The Dichotomizing Views of Research Methodology on the Study of Values: Dynamic Interview and Reflective Constructing

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Abstract

This article presents researchers’ introspective and thinking process in the research of teachers’ value. The researchers’ primordial goal was to tidy up the interview methods. By interviewing three cases’ values (those of an elementary school teacher, a junior high school teacher and a senior high school teacher) about mathematics, education and mathematical education. We attempted to explore whether a successful interview about values required some specific dynamic characteristics. Incipiently, we hypothesize that each case has one potentially implicit value system. The purpose of the interview was to highlight the implicit value system. The dynamic and exploratory process was called IE in this research, 'I' stands for the implicit system, and 'E' stands for the explicit system. We also used the vector symbol (→) to show that the interview is a process with directional characteristics. At the time, we found that many aspects of the relationships between the interviewees and the interviewers might facilitate or set back interviews. In addition, we also tidied up some possible efficient strategies which might be used in the dynamic interviews. Since many researchers participated in the three case studies, there were different interpretations of the same case data. At the time, we started to cogitate from our standpoints of epistemology. All the collected data regarding the relationships between the changes of the research methods and the standpoints of knowledge were comprehensively considered in retrospect. At present, in stead of thinking teachers’ value as a reality, which exists uniquely and objectively. We started to cogitate on how we should reassess the data collected previously, how we constructed the phenomena being seen by us, and how we testify the validity of our researches under the conditions where teachers’ values were though as multiple realities or the result of social constructing. We denote the two different interview methods dynamic interview and reflective constructing. We also compare the differences between them regarding ontological problems, purpose of knowledge, and intention and criteria of good research. At the end of this article, we will indicate how we are going to further our research and to solve the existing problems.

Key Words: teachers’ value, mathematics education, methodology of interview

Preliminary (Project meeting after the value research project had been in progress for more than one year.) (10, 17, 1998).

RW: The method of value justification used by Rath et al. is only giving students a value sheet without any conclusion. The following week the content of this sheet is mentioned once again; however, this is not carried out during our interviews.

RL: We do not provide guidance, but guidance is included in value justification.

RE: We did not teach Values; Values are in there.

RW: We did not intend to teach Values; however, is it possible that Value arises during the interviews interactions?

RE: That depends on how the interviews proceeded.

RB: We ask questions according to some teaching behaviors we have observed in her class or the messages that we get from her during the interviews. Therefore, we did not mean to guide values; yet implicit to explicit values emanated naturally.

RW: It was not our intention to do that, but if it occurred it would be “pure teaching”. However, is there any pos-
sibility that during the interview.........  
(RW, RL, RE, and RB are the main researchers in this Value research project.)

I. The Values Project

The research was proposed by Alan Bishop et al. to carry out the project in Australia, Taiwan and South Korea through four stages: case study, survey, intervention and follow-up in three years (1999-2001). The purpose of this research is to explore mathematics teachers’ intended values and implemented values to promote the efficiency of mathematics teaching. Actually, this 3-year integrating research program was first executed in Taiwan, by the support of the National Science Council. The main purpose is to explore these values and their interactions in mathematics classrooms. The first phase was carried out through the use of case studies to explore the kind of values about mathematics, general education, and mathematics education teachers carry, and how these values are transmitted in mathematics classrooms (Lin, 1997). There are three sub-projects in which each research group studies a mathematics teacher from senior high school, junior high school, and elementary school, respectively. The researchers include six educators from teacher education university, several graduate students, and several teachers on practice in schools.

At the very beginning of this study, we take Frondizi’s (1970) point of view that value exists both in subjective and objective ways. We plan to explore teachers’ values by questionnaires, one-to-one semi-structured interviews based on videotapes of classroom teaching, and classroom observations.

II. Reflections Within the First Year

At the end of the first phase, the three sub-projects correspondingly portray the value systems in the three case studies. We start to evaluate the methodology of values research based upon the sub project reports. By examining the data of three cases, we hoped we could lift the personal artistic level of the interviewers. From the protocols of the interviews in the three sub-projects, we analyze the interactions between the interviewers (researchers) and the interviewees. We found many subtle phenomena which lead us towards the idea of dynamic interview.

