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Reflection-Oriented Qualitative Approach in Beliefs Research

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Teacher beliefs have become important constructs in educational research with the recognition that beliefs are the best indicators of teachers' planning, decision-making and subsequent classroom behaviour. In this movement many probes and strategies have been employed by researchers for effective data collection and analysis. This paper discusses the need for more reflection-oriented approaches in data collection and analysis in beliefs research. A research project assessing and analyzing beliefs about the nature of science is used as an example of such an approach and each step in data collection and analysis is presented in detail. In addition, this paper also presents an example of how technology (Internet-Mediated-Interviews) can be used in data collection and discusses strengths and shortcomings of this approach.

Keywords: Educational Research, Nature of Science, Qualitative Research, Reflection, Teacher Beliefs, Technology

INTRODUCTION

Since the mid-1980s, research on teaching and teacher education has shifted dramatically from a focus on behaviours to an interest in cognition (Richardson, 1996) with the recognition that teachers' ways of thinking and understanding are vital components of their practice (Clark & Peterson, 1986; Nespor, 1987). With this shift, attitudes and beliefs have become important concepts in understanding teachers' thought processes, classroom practices, change, and learning to teach (Richardson, 1996). Although attitudes received considerable attention in the mid-century, teacher beliefs has only gained prominence in the education literature in the last three decades (Richardson, 1996). It is now accepted that research into teachers' beliefs can inform educational practice in ways that prevailing research agendas have not and cannot (Pajares, 1992). This view is based on the assumption that beliefs are the best indicators of the decisions individuals make throughout their lives, or more specifically, teachers' beliefs affect their planning, decision-making, and subsequent classroom behaviour.

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Dewey (1933) was amongst the first to realise the importance of beliefs in education. He described belief as the third meaning of thought, 'something beyond itself by which its value is tested; it makes an assertion about some matter of fact or some principle of law' (p.6). According to him beliefs are crucial, for 'it covers all the matters of which we have no sure knowledge and yet which we are sufficiently confident of to act upon and also the matter that we now accept as certainly true, as knowledge, but which nevertheless may be questioned in the future' (p.6).

Since then, many researchers and theorists have contributed to the efforts to define the nature of beliefs (e.g. Clark & Peterson, 1986; Nespor, 1987; Kagan, 1992; Pajares, 1992; Richardson, 1996). The contributions of such researchers and many others helped to reach a consensus on the nature of beliefs. Accordingly, beliefs are psychological constructs that: (a) include understandings, assumptions, images, or propositions that are felt to be true; (b) drive a person's actions and support decisions and judgements; (c) have highly variable and uncertain linkages to personal, episodic, and emotional experiences; and, (d) although undeniably related to knowledge, differ from knowledge

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in that beliefs do not require a condition of truth (Bryan, 2003).

The difficulty with beliefs research is that beliefs cannot be directly observed or measured; understanding beliefs requires making inferences about individuals' underlying states (Pajares, 1992; Rokeach, 1968). Therefore, researchers need effective probes and strategies to unearth deep and complex beliefs. Throughout the history of research on teacher beliefs, researchers have used different approaches and methods of assessment. The literature indicates that the measurement of attitudes and beliefs in teaching and teacher education have undergone considerable change reflecting the paradigm shift from positivist research strategies to a more qualitative approach. The general trend in mid-century research was to develop predictive understandings of the relationship between teacher attitudes/beliefs and behaviours by developing various inventories (which were usually in the form of paper-and-pencil, multiple-choice surveys) to be used in the selection of teachers (Richardson, 1996).

Current thinking in the assessment of teachers' beliefs is that multiple-choice measures are too constraining in that they are derived from scholarly literature and are predetermined by the researcher (Munby, 1984; Richardson, 1996). With the shift from a focus on behaviours to an interest in cognition in the 1980s, the methodologies and approaches employed by researchers have also gradually shifted toward more qualitative methodologies. The goal of these studies is not to develop predictive indicators of teacher effectiveness but to understand the nature of teachers' thinking and their world-views (Richardson, 1996). In recent years a variety of qualitative methods for eliciting teacher belief has emerged; including semi-structured interviews, during which teachers are asked to recall specific classroom events and decisions; concept maps that teachers are asked to draw to depict their understandings of pedagogical terms; and a close analysis of the language teachers use to describe their thoughts and actions (Kagan, 1992).

