Operant Subjectivity: The International Journal of Q Methodology
45(2023): 1-16, DOI: 10.22488/okstate.23.100501

Operant Subjectivity
The International Journal of Q Methodology

It's Not the Notes That Make It Jazz: Why Structure Is Important in Jazz, the Natural Sciences, and Q Methodology

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Abstract: Our world is full of algorithms that operate within social media, face identification, et cetera. Is the algorithm the secret to uncovering meaning and understanding within Q methodology or are algorithms also full of subjectivity? Stephenson predicted the problems others would have with Q methodology. Steven Brown suggested that one must get "a feeling for the organism" during interpretation, yet some Q researchers seem to seek formulaic approaches to their Q studies, sans a sense of feeling for the subjectivities uncovered. In this way, these formulaic researchers seek a set of algorithms to perform Q studies much like novice physics students often approach problem solving. However, as a famous jazz bassist stated, "It's not the notes that makes it jazz … it's not music without structure." This assertion was the impetus for addressing how Q, jazz music, and natural science use structure to frame exploration, interaction, and inquiry. Thus, the various structures within the stages of any Q study can help frame any study but in a way that is always new and inclusive while embracing inquiry and exploration.

Keywords: algorithms, concepts, inquiry, novices, structure

Introduction

Q methodology (henceforth referred to as Q) embraces qualitative and quantitative research characteristics while uniquely allowing researchers to uncover and describe divergent viewpoints about a topic or event using empirical evidence (Brown, 1980; McKeown & Thomas, 2013; Newman & Ramlo, 2010; Stephenson, 1953). Q encompasses the entire research process, from theoretical framing to data collection, analysis, and interpretation of findings. In short, Q provides a structured approach to understand the diversity of opinions within a group or within an individual. Within this article the five stages of any Q study are addressed, drawing on the work of Steven Brown and William Stephenson, in conjunction with an example Q study, to demonstrate the importance of the structures that are part of the underlying framework of this amazing methodology. Stephenson (1979) understood that Q, with its subjective

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paradigm, was a methodology that few were willing to accept. Certainly, objective ideas have crept into Q methodology from outside and within the Q community. Yet, it is sometimes forgotten that, with PhDs in physics and psychology, Stephenson came to create a methodology that is steeped in scientific principles from the natural sciences including inquiry, exploration, and structure. It is noteworthy that inquiry refers to a systematic process of asking questions and seeking answers through formalized and structured methods. Exploration involves a broader, more open-ended approach aimed at discovering new information, understanding phenomena, or identifying new questions. Unlike inquiry, exploration may not begin with a specific question. Inquiry, exploration, and structure are fundamental aspects of the natural sciences that extend across scientific disciplines including physics.

The impetus for this article came from listening to a recent podcast of Marc Maron (2022) with guest famous jazz bassist Ron Carter. During the podcast, Carter stated that "It's not the notes that makes it jazz … it's not music without structure." Jazz music incorporates structure through its harmonic progressions, standard song forms, and swing rhythm. While jazz allows for improvisation and spontaneity, these underlying structures provide a framework for musicians to interact, communicate, and create within a coherent musical context (Terefenko, 2014). Thus, Ron Carter's statement made me, as a Q methodologist about to enter her third decade studying Q methodology, think about how the concept of structure and its importance within Q methodology gets lost within the idea of "doing Q."

Within Q, factor structure is often discussed more than the other types of structure that permeate Q methodology. The factor structure must be revealed as the Q methodologist seeks operantcy through exploration of multiple factor solutions. The factor arrays provide a key ingredient for the researcher to understand the divergent subjectivities within their P set. Stephenson (1953, 1983) suggested using the factor arrays to create representative sorts for each factor to help interpret the states of feeling that exist. Watts and Stenner (2012) proposed crib sheets for beginning the process of deciphering the subjectivity held within each factor array. However, as a journal reviewer, I often find that those referencing these crib sheets do not extend their factor discussions to holistic views of feeling. Others color code the Q sample items according to their original, researcher-identified themes to gain insight into each subjective viewpoint that emerged within their study (e.g., Jourdain et al., 2021; Sorola, 2022). A review of these articles indicates that these researchers are relying on their initial concourse and Q sample rather than engaging with the structures provided by the Q factors. Still others have combined the crib sheet with the Q-sample theme color coding (McAnulty, 2021). Some Q researchers focus on several specific items in the Q sample that are especially salient for certain factors, and this is the basis of their interpretations. Nonetheless, the sense is still one of following a recipe for doing a Q study rather than seeking meaning and feeling for the organism. In *Against Interpretation*, Stephenson (1983) wrote that "understanding a factor in Q is a complex matter" (p. 74). Not surprisingly, how to best interpret factors (perspectives, viewpoints, etc.) is a common question amongst newer Q researchers. But are algorithmic processes the answer to interpretation? Is "doing Q" a process or an inquiry?

Our current world is full of algorithms that operate within social media, face identification, criminal profiling, etc. Is the algorithm the secret to uncovering meaning and understanding within Q or are algorithms also full of subjectivity? Brown (1989) suggested that one must get "a feeling for the organism" during interpretation. His title

comes directly from Evelyn Fox Keller's (1983) excellent biography of Nobel laureate and maize geneticist Barbara McClintock. Within this book, Keller provides insight into the subjectivity that played a key role in McClintock's success as a natural scientist. To fully understand this idea of "feeling," one must have a deep understanding for all the stages within a Q study including the science behind the structures. We include an example throughout to demonstrate the idea of structure within Q.

