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International Journal of Adult Vocational Education and Technology

Volume 7 • Issue 2 • April-June-2016 • ISSN: 1947-8607 • eISSN: 1947-878X
An official publication of the Information Resources Management Association

Special Issue on Quantitative and Mixed-Method Research

Guest Editorial Preface

Research Articles

The *International Journal of Adult Vocational Education and Technology* is indexed or listed in the following: ACM Digital Library; Applied Social Sciences Index & Abstracts (ASSIA); Bacon's Media Directory; Cabell's Directories; DBLP; Google Scholar; INSPEC; JournalTOCs; Library & Information Science Abstracts (LISA); Linguistics & Language Behavior Abstracts (LLBA); MediaFinder; The Standard Periodical Directory; Ulrich's Periodicals Directory

International Journal of Adult Vocational Education and Technology
Volume 7 • Issue 2 • April-June 2016

A Brief Introduction to Q Methodology

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ABSTRACT

Q methodology is a method to systematically study subjective matters such as thoughts and beliefs on any given topic. Q methodology can be used for both theory building and theory testing. The purpose of this paper was to give a brief overview of Q methodology to readers with various backgrounds. This paper discussed several advantages of Q methodology that makes it attractive to researchers and practitioners who are interested in understanding different perspectives or behavioral patterns toward any given topic, its distinct position as a methodology, and how it fits into the qualitative—mixed—quantitative continuum. The paper further used two research studies as applications to demonstrate how to perform a Q methodological study, involving the following steps: development of the Q sort statements; selection of the P set (participants); Q sorting; and analysis and interpretation of Q sorts.

KEYWORDS

Mixed Methods, Q Methodology, Qualitative Continuum, Subjectivity

INTRODUCTION

Q methodology (Q) is a way to systematically examine subjective matters, such as opinions, beliefs, behaviors, and attitudes (Stephenson, 1975). Q enables researchers to identify different perspectives within a group and the number of individuals who hold each perspective (Newman & Ramlo, 2010). It further compares across these perspectives to reveal the similarity and difference among opinions held by these groups of individuals. Q can be used for both theory building and theory testing (Ramlo & Newman, 2011). This paper gives a brief overview of Q methodology and its unique position as a methodology, and further demonstrates how to utilize and interpret Q methodology through specific examples.

In Q methodological studies, participants are often given a collection of statements on a particular topic and asked to sort this set of items from their own point of view. Through this sorting process, respondents express their subjective opinions on the topic (Brown, 1980). Individuals' sorts then are analyzed statistically to reveal *operant subjective* perspectives, both different and consensual ones, among members in the group. Therefore, Q is a means of measuring operant subjectivity (Brown, 1980).

Q can be thought as an inversion of conventional R methodology (McKeown & Thomas, 1988). R is generally used to examine the interrelationship among variables (items) of an instrument/test in an effort to generate patterns (factors) underlying the variables. By contrast, Q is used to investigate

DOI: 10.4018/IJAVET.2016040104

patterns of intercorrelations among participants (McKeown & Thomas, 1988). Correlated participants indicate similar behaviors or attitudes toward a topic shared by these individuals. Q further provides information on the differences and similarities in viewpoints in a group for detailed examination of these perspectives.

Using Q has several benefits. First, Q involves both the Q-sorting process, qualitative in nature, and sophistical statistical analyses. This enables researchers to examine different patterns of thoughts/opinions in a systematic yet efficient way, which is difficult to achieve through many common research approaches. Second, validity is not a concern in Q (Brown, 1980; Ramlo, 2015). Validity is related to the truth of inferences, typically drawn from the references of the researchers. In a Q study, individual participants offer their subjective points of views by sorting the statements regarding a topic based on their *own* experiences. In this way, the Q sorting process is self-referent; that is, each participant's view is determined *independent* from the researchers' view. Therefore validity is irrelevant in Q as it measures individual personal opinions related to a topic (Brown, 1980). Furthermore, Q correlates participants to generate patterns among them. In other words, people are considered the variables in Q (see "P Set: Participants" section). Consequently, a large sample size is not necessary (McKeown & Thomas, 1988).