As in many disciplines in social sciences, assessing beliefs on various dimensions of science education has become an important research topic in the field of science education. Amongst these dimensions, the assessment of teachers' beliefs regarding the nature of science (NOS) has been the focus of attention in the last two decades with the assumption that teachers' beliefs about the subject matter they teach exert a powerful influence on their instructional practice (Brickhouse, 1991; Shulman, 1986). The NOS has been defined in many ways throughout the decades dating back to its earliest inception in the 1907 report of the Central Association of Science and Mathematics Teachers which emphasized the scientific method and the processes of science (Hammrich, 1997; Lederman, 1992). The most cited definition of the NOS is that by Lederman and Zeidler (1987) in which they refer to the values and beliefs inherent in scientific knowledge and its development. More specifically, McComas, Clough and Almazroa (1998) define the NOS as;

> …a fertile hybrid arena which blends aspects of various social studies of science including the history, sociology, and philosophy of science combined with research from the cognitive sciences such as psychology into a rich description of what science is, how it works, how scientists operate as a social group and how society itself both directs and reacts to scientific endeavors. (p.4)

The history of the assessment of the beliefs about the NOS mirrors the evolution that has occurred in teacher thinking research. Traditionally, the dominant strategies employed with regard to the assessment of individuals' beliefs regarding the NOS have been those associated with quantitative methodology. Lederman, Wade and Bell (1998) report that the majority of researchers tended to develop instruments that allowed for easily "graded" and quantified measures of individuals' understandings. Some of these instruments involved some open-ended questioning; however, little emphasis was placed on providing an expanded view of an individual's beliefs regarding the NOS (Lederman, Wade, & Bell, 1998). Especially during the last 10 years, qualitative approaches have been more widely employed by researchers to assess NOS understandings. In this movement, interviews are considered to be crucial in yielding the essential data (Lederman, 1992) and, the use of such qualitative probes is considered to be important for generating profiles of the meanings individuals ascribe to various aspects of teaching and learning (Hogan, 2000).

Arguably, beliefs about science and its nature represent one of the most highly complex belief systems and as such it is not easy for individuals to express their beliefs completely and accurately without some form of careful reflection. The main argument guiding this paper is that the research probe and analytical approach to be used in any study assessing individuals' beliefs about science should also include means and opportunities to promote reflection in order to achieve a complete understanding of individuals' beliefs. Reflection-oriented approaches and strategies to foster pre-service science teachers' understandings of the NOS have been used by many researchers (e.g. Hammrich, 1997; Meichtry, 1999; Nichols, Tippins, & Wieseman, 1997, Nott & Wellington, 1998; Trumbull & Slack, 1991) in science teacher education. These approaches have been based on the constructivist view of teaching and learning and argue that prospective teachers should be given opportunities to explore, discuss and reflect on their beliefs on the various aspects of the NOS across various contexts in order to achieve desired conceptual change. However, such approaches have been rarely used in researching beliefs about science. Towards this end, this paper describes and discusses a reflection-oriented qualitative approach employed in a research project assessing and analysing beliefs about science. Further, this paper also presents an example of how technology can be used in data collection and discusses strengths and shortcomings of this approach.

THE STUDY

The participants of this study were a group of science teacher educators who, at the time of the study, were studying abroad as a part of the Turkish government's strategy to improve the quality of teacher education. The study assessed the beliefs of these teacher educators regarding the NOS in order to trace how these beliefs may shape the profile of science education in Turkey (Irez, 2006). 15 participants involved in the study. Nine of them were conducting their doctorate level studies in England whereas six of them were in the USA. In order to keep the individuals anonymous, codes were used to represent them (for example; "TE1" stands for Teacher Educator One). In this paper, one of the participants (TE1) of the study will be used as a case in order to explain the data collection and analysis procedure in some detail.

DATA COLLECTION

The data collection process involved two interviews with each of the participants. All interviews with the participants who were conducting their studies in England involved face-to-face interviews. All face-to-face interviews were audio-taped for analysis. The interviews with the participants in the USA were conducted through the Internet using MSN Messenger software.

The use of new and effective technologies in data collection and analysis is not new for researchers. Various strategies such as telephone interviewing and computer-assisted interviewing have been used by social researchers as data gathering tools for many years (Couper & Hansen, 2002; Shuy, 2002). The Internet as a medium for interviewing has also been used in many studies (Mann & Steward, 2000; 2002). Researchers in these studies have usually interacted with the participants using text messages, either synchronously or asynchronously. Synchronous communication has involved an interchange of messages between two or more users simultaneously logged on at different computers or computer terminals and asynchronous communication has involved typing extended messages that are then electronically transmitted to recipients who can read, print, forward, and file them at any time they choose (Ibid.).

However, recent developments have presented opportunities for computer users to simulate face-to-face interviews by communicating synchronously by talking and seeing each other. This is achieved through the use of web cameras and a microphone.

