# Q Methodology and Its Position in the Mixed-Methods Continuum

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***Abstract:*** *In volume 32 of this journal, Paul Stenner suggests that Stephenson was resistant to Q methodology being placed within other theoretical frameworks. Yet in this same piece, Stenner states that it is time for Q methodology to be brought into a greater dialogue with contemporary social theory and research practice. This article seeks to demonstrate how Q fits into the contemporary research practice of mixed methods and argues that this perspective is not in conflict with Stephenson's positions on Q as a methodology. Further, our position reflects recent calls for the development of new techniques and procedures to be used in mixed-methods research. Those making the call will find interest in what Q has to offer the social and behavioral sciences now, 75 years after it emerged in Stephenson's 1935 letter to* Nature, *and even though the term mixed-methods research has only emerged in last couple of decades. Q methodology is shown to fit well methodologically into the mixed-methods continuum as described by prominent mixed-methods scholars, which further supports a position that Q represents a mixed research methodology.*

In volume 32 of this journal, Paul Stenner (2008/2009a) suggests that Stephenson was resistant to Q methodology being placed within other theoretical frameworks. We are aware that others in the Q community also hold steady to the position that Q stands outside other existing theoretical frameworks of research. Thus our focus in this article is to demonstrate how Q fits into the contemporary research practice of mixed methods and that this perspective is not in conflict with Stephenson's positions on Q as a methodology. In this way, we are in agreement with Stenner that it is time for Q methodology (and Q methodologists) to be brought into a greater dialogue with contemporary social theory and research practice.

At this writing, Q methodology is now 75 years old as reckoned from the date of Stephenson's published letter in *Nature* describing Q methodology (Stephenson, 1935). Creswell (2010) states that mixed-method research began around 1988, about a year before William Stephenson's death. Yet we believe that what Stephenson created 75 years ago is in tune with the more modern conceptions of mixed-methods research. Perhaps this is why, since its inception, Q methodology has held a controversial position in social science research (Brown, 1980) that has led to its relatively small following. Certainly, Stephenson's concept of making subjectivity operant through factor structure was, and still is, a novel idea. Yet this conception represents a mixture of both qualitative and quantitative methods as we will discuss.

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We are not the first to suggest that Q methodology represents a mixture of both the qualitative and quantitative aspects of research. Stenner and Stainton Rogers (2004) explain that the philosophical underpinnings of Q methodology are a mixture of qualitative and quantitative ideas and coined the term qualiquantology. Others have been more careful in their categorizing of Q methodology. Brown (2008) states that with its focus on subjectivity and, therefore, on self-referential meaning and interpretation, Q methodology shares many of the focuses of qualitative research while utilizing the type of statistical analyses typically found in quantitative studies. Yet Brown was also careful not to say that Q was a qualitative method—nor that it was a mixture of qualitative and quantitative. In this article, we discuss the qualitative and quantitative aspects of Q methodology as well as how Q methodology follows the qualitative-quantitative continuums described by Ridenour and Newman (2008) and by Tashakkori and Teddlie (2009). First, however, we will discuss the terms constructivism and post-positivism in order to later relate these terms to aspects of Q methodology that represent its dual qualitative and quantitative nature.

## Introduction to Constructivism

Constructivism is most often associated with qualitative research (Mertens, 2010; Ridenour & Newman, 2008; Tashakkori & Teddlie, 2009). Stenner (2008/2009b) offers a brief discussion about constructivism and follows with its connections to Q methodology. Stenner (2008/2009b) suggests that Stephenson would likely have chosen Q methodology to pursue understanding of the various views on constructivism. We agree and note that Stephenson was concerned with viability rather than validity of personal realities in a manner like the postmodernist view of constructivism (Raskin, 2002; Sexton, 1997). Regardless of the "brand" of constructivism, the focus is on human meaning making (Raskin, 2002). Specifically, constructivists use the term hermeneutics to represent the interpretation of something from a specific view (Mertens, 2010). As Raskin (2002, p. 2) describes, "all

constructed meanings represent a point of view." In other words, no point of view represents a purely objective view.