Q'S POSITION IN RESEARCH METHODOLOGY

William Stephenson, a British psychologist and physicist, first introduced Q in the journal *Nature* in 1935 as a unique way to measure human subjectivity. Q as a methodology has mostly been in a controversial position in the social science fields since then (Ramlo, 2015). Some treat Q as a qualitative approach since it studies human subjectivity. Others consider it a quantitative approach as it involves rigorous statistical analyses. With mixed methods research gaining popularity in the last two decade (Creswell, 2010), Q has become more accepted as a mixed method (Ramlo, 2015).

To begin, Q shares similarity with qualitative research (Brown, 2008). The ultimate goal of Q is to understand human subjectivity. In Q, respondents give their subjective meaning to texts, pictures, etc. through the sorting process; and consequently reveal their' subjective viewpoints or behaviors regarding the topic based on their own experiences (van Exel & de Graaf, 2005). Furthermore, even in the data analysis of Q sorts, the analytic choices are often made based on theoretical considerations instead of statistical significance (see "Analysis of Q Sorts and Result Interpretation" section). Indeed, in his article in *The SAGE Encyclopedia of Qualitative Research Methods*, Brown (2008) argued that the assumptions and the purposes of Q are more aligned with qualitative research.

Meanwhile, Q also uses sophisticated statistical procedures for data analysis, similar to most quantitative research. Participants' responses are analyzed through correlation and factor analysis, so that participants with similar viewpoints are grouped into factors. Weighted factor scores are then calculated in order to compare across Q factors (perspectives, behaviors, etc.) for differences and consensus. The analysis of Q is considered as "the scientific base of Q" (van Exel & de Graaf, 2005, p. 8).

Involving both the qualitative exploration of individual opinions and the quantitative statistical analysis makes Q an effective way to systematically examine patterns of thoughts on any topic. Considering both aspects of Q, several researchers have argued that Q aligns well with the practice of mixed methods approach (Newman & Ramlo, 2010, Ramlo, 2015). Q reflects a mixture of both qualitative and quantitative methods (Stenner & Stainton-Rogers, 2004) and fits well into the qualitative—mixed—quantitative continuum (see Tashakkori & Teddlie, 2009; Ramlo & Newman, 2011). Unlike most mixed methods research designs, which have distinct qualitative and quantitative

strands (Tashakkori & Teddlie, 2009); Q combines "quantitative and qualitative within a continuous interaction" (Ramlo, 2015, p. 10). Stenner and Stainton-Rogers (2004) even created a new term, qualiquantology, to represent the "inherent mixture of qualitative and quantitative" (Ramlo, 2015, p. 10) that exists in Q. Interested readers should refer to Ramlo's (2015) article in *Journal of Mixed Methods Research,* regarding Q's unique position in mixed-methods research. In the article, she argued that Q is a qualitative dominant mixed method approach using the qualitative—mixed—quantitative continuum (Tashakkori & Teddlie, 2009).

Given that Q is suited for revealing different patterns of opinions/thoughts on any topic, it has been used in various fields such as political science, environmental science, healthcare, marketing, sociology, finance, public policy, etc. In education, Q has been used to examine topics such as student perceptions of blended e-Education (Kim, 2012), women's attitudes toward mathematics, science, and computer science subjects (Author, 2013), undergraduate student personal epistemology toward physics (Ramlo, 2008), international students' acculturation process (Bang & Montgomery, 2013), and undergraduate student learning behavioral patterns (Author, 2014).

HOW TO PERFORM Q?

This section provides a basic introduction on how to perform a Q methodological study, including the following steps: development of the Q sort statements; selection of the P set (participants); Q sorting; and analysis and interpretation of Q sorts. This introduction entails some technicality along with the methodological assumptions of Q. Interested readers should refer to Schmolck (2014a) for detailed technical procedures and Brown (1980) for a comprehensive explanation of the philosophy, principles, and application of Q.