Algorithms

The *Merriam-Webster Dictionary* (n.d.) defines an algorithm as "a procedure for solving a mathematical problem in a finite number of steps that frequently involves repetition of an operation … a step-by-step procedure for solving a problem or accomplishing some end." The text *Introduction to Algorithms* (Cormen et al., 2009) contains a definition for algorithm that is explicitly tied to well-defined computational procedures that takes a value or a set of values as input and produces some resulting value or set of values as output. In mathematics and the physical sciences, algorithms may be used to solve mathematical equations without understanding either the underlying scientific relationships or the mathematical concepts, such as algebra (Dykstra et al., 1992).

In *The Art of Computer Programming*, Knuth (1997, p. 1) defines an algorithm as "a finite set of precise instructions for performing a computation or solving a problem." These definitions emphasize the key characteristics of an algorithm, including its finite nature, well-defined steps, input-output relationship, and computational nature.

We encounter algorithms regularly because they play a significant role in various aspects of social media and face identification, to name only two. Yet algorithms are not free of subjectivity. Social media platforms employ algorithms to curate users' feeds, recommend content, and target advertisements, and these same algorithms can lead to the amplification of misinformation, polarization, and the spread of biased content (Pariser, 2011). Face identification algorithms, commonly used in facial recognition systems, analyze facial features to identify or verify individuals. However, several studies have shown that these algorithms can exhibit biases, particularly regarding race and gender. Research conducted by Joy Buolamwini and Timnit Gebru demonstrated that commercial face recognition systems had higher error rates for darker-skinned individuals and women when compared to lighter-skinned individuals and men (Buolamwini & Gebru, 2018). This highlights the potential for algorithmic bias and its implications for fairness and accuracy in face identification technology. We use these examples to help indicate that using algorithms does not necessarily mean embracing pure objectivity or being bias-free.

Within the natural sciences, algorithms refer to step-by-step procedures or computational methods used to solve problems, analyze data, or simulate phenomena. For example, numerical integration algorithms, such as the trapezoidal rule or Simpson's rule, are used in physics and engineering to approximate definite integrals (Burden & Faires, 2015). Similarly, algorithms in bioinformatics are developed to analyze DNA sequences, perform sequence alignments, or predict protein structures (Durbin et al., 1998).

Algorithmic thinking contrasts sharply with the ideas that Stephenson articulated about Q methodology. In "Protoconcursus: The Concourse Theory of Communication" (Stephenson, 1986), he critiqued the prevailing intelligence test theory, particularly in the era of computers, arguing that it oversimplified intelligence into mere algorithms

and pattern-recognition processes suitable for machines. Stephenson repositioned issues of intelligence as fundamentally issues of communication, suggesting that the true essence of intelligence is complex and eludes definitive explanation, claiming it "will never find a satisfactory answer" (Stephenson, 1986, p. 76). Within his further description of using Q within this same article, Stephenson made clear that Q is based on scientific inquiry such that a set of standardized routines has no place within Q's zetetic stages.

Brown and Robyn (2004) took a stand like Stephenson's about algorithms, but specifically within Q's factor-analytic stage. There is not one set factor solution, as Brown and Robyn explain, just like there is not one solution for every person with a headache. One could make a case that everything about Q is exploratory in nature; therefore, algorithms cannot take the place of an inquisitive investigator attempting to unearth subjective viewpoints about a topic or event. Similarly, Brown's (1968) review of Q articles that appeared in psychological journals in the 1950s and 1960s revealed a preoccupation with the technical aspects of Q methodology (e.g., statistical improprieties) while excluding Q's broader principles. Thus, we argue that using algorithms is not a replacement for embracing and reflecting upon Q's underlying principles that are based on those of the natural world.

The situation within Q methodology parallels my experiences teaching introductory college-level physics courses. Too often, students rely on an algorithmic approach to solving physics problems rather than developing a deep understanding of the underlying principles, equations, and concepts. In physics, this is referred to as "turning the crank," indicating a mechanical, unreflective approach to problem-solving. Chi et al. (1981) provide an excellent illustration of this issue. In their study, researchers presented Newtonian physics problems to novices and experts, asking them to classify and categorize the problems. Experts categorized the problems based on underlying physics principles, such as conservation of energy or Newton's Second Law. In contrast, novices grouped problems based on superficial features irrelevant to solving them, such as the type of object or physical scenario (e.g., balls versus a box on an inclined plane). Participants' verbal descriptions further revealed the differing approaches: novices relied on specific words and object-based algorithms, while experts used tacit knowledge to connect problems to appropriate principle-oriented knowledge structures, or schemas.

Structure in Q

Structure is a fundamental aspect of the natural sciences. Stephenson (1979) understood that a scientific means for studying subjectivity would need to embrace structure, much like the natural sciences including biology and physics. Within the natural sciences, structures help to systematize knowledge, facilitate communication, and provide a framework for understanding the natural world. Structure in the natural sciences encompasses various levels, from the overall structure of scientific disciplines to the organization of scientific papers and the hierarchical arrangement of biological organisms. For instance, hierarchical structure in biology aids in understanding the relationships and shared traits among different organisms, facilitating the study of biodiversity and evolution.

Kuhn (1970), in his text *The Structure of Scientific Revolutions*, emphasized how the structure of natural science disciplines evolves as new discoveries and theories emerge. Stephenson (1953) saw Q as a similar means for new discoveries and theories within

the social and behavioral sciences. Thus, not surprisingly, there is a reoccurring theme across each of the different stages within any Q study and that theme is structure. However, the stress on structure does not mean maintaining the same structure across each of these stages nor maintaining a limited recipe for performing Q studies. Instead, just as in science and in jazz, structure in Q must be flexible to fit the situation. It is important to recall that Stephenson (1983) stated that in using Q, we are giving form to subjectivity. To demonstrate more clearly each of these structural stages within Q, we will draw on a Q study that investigated free speech on college and university campuses in the United States (Ramlo, 2020a)

The Q-sample Structure

In Q, the Q sample is taken from the concourse, a universe of subjective items, most often statements, which are inclusive of all types of communications on the topic or event of interest. Theoretically, the concourse would be boundless in that the researcher could go on forever collecting unique statements about a topic or event. However, Fisher's pioneering book on experimental design, *The Design of Experiments* (1935), in part drawing on statistical principles originally developed for growing and testing new agricultural products such as corn, provides the Q methodologist with a better approach than collecting thousands of subjective items (Brown, 1980; Stephenson, 1953). Fisher's experimental design procedures allow us to select the Q sample theoretically in such a way that neither thousands of items in the concourse nor hundreds within the Q sample are necessary. This theoretical selection is based on uncovering the structure of the concourse by identifying circumstances and/or themes and then using these to provide selection criteria to create a balanced Q sample design based on theoretical considerations (Brown, 1970, 1971, 1980; Stephenson, 1953).