Stenner (2008/2009a; 2008/2009b) presents a similar reflection on constructivism. He contends that constructivism is not limited simply to understanding humans but extends into our understanding of the hard sciences such as physics and chemistry. This is in line with Kelly (1963), who discusses the conception of "man-as-scientist." In his description of humankind acting as scientists, Kelly states that our personal convictions influence our thinking. This is an important aspect of conceptual-change theory (diSessa, 2007; Duit & Treagust, 2003) such as that used to address non-scientific conceptions held in fields such as physics (Dykstra, Boyle, & Monarch, 1992; Ramlo, 2008b; Thornton, 1997). Such studies may not explicitly state, as Stenner (2008/2009a) has, that our realities are a composite of the objective and subjective, but they have this idea at their core as they attempt to explain, for instance, why some students may change to Newtonian views of force and motion while others hold onto their prior, non-Newtonian conceptions. For instance, students' views of their learning in a physics class, determined by studies involving Q methodology, have been shown to affect the learning of physics concepts (Ramlo, 2008a, 2008b).

Wolf (2008/2009) explains how Q sorters develop meaning as they sort items in their Q sort. She also explains the details of determining the concourse within the context of experience—including the relationship between the sorters' experiences and their ability to understand the Q sample selected from the concourse.

However, Wolf describes in this same article how Stephenson repeatedly stated that Q methodology allows for the objective study of subjectivity. Although some may see a dichotomy between subjectivity and objectivity, Biesta (2010) sees the possibility of intersubjectivity as an alternative to this either-or idea. In fact, he states that no research is purely qualitative or quantitative but is a mixture, whether it is in a field such as education or in a field such as physics. We agree with this position and extend this discussion to Q sorting and analyses in a later section.

Maxwell and Mittapalli (2010) focus their position on mixed methods by combining the ideas of realist ontology and constructivism. Such a position divides the "real world" from people's perceptions. In other words, there is a "real" world that exists (e.g., Newton's Laws of Motion are true for all people and objects) as well as one that is constructed based upon people's perceptions (e.g., non-Newtonian views of motion are strongly held by physics students despite evidence to the contrary) such as reported by Ramlo (2003, 2008b) and Thornton (1997). Such a position suggests that the constructivist view is not actually in conflict with the post-positivist view although it is certainly in conflict with the positivist view.



## Post-positivism

Positivism is essentially the belief that the social world can be studied the same way as the physical world. In other words, science is the only way to discover knowledge and this must be done in a value-free manner (Johnson & Gray, 2010; Mertens, 2010). Within positivism, verification is tantamount and only one reality can exist (Johnson & Gray, 2010). We believe that it was positivists to whom Stephenson was referring in his *Study of Behavior* when he mentioned the "objective purist" in the context of centroid factor extraction and simple structure. From the tone, it seems apparent that Stephenson objected to such a position. Objectivity is mostly associated with quantitative research. But today's quantitative researchers are primarily post-positivists, not positivists (Johnson & Gray, 2010). This is an important distinction and we caution those in the Q community who have implied or stated that quantitative researchers are positivists (Capdevila & Lazard, 2008/2009; Stenner, 2008/2009b). We believe that Stephenson would have few issues, if any, with the post-positivists of today based upon his discussion of objectivity and subjectivity (Stephenson, 1953) which we will discuss in a later section.

Post-positivism began to emerge after World War II to counter many of the issues raised about positivism. One of these was replacing the need for verification with the new concept of falsification (Mertens, 2010). This is the basis of testing the null hypothesis in quantitative research; one can find that the proposition that there is no statistically significant difference between treatment A and treatment B, for instance, is false and therefore one can reject the null hypothesis. However, while analyses can lead one to fail to reject the null hypothesis one cannot accept the null hypothesis (Newman & Newman, 1994). It is important to note here that Stephenson (1953) mentions the use of falsification in this sense but related to the use of Q methodology.

It is not surprising, then, that post-positivism (but not positivism) is most often associated with quantitative research (Johnson & Gray, 2010; Ridenour & Newman, 2008). For example, Campbell and Stanley (1966) are representative of research methodologists who exhibit post-positivistic assumptions. Mertens (2010) describes the typical post-positivist paradigm for a research study much like the description used elsewhere for a quantitative study (Newman, 1997; Ridenour & Newman, 2008; Tashakkori & Teddlie, 2009). Mertens (2010) states that a post-positivist research study commences with the research problem and question. Subsequently, the researcher describes the method, participants, instruments, procedures, results and conclusions. Typically

such a study includes descriptions of the study's limitations. This post-positivist paradigm for research indicates the post-positivist's goal to maintain as much objectivity in research as possible. Yet, post-positivists acknowledge the influence of the researcher in investigations, thus limiting the ability of the researcher to observe objectively (Lincoln & Guba, 1994; Mertens, 2010). In other words, post-positivists accept the concept of the social construction of parts of reality (Johnson & Gray, 2010).