There has been no published research, as far as I have been able to trace, that has used these technologies. An influential factor in making the decision to use synchronous web cameras to conduct the interviews with the participants in the USA was the fact that all the participants had access to Internet connected computers with the necessary hardware (microphone and web camera). All the participants welcomed this initiative. Usually the Internet connection was quite good and we experienced only one or two minor technical problems in the interviews. The interviews were, in one sense, very similar to face-to-face interviews as even facial expressions were clearly visible. All the interviews were saved on to the hard disc drive of the researcher's computer for analysis as the software used, MSN Messenger, also allowed the user to do this.

The first round of interviews

The first interviews lasted about 1 hour. These interviews were devoted to questions aimed at assessing the participants' conceptions about science and scientific processes. The questions of the VNOS-C (Views on the Nature of Science Questionnaire, form C) developed by Abd-El-Khalick in 1998 were used as the interview guide. The original form of the VNOS questionnaire was developed by Lederman and O'Malley (1990) and consisted of seven open-ended questions. It was used in conjunction with follow-up individual interviews to assess high school students' views of the tentative nature of science (Abd-El-Khalick, Lederman, Bell, & Schwartz, 2001). In 1998, the questionnaire was modified twice and the final form (Form C) based on ten questions was developed by Abd-El-Khalick (Abd-El-Khalick et al., 2001). The VNOS-C questionnaire was designed to elicit the participants' beliefs about several aspects of the NOS. These aspects included the empirical and tentative nature of scientific knowledge, the nature of scientific method and scientific theories, the creative and imaginative nature of science, the subjective nature of scientific knowledge and social and cultural influences on scientific knowledge. Although the original questionnaire was developed as a paper and pencil instrument, it was thought that the questions were also appropriate for use in interviews since they were open-ended.

The analysis procedure for the data obtained in the first interviews

The procedure for analysis of the data obtained in the first interviews concerning the participants' understandings of the NOS was quite similar to that suggested by Hewson and Hewson (1989) except for the generation of cognitive maps. The analysis involved four steps.

The first step involved the coding of the data. First, the transcriptions were read. In coding, each question was assigned with a number. Then, each sentence implying a unit of information in the participant's answer was also given a number. The following is an example of such coding taken from TE1's transcription.

> Question (21), Interviewer: After scientists have developed a scientific theory, for example atomic theory or the theory of evolution, does the theory ever change?
>
> TE1: 1 (If we still call it a "theory", yes, I believe that it changes.) 2 (If a theory has not been not accepted by everyone, what I mean by everyone is 'scientists' or the "scientific community"), 3 (because it has not been proven) 4 (due to insufficient technology or lack of knowledge in that field,) then it changes. 5 (For example, we did not know the structure of the DNA until Watson and Crick developed that model in 1956, with that model they explained that genes located on the DNA are the key for our lives and "the information" is transferred to next generation through the DNA.) 6 (Today technology is so developed that we are able to change the locations of genes on the DNA.) 7 (We do not call it the theory of DNA or the theory of Watson-Crick, I mean it is apparently proven.) 8 (There were different theories regarding this issue until 1956, but now…)

The second step of the data analysis involved theme (or category) generation (Hewson & Hewson, 1989). The participant's interview transcript was carefully analysed and the statements regarding the NOS aspects (or themes) that were of interest in this study were grouped together. For example, a participant's statements that informed his/her understanding of the tentative NOS were grouped together. At the end of this process, each participant's statements were grouped under nine themes (or aspects of the NOS) regarding the NOS; which were; *description of science, the empirical NOS, scientific method, the tentative NOS, the nature of scientific theories and laws, inference and theoretical entities in science, the subjective and theory-laden NOS, social and cultural embeddedness of science, imagination and creativity in science.*

The themes were not independent of one another as they represent components of a conception of the NOS. Therefore, some of the statements were placed within more than one theme as they applied to all these themes. Furthermore, some of the themes were broad, for that reason, they consisted of several sub-themes. For example, four sub-themes were detected under the theme "The nature of scientific theories and laws", which were: *theories: well-supported explanations vs. guesses, theory change, the relationship between theories and laws, and the status of laws.*

This theme generation process helped the researcher to check the consistency, or lack thereof, between the participants' statements regarding an aspect of the NOS that were made in response to different questions. Any inconsistency identified as a result of this analysis was noted and was followed up with the participant in the second interview for clarification.

The third step was *statement generation*. This involved summarising the participant's detailed explanations in a single sentence or phrasal statements. An example of this process is shown in Box 1.