A typical Q sample contains 40 to 60 items (Brown, 1980). Using a theoretical structure for a Q sample ensures that the Q sample is comprehensive relative to the variety of communications it contains. However, the Q sorter is unaware of this structure and rarely reflects this structure within their Q sort (Brown, 1970, 1980; Stephenson, 1953). Additionally, the researcher-imposed theoretical structure of the Q sample is relatively unimportant for interpretation of the views expressed by participants because, ultimately, these initial structures are replaced by categories that are *operant* in that they are natural and "functional as opposed to merely logical distinctions" (Brown, 1993, p 97).

For our example study, a literature review was used to develop the concourse of 164 items (statements) related to freedom of speech on university campuses. Eleven themes were identified across these 164 items: Academic freedom, Administration, Contingent faculty, Democracy, Expression of ideas, Faculty expertise, Fear, Historical perspective, Regulation, Social media, and Tolerance. Fisher's balanced design procedure (Brown, 1970, 1971, 1980) was used to select the Q sample from the concourse across the 11 themes. The reduction from concourse to Q sample was performed in three stages with the first iteration taking the number of items from 164 to 86. This initial iteration focused on eliminating similar statements within the concourse and, in some cases, combining two or more items into one. The second iteration focused on balancing the Q sample which resulted in 59 items. The researcher then performed several sorts, playing the role of different types of stakeholders, with these 59 items to further investigate the inclusivity and balance within the Q sample. The final iteration resulted in 55 items from across the eleven themes. The number of items were not the same across each of the eleven themes in this case, but the structure provided a broad, inclusive Q sample. Eight was the largest number of items for a theme and were taken

from the Expression of Ideas category. Five themes had six or seven items. The remaining themes had between one (in Social media) and five items.

The P-set Structure

The number of participants is not the sample size in Q. The sample size is the number of items in the Q sample (Brown, 1980; McKeown & Thomas, 2013; Stephenson, 1953). The P set represents the participants in the study. Sometimes the participants represent a convenient set, perhaps a classroom of students, and sometimes participants are selected purposefully. This is why we use the terms set for the participants and sample for the items (Ramlo, 2021). Purposive selection of participants essentially means there is a structure for the types of participants recruited. Brown (1980) provides a clear example of selecting participants based upon Thompson's theory of public opinion such that one must distinguish between experts, authorities, special interests, and the uninformed. In other words, the Q sample is selected to assure diversity of communications and the P set is selected to assure respondent diversity. Embracing this type of structure increases the likelihood that a diverse set of perspectives may reveal themselves in the form of unique viewpoints (McKeown & Thomas, 2013). The example that follows demonstrates this idea.

Dieteren et al. (2023) found that 10.0% of the Q studies in their literature review used convenient sampling and 56.6% reported using purposive sampling. Snowball-recruiting represented another 5.7% of the Q studies. Other means of selecting participants, such as random selection, were reported for 18.6% of the studies and another 9.1% did not mention how participants were recruited. However, Dieteren et al. do not disclose how they define purposive sampling. Thus, we cannot assume that the percentage reported used the purposive sampling suggested by Brown (1980).

Our free speech example used purposive sampling for selecting the P set based on Thompson's theory of public opinion as described by Brown (1980). Applying Thompson's theory to the free speech study, there were Experts represented by academics with deep knowledge about matters associated with free speech. Authorities included non-expert faculty and staff. In our example we also determined administrators in higher education would represent the category of Special Interests because they may be directly affected or caught up within the outcome of the issue in question. Finally, in our study participants classified as Uninformed were undergraduate and graduate-level college students. This is not to say that the Uninformed are completely ignorant of the concept of free speech on campus, but their knowledge is likely to be at a more basic level than the other categories.

Including gender (male and female) as the other set of variables in the P set matrix provided a 4 X 2 factorial design for seeking a set of participants. If one selected m=3 replications for each combination, this would produce a P set of n = (4)(2)(3) = 24 participants. If replications were set at m=4, there would be n = 32 participants. Approaching the recruiting of participants in this way assists the Q researcher to purposefully seek specific types of people (based on their positionality, as their viewpoints are not yet defined). However, the P set does not have to be completely balanced across all dimensions (Brown, 1980; Stephenson, 1964). Table 1 breaks down the P set structure for the free speech study which resulted in five unique factors.

Table 1

P-set Structure

Category	Number
Gender	
Males	18
Females	18
Total	36
Interests	
Experts	6
Authorities	18
Special Interests	4
Uninformed	8
Total	36

The Q-sort Structure

Each participant is presented with the Q sample items as individual cards – whether those cards are physical or electronic, the latter for online Q sorting. The participant begins by examining each item and placing it in one of three piles: Agree, Neutral, or Disagree. Next, the participant addresses the items in each pile – typically beginning with the agree pile. They find those few statements most salient with their opinion/feeling and place them within the grid at the extreme position of Most Agree. The participant then works on the placement of the agree items across the continuum, heading toward the neutral "0" column. This process is repeated for the other piles. Finally, each participant reviews their sort to ensure that it represents a snapshot of their view on the topic, moving items, as necessary. The Q sort represents the quantification of the participant's feeling about the topic (Stephenson, 1983). The structure of the Q sort represents the participant's subjective viewpoint, and this takes precedent over the theoretical structure of the Q sample (Brown, 1980; Stephenson, 1983).