Some issues are observed from the interactions between the interviewers and the interviewees:

A. The issue of academic status: Three phases of values about mathematics, education, and mathematics education of teachers provide the focus for this research. The main interviewers in the three sub-projects are university educators who teach in universities or teacher colleges with mathematics backgrounds. Additionally, there are some graduate students and novice teachers participating in the interviews. We found out that their confidence about a knowledge of mathematics, education, and mathematics education would influence their performance in the interviews and would influence our exploration of their values. The cases of the elementary school teacher and the senior high school teacher formed a very interesting comparison.

The elementary school teacher, F, is female and graduated from Teacher Training College more than twenty years ago and has taught since. Her major was mathematics and science education. However, through the one-year interview, she seldom expressed her opinion on the content or value of mathematics. Here is a typical example:

RA: I have been thinking about how you, personally, view mathematics. How exactly do you see it? It must be something with structures, and some abstract thought would be needed to clarify and understand it.
F: Yes, from manipulating one by one to abstractly thinking, and then to the ability of technical operation.
RA: Therefore, mathematics is something abstract. Is it correct that you have to grasp this thing by mastering some principles?
F: You have to ask RB about this.
(p.s. RA and RB are female educators in a teacher training college. The former is with a psychometric background, and the later is with a mathematics education background.)

The case of the senior high school teacher, case M, has a master degree in mathematics. He has taught for more than twenty years in a public school (the top ranked school in the region) and used to teach the gifted class. In the beginning, case M was not so clear about what were so called “values”, and he spent some time exploring and asking about them. After a short period, he confidently expresses his own opinions on values about mathematics, education, and mathematics education. Moreover, he enjoys talking and sharing ideas with RC (a male university educator with a mathematics education background). On the contrary, he would sometimes be impatient with the occasional inquiry and need for clarification from the novice teacher RD, who works in the same school with case M. The higher academic status of RC (university professor), influences Case M (school teacher) thinking. Some of Case M thoughts are conveyed in conversation through RD.
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RC: Is it a kind of maturity matter? Or would it be better that you do not teach this until the students are in the twelfth grade? At least students could recognize the format, and they can use "when \( n = 1, \ldots, \) assume \( n = k \) is true, \( \ldots \)". However, afterwards your emphasis should be its meaning. How would you transmit this meaning?

M: I would like to ask RD first. What are the principles in mathematical induction? Strictly speaking, why do we need to define mathematical induction in mathematics? There are different descriptions. Among them, one is that if \( S \) is a subset of natural number set \( N \), \( 1 \in S \) and \( k \in S \) implies \( k + 1 \in S \), then \( S = N \). This is a general description of mathematical induction. Then what do you think the principles are in mathematical induction?

RD: According to my experience, the principles in

Later on M clarified his opinion on the essence of mathematical induction via a dialogue with RD. His explanation also explains the teaching approach in his mathematical induction classes. However, we have the assumption that M would never ask RC the same question as RD.

Concerning the issue of academic status which influences the study of values, evidence from our studies showed that the following strategies may help to deal with it.

1. The interviewers had to express properly that they are “learners” in values research. In this way, the subjects would be less concerned about receiving criticism from these interviewers.

2. Try to make the concrete examples from the observation in classrooms as the materials for the discourse. Abstract, theoretical, or assumptive questions are easy to raise the defensive attitude of the subject.

3. We should limit the mathematics knowledge that we discuss under the domain that the subject can handle. As far as the elementary school teacher is concerned, the limit should be in the elementary mathematics content that he is familiar with. If the interviewers expect the subject to appreciate mathematical aesthetics and abstraction emanating from an ivory tower, the subject would feel a strong pressure on himself/herself.

4. Concerning the role that RD plays in the interviews, we found out that the stable relationship of academic status between the interviewers and the subject would restrict any interaction between them. Sometimes if there is another interviewer with a different status who plays the role of an innocent person in asking questions, the subject might have more opportunities to express his/her thought explicitly, and the effectiveness of the interviews might be increased.

