

A Framework for Action Research for Investigating Children's Decision-Making Skills within Design and Technology Education

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Abstract

This paper is part of a larger study that aims to improve our understanding on how children make decisions while working with design and technology activities. This paper discusses the research methodology employed in the study. The survey was conducted through an action research approach and the paper explains and justifies the reasons why such an approach is appropriate for research in design and technology education, and particularly within the Cypriot educational system.

Keywords

research methodology, action research, decision-making, design and technology, Cyprus

1. Introduction

The study attempts to explore how design and technology teachers in Cyprus support decision-making skills in their teaching, the opportunities that are included in the Cypriot curriculum and books, and what strategies children follow in order to take their design decisions in practice. Although the emphasis of the main study is on children's decision-making strategies, the teachers' role and the impact of the Cypriot national curriculum is also examined. The focus of the study is to understand the existing practice that is used in Cypriot Gymnasia (which corresponds to KS3 in UK) on the issue of decision-making. A graphical form of the framework of the study based on the literature review and the research questions is presented in the following diagram (figure 1):

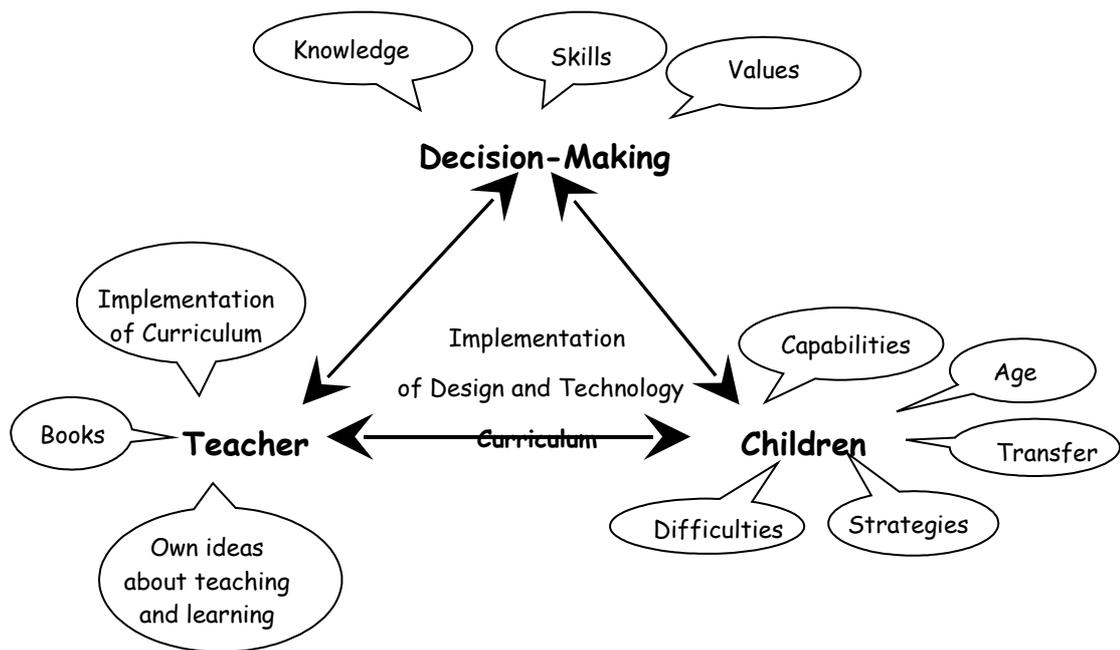


Figure 1: The Framework of the Study

The curriculum plays a central role in the teaching of design and technology. The content and the requirements of the curriculum will affect the decision-making opportunities given to children and the nature of the design tasks. However the way teachers implement the curriculum, their own ideas about teaching and learning and the teaching resources that they are using in their classes will also have an influence on the development of children's decision-making strategies. In addition to the curriculum and teachers' roles, children's capabilities, their age, their ability to transfer the skills from one area to another and possible difficulties they are facing will have an influence on their ability to make decisions. The research acknowledges that other curriculum areas are also expecting children to make decisions and teaching ways of doing it. Therefore the data gathered will need to be analysed taking all those issues and perspectives into account.

The theoretical framework of the study is based on various existing literature (McCormick, 2004; Chapman, 1988; Slavin, 2003; Coles and Norman, 2005; Mettas and Norman, 2008; Nicholl and McLellan, 2007; Hicks et al., 1982; Davis and Krajcik, 2005; Prideaux, 2003). A detailed discussion of the theoretical framework will be presented in forthcoming publications. The intention of this paper is to analyse the research methodology of the study with a particular emphasis on action research.

Cohen, Manion and Morrison (2007, p.3) assert that the choice of research approach must be guided by the question: “how can research questions best be answered?”