Stephenson (1980, 2007) described how C.S. Peirce's philosophy fits the process of Q sorting, calling it "Peirce's Law," while others have referred to it as Peirce's "Law of Mind" (Brown, 1993, 2023). In short, the participant provides order to the Q sample by using feeling to place the items along the grid continuum, Most to Most, such as Most Agree to Most Disagree, based on a condition of instruction, which simply frames the sorting context (Brown, 1993). The final Q sort represents a snapshot of the participant's subjective view (Brown, 1980). In terms of Peirce's view on the mind, he regarded the mind as a complex and dynamic system that engages in continuous processes of inquiry and interpretation. Peirce proposed that the mind uses abduction to constantly generate hypotheses and make inferences to understand and navigate the world (Buchler, 1950). Of course, the structure of each Q sort is what is then analyzed, and a factor matrix uncovered.

In our example, participants were provided a package with the individual items each on a separate piece of paper and a sorting grid. Participants were asked to sort the items based upon their views of free speech on their college or university campus (the condition of instruction). Post-sort, participants answered questions about the most

salient items from their sort (those placed at the +5 and -5 columns) and their sorting experience. Sorts were entered into PQMethod (Schmolck, 2002) for analysis. The researcher read the post-sort comments as she entered the sorts to get a sense for the different expressions of feeling offered by the participants.

The Factor Structure

The purpose of factor theory in Q is to determine which Q sorts are similar in that they represent the same or similar feeling. The factor matrix emerges from the analysis of the Q sorts which involves correlation and factor analysis. The factor analysis provides structure to the Q sorts with similar sorts brought together on factors statistically. The goal is to have the subjective phenomena represented by operant factor structure. Yet there is nothing automatic about this stage within Q (Stephenson, 1983). This is not an application of psychometrics and factor theory (Stephenson in Brown, 1980, p. x).

To select a factor structure, some researchers suggest that eigenvalues of 1.0 or higher and total variances accounted for in the 35-40% range are the hallmarks of a good factor matrix structure and factor solutions that meet these criteria are good (Watts & Stenner, 2012). Although these may simply be seen as suggestions by these and other researchers, many Q researchers appear to take these as criteria rather than suggestive for guidance (Ramlo, 2017, 2020b) making its adoption common within Q studies (Dieteren et al., 2023).

However, guidance based on eigenvalue cutoffs and variance accounted for come directly from R methodological standards rather than those of Q methodology (Brown, 1978, 1980; Ramlo, 2015, 2016, 2020b, 2023). Watts and Stenner (2012) do admit that their guidance comes from R methodology but do not think using objective criteria is a problem as far as finding good factor solutions. They suggest that these quantitative criteria provide an important guide to Q methodologists. Yet it is important to stress that objective criteria for decision making about the factor matrix cannot replace theoretical considerations that are based upon operantcy (Brown, 1978, 1980).

Watts and Stenner (2012) also suggest the use of centroid factor extraction followed by varimax rotation in addition to criteria related to eigenvalue cutoffs and variance accounted for. Ramlo (2017) used survey responses from 68 Q methodologists to examine their practices regarding factor extraction and rotation. Also within that survey, nine participants specifically noted that they routinely use centroid extraction with varimax rotation. Each explained their preference by citing the Watts and Stenner (2012) text. For instance, one of these participants stated, “I choose centroid and varimax based on the recommendations and rationale provided by Watts and Stenner.” Others preferred PCA with varimax with one participant explaining that “simple structure provides easiest interpretation.” In this same study, only four participants stated they preferred centroid with hand rotation, as preferred by Stephenson (1953). However, Stephenson (1953, 1983, 2007) took the underlying principles of exploration and inquiry from the natural sciences and included them within his methodology, as well as his preferences for factor analysis, for he saw no reason to separate the human and natural sciences. In other words, Stephenson was suggesting that, rather than following the same process for each Q study regarding factor extraction and rotation, Q researchers should explore multiple solutions. As such, Stephenson was embracing inquiry, a key aspect of discovery within the natural sciences.

Embracing this desire for exploration and inquiry, Stephenson (1953) chose the preferences of centroid extraction and theoretical rotation for his methodology. The centroid’s indeterminacy best allows the researcher to hand rotate the factors based on

theoretical considerations (Brown, 1980, 1986; Stephenson, 1953). Theoretical rotation is used to explore different factor solutions while seeking to uncover the operantcy that exists within the factor solution, including the structure of the factor arrays. In other words, the Q researcher rotates the axes theoretically, guided by the data and by the researcher's knowledge (Brown, 1980; Stephenson, 1953). Ramlo (2015, 2016) called this a qualitative approach to factor analysis because it is one that is inquiry-based and develops, rather than confirms, theory. Within seeking an appropriate factor solution, the Q methodologist seeks theoretical significance rather than statistical significance (Brown, 1978, 1980, 1986; Stephenson, 1953). However, as Braswell (2022) demonstrated, there is only so much structural variability possible using different extraction and rotation choices.

Q's preferences at the factor analytic stage may seem at odds with the practice of R factor analysis, but these preferences allow the researcher to capture the meaning of the participants' views, as revealed through their Q sorts and expressed as Q factors (Brown, 1980; McKeown & Thomas, 2013; Stephenson, 1953). Rather than representing statistical impropriety, this qualitative approach is based upon theoretical significance rather than statistical significance (Ramlo, 2015, 2016). Recall that Stephenson (1979) stated that Q is based upon a subjective paradigm, not an objective one.