B. The issue of fitness: Values concern a vital issue of one personal professionalism, and relates to personal experiences where the subject must have a feeling of trust and security during the interview relationship. He is then likely to present this psychological phenomenon reflecting his personal experience. Such fitness influences this kind of relationship. The correspondence in academic status mentioned above is one of the issues related to fitness. In the case of the senior high school teacher M, he talked a lot because RC could understand his mathematical thoughts.

RC: Therefore, you approach it from the perspective of geometry, and then you go back to the development of a determinant. It seems that there are different approaches from textbooks. They are weakly related to Cramer’s Rule in the textbooks. Cramer’s Rule just mentioned is that \( Ax = \) equals to \( A \) multiply \( x \), and I think that is wonderful! I would like to know under what kinds of circumstances you have the thought that textbooks are limited, and you have to develop your own thoughts?

M: I put lots of thought into making a good order.

RC: When you first read the materials in textbooks, you are not satisfied with it, you feel it is limited in further development; so you thought of another way to present it.

Besides, religious belief is a strong reason for influencing fitness. RB’s research report reads:

“When I first called case F, asking for her permission as my research subject, she said that she was new in the teaching of the new elementary mathematics curriculum, and she was not so familiar with the materials, so maybe it is food for her to act as the research subject. Later on case F said that she was too busy to have time and energy to cooperate with our research. Therefore, I gave an appointment with her in my office to check out details. Afterwards, case F said to the researchers. Last time you called, and I thought that I did not want to be your subject. As I walked into your office on that day, I saw the “Heart Sutra (心經)” and the holy image of “Kwan-Yin Buddha (觀世音菩薩)” on the wall and I decided to be your research subject”.

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Due to the same religious belief of case F and RB, F made a great change in her decision, and she was willing to put her time and energy into the research. We believe other important personal characteristic will have the same effect. Research on Values is a tremendous investment to both sides. It is a very time and energy-consuming research theme. If we cannot form an interaction of fitness throughout the interviews, there is a possibility the whole study would not come to a meaningful result.

But is there any disadvantage in this? In our protocol, we found out that if it is a fitting and socializing interview, there would be some disadvantages against the interview:

1. Because the researcher and the subject both know each other so well, they did not need to explain to each other so clearly. Therefore, the researcher might not have reliable data as evidence for the study.

2. The interviewers might feel that because there is a sharing of the same point of view, they take the subject’s words for granted, thus inhibiting the need for probing. If the interviewers took an opposite attitude, more information might be collected.

3. Due to high fitness, the pace of the interviews would be fast and smooth, and the interviewers were likely to interrupt and make the finish of the subject’s sentences. In this way the interviewers might misinterpret the subject’s meaning or misguide the direction of the talk.

RA: Here, I think you adopt another strategy; it means that you make a decision. What’s the reason that stirs you to make such a decision?

F: I am afraid that I won’t have enough time!

RA: I am afraid that I can’t achieve the scheduled progress. In order to prepare for the coming exam, I must do my best to achieve the scheduled progress.

F: That’s the difficulty teachers confront! If we can’t achieve the scheduled progress, we feel guilty for failing in our duties to parents. Therefore, we must finish our schedule on time; we do not allow progress to be delayed. That’s the pressure we are confronted by!

RA: Therefore, the pressure of time, parents and exams will make you change your teaching strategy?

F: Right! Without the pressure, I can follow my inclination to teach students. But my strength does not match my ambitions.

(Later on, RA didn’t ask any question. They continued watching another scenario of the video tape.)

From the above case, we think RA ended this interview by identifying with F and thinking F’s compromise reasonable. But values usually hide behind the outcome of a dilemma. If RA didn’t take F’s compromise as a matter of course, she might have had a chance to catch some of F’s teaching values. There are some values when F makes a decision about teaching strategies for “making students achieve mastery through a comprehensive study of the subject” or “dealing with the pressure coming from parents”.