## Stephenson on the Subjective and Objective

Stephenson discusses a similar mixture on page 23 of *The Study of Behavior* when he describes objectivity and subjectivity. Of course, Stephenson created Q methodology to measure the subjective objectively and this is why he no doubt felt the need to describe these terms in a section named "A basic psychological principle" within his first volume dedicated to Q methodology. "Subjective," according to Stephenson, can mean "either inner experience or the opposite of scientifically objective" (Stephenson, 1953, p. 23) whereas the scientific method is objective (Mertens, 2010; Stephenson, 1953). Yet the term "objective" is often used to mean "as observed by others" (Stephenson, 1953). Q, of course, allows researchers to "observe" subjectivity scientifically.

Within *The Study of Behavior*, Stephenson takes issue with behaviorism as the study of behavior that is simply objective while excluding the subjective. How then can one observe the inner-self of someone else scientifically? Stephenson's answer was Q methodology. Still, Stephenson reminds us that Q methodology was designed so that it can be applied to study both subjective and objective behaviors. And with this reminder, he states that there is no valid basis for the separation of objectivity and subjectivity (Stephenson, 1953).

Stephenson's discussion on objectivity and subjectivity is similar to the discussion by Johnson and Gray (2010) about mixed-methods research. They state that the mixed-methods philosophy acknowledges that multiple kinds of knowledge can exist. In other words, in mixed methods ideas such as objectivity and subjectivity can be combined. Thus the concept of combining subjectivity and objectivity exists within Q methodology (Stephenson, 1953) as well as in mixed methods (Johnson & Gray, 2010).

## Qualitative versus Quantitative

Mixed-methods research is, essentially, the combination of qualitative and quantitative research. We have already discussed both constructivism and post-positivism and these two paradigms are typically associated with qualitative and quantitative research,



respectively. To understand how a research method can fall into what is often considered two different camps of social and behavioral research (qualitative and qualitative), one has to understand the differences between what is considered qualitative research and what is considered quantitative research. Although we have discussed the terms constructivism and post-positivism, we need to expand our discussion further to the broader topics of qualitative and quantitative research.

Qualitative research has its roots within the social sciences such as anthropology and sociology. Although some may claim that qualitative research has its basis in words and quantitative research has its basis in numbers, Ridenour and Newman (2008) and Newman and Benz (1998) argue that this is a simplistic and incomplete way of viewing these two research frameworks. Instead, they emphasize that qualitative research focuses on rich description and the meaning of phenomena based on perspectives of whomever is under examination. Qualitative researchers often talk about building theory in the sense of developing or discovering the world views or perspectives held by a person or group of people (Newman & Benz, 1998; Newman, Ridenour, Newman, & DeMarco, 2003; Ridenour & Newman, 2008; Tashakkori & Teddlie, 2009). Such discovery can include statistical analyses (Brown, 2008; Ridenour & Newman, 2008). The focus of qualitative research on developing meaning and on understanding perspectives is no doubt why Q methodology is often described as a type of qualitative research.

We revealed the structure of a typical quantitative research study within the section on post-positivism. As we discussed in that section, quantitative research often commences with a theory to be tested; this can be accomplished in Q as Stephenson describes in *The Study of Behavior* (1953). Stephenson also discusses a rather scientific approach to applying Q. It is this more traditional scientific approach, not simply the use of statistics, which indicates that a study uses a quantitative research methodology (Ridenour & Newman, 2008; Tashakkori & Teddlie, 2009).

## Introducing Q as a Mixed Methodology

We presume it is not surprising to the reader that Q methodology has appeared in numerous qualitative annals (Brown, 2008, 2010; Watts & Stenner, 2005) while others have implied that Q is a quantitative method (Block, 2008; Brown, 2008; McKeown & Thomas, 1988; Nunnally, 1978). Certainly some researchers have insisted on applying statistical considerations of R inappropriately within the analyses in Q. McKeown and Thomas (1988) avoid classification by simply refering to Q as distinct.