Within the free speech on campus study, the researcher explored numerous different factor solutions using different extraction and rotation choices. She wanted to ensure that some of the unique viewpoints expressed within the comments remained within the final factor solution. The researcher chose a PCA extraction with varimax rotation as the best theoretical solution – one that represented the operant solution. This factor matrix contained four factors, including a bipolar factor. This bipolar factor (Factor 4) had two sorters positively correlated and one negatively correlated. To facilitate interpretation, the factor was split in two with the new Factor 4 associated with the positive loaders and Factor 5 associated with the negative loader. Factor 5 was inverted so that sorter, #29, was positively correlated with that factor. Again, this was done to facilitate interpretation, as suggested by Brown (1980).

Thirty-two of the 36 sorters (89%) were represented by a factor/viewpoint. However, having many sorters identified on factors is not as important as finding an operant factor solution. Recall the suggestions by Watts and Stenner (2012) to use variance accounted for an eigenvalue cutoff of 1.0 for determining factor structure. Table 2 contains these values for each of the factors.

Table 2

Variance Accounted for and Eigenvalues for Each of the Five Factors

Description	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Eigenvalues – unrotated factors	11.26	3.40	3.01	1.68	1.35
% Explained Variance	18	16	17	6	6
No. of sorts	12	8	9	2	1

The eigenvalues shown are all over 1.0. However, there were eight unrotated factors, the default for PQMethod (Schmolck, 2002). All eight of these unrotated factors had eigenvalues above 1.0. Recall that Watts and Stenner (2012) also suggest that the total variance accounted for in the 35-40% range represents a good solution. The operant factor solution chosen here represents a total variance of 63%. If we went for a lesser amount, we would have lost the subjective viewpoints of Factor 4 and Factor 5. As we will see within the interpretation section, those views are important for understanding the entirety of the subjectivity regarding free speech on campus.

Interpretation

As a result of the analyses, which only utilize those sorts identified as representative of a factor, factor arrays are created for each view (factor). Each factor array can be used to display a theoretical Q sort, sometimes referred to as a composite sort, for the factor. Each composite, or theoretical, sort represents a transformation of the factor array into the grid pattern (Stephenson, 1983). In other words, each of these composite Q sorts is a representation of its associated view. Unless there is only one sorter on a factor, this composite sort is not identical to any one sort identified with the factor. However, Peirce's "Law of Mind" assures us that a coherent theme or story will emerge from each of the factor arrays (Brown, 2023). In this way, each factor array/composite/theoretical Q sort represents a schema. The Merriam-Webster Dictionary (n.d.) defines schema as "a mental codification of experience that includes a particular organized way of perceiving cognitively and responding to a complex situation or set of stimuli."

Brown (2023, p. 165) brings additional theory into interpretation of Q factors:

> Stephenson was familiar with Gestalt theory and in fact hosted Kurt Koffka, one of the Gestalt founders, at Oxford in the 1930s and subsequently contributed to the Gestalt literature, and one of the central principles of Gestalt psychology – that parts only take on meaning in the context of the whole – is likewise central when it comes to the interpretation of Q factors. Peirce's Law of Mind leads us to look for a common schema in the order among the items within a factor… but the meaning that is assumed most likely to be at issue with regard to any particular item is the one that conforms with the other items within which it is imbedded.

Thus, once again, structure plays an important role, but this time related to the structures of states of feeling. In Q, we should not interpret a factor / view based on only the most salient items in the factor array or just the distinguishing statements. Instead, the structure is to be seen as a coherent theme, as Brown (2023) reminded us, to be interpreted. This means that interpretation in Q is holistic in that it takes the whole factor array into consideration. Because it is quite possible that there are alternative explanations for the similar arrangements of the Q sample into the grid, post-sort comments or interviews help us clarify the coherent structure of the factor arrays. In cases where the coherent structure is more elusive to the researcher, at least at first, these post-sort comments can bring us clarity.

In *Against Interpretation*, Stephenson (1983) stressed that, during interpretation of Q factors, it is the researcher's goal to understand, not simply explain, each view. He stressed that meanings are at issue within Q (Stephenson, 1983) but that understanding each view is a complex undertaking (Stephenson, 1961). He described recreating the theoretical sorts for factors and spending a great deal of time with each to, at least at

first, get a sense of the feeling within these theoretical sorts. With today's software options like KADE (Banasick, 2021), a composite sort is automatically offered for each factor/view.

Stephenson (1983) described the use of abduction to ascertain feelings from the theoretical sorts. At first, he may focus on the differentiating statements for each but always examining the entirety of the theoretical sorts to understand the viewpoints. These understandings are then used to examine the post-sort comments of the participants and provide further credibility to the understanding of each viewpoint (Stephenson, 1983).

Brown (1980) asks Q methodologists to draw on their experience while exploring factor solutions. Nonetheless, this may seem difficult for those new to Q methodology (Watts & Stenner, 2012). Albright et al. (2020) encourage a team approach to interpretation especially if it involves mentorship from a more experienced Q researcher that can guide the novice in the use of abduction and a holistic approach to interpretation. Nevertheless, recall that Peirce declared that the mind is a complex and dynamic system that engages in continuous processes of inquiry and interpretation with abduction allowing us to constantly generate hypotheses and make inferences to understand and navigate the world (Buchler, 1950). Thus, we all have the necessary experience to explore factor solutions and interpret Q findings albeit not necessarily specifically within the application of exploring and interpreting factor solutions in Q.