The research questions for the study are as follows:

1. What types of decisions do teachers expect *secondary* education students (11-14 years old) to engage in during different parts of designing and making?
2. What strategies do *secondary* education pupils’ follow in order to make their design choices?
3. What are the difficulties that *secondary* education pupils’ face in their efforts to make decisions in their designing?
4. To what extent can decision-making skills learnt within the area of design and technology be transferred to other activities?

The next section will discuss the theoretical perspective of the research study, the research approaches with specific emphasis on action research. Then the design of the current study will be presented discussing the design of the pilot and the main study. The sample, ethical issues, triangulation of the results and the limitations of the research approach will also be analysed. The final section includes the conclusions of the study and possible future work.

2. The Theoretical Perspective of the Research Study

Within educational research there exists no unanimity among researchers concerning the choice of research approach. Some researchers employ quantitative approaches (Furby and Beyth-Marom, 1992; Nisbet and Grimbeek, 2004), while some others adopt qualitative approaches (Mioduser & Kipperman, 2002).

According to Robson (2002), in-depth information is necessary for revealing a complex and dynamic issue such as children’s decision-making strategies. For the purpose of the current study it was decided to use a mainly qualitative approach as this approach can provide more generally informative data for answering the research questions. Despite the generally qualitative approach (interviews and observations), some quantitative methods are also used (pre-tests and post-tests) in order to enrich the data.

As Cohen and Manion, (1994) argue, qualitative research enables the researcher to construct an insider's perspective, which is important for obtaining a better insight of the participants' viewpoints. The approach to the study has been situated within action research methodology (McNiff and Whitehead, 2000). The theoretical background of action research and its appropriateness for the current study will be analysed in the following sections.

2.1 Action Research

Action research is becoming increasingly known as an approach that encourages practitioners to be in control of their own practice and contexts. It began in the USA, came to prominence in the UK in the 1970s, and by the 1980s it was making a significant impact in many professional contexts, particularly in teacher professional education. Now its influence is worldwide, and has spread to virtually all areas where personal and professional learning is undertaken (McNiff and Whitehead, 2000).

Action research is a term which refers to a practical way of looking at your own work to check that it is as you would like it to be (Hammersley, 1993). Action research may also be applied with teams of practitioners where researchers/curriculum developers introduce developments and then observe the effects in classrooms. Because, usually, action research is done by practitioners, it is often referred to as practitioner based research; and because it involves thinking about and reflecting on your own work, it can also be called a form of self-reflective practice.

Action research is open-ended and It does not usually begin with a fixed hypothesis but an idea to be developed. The research process is the developmental process of following through the idea, evaluating the outcome, and continually checking whether it is in line with what you wish to happen. Seen in this way, action research is a form of self-evaluation. It is used widely in professional contexts such as appraisal, mentoring and self-assessment (McNiff and Whitehead, 2000).

The process of conducting action research means that you have to evaluate what you are doing. You need to check constantly that what you are doing really is working. This awareness of the need for self-evaluation shows a willingness to accept responsibility for your own thinking and action. Accountability is part of good professional practice. You are always aware that you have to give good service, to attend to the needs of others in the way that is best for them, and to show that you have responsible attitudes and behaviour (Zuber-Skerritt, 1992).

Many writers have developed graphical models to represent the action research process. The common characteristic of those action models is the cyclical process of action research and the reflection on new findings until an improvement is achieved. Lewin (1946) described the process of action research as a spiral of steps, each of which is composed of a cycle of planning, action, and fact-finding about the results of the action. His spiral model was later adopted by various action researchers. Carr and Kemmis (1986) applied the idea of action research exclusively to education and provided a detailed plan on how to use it in that context. Action research usually begins with the identification of a problem situation a need for changes and follows a self-reflecting spiral of planning, acting, observing and revision (Figure 2).

1. Identification of problem area
2. Planning
3. Acting
4. Observing
5. Revision

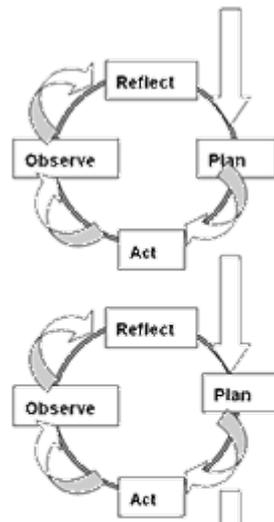


Figure 2: Action research cycle (based on Zuber-Skerritt, 1992: 13)

The processes can be shown as a spiral of cycles, where one issue forms the basis of another and, as one question is addressed, the answer to it generates new questions (McNiff and Whitehead, 2000; Hammersley, 1993; McTaggart, 1996).