Stephenson revealed Q methodology in a letter to *Nature* in 1935 and later described it specifically as a way to scientifically measure

subjectivity (Stephenson, 1953). As a student of Charles Spearman (Brown, 1998), Stephenson was well trained in the quantitative aspects of R-factor analysis and statistical considerations. Yet he was careful to explain that the typical statistical considerations of R were not of interest in his Q methodology (Stephenson, 1953). But we should not confuse this stand about statistical considerations with a rejection of a quantitative/post-positive position for Q. After all, Stephenson's use of the word "scientific" (often interchanged with the term "objective") related to measuring subjectivity with Q implies a post-positivistic stand and an acceptance of the quantitative aspects of Q.

Although debates arose between Stephenson and Burt (1939) about the correlation between persons, at the core of this debate were the differences between objective and subjective measures used to group people (Brown, 2009). Burt used data from objective, normative tests to group people. However, Stephenson's Q methodology uses the Q sorts as data. The Q-sort data are inherently subjective because the data involve sorters' preference for item A over item B. Thus we turn our discussion to the Q sort in Q methodology.

**Q Sort as a Constructivist Process**

The sort items in a Q study can consist of statements, pictures, sounds, or other items. If items are statements, such statements may come from a variety of sources including interviews, focus groups, or newspaper articles (McKeown & Thomas, 1988). However, these statements cannot consist of facts but must instead represent opinions. Although a quantitative researcher/post-positivist would be insistent upon operational definitions for terms used within such statements, this is not the case in Q. Having the researcher define these terms does not allow the sorter to interpret the statements based upon his or her own reference frame and, therefore, construct his or her own meaning of the statements. In this way, the sorting process is inherently subjective (Brown, 1980; McKeown & Thomas, 1988; Stephenson, 1953).

Thus, as the participants sort the items provided, based upon the condition of instruction, they are constructing a representation of their view from the statements provided. There are no right and wrong ways to distribute these statements. It is up to the sorters to interpret these statements based upon their own views of their meaning. In other words, the sorting process is self-referential. As such, the sorting process represents a communicative process (Brown, 1980; Stephenson, 1953). Because of the self-reference of the sorters, post-sort interviews or written comments are typically used to assist the researcher in interpreting the meaning of the sorts.

During the sorting, each sorter constructs his/her own reality with the arrangement of the statements (Wolf, 2008/2009). Such a description represents a constructivist view as we have described it earlier in this article. Yet Stephenson (1953) describes the purpose of the Q sort in Q methodology as the way to provide quantitative data for subsequent analysis. In other words, the Q sorting allows modes of behavior to be defined and therefore undergo scientific study (Stephenson, 1953). This explanation is similar to our position that the use of quantitative techniques to aid in the interpretation of qualitative data is consistent with an objective/post-positivist philosophical stand (Newman & Ramlo, 2010).



**Beyond the Q Sort**

In Brown's (2009) response to an article by Danielson (2009), he explains that too often researchers focus on one of two aspects of Q methodology, the Q sort or the ensuing factor analysis. However, focusing on one or both of these aspects ignores Stephenson's greater methodological considerations as noted in detail elsewhere (Brown, 1980; Stephenson, 1953). With this complaint in mind, we will focus on Q as a research methodology as opposed to simply the Q sort or the statistical analyses. When we examine Q as a methodology we can better reveal its mixed-methods research position, as we will do here while providing details on Q's position within the mixed-methods continuums described by Ridenour and Newman (2008) and by Tashakkori and Teddlie (2009) later in this article.

The factor analysis of the Q sorts allows the researcher to classify persons using sophisticated statistical analyses. Although these are the types of analyses typically considered to be quantitative, we have mentioned previously that quantitative research involves more than mathematical calculations and numerical representations of data; quantitative research also focuses on the testing of theories. Stephenson (1953) discusses Q as a way for testing theories and specifically discusses falsification as a way of investigating these theories using Q methodology, as we mentioned earlier. Again, falsification is an aspect of the post-positivist paradigm and, therefore, is a quantitative consideration. Still, the word "theory" in quantitative research is not the same as the word in qualitative research. In qualitative research, theory frequently refers to a world perspective; however, such a perspective is not falsifiable or testable (Ridenour & Newman, 2008).