Brown (1989) gives us an excellent example of what Peirce was talking about in his article "A Feeling for the Organism." The quote that Brown chose to share in his article in which Keller quoted famed maize geneticist McClintock is also shared here:

> ... she tells us one must have the time to look, the patience to "hear what the material has to say to you," the openness to "let it come to you." Above all, one must have "a feeling for the organism." (Keller, 1983, p. 198)

There is much to unpack within this quote for every Q researcher but especially those new to Q. Interpretation takes time and an open mind. To understand the feelings expressed by each factor, we must allow ourselves to feel what they feel. But Keller also provides us with additional insight into how McClintock sought to understand structures within the maize plants at Cold Spring Harbor laboratory. This again fits into Peirce's Law of Mind and our ability to use inquiry, exploration, and abduction to interpret our scientific findings (Buchler, 1950), specifically in Q and elsewhere, in different contexts.

For our example, the Q researcher sought a holistic description of each factor based upon the factor array, distinguishing statements, and post-sort written comments. She spent time with each of these to get an understanding of each of the five viewpoints. No crib sheets, color-coding or other devices were used to assist in understanding the viewpoints.

The researcher named the factors: *Idealistic View*, *Social Justice View*, *Speech Crisis View, Sage on the Stage View,* and *Fox News View.* Details on these viewpoints are available within the original article (Ramlo, 2020a). The *Idealistic View* embraces the idea that somehow things always work out for good and free speech will prevail. This view and the *Social Justice View* are naïve views, although in different ways. The *Social Justice View* was predominantly populated by those in the P set identified as Uninformed. This view is focused on responsible speech that limits hate speech and accepts the underlying power structures within the context of campus speech. The majority of those on the *Speech Crisis View* came from the same institution. Those on

this view were experiencing the danger of overzealous administrative controls that led to limited shared governance and free speech. Although the last two views emerged from splitting a single factor, they are not opposites per se. The *Sage on the Stage View* is complex. The two sorters on this view believe one can develop an independent point of view without being exposed to different ideas and that democracy does not thrive on dissent, critical inquiry, freedom of speech, and freedom in research. They are also focused on higher education as a means for students to earn a good living. The sense is that they feel rather omnipotent in the classroom and on campus but do not want to have their views challenged. Finally, the *Fox News View* represents one of misinformation and fear that free speech can lead to treason and terrorism. It is noteworthy that these views are not aligned with the original structure used to develop the Q sample.

Limitations

Typically, studies contain a limitation section, and this is common in Q methodology. Typically, researchers identify limitations related to data collection, analysis, number of participants, research design, and any other relevant aspects of the study. A limitations section demonstrates transparency in research. Demonstrating awareness of limitations suggests that the research was conducted with a high degree of integrity and rigor.

Here, we suggest that the limitation section for Q studies be consistent especially regarding the importance of how structure (Q sample, P set, etc.) helps ensure a study's rigor. A study's design and limitations should provide a response that counters typical criticisms about Q. For instance, implementing a Fisherian design for the Q sample selection frames the small sample doctrine used throughout a Q study (Stephenson, 2018). These experimental design principles provide the framework necessary to select the Q sample theoretically from a concourse such that hundreds of items in the concourse are not necessary (Brown, 1970, 1971, 1980; Stephenson, 1993, 2018). The use of principles from Fisher's *Design of Experiments* in selecting the Q sample also provides the ability to embrace a relatively small number of participants compared to large, random selections of participants that are necessary for statistical generalization in quantitative studies (Brown, 1980; Ramlo, 2024; Stephenson, 1989, 1993; Thomas & Baas, 1993). Thus, it is Fisherian design that provides us the possibility of structured Q samples and small P sets. Therefore, small numbers of participants in the P set is typically not a limitation for Q studies.

Likewise, the limitations section should stress that, although Q studies do not provide statistical generalization, there is a specific type of generalization possible within Q. The structure of the views and their interpretation provides substantive generalization such that these structures of phenomena are generalizable about the population. Likewise, the involvement of the researcher in selecting the best factor solution while seeking operantcy should not be considered a limitation as this is an important part of the inquiry process within Q and is that which provides the best factor structure (Brown, 1980; Stephenson, 1953, 1983, 2007). In other words, there should not be an apology for using scientific principles of inquiry, exploration, and discovery within any social science, including Q methodology.

Discussion

This article provides a novel contribution to the Q literature by bringing the connections between structure in jazz, the natural sciences, and Q methodology into the discussion

of the scientific study of subjectivity. Such an analogy provides insight into the importance of inquiry, exploration, and discovery within Q studies rather than the use of algorithmic approaches.

The main difference between structures and algorithms lies in their nature and purpose. Structure pertains to the organization and arrangement of knowledge, theories, or entities, whereas algorithms are specific computational procedures or methods designed to solve problems or achieve objectives within a particular scientific domain. While jazz is known for its improvisational nature, it is built upon a foundation of harmonic and rhythmic structures that provide a framework for musicians to interact, create, explore, and improvise (Terefenko, 2014). The natural sciences also have a foundation of structure that allows for interaction, communication, creativity, and exploration (Kuhn, 1970).

Q methodology is framed upon scientific principles that include uncovering structures that allow for exploration and creativity by the Q researcher. Although "understanding a factor in Q is a complex matter" (Stephenson, 1983, p. 74), the Q researcher can draw on their life experiences to explore and interpret Q factors, which fits into Peirce's Law of Mind (Brown, 1993, 2023). However, the use of such scientific principles should not be seen as a limitation within any Q study but, instead, should be seen as a strength of the methodology. The limitation section should allow readers to better understand the scope and validity of the research findings.

The composite sorts facilitate the researcher's ability to get "a feel for the organism" because the researcher can easily review all item placements within a factor's theoretical sort in conjunction with post-sort interviews and comments from participants connected to each factor (Brown, 1989). Current software such as KADE (Banasick, 2021) facilitates Q researchers' ability to immerse themselves with the feelings presented within the composite sort for each factor without the effort of recreating these sorts from the factor arrays by hand. Although functions such as "crib sheets" (Watts and Stenner, 2012) may assist newer Q researchers' understanding a factor, Q researchers must also remember that interpretation takes time as we become familiar with each view, holistically. Our goal should be to understand rather than just describe each view. As Stephenson (1983) indicated, our job as Q methodologists is to understand the feeling that permeates each of the views we wish to interpret. It is our responsibility, as researchers, to be able to tell the story of each view and convey the underlying feelings they represent. In this way, Q researchers can frame insights and future research that continue their current scientific study of subjectivity.