The last step of the analysis was *the generation of cognitive maps* regarding the NOS for each participant. These cognitive maps were generated by employing a technique that is analogous to that developed and used by Novak and Gowin (1984) for concept maps. The concept mapping technique was invented and developed by Novak and his graduate students at Cornell University in the early 1970s (Wandersee, 2000). Concept maps are intended to represent meaningful relationships between concepts in the form of propositions (Novak & Gowin, 1984).

The potential of concept mapping as a cognitive learning and assessment tool has long been recognised and its validity has been established in many studies (Anderson-Inman & Ditson, 1999; Jonassen, Reeves, Hong, Harvey, & Peters, 1997; Mellado, 1997). Concept maps have also been used in research on science teachers (Hoz, Tomer, & Tamir, 1990; Mellado, 1997; Shymansky, Woodworth, Norman, Dunkhase, Matthews, & Liu, 1993).

The difference between a cognitive map and a concept map is that a cognitive map is drawn from a particular piece of text, such as an interview transcription, and the reader analysing the text is interrogating, rather than the person (Miles & Huberman, 1994). Furthermore, cognitive maps relate, in a partially hierarchical manner, units of information in a broader sense than the concepts used in conceptual maps (Mellado, 1997). In this sense, the cognitive maps generated and presented in this study display an overall picture of the participants' beliefs concerning the NOS.

Box 1. An example of statement generation process. (Taken from the analysis of TE1's first interview)

…
Science represents systematically collected knowledge (7.1,2)
Science relies on evidence (11.4)
A discipline should follow the scientific method to be called 'scientific' (11.2,3)
Scientific knowledge is clear, commonly accepted, and collected without any interpretation (11.5; 12,3,4; 18)
Scientists use their imagination in developing theories (34)
Scientists should not use their imagination unwisely in attempting to explain unscientific phenomena (34.6,7)
One of the main aspects of the scientific knowledge is that it is repeatable and clear (18)
Scientists should not make claims without direct evidence (31.1)
Scientific method is the same in all scientific disciplines (13; 14; 15)
Scientific method: theory – systematic data collection by experiment and observation – evidence – conclusion (13.2,3)
Theories are unproven proposals (20; 21)
Due to insufficient technology and lack of knowledge (21.4)
Theories have not been accepted by all scientists (20.4; 21.2)
Theories change (21)
Theories become laws if they are proven (22; 23)
Example: The DNA model (21)
Laws do not change (22.3)
…

The sentences and phrases (units of information) obtained in Step 3 (statement generation) were used to construct cognitive maps. The construction of cognitive maps involved careful analysis of these units of information, classification of these units into categories, and identifying the relationship between them. The critical point in this phase was to turn back to the full interview transcriptions and check the participant's statements in order to avoid misrepresentations concerning the relationships between the concepts. After being confident about these relationships, the concepts and the relationships between them were represented graphically in the form of a cognitive map. Figure 1 shows TE1's cognitive map on science constructed as a result of this data analysis procedure. These cognitive maps were constructed for each one of the participants.

The codes located above each box on the cognitive maps indicate from which part(s) of the interview that specific information is obtained. For example, 27.1 indicate that the information in this box was obtained from the first sentence of the 27th question asked in the first interview.

It needs to be recognised that the propositional networks in the mind are far more complex than anything that can be represented in cognitive maps. The links between the concepts in cognitive maps are illustrated as one way, in reality, concepts are often linked in multiple ways depending upon the particular meaning of each concept, which is contextually dependent (Jonassen *et al.*, 1997). Therefore, the cognitive maps should be presented and viewed as conceptual summaries of the participants' accounts which provide a partial view of their more complete internalised conceptual frameworks. So as not to loose the rich descriptions provided in the interviews, quotes from the transcriptions should also be referred in order to explain the participant's conceptual maps more fully.

The second round of interviews

Upon completion of the analysis of the first interviews, the transcriptions and the cognitive maps constructed concerning the NOS were sent to the participants by e-mail at least two weeks before the second interviews. The aim was to give the participants an opportunity to think about and reflect on their responses as well as ensuring the authenticity and validity of the cognitive maps constructed from the analysis of the first interviews.

As in the first interviews, the second interviews with the participants in England were carried out face-to-face whereas those in the USA were conducted synchronously using MSN Messenger over the Internet. The difference between the first and the second interviews was that the latter were clinical in nature (Tall, 1979) in that the questions for each participant in the second interview were developed during the analysis of the first interviews and so were different for each individual participant. The second interviews lasted between 30 minutes to one and half-hours depending on the number of the questions asked and the length of the explanations made by the participants. All second interviews were recorded as in the first interviews.