2.2 Limitations of Action Research

Despite its obvious benefits action research has some limitations as well. Usually action research is conducted with small samples and within a specific environment and therefore its results may not be applied to similar cases in different environments. Another limitation is that the personal over-involvement of the researcher may bias research results. As Creswell (2007) states, researchers bring their own worldviews, paradigms, or sets of beliefs to a research project, and these inform the conduct and writing of the study. It is important that these assumptions,

paradigms and frameworks are made explicit in the writing of a study, as they may influence its conduct (Creswell, 2007; Merriam, 2001).

2.3 Action Research in Design and Technology Education

Design and technology education and action research methodology share many common processes. They both normally begin with the identification of a problem and go on with planning a solution, evaluating the plan and end with the best possible solution. Designers and action researchers both reflect on their work in order to improve practice. As a result of the reflection the solution may well be revised and be redesigned again.

Archer (1992) describing the nature of research in design and design education, argued for the designerly activity as a mode of enquiry and therefore the connection of the designer as a researcher. Hence action research as a mode of inquiry and development is especially appropriate to design and technology education (Roberts, 2000).

Green in her Keynote at the International Conference on Design and Technology Educational Research (IDATER 1998) suggested that: 'the fundamentals of action research involve: the questioning of assumptions; the clarification of values; the discovery of the mismatches between espoused values and practice; the understanding of the wider social context in which I work' (Green 1998, p.2).

Carr and Kemmis (1986) claimed that the purpose of educational research is to take actions and wrote: "practical problems are problems about what to do their solution is only found in doing something" (Gauthier 1963 quoted in Carr and Kemmis 1986). This argument is very relevant to many design and technology development activities in the school environment.

2.4 Action Research in Cyprus

Action research is also gaining a significant importance in the Cypriot educational system. Many research studies in the educational context have been conducted through an action research approach by teachers and education policy developers (Tsiakaros and Pasiardis, 2002; Karagiorgi, 2002; Angelides, 2002). Karagiorgi and Symeou (2006) consider action research as one of the important issues that needs to be part of any educational professional development course in Cyprus. Angelides

(2002) argues that staff development and in-service training should be repositioned towards action research that encourages teachers to scrutinise their own practice.

Karagiorgi (2002) points out the significance of action research in the Cypriot educational system. She supports the position that an action research approach from teachers is the key to any effective innovation and improvement in schools. The importance of teachers as practitioners is recognized in the Cypriot National Curriculum (2006):

"the teacher of each class has an important role for the assessment of the national curriculum, use of new teaching methods, the introduction of new technologies to the teaching process and generally any new change" (p. 33).

In a research study Kyriakides, Campbell and Christofidou (2002) generated criteria for measuring Cypriot teachers' effectiveness through a self-evaluation approach. A willingness to undertake action research was considered among the characteristics that an effective teacher should have. From the results of the study Kyriakides et. al. (2002) argued that:

"an effective teacher takes part in action research projects and thereby contributes both to the implementation and evaluation of school-based curriculum innovations" (Kyriakides et.al 2002, p. 308).

2.5 Triangulation

According to Cohen, et.al. (2007), triangulation in the social sciences was used at first in the sense that when using different methods to approach a phenomenon and the findings turned out to converge and corroborate each other, then this was an indication that accurate measures were taken . In educational research triangulation refers to the use of more than one approach to the investigation of a research question in order to enhance confidence in the ensuing findings. Since much social research is founded on the use of a single research method and as such may suffer from limitations associated with that method or from the specific application of it, triangulation offers the prospect of enhanced confidence (Bryman, 2006).

However, completeness was suggested by advocates of triangulation, supporting the notion that the diverse findings that may appear from triangulating research methods represent the different dimensions of the phenomenon (Bryman, 2006). In an attempt

to justify the mixed method approach adopted, the work of Bryman (2006) is recalled, through which 232 social science articles were examined and particularly the rationales for employing a mixed method approach. From the extended review that was followed, Bryman reported that the scheme included researchers suggesting that 'both qualitative and quantitative research have their own strengths and weaknesses so that by combining them allows the researcher to offset their faults and draw on the strengths of both' (p. 106).

The triangulation procedures used in this particular study will be discussed in section 4.3 of this paper.

3. The Action Research Plan

Because of all the reasons that have been described earlier (sections 2.1-2.4), in this particular study a decision was made to adopt an action research approach (a good researcher is aware of its limitations as well). The action research plan of the current research study is presented in Figure 3. Two action research cycles were planned, the first action research cycle was to serve as a pilot study, and after revising some of the data collection methods' the plan was developed and implemented again for the main study. The two research cycles will be discussed in detail in the following sections of this paper.

