>
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<tr>
<td>1</td>
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<td>0.11</td>
<td>8.32</td>
<td>-2.32</td>
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Group 1 = Little or None    Group 2 = SOME to ALL

Normal: Mean = -0.031764706, Std. dev. = 1.3362331
Normal: Mean = 0.10281609, Std. dev. = 1.288219
Group 1 = Little or None     Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

Group by: Education Journal Articles For A Class

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<tr>
<th>n</th>
<th>Mean</th>
<th>Variance</th>
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<th>Std. err.</th>
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![Histograms showing distribution of TBASE MEASURE for Group 1 and Group 2](image)
Group 1 = Little or None      Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

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<th>Group</th>
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<th>Variance</th>
<th>Std. dev.</th>
<th>Std. err.</th>
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<th>Max</th>
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<tbody>
<tr>
<td>1</td>
<td>127</td>
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Normal: Mean = -0.39692913, Std. dev. = 1.0727346

Normal: Mean = 0.68, Std. dev. = 1.3279727

230
Group 1 = Little or None       Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:
Group by: Education Journal Articles Given To You

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<td>0.55</td>
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<td>-2.19</td>
<td>6</td>
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</tbody>
</table>

![Histogram for Group 1](image1)

![Histogram for Group 2](image2)
Group 1 = Little or None  
Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

Group by: Education Journal Articles You Found

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<th>Variance</th>
<th>Std. dev.</th>
<th>Std. err.</th>
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<th>Max</th>
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<tr>
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<tr>
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<td>0.55</td>
<td>7.78</td>
<td>-1.78</td>
<td>6</td>
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Normal: Mean = -0.5368932, Std. dev. = 0.96578631

Normal: Mean = 0.56049587, Std. dev. = 1.3349419
Group 1 = Little or None  Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

Group by: Professional Organization Websites

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<tbody>
<tr>
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</table>

![Histogram for Group 1](image1.png)

Normal: Mean = -0.30563025, Std. dev. = 1.1285078

![Histogram for Group 2](image2.png)

Normal: Mean = 0.48254717, Std. dev. = 1.3610102
Group 1 = Little or None       Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

Group by: Educational Government Websites

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<th>Std. err.</th>
<th>Median</th>
<th>Range</th>
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Histograms for TBASE MEASURE: Group 1 and Group 2.
Group 1 = Little or None   Group 2 = SOME to ALL

Summary statistics for TBASE MEASURE:

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<th>Group</th>
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Deemed "Not Normally Distributed"
Appendix H

Details on “Other” Responses from Online Survey

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<tbody>
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<td>1.</td>
<td>Administration staff</td>
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<tr>
<td>2.</td>
<td>Aims web training, etc</td>
</tr>
<tr>
<td>3.</td>
<td>Articles</td>
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<tr>
<td>4.</td>
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<tr>
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<tr>
<td>6.</td>
<td>Blogs or content specific sites such as American Modeling Teachers Association or American Physics Teachers Association</td>
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<tr>
<td>7.</td>
<td>Books</td>
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<tr>
<td>8.</td>
<td>Books and Guest Lectures/Seminars</td>
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<td>9.</td>
<td>Colleagues</td>
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<td>11.</td>
<td>Discussion with department</td>
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<td>12.</td>
<td>Family, friends, former colleagues, and other teachers.</td>
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<td>26.</td>
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<td>36.</td>
<td>Other teachers who have been in the field and teaching longer than me</td>
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39. Peers from other districts
40. Personal experience
41. Professional development and ESC
42. Resident educator
43. Science-Oriented Organizations: NASA, NOAA, etc.
44. Self exploration
45. Teacher created blogs and other teacher created sites to help other teachers
46. The internet
47. The internet
48. Usatf coaching education classes
49. Web
TBASE = 0 to 1
Word counts for Identify the other source of knowledge you just ranked.

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TBASE = 2 to 3
Word counts for Identify the other source of knowledge you just ranked.

- kent
- listserv
- oaes
- slis
- state
- syracuse
- university

TBASE = 3 to 4
Word counts for Identify the other source of knowledge you just ranked.

- education
- outdoor