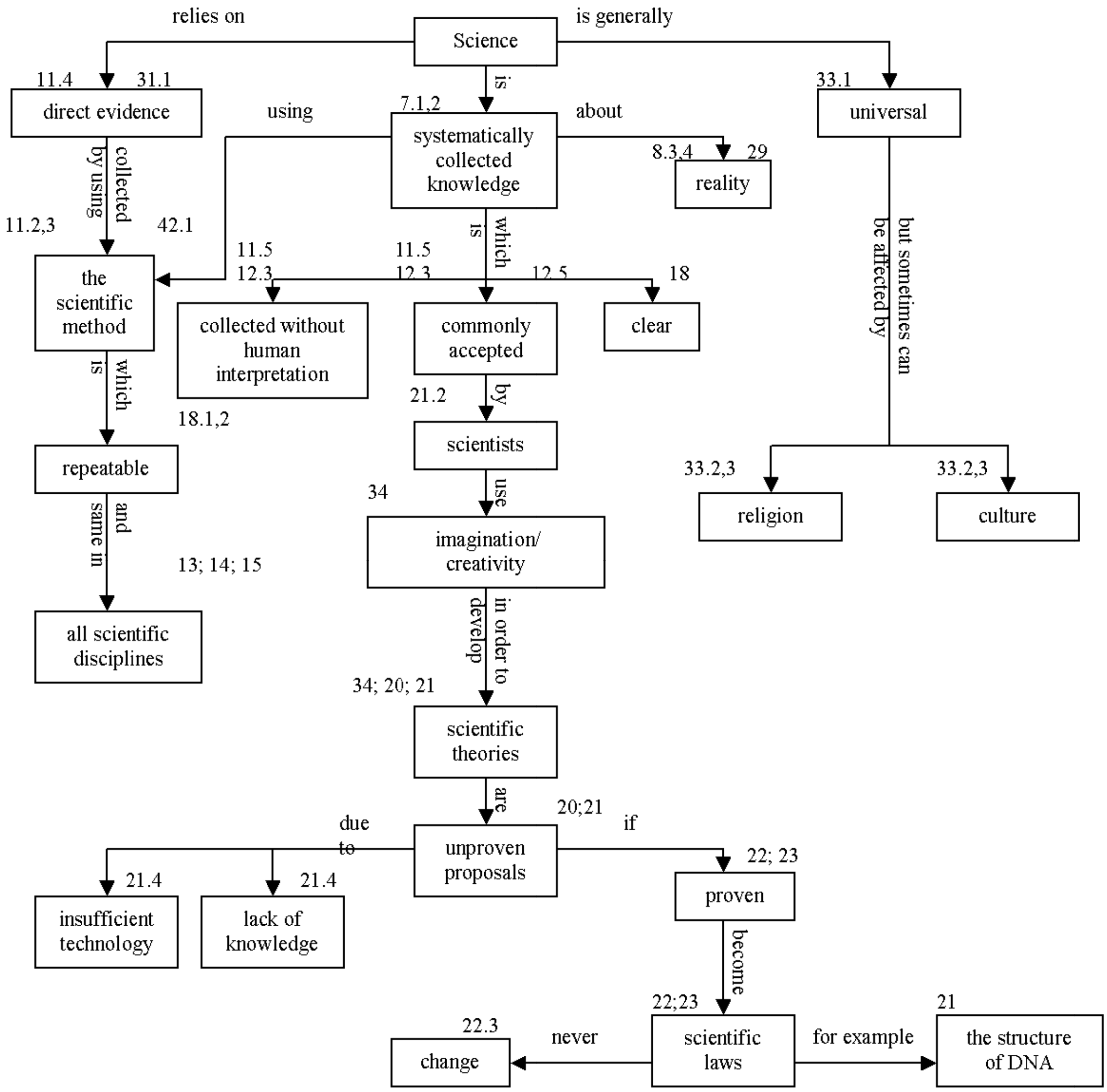

Figure 1. TE1's cognitive map on science generated on the basis of the first interview

The second interviews started with conversations about the cognitive maps. The participants were mainly asked whether they felt that the cognitive maps reflected their beliefs about science and its nature. These conversations led to further discussions and questions about contradictions and inconsistencies in their beliefs detected in the analysis of the first interviews and illustrated in their cognitive maps. For example, one of the questions asked of TE1 in the second interview was:

> Interviewer: As I illustrated in your cognitive map, in some parts of the first interview you mentioned that scientists use imagination and creativity in their work and that culture and religion affect the scientific process. However, in some other parts earlier in the first interview, you also mentioned that one of the important aspects of scientific knowledge is that it is collected without human interpretation using the scientific method and that it is accepted by everyone. Do you think that these two statements contradict each other? Can you elaborate?
>
> TE1: [Pause] … Well … If you reach a truth in the light of scientific investigations it is the truth. Culture and religion affects people's interpretation and use of that reality. I mean, culture and religion might be decisive on whether or not to use that reality or knowledge but this does not affect a scientist in reaching a conclusion.