The strengths of Q are more apparent when investigators explain how the factors enrich the reconsideration of subjectivity and behavior. Such explanations can be accomplished by revealing the differentiated perceptions about a topic or event. Q findings can challenge prior assumptions and research findings by uncovering new theories. By adhering to the structures Stephenson and Brown support throughout the different stages of Q methodology and embracing a "feeling for the organism," we can better explore the subjectivities related to various topics and events while also challenging the typical disputes regarding Q's rigor and improprieties upfront.

References

Albright, E. A., Christofferson, K., McCabe, A., & Montgomery, D. (2020). Lessons learned: Some guidelines to factor interpretation. *Operant Subjectivity*: *The International Journal of Q Methodology*, *41*, 134-146.

https://doi.org/10.22488/okstate.20.100581
Banasick, S. (2021). KADE Desktop Q sort Analysis Software for Research (Version 1.2.1) [Software]. Available from https://github.com/shawnbanasick/kade
Braswell, R. (2022). Comparative rotations and analyses of Q data: A worked example. In J. Rhoads, D. Thomas, & S. Ramlo (Eds.), *Cultivating Q Methodology: Essays Honoring Steven R. Brown* (pp. 145-181). International Society for the Scientific Study of Subjectivity.
Brown, S. R. (1968). Bibliography on Q technique and its methodology. *Perceptual and* Motor *Skills, 26*, 587-613. https://doi.org/10.2466/pms.1968.26.2.587
Brown, S. R. (1970). On the use of variance designs in Q methodology. *Psychological Record, 20,* 179-89. https://doi.org/10.1007/BF03393928
Brown, S. R. (1971). Experimental design and the structuring of theory. *Experimental Study of Politics, 1*(1), 1-41.
Brown, S. R. (1978). The importance of factors in Q methodology: Statistical and theoretical considerations. *Operant Subjectivity*, *1*(4), 117-124. https://doi.org/10.22488/okstate.78.100516
Brown, S. R. (1980). *Political subjectivity: Applications of Q methodology in political science*. Yale University Press.
Brown, S. R. (1986). Q technique and method: Principles and procedures. In W. D. Berry & M. S. Lewis-Beck (Eds.), *New tools for social scientists: Advances and applications in research methods* (pp. 57-76). Sage.
Brown, S. R. (1989). A feeling for the organism: Understanding and interpreting political subjectivity. *Operant Subjectivity*, *12*(3/4), 81-97. https://doi.org/10.22488/okstate.89.100537
Brown, S. R. (1993). A primer on Q methodology. *Operant Subjectivity*, *16*(3/4), 91-138. https://doi.org/10.22488/okstate.93.100504
Brown, S. R. (2023). Poetry, science, and a science of poetry: With an illustration of poetry and ageing. In O. V. Lehmann & O. Synnes (Eds.), *A poetic language of ageing* (pp. 155–173). Bloomsbury Academic. http://doi.org/10.5040/9781350256835.ch-009
Brown, S. R., & Robyn, R. (2004). Reserving a key place for reality: Philosophical foundations of theoretical rotation. *Operant Subjectivity*, *27*(3), 104-124. https://doi.org/10.22488/okstate.04.100523
Buchler, J. (Ed.) (1950). *The philosophy of Peirce: Selected writings.* Harcourt, Brace.
Buolamwini, J., & Gebru, T. (2018). Gender shades: Intersectional accuracy disparities in commercial gender classification. *Proceedings of the 1st Conference on Fairness, Accountability, and Transparency* (pp. 81-91). Retrieved at https://proceedings.mlr.press/v81/buolamwini18a.html
Burden, R. L., & Faires, J. D. (2015). *Numerical analysis* (10th ed.). Cengage Learning.
Chi, M.T.H., Feltovich, P.J. & Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. *Cognitive Science, 5*, 121-152. https://doi.org/10.1207/s15516709cog0502_2
Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2009). *Introduction to algorithms* (3rd ed.). MIT Press.
Dieteren, C. M., Patty, N. J. S., Reckers-Droog, V. T., & van Exel, J. (2023). Methodological choices in applications of Q methodology: A systematic literature review, *Social Sciences & Humanities Open,* 7(1), https://doi.org/10.1016/j.ssaho.2023.100404
Durbin, R., Eddy, S. R., Krogh, A., & Mitchison, G. (1998). *Biological sequence analysis: Probabilistic models of proteins and nucleic acids*. Cambridge University Press.

Dykstra, D. I., Boyle, C. F., & Monarch, I. A. (1992). Studying conceptual change in learning physics. *Science Education, 76* (6), 615-652. https://doi.org/10.1002/sce.3730760605

Fisher, R. A. (1935). *The design of experiments*. Oliver and Boyd.

Jourdain, D., Namakando, N., Mungatana, E. D., et al. Revealing Salient Aquatic Ecosystem Services Bundles: A Q-Methodology Application in South Africa, 22 October 2021, PREPRINT (Version 1) available at Research Square https://doi.org/10.21203/rs.3.rs-990434/v1

Keller, E.F. (1983) A *feeling for the organism: The life and work* of *Barbara McClintock.* W. H. Freeman.

Knuth, D. E. (1997). The art of computer programming: Fundamental algorithms (3rd ed., Vol. 1). Addison-Wesley Professional.

Kuhn, T. S. 1970. *The structure of scientific revolutions* (2nd ed.). University of Chicago Press.