Yet, Watts (2008/2009, p. 31) discusses the "almost objective status of human subjectivity" with regard to reliability of the factors that emerge from the sorting process even in studies that are separated by both distance and time. As he states, this supports Stephenson's contention that Q methodology is an effective way to capture the reliability of human subjectivity both mathematically and experimentally. Yet Stephenson (1953) was also interested in the

usefulness of the factors that emerge in Q. This is found in his discussion on the use of hand rotation in order to find psychologically meaningful factors. This standpoint fits with the postmodern view of constructivism, which focuses on viability rather than validity of personal realities (Raskin, 2002; Sexton, 1997).

The analyses of the factors in Q methodology provide context-rich results that are highly descriptive; the level of description is more typical of qualitative research than quantitative research. Interpretations of these results allow Q methodologists to describe the opinions or views of those who have sorted the Q sample and, therefore, to address research purposes associated with such determinations. These types of results allow researchers to possibly confirm theory (quantitative) but also allow researchers to develop theory (qualitative).

Hand rotation allows the researcher to investigate hypotheses (a quantitative aspect of the continuum) using abductive reasoning or, in colloquial terminology, to consider hunches (Brown, 1980). Therefore, hand rotation considers the context of the study (Brown, 2010); yet it is exploratory (Brown, 2010; Newman & Ramlo, 2010). Thus, as we will include in our discussion in the next section, Q can be used to develop theory but also to test theory. In this way, Q has the ability to address both qualitative and quantitative research purposes.

## Q and the Qual-Quant Continuum

In the prior section, we discussed the dual nature of Q methodologically—with its qualitative and quantitative aspects—and how this duality was not in conflict with the writings of William Stephenson. In this section we focus our discussion not simply on the use of quantitative techniques to aid in the interpretation of qualitative data but specifically on how Q methodology can be represented by the qualitative-quantitative continuum described by Ridenour and Newman (2008). In their book, *Mixed Methods Research: Exploring the Interactive Continuum*, Ridenour and Newman attempt to remove the conceptualization that quantitative and qualitative research methods represent a distinct dichotomy. Instead, they describe a continuum between these two methods such that mixed methods represent a more holistic way of approaching research in social sciences.

Tashakkori and Teddlie (2009) also discuss a continuum between qualitative and quantitative research while discussing the advantages of using mixed methods to answer research questions. Bazeley (2010) agrees that the integration of qualitative and quantitative research methods enables researchers to better address research questions and broader research purposes. Similarly, Newman et al, (2003) stress that it is a typology of research purposes that determines the selection of the methods used, not whether the methods are considered qualitative,



quantitative or mixed.

Certainly Q methodology fits within the mixed-methods framework as has been indicated elsewhere (Newman & Ramlo, 2010; Stenner & Stainton Rogers, 2004) and as we have described within this article thus far. In our view, the mixing of qualitative and quantitative methodologies is pervasive in Q methodology. To further support this claim, we will now turn our attention to expanding our description by integrating Q into the continuum of qualitative-quantitative research as described by Ridenour and Newman (2008) and by Tashakkori and Teddlie (2009).

***Table 1: Multidimensional Continuum of Research Projects***

| ***Quantitative Extreme (Post-positivist)*** | ***Qualitative Extreme (Constructivist)*** |
|---|---|
| Objective purpose | Subjective purpose |
| Explanatory | Exploratory |
| Numeric data | Narrative data |
| Structured/close-ended | Open-ended |
| Statistical analysis | Thematic analysis |
| Probability sample | Purposive sample |
| Deductive inference | Inductive inference |
| Value neutral | Value rich |

*Note: Simplified version of the multidimensional continuum of research projects, adapted from Tashakkori and Teddlie (2009) in order to focus on specific aspects of Q methodology.*

### The Qualitative-Quantitative Continuum

Tashakkori and Teddlie (2009), in *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences*, created a table showing the continuum of various segments of qualitative and quantitative research. We have modified that table, as shown in Table 1, in order to focus on the key methodological aspects of Q methodology. Tashakkori and Teddlie describe the right-hand side of this continuum as holding most, but not all, aspects of qualitative research (sub-labeled as constructivist). The left-hand side has most, but not all, of the items typically found in a quantitative research project (with a sub-label of post-positivist). Rows have arrows flowing between the left side (quantitative) and right side (qualitative) for each item. These arrows represent the continuum nature of these ends of the spectrum rather than thinking of each item as a dichotomous variable of research. Tashakkori and Teddlie state that it is difficult for any research project to be purely qualitative (meeting all items on the right-hand side) or purely quantitative (meeting all items

on the left-hand side); instead, they suggest that most research projects contain aspects of both qualitative and quantitative research.

