

# The Role of Quantification in Qualitative Research in Education

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The term "qualitative research" is used by researchers with different understanding and is not representing one single approach, it stands for a variety of methods including ethnography, educational connoisseurship and criticism, naturalistic inquiry, vignette analysis, case study, analysis of ecological specimen records, and so on. In this paper, different types of qualitative research are classified on the basis of epistemologies and approaches. It is argued that some inquiries are truly qualitative, but some are not. Furthermore, it is also argued that, at the level of epistemologies, one should combine interpretivism and positivism in looking at educational problems. At the level of procedures, quantifying qualitative information can make data analysis more efficient and manageable. Modern-day ethnographers should also be well-trained in certain areas in quantitative methods, particularly in research designs and non-parametric statistics. However, it is important to observe that in the process of quantification, the interpretive stance and the subjective elements of the qualitative information are not distorted nor eliminated. Otherwise, the qualitative inquiry will be "engulfed" by the quantitative paradigm.

「質性研究」並不是代表一個單一研究方法的名稱，而是代表一組各類型研究方法的名字，例如：民族誌，教育鑑識及評論，自然式探究方法，片段分析法，個案研究，生態樣本記錄及分析法等等。本文試從知識論及方法論去歸納及解釋各類型質性及量性研究的特徵，並指出質性研究應有演繹主義色彩，而量性研究則應有實證主義意味。本文亦指出，從知識論角度來看，演繹主義及實證主義可以兼容，並可使觀察事物更清楚。若從方法論來看，質性研究與量性研究亦可以互取所長。現今的趨勢是，質性研究員也需要接受量性分析法的訓練，尤其是有關研究設計與非參數統計的知識。但需要注意，當我們以量化方式應用於質性資料時，不要硬性地將質性資料的主觀成份及演繹意味切除，否則，質性研究將會失去其應有之特徵，同時亦會被量性研究所「吞併」。

As reflected in the current literature, qualitative research in education has become increasingly popular. Tracing it back to its relatively short history, qualitative research in education emerged as significant in England in the late 1960s (Atkinson, Delamont, & Hammersley, 1988), and then spread to the United States, Australia, New Zealand, and Germany in the 1970s (Erickson, 1986). According to Fetterman (1988), educational evaluators are increasingly turning away from traditional positivist approaches toward the acceptance of qualitative or phenomenological approaches. Today, qualitative research has become a "part of the intellectual landscape in educational evaluation". This change in direction in educational research is depicted by Fetterman as a "silent scientific revolution in evaluation" (p. 17).

Today, this "revolution" is not yet over, because wars of words on various issues are still often seen in the literature, and one of the heated debates is on the issue of combining quantitative and qualitative research methods (Howe, 1985, 1988; Donmoyer, 1985; Smith & Heshusius, 1986; Fetterman, 1988). Relating to this issue is the question of the role of quantification in qualitative

research, i.e., to what extent can qualitative research employ quantitative concepts and procedures? The purpose of this paper is to make an introductory discussion of this question. It first begins to clarify the nature of qualitative research, then it will examine the role of quantification in doing qualitative research.

## The Concept of Qualitative Research

Although the term "qualitative research" is a familiar one, its meaning is relatively confusing. Before discussing some of its characteristics, let us look at two misconceptions.

The first one is that qualitative research is sometimes regarded as if it were one single method. But this is not true. In a review of qualitative research traditions, Jacob (1987) included the following: ecological psychology, holistic ethnography, ethnography of communication, cognitive anthropology, and symbolic interactionism. She also discussed how researchers can adapt these traditions to educational research. Fetterman (1988) introduced some of the qualitative research methods in education, including: ethnography,

naturalistic inquiry, generic pragmatic qualitative inquiry, connoisseurship and criticism, and the more novel approaches, such as metaphors and phenomenography. Fetterman concluded: "Qualitative educational evaluation is not a monolithic entity. A multitude of qualitative approaches exist" (p. 17). Erickson (1986, p. 119) also cited some similar but "slightly different" alternatives of qualitative research, including ethnographic, participant observational, case study, symbolic interactionist, phenomenological, constructivist, or interpretive. However, Erickson prefers to use the term interpretive because it points to the key feature of qualitative research. Erickson's point is correct, nevertheless, the term qualitative is retained in this paper because it can be used to cover a wider range of methods in the literature.