Development of the Q Sort Statements

The main interest of a Q study is to identify viewpoints, behaviors, attitudes, or preferences among participants and the extent to which these perspectives are similar or different (Brown, 1980). To provide their perspectives, participants sort a collection of items regarding the topic. The development of the collection of items is the starting point for conducting a Q study. This collection of items is known as *concourse* and should represent all communications (e.g., statements, pictures) the individuals can possibly make about the topic (van Exel & de Graaf, 2005). Q correlates individuals *instead of statements*; thus the statements are considered the subjects, not variables in a Q study. The well-structured statements should include all aspects and/or opinions on the topic. If the concourse of the statements is too lengthy to be fully included in one study, a subset of the statements, called *Q sample*, can be selected from the concourse for the study (see Brown, 1993). Different Q samples may be chosen from the same concourse for different studies, as long as the selected Q sample includes statements representing a wide range of aspects and/or opinions on the topic (van Exel & de Graaf, 2005). Ultimately, regardless of the researchers' intention, it is the participants who give meanings to the statements through the sorting process (Brown, 1980).

Q samples can be developed through different sources: naturalistic, ready-made, and hybrid (McKeown & Thomas, 1988). Naturalistic statements are often taken from direct communication with participants, such as interviews, focus groups, journals, blogs, etc. Ready-made statements are drawn from sources other than participants' direct communication (e.g., survey instruments, media reports, magazines). Hybrid samples combine both naturalistic and ready-made statements. No one source is necessarily better than the others; researchers can select the kind that fits their study (McKeown & Thomas, 1988).

P Set: Participants

Q explores patterns within and across individuals based on their viewpoints on a given issue (Ramlo, 2015). Therefore, in a Q study, it is the data of individuals that are examined in order to identify

different types of participants who responded to the topic in a similar way. In other words, Q groups *persons* rather than statements (Newman & Ramlo, 2010). Participants are considered the variables, known as, *P set*.

Q studies typically involve small numbers of participants. This is psychometrically acceptable because in essence a Q study is an inductive and exploratory process rather than a deductive or predictive one (McKeown & Thomas, 1988). Nevertheless, if researchers intend to conduct further statistical analyses (e.g., linear regression) using the findings of a Q study, an adequate sample size is necessary in order to have satisfactory statistical power (Newman & Ramlo, 2010).

More often than not, Q studies use nonrandom sampling, such as purposive sampling. The choice of sampling is often driven by theoretical considerations or interests (Ramlo, 2015). Similarly, the number of participants who turn out to subscribe to a particular perspective (correlate with a factor) is not of much importance. Participants in a Q study are variables, not subjects, thus representativeness and generalizability of the P set is irrelevant (Brown, 1980).