As a result of the above analysis, we started trying to clarify the characteristics of Good Values research. The preliminary assumption is that there are some implicit Value systems that the subject might be carrying, and these are implicit to both carrier and researchers. The interviewers must create a fitting and dynamic setting, letting the subject explicitly express his Value. In this sense we name this process “dynamic interview” in that the interview for the Values research is the process of mutual understanding between the subject and the interviewers, or even the inner dialogue of the subject himself. Though the interviewers had some semi-structured interview questions in advance, it was not easy for those questions to unearth the values held by the subject. He gradually understood the purpose of the interviewers through questioning and doubting the interview questions; meanwhile, he has clarified the implicit Values by himself. The interviewers constantly modified their ways of questioning throughout this process, making the questions connect with the subject’s old experiences so they could collect the data for Values. At that time we thought that since the purpose of the interview was to illustrate the implicit viewpoint of the subject and express it by words, we could have examined it to see if it could pass the criteria of Values’ clarification. Thus we take the symbol “$IE$” to represent the process of the exploration and clarification. I (implicit) represents the implicit inner property of the subject; E (explicit) represents the purpose of the interview to make the implicit become explicit. We took the vector symbol ($\rightarrow$) to show that this is a process with direction. Besides, we also reviewed some suggestions on the interview skills in the literature (Fowler & Mangione, 1990; Holstein & Gubrium, 1995; Rubin, 1995; Seidman, 1991).

A good example of dynamic interview was in the research of the senior high school case study (Chin & Lin, 1999). This case study report indicated that the function of the dynamic interview was to promote a mathematics teacher from a Value carrier to Value communicator. From this $IE$ process we could find out that the cognitive process of the subject M showed the evolution is a sequence of questioning, perceiving,
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using vocabulary, understanding, and clarifying. When the subject at last could clarify his own Values, he would use this word “Values”. Meanwhile, the report indicated that the mechanism that made a Value carrier transmit to a Value communicator were dialogues, communications, and reflections on teaching.

RC: In the beginning, you (ie., subject M) and I both are lacking a sense direction and did not handle things so well. Until January, the word “Values” appeared more frequently in M’s vocabulary. So here is my question: During the early part of our discourse, what kinds of factors influenced your judgement in the way that you spoke some of your thoughts?

M: Many things are likely to be expressed more clearly, the more times you think or speak about them. The listeners would listen clearly and the speaker would express himself more clearly than before.

RC: Did your thoughts exist already or did they form gradually through our talks?

M: Because I took a part in this research, the experience made me reflect upon some of my thoughts, but it is just a very small proportion. My teaching rational is influenced more from my experience of textbook writing during the past few years.

RC: So there are two factors that showed your teaching Values; one is the reflection of the dialogues, and the other is the textbook writing that made you think profoundly about how the materials should be presented.

M: I just make it clearer; I own most of the thoughts myself.

RC: You think you own the thoughts already?

M: Yes.

In order to make sure of the reliability a “Multifaceted triangulation” was used throughout the senior high school case study. Through three different phases of data, including the dialogue the subject had in the classroom, the dialogue in the teachers’ seminar, the dialogue with a student teacher, and different observers, the researcher, one novice teacher who is a colleague of M, two trainee teachers on practice in M’s school, and one senior mathematics teacher modified and checked M’s Value system in his institution.

It’s time, for us to start to review the methodology of Values research. From the expression of “Values carrier” and the methods that the researchers took in the senior high school case, we know that the dynamic interview ensures subject’s Value to be “the reality”. The researchers must try to be empathetic and create an atmosphere of security during the interviews to get the real Values system from the subject.

However, did particular Values exist as a reality inside one person or were they constructed socially as a reality through the interview dialogues between the interviewers and the subject? Was there any possibility that different interactions might show different “realities”?

III. The Effects of the Interviewers

There are three major researchers in the elementary school project, the aforementioned RA, RB and RW. We found out that different interviewers asked questions in different ways and the emphasis placed upon questions were different, and there were different relationships with the subject. In the technical report of the first year, there were differences that various researchers would like to present in the characteristics of the subject. The following is the contrast between RA and RB, showing the issue of interviewer effect, and reflecting the possibility that some Values might be constructed by the interviewers and the subject jointly.

