

Research Using ICT: the design and implementation of a research study using Internet-Mediated-Interviews

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This paper presents a research study which, using available hardware and software, simulated face-to-face interviews through the internet by communicating synchronously with the participants. The nature of research required the researchers to reach science educators who are located in different places in the USA and in England in order to assess their beliefs about nature of science from a qualitative perspective. This is achieved through the *Internet-Mediated-Interviews (IMI)* using web cameras and a microphone. The paper presents the design and implementation of the study in detail and discusses the advantages and shortcomings of using such a technology in research programs. Despite challenges, this study proved that the Internet presents enormous potential for research projects and researchers are encouraged to further explore and exploit this potential.

Keywords educational research; internet; interviewing

1. Introduction

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 nature of science (NOS) has been the focus of attention in the last two decades [1, 2]. The history of the assessment of the beliefs about 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. In 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 [3] 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 [4].

One of the main problems in an interview research is to cross the time and space barriers which might limit face-to-face interviews [5]. To overcome this problem, and as technologies develop, various strategies such as telephone interviewing and computer-assisted interviewing have been used by social researchers [6, 7]. The Internet as a medium for interviewing has also been used in many studies [5, 8]. 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 [5, 8].

However, recent developments have presented opportunities for computer users to simulate face-to-face interviews by communicating synchronously by talking and seeing each other. To this end, this paper presents a research study which, using available hardware and software, simulated face-to-face interviews through the internet by communicating synchronously with the participants.

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2. The study

2.1 Participants and the interviewing procedure

The participants 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 NOS in order to trace how these beliefs may shape the profile of science education in Turkey. 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.

The data collection process involved two interviews with each of the participants. All the interviews with the participants who were conducting their studies in England involved face-to-face interviews. The interviews with the participants in the USA were conducted through the Internet using MSN Messenger software. This is achieved through the use of web cameras and a microphone.

There has been no published research, as far as we 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. Without adopting this strategy, we would not have been able to include these participants in this study. But more importantly, the study became incredibly interactive since the use of the Internet allowed me and the participants to communicate at any time regarding the research in addition to the more formal interviews.

After deciding to use the Internet as the interviewing medium and gaining their agreement, we contacted the participants in the USA through e-mail explaining the interview procedure and asked them to give us a date and time for the first interviews so that we could be logged on at the same time. This proved successful. Usually the Internet connection was quite good and we experienced only one or two minor technical problems. 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 researchers' computer for analysis as the software used also allowed the user to do this.

2.2 First interviews

These interviews were devoted to questions aimed at assessing the participants' conceptions about science and scientific processes. The procedure for analysis of the data obtained in the first interviews concerning the participants' understandings of NOS was quite similar to that suggested by Hewson and Hewson [9] 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 second step of the data analysis involved theme (or category) generation [9]. The participant's interview transcript was carefully analysed and the statements regarding NOS aspects (or themes) that were of interest in this study were grouped together. At the end of this process, each participant's statements were grouped under nine themes regarding 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. This theme generation process helped the researcher to check the consistency, or lack thereof, between the participants' statements regarding an aspect of 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.

The last step of the analysis was the generation of cognitive maps regarding NOS for each participant. These cognitive maps were generated by employing a technique that is analogous to that developed and used by Novak & Gowin [10] for concept maps. 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 one of the participants' (TE1) cognitive map on science constructed as a result of this data analysis procedure. These cognitive maps were constructed for all the participants.