The aim of the study was to explore how children develop decision-making skills in design and technology education. Therefore the starting point of the research cycle was to review existing literature and national curricula. Existing literature was searched using keywords from scientific databases of journals and books. National curricula were examined in relation to their requirements about decision-making and the opportunities that they offer to teachers and pupils. In addition the current practice of teachers was investigated. The next step of the research required students to work with specific decision-making tasks and during that process, data were collected through observations and interviews. The observation and interview protocols were based on literature reviewed and several discussions with academics, other teachers and children. The data analysis and the interpretation that followed provided a valuable framework to revise and then repeat the research plan for the main study (the second action research cycle).

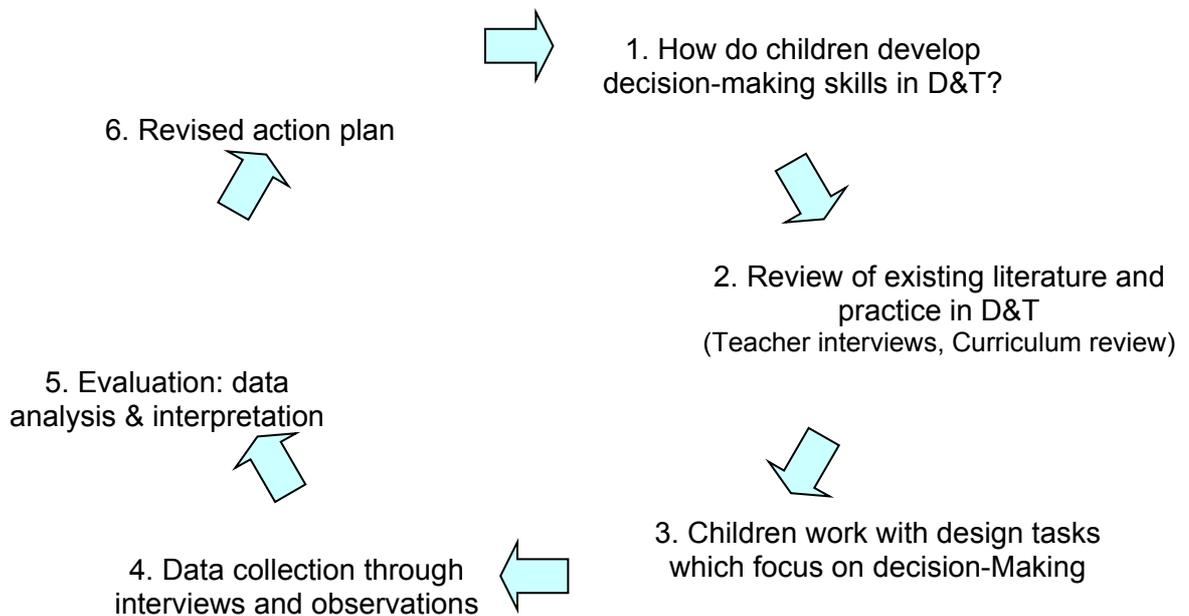


Figure 3: Action research plan on the development of decision- making skills

3.1 Ethical Issues

Ethical issues encountered in educational research can be complicated and require careful considerations since children are involved in the studies. The ethics of educational research has been significantly complicated over the last several decades as a consequence of the "interpretive turn" and the ever-increasing use of qualitative research methods that have accompanied it (Thomas and Denton, 2006). In this section, the ethical issues that have been considered during the research are discussed.

Guidelines on ethical issues are provided usually from Universities, education authorities and national or international laws. In this study, national guidelines from the Ministry of Education of Cyprus were used together with the guidelines of the British Educational Research Association (BERA, 1992) and the Loughborough University guidelines, last revised in 2003. The above guidelines provided the framework of the study to ensure that the participants in the study will be protected.

For this study permission was requested from the Cypriot Ministry of Education, assuring them that all necessary processes regarding ethical issues will be followed. After the permission was given, a meeting with children and their parents was called to explain the purpose of the research and the methods and recording equipment

employed in the study. The children were also assured that participation was voluntary and anonymity was guaranteed (BERA, 2004).

Parents of children in the study were provided with an outline description of the study and invited to contact the researcher if they had any questions. Children and teachers were also informed about the names of the researcher and supervisor and the purpose of the study. They were informed about the timing and length of interviews, observations and tests, as well as their rights during the study.

Despite the importance of informing children about the research procedures, at the same time individual behaviours may be altered because they know they are being studied (Hawthorne effect). This problem was overcome to some extent since the study took place over a period of approximately 3 months and as a result, students appeared to behave as they were doing in a normal teaching period after the first sessions.

4. Research Design

The study's methodological perspective was continually open to review. This is consistent with action research and qualitative analytical techniques concerning the relationship between data and research issues, as well as contributing to the continual revision of the assertions emanating from the study (Ritchie and Hampson, 1996; Patton, 1990).