The second misconception lies in matching "qualitative research" with the "thick descriptive" approach. It is true that qualitative research often uses thick descriptions, but thick descriptions do not automatically make the study qualitative in nature. Take for instance, Erickson (1986) illustrated that, since the last decade of the 19th century, "continuous narrative description", which is a "play-by-play account of what an observer sees observed persons doing" (p. 119), has been used in social and behavioral psychology, and some of these narrative techniques are not interpretive because they are used in a "positivist and behavioral orientation that deliberately excludes from research interest the immediate meanings in actions from the actors' point of view" (p. 120). Thus, according to Erickson, studies using thick descriptions but excluding the interpretive focus and intention are not qualitative studies. However, as discussed later under Type 4 research, some other researchers, e.g., Jacobs (1987), would disagree with Erickson on this point.

*Types of "Qualitative-Quantitative" Research*

As illustrated in above, the term qualitative research has been used with different meanings. One reason is that this term can be defined at the level of epistemology (i.e. generally meaning interpretive) and/or at the level of procedures (i.e., generally meaning non-numerical). Complications arise because some qualitative researchers prefer to take an ecumenical stance as well. Combining the ecumenical stance together with the dimensions of epistemologies and procedures, a diagram with five cells can be formed as shown in Figure 1. In this figure, each cell represents one type of research. The reason for the confusion of meaning

is that the term qualitative has been used to refer to research classified in each of the first four cells. In order to explain the meaning of different types of qualitative research, two examples are listed in each cell (except for cell 3), the first one referring to a research tradition, e.g., holistic ethnography, and the second one referring to a technique, e.g., vignette analysis. Due to limited space, not all the examples are elaborated. It should be noted that, due to variations within a tradition or a technique, the line of distinction between these five cells is not rigid, e.g., the synoptic report is based on the results of vignette analysis, ethnography of communication can use both quantitative and qualitative techniques in data analysis, the ecological specimen records can be used on a positivistic or the interpretive stance. The purpose of creating such a framework as shown in Figure 1 is more to help understanding of the diversity of meaning of qualitative research than to classify the different types of studies. In the following, each type of research in this figure will be briefly explained.

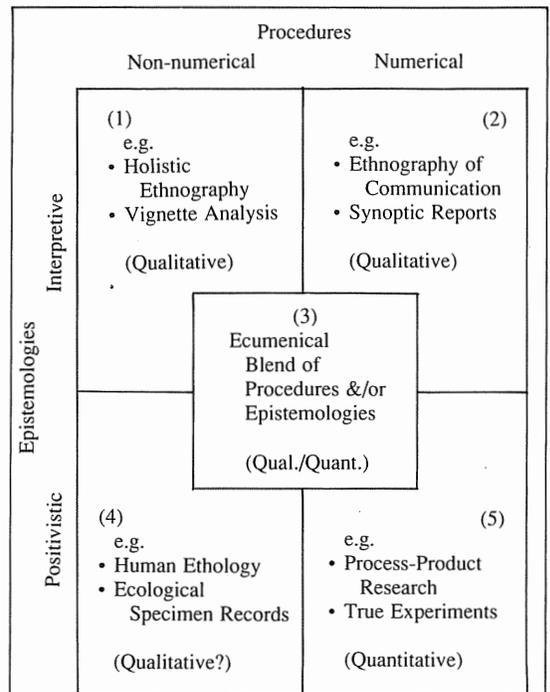


FIGURE 1. *Types of "Qualitative-Quantitative" Research.*

Type 1 research takes the interpretive stance which attempts to understand human behaviour from the "insider's" perspective in a natural, uncontrived, and unobtrusive setting. A typical example is the anthropologists' method of ethnogra-