There were more than ten interviews within a year, and on some occasions only RA or RB did the interviews. RW sought to pair individual interviews according to each situation, for example both proceeded after watching video tapes, and interview timing ensured both interviews were carried out within one week. Three sets of contrasting data are selected to show the influences of these two interviewers, RA and RB. As mentioned above, the subject and RB were believers in Buddhism. After one year of interviews, RB was especially interested in the influences that the subject’s belief in Buddhism had on her Values. RA was more interested in the way her values were influenced by her authority. It seems a very interesting contrast in the way the two researchers handled with the issue of Buddhism during the interviews. Because there were many Buddhist expressions, it was easier to identify the issue of Buddhism than the issue of authority. The listed three sets of data will compare the corresponding responses to Buddhism that the two researchers had during the interviews, and the frequencies that the subject used Buddhism expressions when facing one of the two researchers.

I(A): Appendix 4-1, Technical reports (Nov. 11, 1997) Interview was base on classroom teaching videotapes. Subject F, RA, and two graduate students as part-time research assistants were participants.

In the protocol of page 13, Subject F spoke the word “enlightenment” twice, and she did not mention any word about Buddhism. On page 120, F
mentioned "enlightenment" once, but nobody kept on asking, and F did not keep on talking about it. On page 211, RA asked F if her story could be the metaphor for "something" of students. What is "something"? F answered, "the learning attitude". F then turned to another phrase, "his enlightenment". RA repeated, "his enlightenment." And F went back to the usual expression to explain her thoughts and meanings.

1(B): Appendix 4-2, technical reports (Nov. 18, 1997) Interview was based on classroom teaching videotapes. F, RB, and RW participated in the interview.

In the protocol of page 14, the issue concerning Buddhist enlightenment showed only once. F indicated the importance of "enlightenment" in one's life when answering the writer's inquiry. She also gave a long explanation of it. However, she used the Buddhist expression "enlightenment" only once, and she went back to the usual expression of awareness.

We did not see many of the effects of the interviewers in this set of data, but it is noteworthy to mention that those two interviews proceeded at the preliminary state of this research. The interviewers and the interviewees were both trialling points of discussion with each other. To what degrees would the interviewers take note of my words? To what depth would the subject talk about it?

2(A): Appendix 4-3 (Nov. 26, 1997) Interview was based on classroom teaching videotapes. F, RA, and two graduates were participated.

In the three pages of the protocol, F used no Buddhist expressions.

2(B): Appendix 4-4 (Dec. 2, 1997) Interview was based on classroom teaching videotapes. F, RB, and RW were in the occasion.

In the thirteen pages of the protocol, dialogue concerning the Buddhist viewpoint appeared in three pages. First (p. 247), where the writer confronted F if the emphasis on concentration worked during the teaching. F answered, "you are making a key point here; this is the whole point of learning. I do not know if you are doing work influenced by Buddhism". This question was for RB, and RB answered "Yes, I suppose I did". Later, there was a very long dialogue between F and RB. Within it, F explained her opinions on learning differences and the influences that Buddhism and its related expressions (pp. 247/8) had on the view of learning (p. 249). The issue switched showing that though F was answering the question RW proposed, she talked freely and naturally to RB using Buddhist expressions; it was as if she had found somebody the spoke her language.

The data of set 2 showed that after a period of contact with each other, there was no Buddhist expression in the dialogues between F, RA and RW. However, F talked with RB freely on the language of Buddhism. F mentioned that she would not have to express her thought merely in Buddhist expressions. The dialogue with RA explained the situation. F used many expressions like "pay attention; perceive your own mistake; learning is your own business". She used the same expressions in the dialogue with RB, but she would explain the same viewpoint through Buddhist expressions.

3(A): Appendix 4-11 (Mar. 27, 1998) Interview about Value. F, RA, and RW were involved on this occasion.

In the nine pages of the protocol, no Buddhist expressions appeared in the dialogue between the interviewers and F.

3(B): Appendix 4-8 (Mar. 17, 1998) Interview about Value. F, RB, and one graduate student were involved on this occasion.

In the eight pages of the protocol, many Buddhist expressions appeared. At the beginning of the interview (p. 279), the graduate student used the term "concentration" to inquire of F about the normality in her classroom. Later, RB directed the whole discussion towards the effect of Buddhist upon F.

The graduate: We've thought about this before. You think students have to concentrate. Why do they need to concentrate? Is it because they could........

F: Concentration makes you accomplish your teaching goal. If you teach over their heads; and you fail to understand that students speak at peer group level, when you finish your lesson, they still won't know what you were talking about.