The research progressed through a pilot study (cycle 1) before of the main study (cycle 2). The pilot study was a smaller version of the main study and was conducted to prepare the data collection methods for the main study. In the pilot study a pretesting of research tools like interviews and observations occurred.

4.1 Pilot Study – The First Action Research Cycle

The term 'pilot studies' refers to mini versions of a full-scale study, as well as the specific pre-testing of a particular research instrument such as a questionnaire or interview schedule. Through that process the researcher gains experience in the use of the instruments. According to Bryman (2006), pilot studies are a crucial element of good research design. Conducting a pilot study does not always guarantee success in the main study, but it does increase the likelihood of success. Pilot studies fulfil a range of important functions and can provide valuable insights for other researchers. Silverman (2000) suggests that the effectiveness of the data collection tools can be enhanced by carefully piloting them. Based on the research questions and the nature

of decision-making the pilot study was divided into a number of steps and processes that are presented in figure 4.

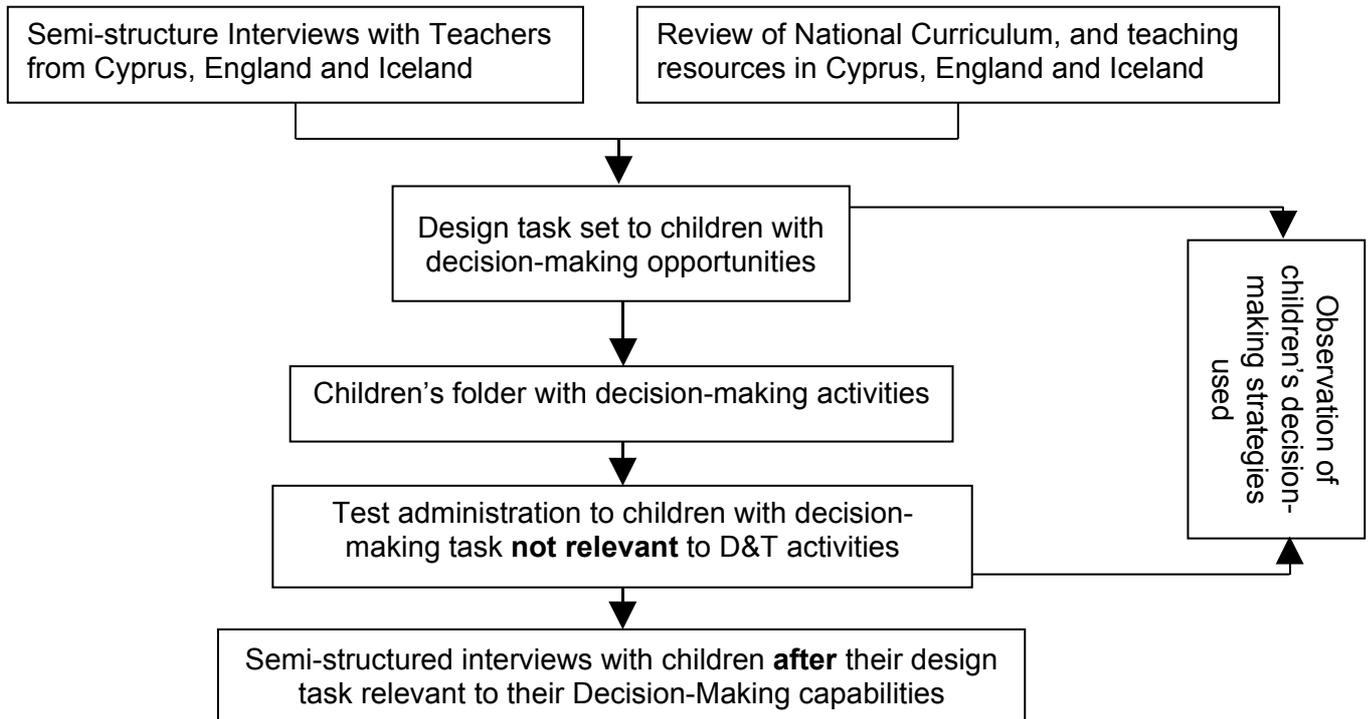


Figure 4: The Design of the Pilot Study

The first phase of the pilot study included interviews with teachers from Cyprus, England and Iceland, and the review of national curricula and teaching resources in those countries. The aim was to understand how cultural differences may affect teachers' ideas about decision-making and consequently a comparative study of practice was designed (research question 1). England was selected as a country where design and technology education is well established in the national curriculum, and the English practice has inspired many other countries to establish similar subjects. Cyprus and Iceland are both small islands that were influenced in a way by the English model of design and technology, and which might reveal such cultural differences. Cyprus was selected since it is the home country of the researcher and the main research will be undertaken there. Iceland was selected because at the same time that the researcher was doing his research at Loughborough University, another researcher from Iceland with similar research interests was studying there as well and he was willing to contribute to the study. The teachers gave their permission to the researcher to audio record the interview.