phy, which is “a monograph-length description of the lifeways of people who were ethnoid, the ancient Greek term for ‘others’ - barbarians who were not Greek.” (Erickson, 1986, p. 123). Developed first by Franz Boas in the United States and Bronislaw Malinowski in England, the purpose of holistic ethnography seeks “to describe and analyse all or part of a culture or community by describing the beliefs and practices of the group studied, and showing how the various parts contribute to the culture as a unified, consistent whole” (Jacob, 1987, p. 10). Derived largely from the methodological statements of Malinowski (1922/1961), there are a few basic tenets that most holistic ethnographers agree on in conducting research, including: firstly, it is important for ethnographers to collect data in “fieldwork” directly themselves in the culture they are studying. Secondly, the native’s viewpoints are important to record, i.e. “his vision of his world” (Malinowski, p. 25). Thirdly, verbatim statements from natives should also be included. Fourthly, a wide range of data using a wide range of methods should be used. In conducting fieldwork, some methods commonly used include participant observation and informal interviewing.

Another example of research listed in cell 1 in Figure 1 is the vignette analysis which is linked to the development of synoptic reports. Therefore, these two methods will be described together in the following.

Type 2 research is similar to that of Type 1 in terms of epistemology, in that both accepted the interpretive paradigm, therefore seeing through the same lens and identifying similar variables and asking similar research questions. In terms of procedures, i.e., non-numerical and numerical, the difference can be a matter of degree rather than of kind. In fact, one can change a piece of research from Type 1 into Type 2 by codifying and quantifying the qualitative data, provided that in the process of quantification, the original interpretive intention of the study and the subjective elements in the data are kept. If the researcher first analyses the data qualitatively and then quantitatively, then basically both types of procedures are used. This is the case with the method of using vignettes and the synoptic reports.

According to Erickson (1986), in interpretive research, one basic task of data analysis is to generate “empirical assertions” largely through induction by reviewing the data corpus, including field notes, interview notes, documents, audio-visual recordings, and so on. Another task is to test the

validity of these assertions by examining details of particular instances, such as narrative vignettes and direct quotes from interviews. The narrative vignette is a vivid portrayal of the conduct of an event of everyday life, and because of its highlighted information, it gives the reader a sense of being there in the scene. The function of the vignette is rhetorical, analytic, and evidentiary. The vignette provides concrete particulars of an event for supporting that the claims of an assertion did occur at least once (the assertion becomes a warranted assertion); otherwise, the assertion becomes anecdotal information.

The importance of warranted assertions is similar to the advice of Dobbert (1982) that the “best way to avoid problems in ethnographic writing is to view an ethnography as a set of generalizations that must be supported by specific examples taken from the data” (p. 277). Dobbert identified four types of generalization frequently used in ethnography reporting — categorization, normative generalization, cluster generalization, and subjective probability generalization. Readers can refer to the work of Dobbert for the meaning of these different types of generalization.

Reporting an assertion supported by a vignette or direct quote does not demonstrate the degree of typicality of the instance. The next step is to establish the generalizability of patterns. “Failing to demonstrate these patterns of distribution — to show generalization within the corpus — is perhaps the most serious flaw in much reporting of fieldwork research” (Erickson, 1986, p. 151). This can be done by showing analogous instances. Here quantitative methods come in to help present and describe the pattern of distribution of instances (called synoptic data reports). Erickson recommended the use of non-parametric statistics because the data are usually involving qualitative judgments using nominal scales.