As previously mentioned, Ridenour and Newman (2008) also describe a continuum of qualitative-quantitative research. However, their conceptualization revolves around the concepts of developing and testing theory. Their diagram demonstrating this cycle is shown in Figure 1. Numbers 1 through 6 represent the flow of theory testing typical of quantitative research. In other words, quantitative researchers typically begin with theory. After a review of the literature, quantitative researchers develop hypotheses that then lead to the collecting of data and their analysis. Conclusions are based upon these analyses.

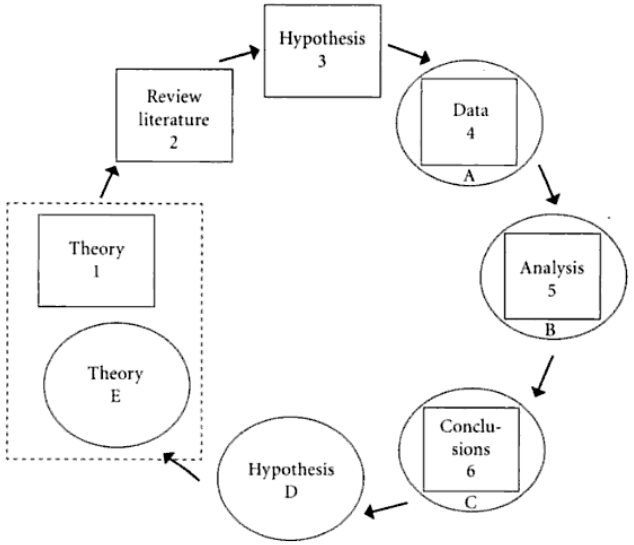


***Figure 1: Ridenour and Newman's (2008) Depiction of the Qualitative-Quantitative Continuum***

However, Ridenour and Newman (2008) use Figure 1 to also explain the development of theory that occurs within qualitative research. Within the continuum, letters A through E indicate how theory, used interchangeably here with the term "world perspective" in qualitative research, is built but not tested. Thus, in qualitative research, we start with data followed by its analysis. Conclusions are drawn from this data and hypotheses are developed. This leads to the development of theories, but these theories are not tested within qualitative research.

Thus theory is neither at the beginning nor at the end of the continuum. The theory square (quantitative) and circle (qualitative) overlap and continue the cycle. Neither squares nor circles make a whole. Yet, this continuum indicates that what researchers need is a way to both build and test theory. Thus, mixed methods can be used to close the gap and complete the cycle of research in the social and behavioral sciences. As already mentioned, Q methodology can be used to build theory but also to test theory.



Ridenour and Newman (2008) offer examples of both the benefits of mixed methods (e.g., how qualitative methods can be used to inform researchers about what quantitative results really mean) and how various studies are part of the continuum. We next discuss how Q methodology is also part of Ridenour and Newman's research continuum.

## Q Methodology's Place in the Continuum

So far, we have described two different representations of continuums of research. We have also discussed the aspects of Q methodology that fit into qualitative and quantitative paradigms. Our goal now is not to blend these discussions in order to describe Q methodology's position within each of these continuums. We start with the multidimensional continuum of research projects (Tashakkori & Teddlie, 2009).