RB: We have discussed the part that concentration plays. The concentration you are asking of students is from the way of their own enlightenment and their potential. Are there any differences between the concentration in your sense and the one from other teachers'?

......

F: I do not know. I did not see someone else's situation.

RB: The concentration which you are referring to now is, from my viewpoint, influenced by Buddhism. I wonder if you would have had the same notions before you came into contact with Buddhism?

F: I did. But I had the feeling that the effect was not as good before.

The data of set 3 were collected after half a year.
of the study. It shows very clearly in the effects upon
the interviewers. On Mar. 24, 1998, RB did a special
interview on “the influences of Buddhism upon F’s
teaching”. RA did not join this interview. We found
out that not only did F use different languages when
facing different interviewers, but also the interviewers
would use different languages in different themes.
Therefore, the content of the protocol was dependent
upon the mutual interaction between the interviewers
and the subject.

Lastly, RA and RB would have their preferences
on the subject they described. This was not because
they received different messages as they both partici-
pated in part of the interviews and all the protocols
of the interviews would be handed to all the members
in this research group after ten days. Basically they
both read the same information. However, how the
information would be selected, and organized leads us
to the issue of the effects of interviewers.

The issue of the difference between RA and RB
could be a methodological issue, and also how they
view the subject’s Values. Is it “the reality” or “a
reality”? What did they intend to present in their
reports? What did they hope to tell the readers?

“I often feel that the case study only shows the world
of the researchers. What about the case? The subject is just
a tool used by the researcher. Therefore I borrow from
positivism to explain my research. Through the training of
positivism, I offer you much empirical data, events of
observations, dialogues, and so on. My purpose is to make
you feel that I do speak with evidence, and to give you my
impressions of the subject.”

(RA, Feb. 1999)

“...Because the researcher is a Buddhist, F mentioned
enlightenment recurring again and again during the interviews.
What if the researcher was not a Buddhist? Maybe F would
not have changed her mind about being a subject. Even if
she continued to be the subject, a non-Buddhist researcher
would probably not able to discover F’s Values.”

(RB, Feb. 1999)

Interviewed with RA, she specifically expressed
that she wished to take an interpretive approach to
describe the image that she saw of the subject. RA
thought it was a good interpretive approach from a
Buddhist viewpoint; however, this was not what touched
her the most, she would not have chosen this perspec-
tive to describe the subject. As for RB, she took
an empirical approach to describe specifically every aspect
she could think relating to the subject and reminded
herself of the operative definition of Value, hoping to
know very well the subject’s “true Values”. RB had
no doubt that her own belief in Buddhism influenced
the interviews, and she thought that this was the reason
she would have the chance to identify the subject’s
Value in “recovering enlightenment”.

IV. The Methodological Literature on
Interview

There were various kinds of approaches in qualita-
tive interviewing in the literature (Holstein &
Gubrium, 1995; Rubin & Rubin, 1995). The family
of qualitative interviews differs in the degree of
emphasis on culture, in the choice of the arena or
boundaries of the study, and in the specific forms of
information that are sought.

Holstein & Gubrium (1995) contrasted “vessel
of answers” vs. “meaning making” and took the dif-
fferences between the viewpoints of positivism and
social constructivism. The former saw the case as a
reporter; the latter saw the case as a narrator. They
explained and testified through several written articles
on the interview method. For example, in 1974,
Converse J. and Schuman H. emphasized that though
the responses from the interviews were made so in-
terpretively active, the interviewers could not give up
seeking for a goal of objective responses. The inter-
viewers must learn to control the interview situation,
to constrain his personal opinions, to avoid the stub-
born stereotype on the case, etc, in order to get the
real responses of the subject. Douglas (1985) differed
in his opinion from Converse & Schuman regarding
the interview method. His “creative interviewing” put
much emphasis on the putting in of the interviewers’
emotions to detect the subject’s deep experiences. He
avoided making interviews merely words or phrases.
The interviewers must have to seek for a mutual
disclosure and a creative search for mutual
understanding. For a mutual disclosure the interview-
ers must constantly do self-analysis to remove the
interviewers’ own defense mechanisms. According to
the comments from Holstein & Gubrium (1995), they
thought the purpose that Douglas insisted in creative
interviewing, was to create an interview situation,
which made the subject open his mind and really show
his experiences. This was a viewpoint of a “vessel
of answers”.