Type 3 research, in comparison with other types, is more ecumenical with respect to different paradigms and approaches. A number of examples of this type of methodology can be found in the classic book entitled *Qualitative Data Analysis* by Miles and Huberman (1984) who argued for an “ecumenical blend of epistemologies and procedures.” In fact, Huberman (1987) regarded the ecumenical blend as an asset:

I am more ecumenical than before – that, for instance, I can hold a rational and conflict-theoretic paradigm together in my head and build both into the study at hand. In that respect, and unlike many of my European colleagues, I am on the lookout for areas of intersection

between the two paradigms that are conceptually consonant and empirically configural, and do not assume on kneejerk epistemological grounds that there are no such areas. (pp. 12-13).

To Miles and Huberman (1984), "the field of qualitative research badly needs explicit, systematic methods for drawing conclusions, and for testing them carefully – methods that can be used for replication by other researchers, just as correlations and significance tests can be by quantitative researchers." As there are "few agreed on canons for qualitative data analysis" (p. 16), their task, as clarified by Huberman (1986), is to assemble the arsenal of analytic methods in one place and to add a few of their own.

As described in their book, qualitative data analysis "consists of three concurrent flows of activity: data reduction, data display, and conclusion drawing/verification" (p. 21). Data reduction is achieved by means of the process of data selecting, focusing, simplifying, abstracting, transforming, and sometimes quantifying. Data display is an organized assembly of information for the purpose of drawing conclusions and taking actions. Display is achieved by building matrices, graphs, networks, and charts, all of which present information in a compact form. Conclusion drawing can be helped by a number of tactics, including counting, noting patterns, seeing plausibility, clustering, making metaphors, splitting variables, subsuming particulars into the general, factoring, noting relations between variables, finding intervening variables, building a logical chain of evidence, and making conceptual coherence, and so on. Conclusions also need to be verified, and some of the tactics include checking for representativeness, checking for researcher effect, triangulating, weighting the evidence, making contrasts, checking the meaning of outliers, and so on. As the names of these topics suggest, there is quite a lot of "mirroring" (Marshall, 1984) of quantitative techniques, and the purpose of their book is to make qualitative inquiry a more scientific enterprise.

By focusing mainly on the techniques and perhaps using the ecumenical blend as an excuse for leaving the epistemological debate to others, the interpretive nature of the methodology suggested by Miles and Huberman (1984) has been questioned. Smith and Heshusius (1986) queried:

Thus, this approach, with its epistemological ecumenicalism and methods that will make qualitative inquiry 'scientific in the positivist sense of the word' (*Miles and Huberman, 1984, p. 21*), is little more than a variation on the quantitative theme. Like LeCompte and

Goetz, Miles and Huberman transform the paradigmatic debate into a discussion of methodological variations within a realist philosophical temperament. (p. 8)

The "middle ground" epistemology adopted by Miles and Huberman (1984) was also challenged by Donmoyer (1986) who wondered if they were making the assumption that moderation itself be a virtue. In the context of "competitions" between paradigms, the mixing of epistemologies and procedures is particularly sensitive because some researchers may worry that the blending of methods may end up in having one paradigm "capturing" the other. More of the issues of combining and mixing paradigms and procedures will be discussed in the second half of this paper.

Type 4 research includes those qualitative studies that take a positivistic stance. One example is human ethology which is developed from the study of animal behaviour within biology (Blurton Jones, 1972; Charlesworth, 1978). The focus of human ethology is on the causes, development, and evolution of behaviour. However, the subjective perceptions of human behaviour is not the main concern. Human ethologists primarily study behaviour through video-taping and non-participant observation. According to Jacob (1989), "human ethologists often collect qualitative observational data in naturalistic settings, but their philosophical assumptions are essentially positivistic" (p. 231).

Another example is ecological psychology which is concerned with the relationship between human behaviour and the environment. One of the tools used by ecological psychologists is the "specimen records" methodology which contains two elements: the first being the objective part containing the description of an individual (usually a child) in a natural, uncontrived situation seen by a trained observer over a fairly long period of time, and the second part is the observers' inference about the meaning to the child of his or her behaviour and the features of the environment. In the process of data collection, the observers try to be as non-directive and non-obtrusive as possible. After observations have been made, the researcher identifies units of behaviours in the records and infers the intentions of the behaviours of the child. Finally, the properties of the units are described quantitatively and group characteristics are presented descriptively. Inferential statistics are also used to test group means. It should be noted that this last part of the study is quantitative in nature. As in the case of human ethology, Jacob (1987) includes ecological psychology in the

qualitative traditions.