After the interviews and the review of existing practice a specific decision-making task was designed and given to children. The theme of the task was to design and

make a moving picture using levers and linkages. This particular task was used in the pilot study because during the period that the pilot study was taking place, this specific type of mechanism was required by the Cypriot design and technology curriculum. Despite the defined project, children had to take the following design decisions:

- what the moving picture will be about;
- what images the moving picture will contain;
- which parts of the picture will move;
- the suitable type of mechanism that will give the desired movement;
- any additional features for the decoration of the picture.

During the project children recorded and justified their design decisions in their log-books. During that period open observation of children while designing was taking place (research questions 2 and 3). The purpose of this kind of observation was to identify the factors that were involved in children's decision-making in practice without any pre-set criteria. The outcomes of this open observation would guide the development of a semi-structured observation in the main study.

After the task was completed a test was administered to the children with decision-making opportunities not directly relevant to design and technology activities. The purpose of that procedure was to gather information about children's ability to transfer their skills learned in design and technology classes to other activities (research question 4). The last section of the pilot study consisted of a semi-structured interview after the children had finished with the decision-making tasks set to them. In semi-structured interviews, the interviewer has a predetermined questionnaire but is free to modify the wording and order of the questions to some extent (Robson, 1993). Explanations are given about the questions, and also particular questions which seem inappropriate with a particular interviewee can be omitted, or additional ones included (Robson, 1993). They also give an interviewer a great deal of flexibility in wording questions and changing their order, since they are more like a conversation than a question-response dialogue. The rationale for that step was to shed further light on some specific areas of practice during their decision-making tasks (research questions 2, 3 and 4).

4.1.1 Selection of School and Participants of Pilot Study

The students involved in the pilot study were drawn from one public secondary school of 510 students and 52 teachers, serving an urban area in Nicosia, the capital of Cyprus. This school was purposefully selected, because the researcher used to work there as a teacher at the time that the research was conducted. Thus, it was easier to gain access and approval for the research. Information about the nature of the two classes are shown in the table 1.

Grade	Number of pupils in class
A class (12year-olds)	30 (16 girls, 14 boys)
B class (13year-olds)	29 (14 girls, 15 boys)

Table 1: Characteristics of the Sample of Pilot Study

Various data were collected as part of the pilot study. Table 2 presents the number of participants and the duration of the data collected in the pilot study.

	Teachers Interviews	Children Interviews (pre-observational)	Children Interviews (post-observational)	Observations	Post-test	Children Log-Books
Number of Participants	N=12	N=15	N=15	N=59	N=59	N=59
Duration (min)	30-35	15-20	15-20	(3X6X45)* 810 (12h)	40	-

Table 2: Pilot Study Data Collected

*(3x6x45) = 3 classes x 6 observations x 45 minutes each

4.2 Main Study - The Second Action Research Cycle

After the analysis of data collected from pilot study, the action research plan was revised taking into account the limitations and weaknesses revealed from the pilot study (Clough and Nutbrown, 2002).

More specifically the following issues were considered for revising the data collection tools for the main study: (1) if problems existed with the wording of the preliminary

survey instructions that were read to the participants by the researcher (2) if problems existed within the wording or nature of the tasks or interviews (3) the time needed to complete the pre-test, interviews and observation and (4) if the survey was capturing the information needed to successfully answer the respective research questions for this study.

During the pilot study, after the interviews and observations, the children provided feedback about the types of questions, their format and appropriateness (Robson, 2002), which helped to modify the interview and design the observation schedule. The pilot open-observation was not structured and its purpose was to gather information and factors that were involved in children's decision-making. At that stage of the research our understanding on children's decision-making behaviour while designing was limited. During the observation the observers reported on field-notes the factors that were involved in children's design-decisions. Based on the notes of the pilot observation, a semi-structured observation protocol was designed for the main study. The new observation protocol included factors that are involved in decision-making both from literature review and the pilot observation notes.

Another modification of the main study as compared to the pilot was the submission of a pre-test and a post-test before and after the decision-making tasks when given to children. The emphasis of the test is on decision-making tasks from areas further than design and technology in order to explore the ability of children to transfer their skills to other activities. The design of the main study was modified based on the limitations and weaknesses of the pilot study and is presented graphically in figure 5.