***Table 2: The Multidimensional Continuum of Research Projects (Tashakkori & Teddlie, 2009) with Q methodology Positions Entered***

| ***Quantitative Extreme (Post-positivist)*** | ***Mixed/Other*** | ***Qualitative Extreme (Constructivist)*** |
|---|---|---|
| Objective purpose | **Q** | Subjective purpose |
| Explanatory | **Q** | Exploratory |
| Numeric data | **Q** | Narrative data |
| Structured/close-ended | **Q** | Open-ended |
| Statistical analysis | **Q** | Thematic analysis |
| Probability sample | **Q** (sample is items) | Purposive sample |
| Deductive inference | **Q** (uses abductive reasoning) | Inductive inference |
| Value neutral | **Q** | Value rich |

Table 2 contains the same items from our adaptation of Tashakkori and Teddlie's (2009) table, as shown in Table 1, but with **Q**'s representing Q methodology's position for each of these continuums. For all but one of these items, we have placed Q at the center of the continuums. The exception is Q's position toward the qualitative side of the continuum related to the research purpose. The purpose of Q methodology studies is to measure subjectivity although it does so objectively because subjectivity is made operant through factor structure (Stephenson, 1953). Q methodology is placed in the center

of the remaining continuums, representing a mixture of both the quantitative and the qualitative positions on research. The first of these placements is based upon Q methodology being used to seek explanations but also to explore subjectivity. For the next continuum, Q is again placed in the center because the narrative data of the concourse and ensuing Q sample are obviously qualitative yet as Stephenson (1953) stated, and as we mentioned earlier, the sorting provides quantitative data. For the fifth row, the continuum is statistical to thematic. As we discussed earlier, Q uses sophisticated statistical analyses; however, the interpretation of the results is similar to theme analysis; thus, Q is placed in the center of that continuum as well.

The sixth continuum in Table 2 ranges from probability sample (random sample) to purposive sample (selected by the researcher subjectively based upon his/her belief that it is representative of the population). Of course, in Q methodology, the sample is actually the set of items sorted (Q sample), not the group of people who participate in the sort (P set). The selection of these items comes from the concourse (McKeown & Thomas, 1988). Unlike surveys or a population, the limits of concourse are boundless and, therefore, the number of items infinite. Items selected for sorting come from the concourse identified by the researcher and represent the communicability of the topic such that they are suitable for experimentation. The Q-sample selection can be done with an unbalanced or balanced design, such as those in accordance with the experimental design principles developed by Fisher (Brown, 2010; Stephenson, 1953). Fisher's (1951) original 1935 text, *The Design of Experiments*, essentially founded the field of experimental design and presented concepts such as randomization, replication, and block design. Yet Stephenson (1953) states that any sample of statements that is assembled theoretically is acceptable regardless of the design considerations and discusses how researchers using different Q-samples are still able to investigate the same theory. Finally, Stephenson stresses that items for the Q sample must never be selected purely at random from the universe of items (concourse). With the possibility of Q researchers using different means of selecting the Q sample, other than purely random selection, we have placed the Q in the center of this continuum.

The final row of Table 2 includes the range from inductive to deductive reasoning. Q uses abductive reasoning and we have placed its position at the midpoint of this last continuum. Abductive reasoning involves logical inference that leads to an explanatory hypothesis. Johnson and Gray (2010) state that although some consider abductive reasoning as a type of inductive reasoning, others believe it is a separate type of reasoning that involves arriving at the best explanation possible. We agree with the latter and have placed Q's position in the middle of



that continuum. Thus, with the exception of the continuum of research purpose, we have placed Q within the center of each of the research continuums presented in Table 2. Therefore, based upon the placements of Q within Tashakkori and Teddlie's (2009) continuums, Q appears to, again, represent a mixed research methodology.

Next we consider the research continuum offered by Ridenour and Newman (2008) and Q methodology. As we described in the previous section, central to their research continuum is the idea of theory: developing theory (qualitative) and testing theory (quantitative). Theory and experimentation are central to Stephenson's (1953) discussions of his method. As we have just mentioned, Stephenson sees theory as important in the selection of Q samples. In *The Study of Behavior*, he often mentions how Q allows one to investigate existing theory. Similarly, McKeown and Thomas (1988) state that, when researchers use structured Q samples, they are promoting the investigation of theory.