As can be seen in TE1's cognitive map (Figure 1), his ideas in the first interview led the researcher think that he believed that science is generally universal but can be affected by society and culture. However, TE1's answer to the above question in the second interview revealed that he actually believed that scientific processes are independent from cultural influences. However, he thought that society has the authority on how and in what ways the products and knowledge that science presents will be used.

There were many other examples of such instances where, with the help of cognitive map generation process, participants' inconsistent ideas were detected and asked in the second interviews. Combined with cognitive maps, asking for further explanations about such inconsistencies forced the participants reflect on their beliefs. This process provided rich descriptions of the participants' belief systems about the NOS. Following is two other examples of this taken from the interviews with two other participants (TE4 and TE13).

> Interviewer: In the 22nd and 23rd questions of the first interview you claimed that subjectivity is a necessity for the development of science. On the other hand, in the following questions you expressed that science should be universal. Are these views contradictory? What you think?
>
> TE4: Let me ask; is there an agreement amongst scientists about the theory of evolution? These are specific things, I generalised when we were talking about these things in the first interview. Science generally deals with certain realities independent of everything, but sometimes culture and society may affect science in certain issues. It depends on the subject. Gravity, for example, is truth. Subjects such as the theory of evolution constitute 3-5% of science, the remaining 95% are the truths and not affected by society and culture.
>
> --------------------------
>
> Interviewer: In some questions at our first meeting you expressed your doubts about the investigation methods and findings of some disciplines and their theories, such as the theory of evolution and the theories about the extinction of dinosaurs…
>
> TE13: Right, I said that we could not reach the truth about the beginning of life, because it happened a long time ago, we cannot see, therefore it is difficult to prove.
>
> Interviewer: Yes, on the other hand, you claimed that atomic theory is a well-sustained theory. But, both theories are about unobservable things and in your words at the first interview 'estimations' of scientists relying on indirect evidence…
>
> TE13: But, for example you mentioned about volcanoes, meteors and the extinction of the dinosaurs. There is no evidence… no, of course some evidence exists, but… they are different… I think it is possible to develop and support atomic theory; it is easy to believe it. Because one theory is about a thing that happened millions of years ago, I could not be sure that the fossils that I have are from that period of time. In contrast, in the case of atomic theory you might find new evidence with the development of technology. I mean, I don't know…

Responses to such questions helped the researcher have a clear understanding about the participants' beliefs and the rationale they put behind these. In this process, the participants were given an opportunity to make changes to their cognitive maps and to provide the reasons for that change.

The analysis procedure for the data obtained in the second interviews

All the second interviews were transcribed in verbatim and coded. The process for analysis for the second interviews was more straightforward than that of the first interviews. The participants' cognitive maps were modified in the light of their explanations. The cognitive maps illustrated in the final report would be these final versions that were created after the second interviews, since they represent a comprehensive and "validated" picture of participants' beliefs.

To give one instance, TE1's cognitive map for science which was modified in the light of his explanations in the second interview is illustrated in Figure 2. The shaded areas in the figure show the modifications that were made after the second interview with TE1 in accordance with his explanations.

It is important to note that this second cognitive map was constructed in the light of the analysis of two interviews with TE1. In order to avoid any confusion regarding the codes placed above each box in the map, any information unit obtained from the second interviews is coded with the '*' sign whereas the codes showing the units of information obtained from the first interviews do not carry any symbols (For example, 8.2,3* indicates that this information was obtained from the second and third sentences of the 8th question asked in the second interview whereas 27.1 indicates that the information in this box was obtained from the first sentence of the 27th question asked in the first interview.).