On the contrary, Holstein & Gubrium (1995)
developed their own “active interview”, strongly in-
sisting that all interviews are interpretive active, and
implicating evolving meaning. They also showed their
rational of social constructivism. They thought that
insisting on active interview could cause an unaccept-
able form of bias to those positivists. They objected
that this criticism exists only if there was the condition of performance and pure reality. If any interview situation, no matter how it was formalized, restricted, or standardized, relies on the interaction between interview participants, then all the interviews are supposed to be a process of evolving meaning.

A consequential question is, how do we evaluate a social constructivism research or other non-positivism research? The solution to this question is still in its development. Altheide & Johnson (1994) suggested six ways of validity thinking: validity as culture (VAC), validity as ideology (VAI), validity as gender (VAG), validity as language/text (VAL), validity as relevance/advocacy (VAR), validity as standards (VAS). An alternative thinking of validity was growing. Researchers who challenge the traditional academic authority put their emphasis on the reconstructing of ethics. Hammersley (1990) brought up his viewpoint “validity as reflexive account”. He thinks that the reflection of researchers will promote validity. We will come back to Hammersley’s view in the next paragraph.

V. Dynamic Interview vs. Reflective Constructing

The interview method that takes multiple realities in ontology is called reflective constructing. What are the differences between this method and dynamic

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C. Intention--application vs. appreciation: Due to different expectations of the research results, the attempts at research must have been different. Dynamic interview intended to provide us with data of application; reflective constructing afforded data that touched the readers. This integrated value project indicated in the proposal that a very important contribution of this research will be its application. Based on grounded theory, the structure of transmitting through values in the process of mathematics teaching will be developed, and the possibility of native culture enculturation in mathematics teaching will be raised. As a result, these studies expect to solve the issue of acculturation in Taiwan mathematics education. In the report the subject from senior high school showed that the purpose of the study helped not only teachers values research in its applicability and ability to be generalized, but also for teacher professional development curriculum with transmission of values. This showed that an application research was more likely to take the same research methods as dynamic interview.

phenomenon would be influenced by the operation of human minds. The subjective interests, emotions, and values of researchers could undoubtedly influence the process of the research, and the process of the research would influence this constructing of theories and the grasp of realities.

B. Purpose of Knowledge--instrumental vs. intrinsic: Davish & Hersh (1981) inferred that there are Maoism and Hardyism in mathematics knowledge when classified from utility. The former sought for a useful mathematics knowledge for society, which the latter was in complete opposition to. Stake (1995) indicated that there were two characteristics in a case study; one was instrumental, and the other was intrinsic. The former was the researchers attempt to explore some confusion through some special instances, where in the end they looked for a common understanding. The latter was out of inner interest and curiosity, with an attempt to know the uniqueness and complexity of the subject. Dynamic interview hopes to see the population from one case. Those such as RB (Leu, 1999) brought up the data of “Tzu Chi (慈濟)” teachers association in F’s report, explaining the great and broad influences that Buddhism had with elementary school teachers. Its purpose was hoping that this case could represent a sub-population to some extent. Reflective constructing was only describing the uniqueness of the case. It was not concerned whether this research could solve the general problems.
On the contrary, the purpose of research using reflective constructing was to touch the readers and make them interpret from the description of the subject, and hence get specific meanings to the readers themselves. Both the interviewers and the subject intertwined the description to the subject. The understanding of the subject was interacted both by the readers and the subject reports. The researchers could not anticipate how the readers would explain the subject reports, but they have to make efforts to complete a text which is touching to the readers.

D. Criteria of a good research: Based on the above ontology and the research goal, we could go further in discussion of the criteria of research quality. In evaluating the research results, dynamic interview took the criteria of reliability and validity of consistency, stability, and replicability as other positive-empirical approach. In other words, they were cross-checked by various kinds of research methods, researchers, empirical data, and theories. The cross-checking in triangulation or multi-faceted triangulation indistinctly pointed to the existence of an external reality.