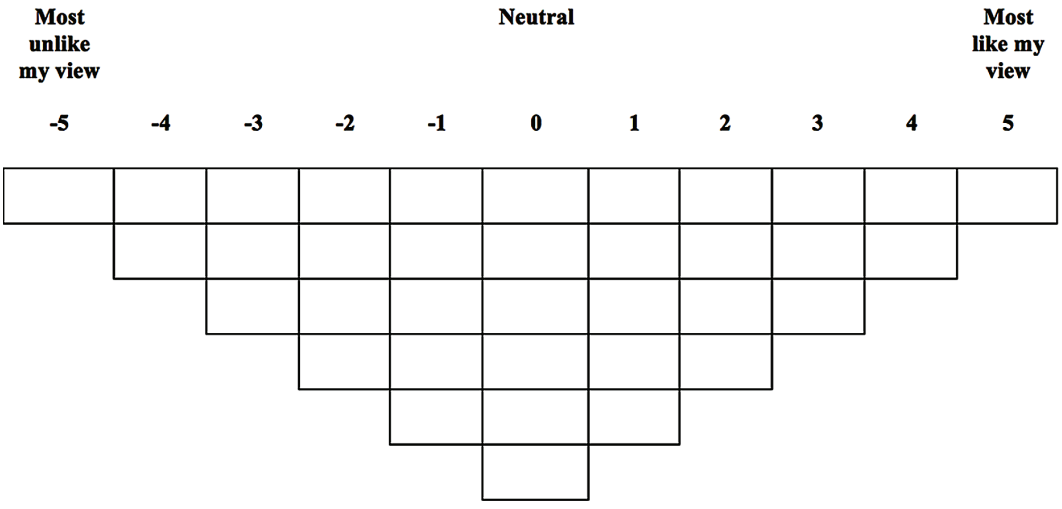
Q-Sorting Procedure

Each statement in the Q sample is placed on a separate card before the sorting process begins. Participants are given the Q sample and asked to sort statements based on the *condition of instruction*, typically their view regarding the topic. For example, in a recent study about freshmen' personal perceptions of engineering knowledge in an introductory engineering course (Author, 2016), participants were instructed to sort based on the degree to which each statement is like or unlike their view of learning in this engineering course.

Participants first read through all statements to get a sense of the range of the opinions at issue. They initially placed the statements into three piles: the statements like his/her view, the ones unlike his/her view, and the ones about which he/she felt neutral or uncertain. Participants then rank ordered the statements on the forced quasi-normal distribution grid shown in Figure 1. The grid was a continuum ranging from a maximum negative value -5 (*most unlike my view*) to a maximum positive value +5 (*most like my view*). Each statement can be used once only. Participants were free to rearrange individual statement cards. Once participants were satisfied with their statement distribution, they recorded the statement numbers in the grid.

What makes Q unique is that it forces participants to rank-order each item in relation to other items into this distribution grid based upon their own opinions. In other words, the sorting process forces

Figure 1. Sorting grid with one unique statement number placed in each cell



each participant to examine his/her viewpoint or perspective in a systematic way. Additionally, the relational comparison aspect of the sorting makes the validity and operational definitions irrelevant (Brown, 1980; Ramlo, 2015).

Analysis of Q Sorts and Result Interpretation

Data analysis in Q is carried out by specialized Q software programs. Among them, PQMethod (see Schmolck, 2014b) is a commonly used free software, both Mac- and Windows- compatible. It can handle up to 299 participants and 200 statement items in a single study. Data analyses in Q studies involve a series of statistical procedures, and consequently, the result outputs can be very lengthy, depending on how many meaningful Q factors emerged. Brown (1980) provided a detailed explanation of all statistical procedures in Q. This section will focus on the components essential to interpreting the results. In the example used here to demonstrate the interpretation of the Q, the researcher explored college undergraduates' learning behavioral patterns by asking 152 students from a variety of majors about their typical learning behaviors when they carried out academic tasks. Because the focus of this article is on the use of Q, more information on the background and the analyses can be found elsewhere (Author, 2014). However, it should be noted that a large sample size was used because regression analyses were conducted using the emerging Q factors to predict students' academic achievement (Author, 2014).

Q Factor Analysis

The completed Q sorts are first correlated with one another in order to calculate the degree to which these sorts are similar or different. This represents the degree of agreement or disagreement of viewpoints among individual respondents. The correlation matrix is then subjected to Q factor analysis (QFA), which is the key statistical technique used to group participants based on their response patterns (McKeown & Thomas, 1988). Specifically, PQMethod software forces all participants' responses into a maximum eight factors as the default. These emerging factors are called Q factors. Each Q factor represents a unique viewpoint or response pattern held by a type/group of participants who sorted statement items in a similar way (Ramlo, 2008). For example, if all respondents have similar responses on the topic and therefore sort statement items in the same way, all correlations would be high and positive and only one Q factor would emerge. By contrast, if each participant responds to the items in a unique way, then no two sorts will be highly correlated and no common viewpoints will emerge.