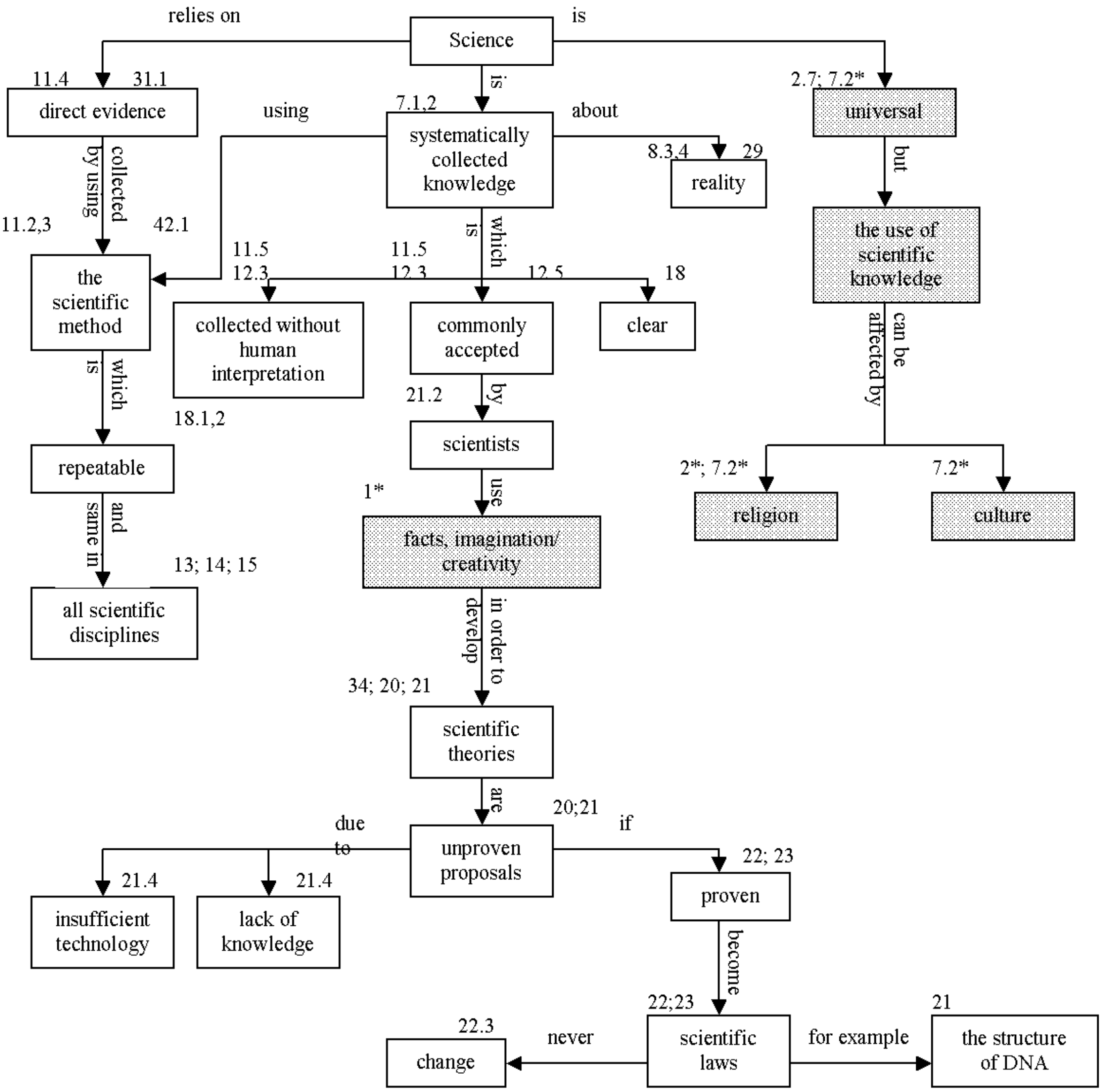

Figure 2. TE1's cognitive map on science after the second interview

It is worth noting that not all participants requested changes and modifications regarding their cognitive maps. Indeed most of the participants were happy with their cognitive maps and commented positively on them. Some of the remarks were:

> … I could easily say that this map precisely reflects my thoughts. (TE3)
>
> It was very interesting to see the map of my thoughts… I felt like somebody had taken a picture of my mind. (TE9)
>
> I really liked it; it reflects what I believe about the nature of science. (TE11)
>
> … In short, it is a summary of my thoughts. (TE14)

Furthermore, additional cognitive maps (on scientific methodology and scientific change) were constructed for some participants in the light of the first and second interviews in order to present a more detailed graphical summary of their understandings of some aspects of the NOS.

DISCUSSION AND IMPLICATIONS

This study argued that in order to achieve a complete understanding of individuals' thinking processes successfully, reflection-oriented probes and strategies are needed. The reason behind this rationale is the idea that any individual is likely to have a series of beliefs which will probably be incoherent and contradictory (Zeichner, 1986). Individuals are often not aware of these beliefs until such time as they are overtly challenged (Tann, 1993) since most of these beliefs usually exist at an implicit or a "common sense" level (Calderhead, 1987).