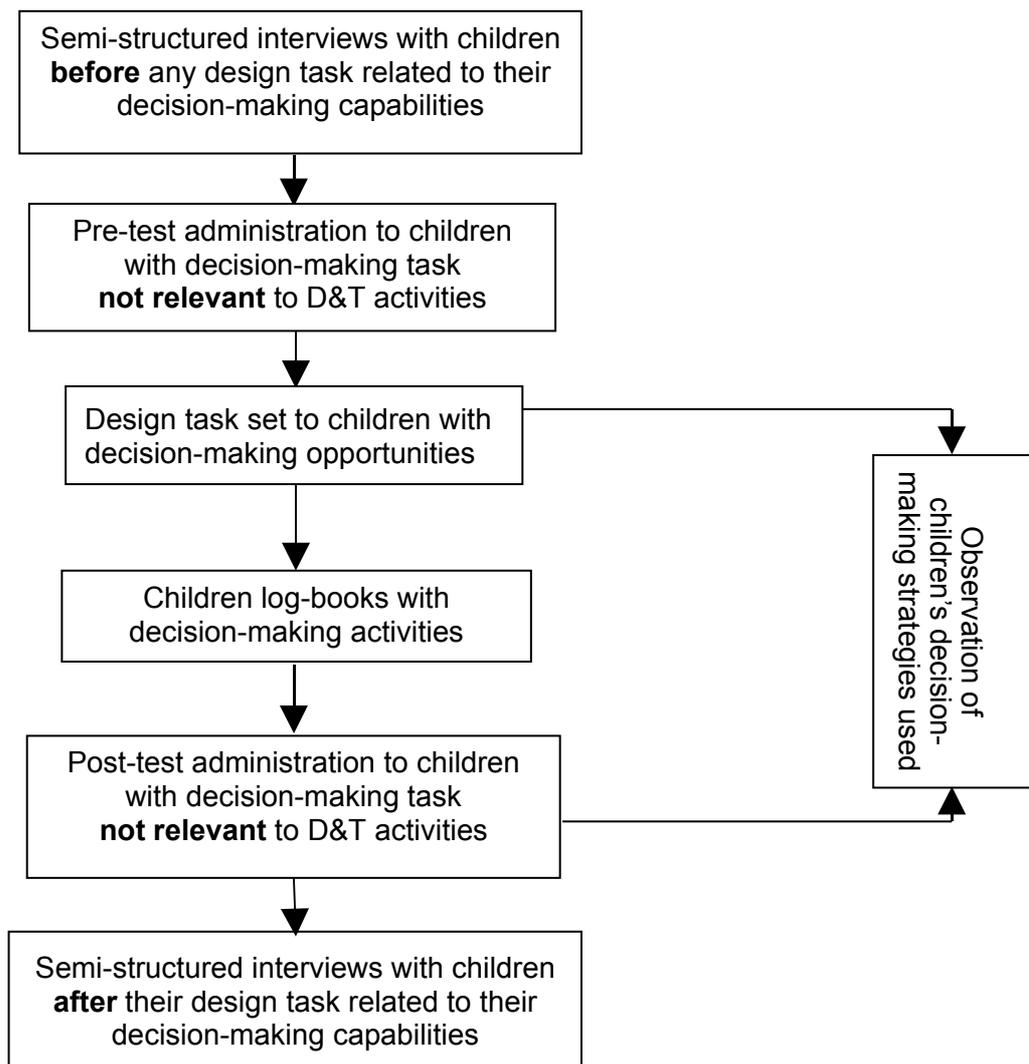


Figure 5: The Design of the Main Study

4.3 Triangulation of the Data Collected

For the purpose of the current study a variety of data sources was used to triangulate findings, including a mixture of qualitative and quantitative methods. For example interviews, participant observation and collected documents were used in the study in combination with data from pre-test and post-tests. In addition to that the data depicted perspectives from children, teachers and teaching materials and these were used to confirm assertions made in the study. For each research question (RQ) data were collected with more than one data collection method. The data collection methods for each research question of the study are shown in Table 3.

	Literature Review	Teachers Interviews	Curriculum/Books	Children Interviews	Observations	Pre-test	Post-test	Children Folders
RQ1		*	*	*				
RQ2	*	*		*	*	*	*	*
RQ3	*	*		*	*	*	*	*
RQ4		*		*		*	*	

Table 3: Data Collection for Research Questions

4.4 Main Study Sample

The research was conducted in the same school as the pilot study, where the researcher serves as a design and technology teacher. The pupils' of the school were mainly Greek-Cypriot in mixed-ability classes. The study used a convenience sample of 110 design and technology lower high school pupils. All participants were aged between 11 and 14 at the beginning of the study. The data collection obtained for the main study and their duration are presented in Table 4.