When examining factors, the immediate question to ask is whether or not a factor is interpretable and statistically meaningful. One common rule used to make such decision is the eigenvalue criterion. A factor with an eigenvalue ≥ 1.00 indicates the factor explains more variance than a single variable and thus is typically considered interpretable. However, using the eigenvalue criterion *alone* could lead to two potential problems (McKeown & Thomas, 1988). First, the eigenvalue of a factor could be greater than 1.00 purely due to the size of the P set and/or the Q sample (Brown, 1980; McKeown & Thomas, 1988). More importantly, such a cutoff rule could leave out important information from the data. A factor may be considered not interpretable in the statistical sense (and thus be discarded), but can provide unique practical insights on the issue from the theoretical standpoint (Brown, 1980; van Exel & de Graaf, 2005). Therefore, in addition to the eigenvalue criterion, the significance of each Q factor should also be decided by whether a factor would make a unique contribution to understanding the perspectives of the participants. The practical rule, suggested by Stephenson (1975), is that any factor with two or more subjects highly loading on it will be accepted (Brown, 1980).

As in other factor analyses, researchers need to choose the method of extraction and rotation in QFA (see Cattell, 1978). Rotation can be either objective, using statistical rules, or subjective, drawing on theoretical considerations or a particular idea the researcher(s) want to explore (van Exel & de Graaf, 2005). Centroid extraction with hand rotation is often preferred in Q methodological studies. It is more indeterminate, allowing researchers to examine and interpret data based on theoretical considerations (see Brown, 1980). Nevertheless, principal components extraction with varimax

rotation has also been widely employed in Q studies (McKeown & Thomas, 1988). There is little statistical difference between using principal components, centroid, or any other available method (e.g., Brown, 1971; McKeown & Thomas, 1988).

PQMethod offers both principal components extraction with varimax rotation and centroid extraction with hand rotation options. Taking both theoretical interpretations and statistical considerations together, researchers will come to a final factor solution. Each resulting final Q factor represents a unique viewpoint held by a group of individuals. In the learning behaviors application example, the researchers used principal components extraction with varimax rotation. Multiple factor structures were considered and reexamined to arrive at the final two-factor solution, which was the most theoretically interpretable and retained a satisfactory amount of variance (Table 1). Eighty-eight respondents highly loaded on Factor 1, which accounted for 25% of the total observed variance in the data. Factor 2 had 52 respondents highly loaded on it and accounted for 13% of the variance in the data.

Factor Loading and Defining Participants

Along with the Q factors, QFA will assign each participant a factor loading value on each factor. Each participant's factor loading on a given factor is a correlation coefficient indicating the magnitude of association between a person's sort and the underlying factor. Factor loading values can range from -1 to +1. A participant's loading on a factor can be either positive or negative, and represents that person's sharing or rejection of the concepts underlying that factor (McKeown & Thomas, 1988).

Participants who loaded strongly on a given factor are considered to be "defining respondents" of that factor and are key to understanding the emerged factors. PQMethod program automatically flags the defining participants using the default algorithm (see Schmolck, 2014a) by placing an "X" next to these respondents' factor loadings. PQMethod also offers manual flagging by adjusting cutoff factor loading values (Schmolck, 2014a). Then, *only* the definers' responses are used to further calculate and explain the characteristics of that given factor. In the application of learning behaviors, the factor score for each item on Factor 2 was calculated based on the responses from the 52 defining participants on that factor. Tables 2 and 3 display the factor loadings and defining respondents (marked with Xs) on each factor in the learning behavior example. For example, participant 3 has a factor loading of .518 on Factor 2, indicating this participant shares (positive factor loading) the behavioral patterns of Factor 2 to a great degree, thus has been flagged as a definer of Factor 2.

Factor Scores

In order to interpret each type of behavioral patterns, the researchers need to examine the factor score of each statement item for each factor. QFA generates a normalized weighted factor score (z-score) on each item for each factor (McKeown & Thomas, 1988). It is the average score of an item given by all defining respondents on a particular factor. The items that have positive factor scores (z-scores) are considered to load positively on a factor; whereas those with negative z-scores are considered to load negatively on a factor. QFA yields three pieces of outputs based on the factor scores (z-scores), namely extremely ranked statements, distinguishing statements, and consensus statements. These provide the main basis for interpreting the characteristics of the factors in a Q study.