Therefore, a highly reflective probe (VNOS-C questionnaire) and cognitive mapping technique were utilized in this study in order to unearth the participants' beliefs about the NOS and conceptualisations of science education. This approach provided the participants with opportunities to explore and reflect on their thinking. Feedback and comments from the participants showed that cognitive maps were very effective in starting the process of reflection. Therefore, researchers are encouraged to employ similar techniques and strategies that encourage participants to reflect on their thinking. Such techniques and strategies can be utilized from a growing body of activities and approaches suggested by researchers in order to achieve desired conceptual change by engaging prospective teachers with exploring and reflecting on their beliefs. Examples of these activities are co-operative controversy strategy (Hammrich, 1997), journal writing (Holly, 1989; Nichols et al., 1997), the use of metaphors and proverbs (Nichols et al., 1997) and, critical incidents (Nott & Wellington, 1998).

The use of cognitive maps has also proved to be effective in data analysis. Generating cognitive maps is a labour-intensive procedure. But when they are completed, they provide a graphical summary of each participant's belief system. This summary supports the researcher in locating elements in an individual's belief system and reveals consistencies and inconsistencies between beliefs. The important thing to remember is that cognitive maps have a way of looking more organised and systematic than they probably are in the person's mind (Miles & Huberman, 1994). It was important for the researcher to constantly check with the actual transcriptions when making interpretations.

An important contribution of this study is, perhaps, pointing out the potential of the Internet as a research medium. Although this potential has been explored and exploited by a few researchers in recent years (Mann & Steward, 2000; 2002), this has been limited to obtaining and exchanging textual data via e-mails or online chatting. This study moved a step further and, using available hardware and software, simulated face-to-face interviews by communicating synchronously with the participants by using web cams. The result was more than satisfying as the interviews via the Internet were almost like face-to-face interviews. In the light of this experience, I believe that the practical benefits of incorporating Internet mediated interviews (IMI) into research design could be substantial.

The obvious advantage of conducting IMI is that the researcher crosses the time and space barriers which might limit face–to-face interview research (Mann & Steward, 2000). Besides, IMI minimizes the cost by saving the researcher and participants from travel expenses. This also minimizes the time input of participants and increases the flexibility in the timing of the interviews. Indeed, the use of IMI in this study did not only offer a means of minimizing the constraints of time and cost but also allowed me to include participants from another continent.

The fact that IMI allows the researcher to sent and receive files from participants during the interview might also be potentially important for research projects requiring or involving textual data presentation. The researcher can present the necessary information to participants in various ways such as using Microsoft PowerPoint.

There are, of course, challenges involved in including IMI into research design. Clearly, there are some basic requirements in order for a research design using IMI to be conducted successfully. Obviously, the potential participants and the researcher need to have (or have access to) the appropriate technology, such as a computer system, internet connection and, necessary hardware and software. Furthermore, some degree of technical expertise both on the parts of the researcher and participants is required.

Qualitative research relies on the development of rapport, a mutual respect arising between researcher and participants (Mann and Stewart, 2000). In face-to-face interviews, rapport is developed through verbal and non-verbal paralinguistic cues (Ibid). However, despite its similarity to face-to-face interviews, IMI limits non-verbal communication to a certain degree. This may create problems in the development of rapport as it may hold back researchers and participants who primarily express themselves in different ways such as body language or facial expression. This situation may result in difficulties in attracting participants or may threaten the quality of data obtained from interviews. Arguably, this study did not suffer from such difficulties due to the fact that the participants were in the same position as the researcher and thus they could relate to their position. They showed a willingness to cooperate and tried to overcome the difficulties mentioned above. However, researchers may experience problems in other contexts. One way that researchers may ensure the development of rapport in qualitative studies involving IMI is by getting in touch with potential participants at an early stage in the research in order to increase familiarity with them and gain their trust. As a result, researchers and participants may find IMI less threatening as a good research relationship is built beforehand.

There are also some challenges arising from shortcomings of available technology. A key challenge is to sustain electronic connection with participants during the interviews. Although this study did not suffer from connection cuts, the researcher was aware of the possibility. Such disconnections might have resulted in losing concentration and motivation during the interviews which would have severely affected the research process. The reason for these connection cuts is usually poor and slow internet connection. However, this problem can be overcome by the use of more advanced technologies, such as broadband internet connection, as they are faster and more reliable.

Unfortunately, the available software only allows for voice conversation between two users, therefore, for now, it is not possible to conduct interviews involving more than one participant, such as focus group interviews.

Despite these challenges, this study proved that the Internet presents enormous potential for research projects and researchers are encouraged to further explore and exploit this potential.

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