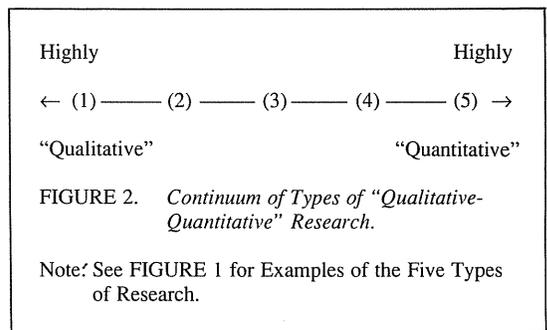
This specimen records methodology is in fact the method of "continuous narrative description" described by Erickson that was discussed in a previous section. To Erickson (1986), qualitative work must reflect the underlying interpretive stance, and since the continuous narrative description fails to take into account the actors' view point, it is not qualitative. However, Jacob (1988) shows that qualitative research and the interpretive paradigm are not always related. In this context, I would agree with Erickson that the interpretive stance should be the key feature of qualitative research, otherwise, the difference between qualitative and quantitative research becomes minimal.

The above example illustrates the confusion of the meaning of qualitative research. Lincoln (1989, p. 238) agreed: "It is critical because it is still not clear yet what is meant by the omnibus term 'qualitative research,' although it is clear that different persons engage in it with radically different assumptions".

Type 5 research is quantitative, and it is included here for comparison purposes. As summarized by Firestone (1987, p. 16), this type of research is based on the positivistic stance which assumes "that there are social *facts* with an objective reality apart from the beliefs of individuals." In terms of purpose, quantitative research seeks to "explain the *causes* of changes in social facts, primarily through objective measurement and quantitative analysis." In order to reduce bias and error to a minimum, quantitative researchers frequently take a detached role in conducting the study, and data are collected through experiments in standardized and contrived situations. A well-known research design in this category is the double-blind true experiment in which subjects are randomly allocated to two groups. One of the groups would receive a treatment (experimental group), but the other would receive a faked one (control group). The subjects themselves do not know the type of treatment they have actually obtained. At the end of the study, both groups are measured with respect to some dependent variables. The logic is that any difference between the two groups can be attributed to the treatment effect and not to other confounding factors. The results are indeed very persuasive if every one in the treatment group performs better than those in the control group. This type of design is particularly popular in the medical science. A good introduction to different kinds of experimental designs is given by Campbell and Stanley (1963).

In terms of utility, it is impossible to conclude which methodology is more useful. It can be seen that true experiments indeed can provide convincing results when the purpose of the study is to search for treatments to be effective for every one across the board. On the other hand, the purpose of qualitative studies is more concerned with meaning and understanding of the social phenomenon from the insiders' perspectives. In other words, which method to use should be determined by the nature of the question.

To summarize, the five types of research above are graphically illustrated in Figure 2. As we travel from right to left, the nature of the research is becoming more and more qualitative in intent and approaches. As indicated previously, qualitative method is not a single entity. It is a name representing a rainbow of different methods. Types 1 and 2 are typically qualitative, whereas Type 5 is quantitative. Type 3 is in the middle ground, supposing to look at reality from different perspectives. By excluding the interpretive stance, Type 4 research is not qualitative (Erickson, 1986), though other researchers (Jacob, 1987) would disagree with this conclusion.