Table 1. Two-factor solution with number of defining respondents (n = 152)

Characteristic	Factor 1	Factor 2	Total
Number of Defining Respondents	88	52	140
Eigenvalue	38.25	19.89	
Percent of Variation Explained	25	13	38

Table 2. Participants' factor loadings on each factor with an X indicating a defining participant

Subject	Factor 1	Factor 2	Subject	Factor 1	Factor 2	Subject	Factor 1	Factor 2
1	0.3280	0.4419X	34	-0.2297	0.5836X	67	0.7739X	0.2399
2	-0.3396X	-0.0037	35	-0.0981	0.0100	68	0.4609	0.5546X
3	0.0480	0.5181X	36	0.4672X	0.2341	69	0.6542X	0.1426
4	0.3640X	0.2598	37	0.4699X	0.3613	70	0.3068	0.6268X
5	0.6928X	0.3346	38	0.3383	0.4584X	71	0.7835X	0.1202
6	-0.2341	0.5606X	39	0.6769X	-0.0429	72	0.9327X	0.0903
7	0.3314X	0.0584	40	-0.0678	0.3437X	73	0.3000	0.4180X
8	0.3471	0.4819X	41	-0.0548	0.6965X	74	0.8663X	0.1189
9	0.3955	0.6780X	42	0.5780X	0.3276	75	-0.3279	0.5026X
10	0.3047	0.4252X	43	0.7206X	0.2856	76	0.6501X	0.2300
11	0.3895	0.4779X	44	0.3200	0.5628X	77	0.8042X	0.1483
12	-0.1257	0.2950X	45	-0.0153	0.1615	78	0.6377X	0.1790
13	-0.1177	0.5844X	46	0.3548X	0.3425	79	0.5537X	0.4823
14	0.8607X	0.1173	47	0.2925	0.4884X	80	0.7416X	0.2410
15	0.1460	0.1920	48	0.3597	0.5288X	81	0.4776X	0.0020
16	0.4551	0.4973X	49	0.4456X	0.4187	82	0.7162X	0.3823
17	0.6068X	0.3576	50	0.5855X	0.2297	83	0.3281	0.3648X
18	0.4345X	0.2076	51	0.4584	0.5874X	84	-0.2777	0.2263
19	0.3923X	0.2294	52	0.3871	0.4206X	85	0.4535X	-0.1728
20	0.2523	0.6150X	53	0.7490X	0.0893	86	0.6671X	-0.1515
21	0.2110	0.5330X	54	0.1172	0.5361X	87	0.2204	0.1550
22	0.2198	0.3110X	55	0.6859X	0.3832	88	0.5416X	0.4438
23	0.2740	0.5436X	56	0.5498X	0.2564	89	0.6717X	0.0820
24	0.5004X	0.2716	57	0.8264X	0.1342	90	-0.1920	0.4463X
25	0.0792	0.6499X	58	0.0026	0.5362X	91	0.4038X	0.3878
26	0.6086X	0.3837	59	0.7446X	0.1391	92	0.2813	0.4332X
27	0.7049X	0.1411	60	0.8399X	-0.0562	93	0.6792X	0.2592
28	0.5273X	0.3884	61	0.3615X	0.3217	94	0.6698X	0.2495
29	0.7362X	-0.0510	62	0.6601X	-0.0226	95	0.2618	0.3465X
30	0.2277	0.5433X	63	0.6794X	0.1563	96	0.5375X	0.1885
31	0.0280	0.0463	64	0.6940X	0.1258	97	0.1901	0.1470
32	0.4149	0.5484X	65	0.0621	0.4713X	98	0.4682X	0.2697
33	0.5678X	0.4130	66	0.2923	0.4268X	99	0.7821X	0.0011

Extremely Ranked Statements

To begin with, the statements items with the highest z-scores and the lowest z-scores are rank ordered for each factor (Schmolck, 2014a). These are known as the most extremely ranked statements, usually placed at both extreme ends of the composite sort of a factor. Extremely ranked statements strongly define the factor and thus provide a first comprehensive description of the viewpoint or the behaviors represented by this factor. Statements with extreme z-scores demonstrate the characteristics that participants feel most strongly about on the topic. Statements have to be examined individually and