Maron, M. (Host) (2022, October 27). Ron Carter (No. 1378) [Audio podcast episode]. WTF with Marc Maron. WTF Production Company. https://www.wtfpod.com/podcast/episode-1378-ron-carter

McKeown, B., & Thomas, D. (2013). *Q methodology* (2nd ed.) SAGE.

McAnulty, Joseph (2021). *Reacting to political content on social media: Pedagogical implications for social studies teaching*. Doctoral dissertation (Social Studies Education), University of Georgia, Athens, GA.

Merriam-Webster Dictionary (n.d.). Merriam-Webster: America's Most Trusted Dictionary. https://www.merriam-webster.com/

Newman, I. & Ramlo, S. (2010). Using Q methodology and Q factor analysis in mixed methods research. In A. Tashakkori, & C. Teddlie (Eds.), *Handbook of mixed methods in social & behavioral research* (2nd ed., pp. 505-530). Sage.

Pariser, E. (2011). *The filter bubble: What the internet Is hiding from you*. Penguin. https://escholarship.org/uc/item/8w7105jp

Ramlo, S. (2015). Theoretical significance in Q methodology: A qualitative approach to a mixed method. *Research in the Schools*, *22*(1), 68-81.

Ramlo, S. (2016). Centroid and theoretical rotation: Justification for their use in Q methodology research. *Midwestern Researcher, 28*(1), 73-92. Available at http://www.mwera.org/MWER/volumes/v28/issue1/v28n1-Ramlo-SPECIALIZED-RESEARCH-STATISTICAL-METHODS.pdf

Ramlo, S. (2017). The preferences of Q methodologists at the factor-analytic stage: An examination of practice. *Research in the Schools, 24* (2), 40–55.

Ramlo, S. (2020a) Free speech on US university campuses: Differentiating perspectives using Q methodology, *Studies in Higher Education, 45*(7), 1488-1506. https://doi.org/10.1080/03075079.2018.1555700

Ramlo, S. (2020b). Divergent viewpoints about the statistical stage of a mixed method: Qualitative versus quantitative orientations. *International Journal of Research & Method in Education, 43*(1), 93-111. https://doi.org/10.1080/1743727X.2019.1626365

Ramlo, S. (2021). Promoting conceptual understanding of Q Methodology using insights from science education. *International Journal of Multiple Research Approaches, 12*(3), 319-334. https://doi.org/10.29034/ijmra.v12n3a3

Ramlo, S. (2024). Non-statistical, substantive generalization: Lessons from Q Methodology. *International Journal of Research & Method in Education*, 47(1), 65-78. https://doi.org/10.1080/1743727X.2023.2173735

Schmolck, P. (2002). *PQMethod manual mirror.* Unpublished manuscript. Retrieved April 29, 2004, from http://www.rz.unibw-muenchen.de/~p41bsmk/qmethod/

Sorola, M. (2022). Q methodology to conduct a critical study in accounting: A Q study on accountants' perspectives of social and environmental reporting, *Critical Perspectives on Accounting, 86*, 1-37. https://doi.org/10.1016/j.cpa.2021.102355

Stephenson, W. (1953). *The study of behavior: Q-technique and its methodology*. University of Chicago Press.

Stephenson, W. (1961). Scientific creed — 1961: Abductory principles. *Psychological Record, 11*, 9-17. https://doi.org/10.1007/BF03393381

Stephenson, W. (1964). Application of the Thompson schema to the current controversy over Cuba. *Psychological Record, 14*, 275-290. https://doi.org/10.1007/BF03395996

Stephenson, W. (1967). *The play theory of mass communication*. University of Chicago Press.

Stephenson, W. (1978). Concourse theory of communication. *Communication, 3*, 21-40. https://ojs.library.okstate.edu/osu/index.php/osub/article/download/9159/8221/19339

Stephenson, W. (1979). *A peripatetic educator* [unpublished]. William Stephenson Papers (Accession CA4878, Box 26), The State Historical Society of Missouri, Research Centre-Columbia, Columbia, MO, United States.

Stephenson, W. (1980). Consciring: A general theory for subjective communicability. In D. Nimmo (Ed.), *Communication yearbook 4* (pp. 7-36). Transaction.

Stephenson, W. (1983). Against interpretation. *Operant Subjectivity*, *6*(3), 73-103. https://doi.org/10.22488/okstate.83.100517

Stephenson, W. (1986). Protoconcursus: The concourse theory of communication. *Operant Subjectivity*, *9*(2), 37-58. https://doi.org/10.22488/okstate.86.100574

Stephenson, W. (1993). Introduction to Q-methodology. *Operant Subjectivity*, *17*(1/2), 1-13. https://doi.org/10.22488/okstate.93.100509

Stephenson, W. (2007). Consciring: A general theory for subjective communicability. *Operant Subjectivity*, *30*(3/4), 89-136. https://doi.org/10.22488/okstate.07.100562

Stephenson, W. (2014). General theory of communication. *Operant Subjectivity*: *The International Journal of Q Methodology*, *37*(3), 38-56. https://doi.org/10.22488/okstate.14.100540

Stephenson, W. (2018). Q-Methodology: Basis of quantized subjective science. *Operant Subjectivity*: *The International Journal of Q Methodology*, *40*, 21-35. https://doi.org/10.22488/okstate.18.100571

Terefenko, D. (2014). *Jazz theory: From basic to advanced study*. Routledge.

Thomas, D. B., & Baas, L. R. (1993). The issue of generalization in Q methodology: "Reliable schematics" revisited. *Operant Subjectivity*, *16*(1/2), 18-36. https://doi.org/10.22488/okstate.92.100599

Watts, S., & Stenner, P. (2012). *Doing Q methodological research: Theory, method and interpretation*. Sage.