Because of the variety of meaning, it is hard to list the commonly accepted characteristics of qualitative research. Like Erickson, the present writer tends to regard only studies with an interpretive intent as qualitative research. With this in mind, some of the characteristics of qualitative studies can be specified:

1. The purpose of qualitative research is to understand "his vision of his world" (Malinowski, 1922/1961, p. 25), that is to understand the social phenomenon from the actors' or insiders' point of view (Rist, 1977; Taylor & Bogdan, 1984; Lincoln & Guba, 1985; Fetterman, 1988).
2. Research should be conducted in a natural setting (Lincoln & Guba, 1985; Patton, 1980).

3. Theories emerge in the process of data collection and analysis (Bogdan & Biklen, 1982; Rist, 1977).
4. The common method used is participant observation (Bogdan & Biklen, 1982; Wilson, 1977).

Thus, in the words of Erickson (1986, p. 119), the central research interest of qualitative studies is in "human meaning in social life and in its elucidation and exposition by the researcher."

### The Role of Quantification in Qualitative Research

Each of the five types of qualitative-quantitative research shown previously in Figure 1 has unique assumptions and approaches. Although the purpose of this figure is to clarify the concept of qualitative research, it does not follow that when we conduct a piece of research, we must confine ourselves to the methodology in a particular cell in the figure. This is analogous to say that although there are different ways of cooking, like western and eastern, we do not have to confine ourselves to only one type of cooking for a meal. As there are unique strengths in both qualitative and quantitative methods, it would indeed be ideal to have the best from both worlds. In order to achieve this effect, we need to consider the issues of combining paradigms and procedures.

#### Combining Paradigms

As Fetterman (1988, p. 18) posited: "The fundamental differences between scholarly orders are based on philosophical and epistemological, not methodological grounds." Thus, it is necessary to discuss the issues of mixing qualitative and quantitative methods at the epistemological level. The incompatibilists' argument (e.g., Smith & Heshusius, 1986) is mainly that qualitative and quantitative methods are not compatible because the underlying paradigms of interpretivism and positivism differ in their different conceptions of reality, truth, the relationship between the investigator and the object of investigation, and so on. However, by appealing to a pragmatic philosophical perspective, Howe (1988) argued that one should not get bogged down in superconcepts. In fact, much of pragmatic philosophy is "*deconstructive* – an attempt to get philosophers to stop taking concepts such as 'truth,' 'reality,' and 'conceptual scheme,' turning them into superconcepts such as 'Truth,' 'Reality,' and 'Conceptual Scheme,' and generating insoluble

pseudoproblems in the process" (p. 15). Howe also argued that the forced-choice between the two exclusive epistemological paradigms did not exhaust the possibilities, e.g., the pragmatic tradition of Dewey, Quine, and Kuhn, and so on, is excluded. Furthermore, the one-way direction of control from epistemology to approaches is also problematic. Bernstein (1983) called this kind of control as the "tyranny of method". In this context, Howe (1988) quoted the delightful story of Kaplan about the 'principle of the drundard's search':

There is a story of a drundard searching under a street lamp for his house key, which he had dropped some distance away. Asked why he didn't look where he had dropped it, he replied, 'It's lighter here' (1964, p. 11)

In other words, the incompatibilists permitted the street lamp (the paradigm) to determine where to do the search (the nature of the research question and the procedure). However, they have not thought of the possibility of adjusting the lighting output, the lighting direction, and perhaps even the location of the lamp (modifying the paradigm) or using an additional torch (combining paradigms) in response of the need and nature of the search. Kaplan (1964) contended that the relationship between the paradigm and the procedures should be closely related and would need mutual adjustment.

According to Howe (1988), researchers should move forward beyond the focus on two forced-choice paradigms of interpretivism and positivism, and to study how the elements of the two paradigms can be combined. Howe (1988) quoted the works of Geertz (1979, p. 239) who argued that an understanding of human behaviour requires a "continuous dialectical tacking between the most local of local detail and the most global of global structure." Geertz also explained: "Confinement to experience-near concepts leaves an ethnographer awash in immediacies as well as entangled in vernacular. Confinement to experience-distant ones leaves him stranded in abstractions and smothered in jargon" (p. 227). As quoted by Howe (1988), Giddens (1976) favoured a process dubbed as "double hermeneutic" in which social research must work back and forth between the technical, scientific vocabulary of social science and the wordaday, natural vocabulary of social conduct. According to Howe (1988), notions like Geertz's "dialectical tacking" and Giddens's "double hermeneutic" suggest that "it not only *permits* combining paradigms, it *requires* such a combination" (p. 14).