Table 3. Participants' factor loadings on each factor with an X indicating a defining participant

Subject	Factor 1	Factor 2	Subject	Factor 1	Factor 2	Subject	Factor 1	Factor 2
100	0.6568X	-0.0173	118	0.3936	0.5064X	136	0.2083	0.3395X
101	0.4410X	0.3746	119	-0.0150	0.2336	137	0.4939X	0.2242
102	0.5037X	0.2294	120	0.4396X	0.3219	138	0.4535	0.5403X
103	0.8416X	0.1329	121	-0.0287	0.3143X	139	0.2964	0.4988X
104	0.3377X	0.0064	122	0.6567X	0.4846	140	0.6955X	0.1703
105	0.5524X	0.5326	123	0.5708X	0.3534	141	0.2542	0.2468
106	0.3129	0.6048X	124	-0.1780	0.4568X	142	-0.3862X	0.2485
107	0.4809X	0.3999	125	0.4473X	0.0507	143	0.7948X	-0.2055
108	0.4584	0.5418X	126	0.5971X	0.4678	144	0.8170X	-0.0270
109	0.7129X	0.1790	127	0.3356X	0.2915	145	0.7007X	0.1490
110	0.1068	0.4554X	128	0.3824X	0.3394	146	0.3274X	0.1608
111	0.2689	0.3330X	129	0.0391	0.4157X	147	-0.2337	0.5550X
112	0.7890X	0.2146	130	0.6783X	0.1699	148	0.5111X	0.2986
113	0.5396X	0.3322	131	-0.2467	-0.0719	149	0.8458X	-0.0590
114	0.3612X	0.3126	132	0.6443X	0.0299	150	0.1376	0.1039
115	0.7545X	-0.1779	133	0.3850X	0.1458	151	0.7978X	0.1544
116	0.4072X	0.3120	134	0.2713	0.2985X	152	-0.1480	0.2690
117	-0.0575	0.5289X	135	0.3543X	0.2447			

collectively in order to understand the holistic viewpoint or characteristics each Q factor represents. Take Factor 1 from the aforementioned example, Tables 4 and 5 contain extremely positioned statements with highest and lowest z-scores, respectively. Those represented by this factor are reflective and well-organized. These students learn in a holistic way by connecting study materials and seeking the underlying structures that made sense to them. Additionally, these students manage their time effectively.

It is important to note that a negative z-score does not necessarily indicate a negative opinion. Rather, when a negative score is given to a negatively phrased statement, the opinion expressed in the statement is actually supported. For instance, a statement reads: *"I put off writing themes,*

Table 4.Factor 1 top 6 extreme statements with highest z-scores

No.	Statement	*z*-Score
11	In preparing reports, themes, term papers, etc., I make certain that I clearly understand what is wanted before I begin to work.	1.867
4	I complete my homework assignments on time.	1.765
40	If time is available, I take a few minutes to check over my answers before turning in my examination paper.	1.692
30	I keep all the notes for each subject together carefully arranging them in some logical order.	1.463
26	When in doubt about the proper form for a written report, I refer to an approved model to provide a guide to follow.	1.388
5	I try to carry over and relate material learned in one course to that learned in others.	1.357

Table 5. Factor 1 top 6 extreme statements with lowest z-scores

No.	Statement	*z*-Score
2	I find it hard to force myself to finish work by a certain time; work is unfinished, inferior, or not on time.	-1.130
19	I watch too much television, and this interferes with my studies.	-1.140
39	Although I work until the last possible minute, I am unable to finish examination within the allotted time.	-1.142
14	My teacher criticizes my written reports as being hastily written or poorly organized.	-1.175
33	I do poorly on tests because I find it hard to think clearly and plan my work when I am faced with an exam.	-1.181
38	I am careless with spelling and mechanics of English composition when answering examination questions.	-1.194

reports, term papers, etc., until the last minute" is a negative study behavior. A negative z-score on this statement indicates a student's *effective* time management, which is desired.