On the contrary, reflective constructing insists that the research results are an outcome of social construction. It has to contain various kinds of different opinions and it is meaningless to get the same research result. Then, what are the criteria for good research? It may be the multiple meaning of the data, the researchers' reflections presented in the reports, and the process of refutation and argument.

Wu (1999) indicated an example from her classroom assessment research in England. Different members of the research group define the word “middle class” from a different index, and it results in abundant and multiple meanings. The economical status as well as the cultivated values of the family classified it then. In other words, it is possible that there are poor middle class and rich working class people. Besides, the researchers should present their reflections in the research and the reports, how they refuted themselves, and how these refutations were not able to stand up to scrutiny. These explained why the researchers thought they were giving meaningful descriptions to the subject, and thus so-called “reflective constructing.” There are fewer papers like this in the mathematics education field. Skemp (1976) had self-refutation concerning relational understanding and instrumental understanding. Hammersley (1990) indicated “validity as reflexive account.” He thought that researchers should have thought of five questions about validity.

Hammersley's suggestions reminds researchers of the required directions of research' self-reflection:
1. The relationship between the subject and culture, politics, economy, and the historical context.
2. The relationship between the subject and the researchers.
3. The relationship between the researchers' viewpoint and the explanation of the data.
4. The role of the readers in reading the research reports.
5. The representations, expressions, and the authority of the written styles of the research report.

VI. Researcher, Subject, and Timing in Value Study

This article is about to present researchers' introspective methodology by exploring three sub-plans of values studies in mathematics education. We compared the differences between two various interview methods, dynamic interview and reflective constructing. In order to start a value study or to analyze the results of studies or values in mathematics education, should we take the perspective that dynamic interview and reflective constructing stand persistent, dichotomizing views, and interpret them separately? Or, should we seek for a conceptual model from which we can inspect the protestations of each method and explore the possible characteristics of the products obtained by these two different interview methods and other methods? It seems that many more studies are necessary before we can deal with such a debatable issue. However, this paper has shown that the three variables s (research subject), r (researcher), and e (event and timing) should all be taken into consideration when data of values studies are interpreted. The features of s include the characteristics of the subject, such as self-confidence and openness, the professional knowledge of mathematics education and the situations on life tasks, such as suitability for teaching, family situation, children's education and general philosophical view about life, etc. The features of r include the characteristics of the researcher, the readiness of values issues and the rational about values study.

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價值研究的二元對立觀：動態訪談與反思性建構

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摘要

本文旨在呈現研究者（師資的培育者）在一項教師價值研究中的反思歷程。研究者原始的目標在於整理價值研究的訪談方法，從訪談三個個案（國小、國中、高中教師）在數學、教育、數學教育等範疇的價值，我們意欲探討成功的價值訪談是否具備某些特殊的動態特徵。起初，我們假設個案具有一內隱的價值體系，訪談的目的是在於彰顯該內隱的價值，本研究稱這種動態的、探索的歷程為 IED，I（implicit）用來表示訪談者所內隱的價值；E（explicit）則是訪談的目的在於清楚地彰顯這些標的價值，並以向量的符號 I→E 表示此具有限性向的歷程。當我們發現訪談者和被訪談者的關係中有許多促進或阻礙訪談的面向，也整理出動態訪談中可能有效的一些策略，同時也開始反思研究者在研究所扮演的角色。

由於前述三個個案研究有多名研究人員與其參與其中，這些研究人員對相同的個案資料有時會有相當不同的解讀，此時，我們開始思考本身的知識論立場的關係。我們不應再將教師個案的價值視為唯一的、客觀存在的實體，等待我們去發現的，而將教師的價值視為多重實體的（multiple realities），或是社會建構（social constructing）的結果，我們應該如何看待先前已收集到的資料？如何建構我們所看到的現象？以及如何檢正我們的研究是否有效？我們以動態訪談與反思性建構來命名前述兩種不同立場的訪談法，並且對照了兩者在本體論、知識的目的、意圖，與好研究的判準上的差異。文末，我們指出訪談與解釋個案資料時，應將個案的特質、研究者的特質，以及研究的情境與時機納入考量。