	Children Interviews (pre-observational)	Children Interviews (During observation)	Children Interviews (post-observational)	Observations	Pre-test	Post-test	Children Log-books
Number of Participants	N=15	N=15	N=15	N=110	N=110	N=110	N=110
Duration (min)	15-20	4-5	15-20	(6X6X45)* 1620 (24h)	25	25	-

Table 4: Data Collection Planned for the Main Study

*(6x6x45) = 6 classes x 6 observations x 45 minutes

*(3x3x20) = 3 classes x 3 observations x 20 minutes

4.5 Limitations and Weaknesses of the Methodology

The use of the pilot study minimised any major limitations of the data collection tools such as interviews and observations. Despite that the nature of the design tasks set to the children was mainly driven from the Cypriot national curriculum as the curriculum is compulsory for all public schools. As a result a different theme of a design project was given to children from different age groups, but at least with the same decision-making requirements. Therefore comparisons between each year group need to be drawn very carefully.

Also, the survey and the interview schedule had to go through a process where they had to be approved (in English) before translating them for the participants whose mother tongue is the Greek language. After transcribing the interviews, they had to be translated in English so further analysis could take place. There was some difficulty in this matter because some expressions when translated did not have the same meaning. This challenge was overcome by summarizing the participant's response or by using some other English expressions that would help communicate the intended message.

5. Data Analysis

The analysis of the individual data gathering elements will be analysed using standard approaches. As Cohen *et al* (2007, p. 461) assert, "there is no one single or correct way to analyse the qualitative data; how one does it should abide by the issue of fitness for the purpose". Nevertheless, because qualitative data are often overwhelming and unstructured (Creswell, 2007), coding is necessary for reducing the data into meaningful themes (Darlington and Scott, 2002). The coding followed the guidelines given by Miles and Huberman (1994), who distinguish between first- and second-level coding. According to these authors, first-level coding is concerned with attaching labels to groups of words. Second-level, or pattern coding, groups the initial codes into a smaller number of themes or patterns.

Furthermore, for this analysis, the interview and observation protocols were used as a framework to determine the themes. The protocols were segmented and each segment was coded. These codes were related to the research questions and the concepts that emerged from the literature review (Miles and Huberman, 1994). Although the areas of interest had been predefined, the analysis was responsive to additional factors that could emerge in the data (Cohen *et al*, 2007). After reading through the transcripts, the codes were applied to the data. Later, the codes were combined into broader categories (Creswell, 2007).

The recorded audio files were transcribed into protocols. The field notes during observation, and written works by children, were also used to support the analyses. The protocols were segmented (each sentence was either a simple sentence or an independent clause in a more complex sentence), and then each segment was coded. The coding system for analysing the data was based on the general coding system related to decision-making (Bettman and Park, 1980; Puff, 1982), and it was extended to this study by considering detailed behaviours that appeared in pupils' decision-making processes.

As shown in the introduction (section 1), figure 1 illustrates the factors which are involved in pupils' design decision-making that emerged from the literature review. According to this figure there are many factors that are implicated in decision-making and hence the complexity of analysing the relationship of these factors in relation to particular design decisions. Based on this theoretical framework and the research questions, there are initial categories set from the pilot study data that guide the data analysis like the children's age, strategies, difficulties or teachers' own ideas about teaching and learning and the resources that teachers use in their classes. There are also some more complicated issues like knowledge, skills and values that are involved in decision-making and issues relating to these will emerge from the data analysis.

The results of the study are now being processed and will be published as soon as they are available.

6. Conclusion and Future Work

The purpose of the research was to identify factors that affect children's decision making strategies. The theoretical framework emerged from a literature review which revealed the complexity of the processes involved. An action research was developed to reveal aspects of the design decision-making processes in a Cypriot context.

Direct observations, interviews, log-books, pre-tests and post-tests formed the data of the research and from which useful information is emerging on how children handle decision-making in design and technology education.

As a research approach 'action research' has proved an invaluable tool in investigating children's decision making strategies in the area of design and technology. The main weakness of action research is that its results may not be applicable in a general context. Green (1999) argues that 'Action research does not attempt to produce results that are immediately transferable to other teaching situations... it is the understanding of the complexities of the particular situation and the recognition of the different ways in which the familiar can be interpreted that is the aspect that is so readily transferable' (Green 1999: 107). As Lewin (1946) put it "there is no research without action and there is no action without research". Based on all the perspectives presented here, action research in this context has been demonstrated to be an appropriate research approach to adopt.

The action research plan for this study started with the review of existing literature and explored current practice, gathering data, taking an action, evaluating that action and then gathering more data. The cycle was repeated twice starting with a pilot study and reflecting on its results before the main study was conducted in order to examine current practice.

The experience of this study indicates that an action research approach is a very valuable tool for teachers in order to examine their own practice. Leaders for change can become learners as well when they engage in research. As a result, they become less vulnerable to and less dependent on external answers to the challenges they face (Fullan, 2000).

Future work will include further analysis of the results and, based on this, the design of educational materials that reflect on this action research project and that support children's decision-making skills in the field of design and technology education. As a result of the researcher's involvement in curriculum development for design and technology education in Cyprus the findings of this research will be carried into the emerging policy debate.

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