Certainly, however, Q methodology can be used to help determine theories as world views. As an example, we can return to the studies by Ramlo (2008b) that investigated students' views of their learning in a first-semester physics course. Previous studies using aggregate data from Likert-scale surveys demonstrated that there were disconnects between views of learning held by physics experts and physics students (Adams, Perkins, Dubson, Finkelstein, & Wieman, 2005; Gire, Price, & Jones, 2007; Halloun & Hestenes, 1998; Perkins, Adams, Pollock, Finkelstein, & Wieman, 2005). These studies assumed that "experts" had correct epistemological views and novices had incorrect views. Other investigations, not specific to physics students, such as Schommer (1990), also typically used aggregate data from Likert-scale surveys and focused on students' views such as the stability of knowledge. Although Ramlo based her Q sample on the study by Schommer, she expanded this to investigate new theories such as students' willingness to consider connections between conceptual ideas in a first-semester physics course using Q methodology. Her work demonstrated that seeking connections for a more holistic view of force and motion is important if we want students to gain a Newtonian view of force and motion.

Thus, Q allowed Ramlo to utilize previously developed theory while exploring new ideas and developing new theories associated with the learning of force and motion concepts. A subsequent study (Ramlo & Nicholas, 2010), using in-service science teachers, demonstrated the replicability of Ramlo's earlier findings. The idea of replicability is typically associated with quantitative research and, as Ridenour and Newman (2008) discuss, more important than demonstrating statistical significance in a single study. Therefore, we have illustrated how Q can be used to both develop theory and to test theory. In addition, Ramlo,

using Q methodology, has demonstrated what Ridenour and Newman (2008) describe as occurring with the combination of qualitative-quantitative research methods; in such studies, they state, the research is more holistic with a closing of the gap between qualitative and quantitative. In this way, mixed methods complete the research cycle.

## Conclusions

We believe that we have presented ample evidence that Q methodology is a mixed research method that existed before the term mixed-methods research was even considered a possibility. William Stephenson created Q in order to objectively study subjectivity, which appears to us to be inherently a mixture of methods, qualitative and quantitative. Tashakkori and Teddlie (2009) argue that most social and behavioral research is inherently mixed, containing both qualitative and quantitative aspects although not in equal mixture. Yet Q methodology possesses more than aspects that are qualitative or aspects that are quantitative. Instead, Q is a unique hybrid of qualitative and quantitative research methods. Within the qualitative-quantitative continuum presented by Ridenour and Newman (2008), we see that Q methodology can be used to both develop theory (qualitative) as well as test hypotheses to confirm theory (quantitative). Within the multidimensional continuum of research projects presented by Tashakkori and Teddlie (2009), we see that Q methodology is most frequently a mixture of aspects from the post-positivist view of research (quantitative) and the constructivist view of research (qualitative). Methodologically, based upon the methodological continua of QUAL-MIXED-QUANT research of Tashakkori and Teddlie (2009), we see again that Q methodology fits within that MIXED column.

We believe, therefore, that we have successfully demonstrated that Q methodology fits into the contemporary research practice of mixed methods and that this perspective is not in conflict with Stephenson's positions on Q as a methodology. In addition, we have shown that Q methodology already contains, as a hybrid methodology, techniques and procedures that allow researchers to mix qualitative and quantitative research methods. Thus, Q methodology is well positioned to be described as a mixed research methodology.

We close by suggesting that a position within the qualitative-quantitative continuum may enable Q methodologists to more readily publish in a variety of journals by presenting Q as a mixed methodology rather than a qualitative or quantitative methodology. Stenner and Stainton Rogers (2004) noted that qualitative and quantitative researchers alike often feel uncomfortable with certain aspects of Q methodology. Certainly more quantitatively oriented reviewers who see Q methodology may view Q as a quantitative method because of its use



of sophisticated statistics, including factor analysis, and therefore may also feel put off by its more qualitative methodological aspects (e.g., see the Q sort as not representing objective data). Such reviewers might also try to impose methodological considerations from R-factor analysis onto the Q studies they review because they are missing, in part, the mixture of methods in Q. Similarly, qualitative researchers who review Q studies may embrace the measure of subjectivity but feel uncomfortable about its statistical analyses and its focus on objectively studying subjectivity. However, such discomfort can, perhaps, be alleviated by noting that concerns often raised by qualitative and quantitative researchers about Q methodology can be assuaged by focusing on Q methodology's position within the qualitative-quantitative continuum known as mixed-methods research. In addition, allowing Q to have a position within mixed-methods research allows it to be more than an isolated, unique research method with a relatively small following. Instead, inclusion within a larger methodological umbrella may assist Q methodologists, and other researchers, in the purpose of all science, which is communication, the demonstration of relationships, and heuristic value.

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