Distinguishing Statements

Distinguishing statements differentiate a given factor the most from the other factors. They help researchers to interpret salient features of a given type. Statements with greater z-score difference are typically distinguishing statements, indicating a greater magnitude of the difference between any two factors. Once the z-score difference of a statement on two factors reaches the cutoff z-score difference (see Brown, 1980 for calculation details), it is statistically significant and automatically signified by PQMethod as distinguishing statements. Distinguishing items show what is unique about a given factor. In the learning behavior example (Table 6), Factor 1 indicated that those represented by this behavioral pattern demonstrated good organization skills concerning both learning materials and time. This group also appeared to be active learners who took initiative in their studying in spite of the obstacles. By contrast, distinguishing items suggest that Factor 2 students were poorly organized in terms of both learning materials and time. They tended to procrastinate while studying and cram for assignments and tests as deadlines approach. In the further analyses, students exhibiting the first behavioral type (Factor 1) showed statistically significant higher cumulative grade point averages (GPAs) than those identified as Factor 2 (Author, 2014).

Consensus Statements

Comparing z-score differences for each statement between factors also helps reveal the consensus across all types of participants. Consensus statements are statements scored similarly by all types of participants, and thus have a minimal z-score difference (van Exel & de Graaf, 2005). Consensus statements illustrate the viewpoints or characteristics held in common among all types of respondents. Consensus statements in the learning behavior example informed the researcher that both types of students prefer studying independently than with others. Neither do these same students believe they have difficulties in expressing their ideas or writing in English.

Table 6. Distinguishing statements for factor 1 and factor 2

No.	Statement	Type 1 *z*-Score	Type 2 *z*-Score	*z*-Score Difference
10	When I am having difficulty with my school work I try to talk over the trouble with my teacher.	0.87	-1.35	2.22
7	I keep my assignments up-to-date by doing my work regularly from day to day.	1.35	-0.56	1.91
31	Before attending class, I prepare by reading or studying the assignment.	0.22	-1.40	1.62
9	At the beginning of a study period, I organize my work so that I will utilize the time more effectively.	1.26	-0.35	1.61
29	After a class lecture, I go back and recite to myself the material in my notes – rechecking points I found doubtful.	-0.25	-1.69	1.44
27	When reading a long textbook assignment, I stop periodically and mentally review the main points that have been presented.	1.04	-0.18	1.22
44	I study harder for final exams than for the rest of my coursework.	-0.08	1.56	-1.64
1	My time is unwisely distributed; I spend too much time on some things and not enough on others.	-0.49	1.19	-1.68
18	I put off writing themes, reports, term papers, etc., until the last minute.	-0.72	1.05	-1.77
16	My studying is done in a random, unplanned manner impelled mostly by the demands of approaching classes.	-0.68	1.19	-1.87
43	I believe that grades are based upon a student's ability to memorize facts rather than upon the ability to "think things through".	-0.39	1.53	-1.92

In sum, using rigorous analyses, Q enabled the researcher to identify multiple learning behavioral patterns within the sample. Without realizing that there were two factors identified through Q, I may incorrectly assume all participants share similar learning behavioral pattern and thus would treat them uniformly. Furthermore, factor scores revealed the unique characteristics as well as similarities of these behavioral patterns, which can be utilized to examine along with other outcomes, such as GPAs in this example. It suffices to say, Q is a powerful methodology in determining perspectives and/or behaviors.

CONCLUSION

This paper offered a brief introduction of Q methodology. The paper demonstrated the basics of performing a Q study using the example related to undergraduate students' learning behavioral patterns. It established that Q is unique in allowing individuals to express their viewpoints through statement sorting process and enabling researchers to explore multiple perspectives, behavior patterns, or preferences on any topic within a group. Readers interested in learning more about Q methodology can join Q electronic listserv by sending an email to LISTSERV@LISTSERV.KENT.EDU with the message SUBSCRIBE Q-METHOD. Additional information and resources can be found at Q methodology website (www.qmethod.org).

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