In other words, by appealing to a pragmatic philosophical perspective, Howe is arguing that

there is no incompatibility between qualitative and quantitative methods at both the levels of practice and epistemology. Concerning this paradigmatic debate, Howe (1985, p. 16) emphatically concluded that "all researchers who advocate combining quantitative and qualitative methods are thus on solid epistemological grounds".

The idea that paradigms can be mixed has significant implications. Paradigms, such as interpretive, positivistic, conflict, functional, and so on, often control the whole research design in terms of identifying the issues, formulating the research questions, designing the study, collecting, analysing, and interpreting the data. Donmoyer (1985) made this point clear that "different theoretical languages will lead researchers to employ quite different dependent variables, and these variables will profoundly influence research findings and the explicit or implicit policy recommendations the researchers provide" (p. 19). Take for instance, when a student is looking at the window in the classroom, the intentionalist will probably study the reason(s) behind, and the behaviorist will probably look at the frequency, duration and the consequences. Combining paradigms means that we need to study the student from different perspectives. This is advantageous because we may see more areas lighted up by the different paradigms. Thus, as advocated by Patton (1988), the mind should shift back-and-forth between paradigms within a single evaluation setting.

Relating to this paradigmatic debate are two further points to observe. Firstly, there is a difference between combining paradigms (in order to see reality brighter) and the "middle-ground" epistemology (in order to bypass the paradigmatic debate) that seems to have been adopted by Miles and Huberman (1984). Smith and Heshusius (1986, p. 7) ironically remarked:

Thus, as far as philosophical questions go, they recommend that researchers be epistemologically ecumenical and leave the larger debate to those who are most interested in it. This position leaves them free to label themselves as 'middle-range qualitative inquirers,' 'soft-nosed positivists,' and 'right-wing qualitative inquirers,' and then proceed to various techniques that will make qualitative inquiry 'scientific in the positivist sense of the word'. (p. 21)

Secondly, the fact that we can combine or mix paradigms does not mean we can ignore the assumptions of methods or label any mixed-method as a valid procedure. Rist (1980) warned the educational community to beware of "blitzkrieg ethnography" in which the untrained, self-styled researcher ignored the assumptions of methods and

composed new ones on the spur of the moment but relabelled it as a "new form of ethnography".

### *Combining Procedures*

Leaving the paradigmatic debate behind, what one often finds in reality today is, as Fetterman (1988) observed, studies must be both quantitative and qualitative in order to get funding. In fact, there are a number of reasons for mixing qualitative and quantitative data and research methodologies. Firstly, quantitative data can reduce the "thickness" of qualitative research, thus achieving efficiency. Howe (1985) illustrated: "Imagine trying to do arithmetic in English with no mathematical symbols" (p. 15). Secondly, as Campbell (1974, 1979) posited, quantitative data can go beyond and provide a useful check on qualitative data. Thirdly, combined qualitative and quantitative research can provide a better understanding of reality. When focused on the same problem, qualitative and quantitative studies can triangulate to assess the stability of the findings (Jick, 1979). Evertson and Green (1986) quoted a series of studies using a variety of qualitative and quantitative data collection and analysis methods. They concluded:

The studies also demonstrated that qualitative and quantitative approaches are complementary. Each serves a different purpose. The use of a specific approach depends on the purpose of the study, the questions asked, and the setting in which the observations are occurring. These studies also demonstrate that any one study captures only a slice of reality. In addition, they demonstrate that different collection tools and procedures produce different and often complementary pictures of the observed phenomena. (pp. 204-205)

In combining qualitative and quantitative methods, there are basically three ways. The first is that qualitative and quantitative methods are employed "disjunctively" (Howe, 1985) to investigate different issues within the same study. Take for instance, a group of students are first surveyed using quantitative techniques, and then a subgroup of the students are video-recorded and studied using ethnographic methods. This is a relatively straight-forward case of combination because the methodological rules for both the quantitative and qualitative parts of the study are already available.