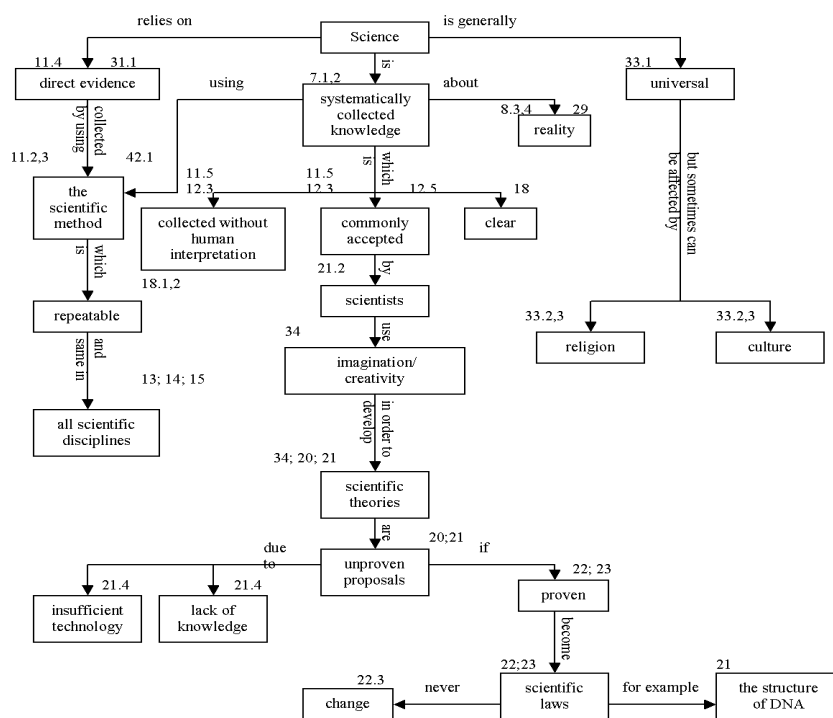


Figure 1 TE1's cognitive map on science generated on the basis of the first interview

2.3 Second interviews

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.

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 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.

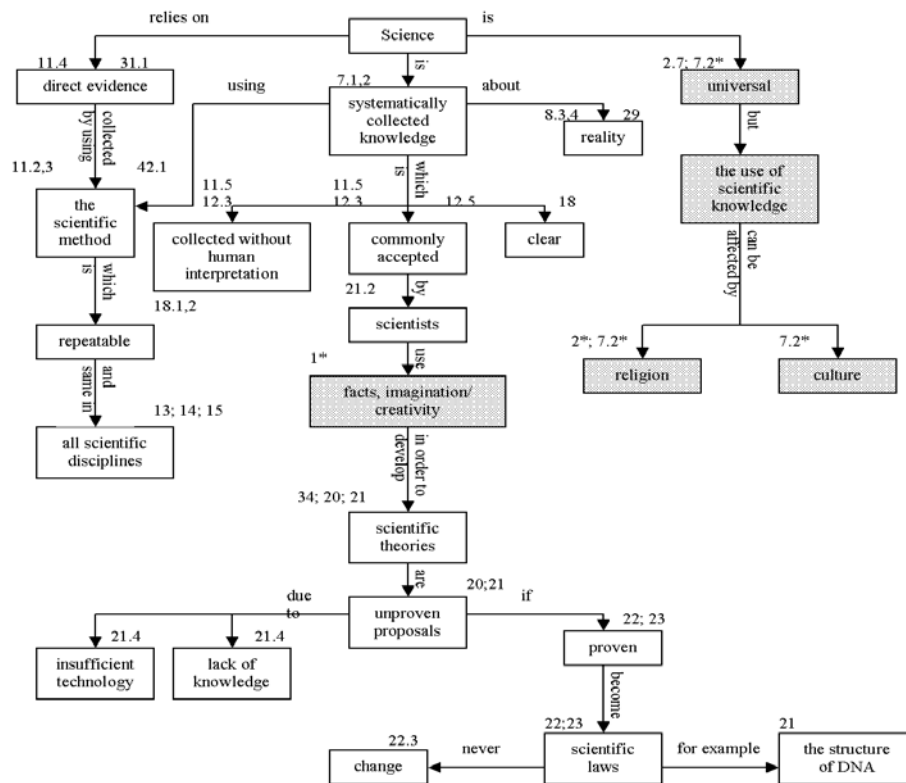


Figure 2 TE1's cognitive map on science after the second interview

3. Discussion and conclusion

Although the potential of the Internet as a research medium has been explored and exploited by a few researchers in recent years [5,8], 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, we believe that the practical benefits of incorporating 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 [5]. Besides, IMI minimizes the cost by saving the researchers 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 us to include participants from another continent.

The fact that IMI allows the researcher to send 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 [5]. In face-to-face interviews, rapport is developed through verbal and non-verbal paralinguistic cues [5]. 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 researchers 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, we were 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 as the Internet technology develops.

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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