The second is to combine quantitative and qualitative methods "conjunctively" (Howe, 1985) to investigate the same issue. Take for instance, in the process of triangulation, both quantitative and qualitative methods are used to collect data on the same problem. In both the first and the second

ways, the effect of "combining" is achieved by the use of a mix of methods.

The third way of combining is more challenging. It is to use quantitative methods to describe and analyse qualitative information. Because of the "thickness" of qualitative data, quantitative methods can help to thin down qualitative information. In addition, quantitative methods can also help to strengthen the generalizability of qualitative research findings (Yin & Heald, 1975; Kennedy, 1979; Miles & Huberman, 1984; Yin, 1989). Firestone (1993) explored three broad arguments for generalizing from qualitative data, including: sample-to-population extrapolation (i.e., generalizing results from a sample to a population), analytic generalization (i.e., generalizing results to a broader theory), and case-to-case transfer (i.e., generalizing results from one case to another case). He argued that out of these three methods, analytic generalization has more promise because there are more ways to make links between cases and theories. Using Ragin's (1987) Boolean approach as an example, Firestone (1993) showed how to compare cases and to generalize findings to a "theoretical space" represented by the "truth table".

Compared with disjunctive and conjunctive types of combinations that Howe mentioned, the third way is a genuine process of "integrating" quantitative techniques in qualitative research, resulting in part or in whole data transformation from the qualitative to the quantitative. Unless this quantification process is done carefully, it will lead to the danger warned by Smith and Heshusius (1986) that "this transformation is not based on the development of a legitimate *via media* between the two perspectives, but is actually a matter of the 'capture' of qualitative inquiry by the quantitative approach" (P. 10).

In order to avoid the trap of being "captured", two important criteria of quantification should be observed. These two criteria are important because they ensure that quantitative methods are only used as tools for qualitative research. Firstly, in the process of quantification, the interpretive nature of the study should remain untouched. In operational terms, this means that the type of research questions asked, and the kind of phenomena investigated should remain interpretive in nature. Since positivists and interpretivists see different things, it would be more "safe" to first conceptualize the research problem and the research design through the interpretivists' lens assuming of course that this is the lens one wants to use.

Secondly, the subjective and personal elements in qualitative information should not be eliminated or changed in the process of quantification. This is important because one main characteristic of qualitative information is that it incorporates subjective and personal elements such as values, intention, beliefs, and so on. By removing this subjective element, the flavour of qualitative information is lost. In operational terms, one safe way to ensure that subjective elements are not eliminated is to return the coded data to the subjects to confirm if the subjective elements are properly coded, quantified and described. For some types of qualitative information, e.g. stories, visual materials, there may be no direct quantitative analogues. Although as suggested by Howe (1988), one may count and make ratings on them, great care should be exercised to ensure that the transformed data are valid in meaning.

## Conclusion

Provided that the two criteria of quantification in above are observed, quantitative methods are indeed useful tools to the qualitative researcher. At the epistemological level, the educational researcher should be able to see reality better when things are looked at through both the quantitative and the qualitative lens. At the procedures level, quantification can also help to make the qualitative data analysis more efficient and accurate. The shift of present-day researchers towards qualitative methods is described by Fetterman (1988, p. 22) as a "silent scientific revolution." To protect and to develop the fruits of the revolution, the modern-day qualitative researchers should be well-trained in certain areas of quantitative methods, particularly in research designs and non-parametric statistics. Institutions should not neglect this quantitative component in the training of their future qualitative researchers.

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