Can Digital Mind Mapping with Collaborative Learning enhance learning in Saudi primary schools?

AL-WAZZAN, MONA,SALEH,I

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By

Mona Saleh Alwazzan

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Abstract

Much recent educational research has focused on teaching and learning in the classroom and the role of technology as a means of support for the educational process. The central focus of this study is promotion of Digital Mind Mapping with Collaborative Learning in Islamic Education in primary school classroom in Saudi Arabia. This study enquires into the extent to which Digital Mind Mapping, when used in conjunction with Collaborative Learning, can currently be applied to improve academic achievement in Islamic Education in primary schools in Saudi Arabia. This study looks for evidence on these questions through a research project using mixed qualitative and quantitative methods. The research itself consists of interviews with teachers and students at primary schools in Qassim, Kingdom of Saudi Arabia, together with direct observation of their classrooms, and pre- and post-tests. The conclusions of this research point at various features and educational abilities that influence the effectiveness of using Digital Mind Mapping supported by Collaborative Learning as an educational aid. These features and educational abilities appear to have led to improved academic achievement among students. The research also revealed several obstacles faced by teachers and students in their efforts to integrate Digital Mind Mapping supported by collaborative methods of learning into their classrooms. This study sets forth the importance of changing educational practices in the teaching of Islamic Education and the extent to which this method can improve these practices.

Acknowledgements

In the Name of Allah, the Most Gracious, the Most Merciful, "Praise be to Allah, to whom belong all things in the heavens and on earth: to Him be Praise in the Hereafter: and He is Full of Wisdom, acquainted with all things" (Holy Quran).

First of All, Praise and Gratitude be to Allah (God) that inspired me, granted me strength and patience and time to finish this work. Prophet Mohammed (Peace be upon him) said: "He will not be thankful to Allah, he who would not be thankful to people".

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Declaration

This thesis is my own work and no part of the materials contained in it has previously been submitted for a degree in this or any other university.

Statement of copyright

Definitions

Academic achievement or **academic performance outcome**: what students have learned in the Islamic Education curriculum.

Islamic Education curriculum: what is to be taught to students regarding the religion of Islam. It is a compulsory requirement in schools (primary, secondary and high). There are five topic areas in Islamic Education in primary schools: Quran with *Tajweed* (its rules for recitation), Monotheism (*Tawheed*), Jurisprudence (Fiqh), and Prophet's Biography (Hadith). In the current study were selected two materials, (Tafsir) which is Interpretation of the meaning of words of the Noble Quran, Fiqh and Hadith. Fqih includes Islamic rulings and Hadith includes the Prophet's biography.

Abbreviations

CL Collaborative Learning

PMM Paper Mind Mapping

DMM Digital Mind Mapping

CLDMM Collaborative Learning with Digital Mind Mapping

IDRF Initiation and Discussion Response Feedback

ICT Information and Communication Technology

BERA British Educational Research Association

MoE Ministry of Education in Saudi Arabia

KSA Kingdom of Saudi Arabia

Table of contents

Contents

Abstract....2
Acknowledgements....3
Declaration....4
Statement of copyright....4
Definitions....4
Abbreviations....5
Table of contents....6
List of Tables....11
List of Figures....12
List of Pictures....13
1. Chapter One: Introduction....15
1.1 Rationale for the study....15
1.2 Statement of the research problem....19
1.3 Overview of research methods....21
1.4 School profiles....21
1.5 Research questions to be addressed....23
1.6 Purposes of the research....25
1.7 Significance of the study....26
1.8 Organisation of the thesis....27
2. Chapter Two: Overview of education in Saudi Arabia....30
2.1 Introduction....30
2.2 Background of the education system in Saudi Arabia....31
2.3 School stages in Saudi Arabia....36
Pre-primary (kindergarten) stage....36
Primary stage....37
Intermediate stage....37
Secondary school stage....37
Higher Education....38
2.4 Primary school stage in Saudi Arabia....40
2.5 Islamic Education curriculum in the primary stage in Saudi Arabia....44
2.6 Overview of the Ministry of Education's policy for ICT in Saudi Arabia....48

2.7 Implementation of Information and Communication Technology in education in Saudi Arabia 50
2.8 Educational development projects in Saudi Arabia 53
Firstly: Active Learning 53
Secondly: Watani Project 54
Thirdly: The King Abdullah Public Education Development Project 55
Fourthly: Digital Education (Classera) 56
Fifthly: Digital transformation (Future Gate) 57
Sixthly: The National Centre for e-Learning 59
2.9 Summary 60
3. Chapter Three: Collaborative Learning with Digital Mind Mapping....................63
3.1 Introduction 63
3.2 Visual learning...65
3.3 Visual organisers 67
3.4 Mind Maps 72
3.4.1 Theories related to Mind Mapping 80
3.4.2 Mind Mapping in Islam 84
3.5 Digital Mind Mapping 86
3.5.1 Introduction 86
3.5.2 Definition and difference between Digital Mind Mapping (DMM) and Paper Mind-Mapping (PMM) 87
3.5.3 Digital Mind Mapping and Learning 88
3.5.4 Using digital technology applications to support learning and teaching 91
3.5.5 Aspects of integration of digital technology in education 97
3.5.6 Hindrances to integration of ICT Usage into Teaching and Learning 101
3.5.7 The importance of Digital Mind Maps for learning and teaching 103
3.5.8 Advantages and disadvantages of Mind Maps related to education 107
3.5.9 Potential for Digital Mind Maps in the teaching of Islamic Education 109
3.6 Collaborative Learning 112
3.6.1 Introduction 112
3.6.2 Collaborative Learning stages 113
3.6.3 Features and limitations of Collaborative Learning 115
3.7 Enhancing Digital Mind Mapping with Collaborative Learning 120
3.7.1 Introduction 120
3.7.2 Main features of using Digital Mind Mapping with Collaborative Learning in education 124

3.7.3 21st century skills in CLDMM 127
3.8 Characteristics of primary students' development 134
3.9 Previous studies of Paper-based Mind Maps and Digital Mind Maps................139
3.9.1 Process of searching previous studies 139
3.9.2 Previous studies on Paper-Based Mind Maps 143
3.9.3 Previous studies on Digital Mind Mapping 146
3.9.4 Previous studies on Paper-Based Mind Maps and Digital Mind Maps in Islamic Education 148
3.9.5 Reflections of the previous studies and relationship with this topic 149
3.10 Summary 152
4. Chapter Four: Research Design and Methodology..153
4.1 Introduction 153
4.2 Research questions 154
4.3 Reasons for choosing the study methods according to previous study.............155
4.4 The Role of Researcher 157
4.5 Research paradigm and approach 159
4.6 The research methodology 161
4.7 Mixed methods of research 163
4.8 Methods of data collection..164
4.8.1 Qualitative methods of data collection 164
4.8.2 Quantitative method of data collection 170
4.9 Sampling..172
4.10 Intervention and Pilot study 173
4.10.1 Pilot Study 174
4.10.2 Intervention 175
4.11 Observation of a typical lesson for CLDMM 176
4.11.1 Design of resources to support activities 177
4.11.2 Lesson procedure 177
4.11.3 Lesson activities 178
4.11.4 Group work 179
4.11.5 Assessment and evaluation 180
4.12 Data Analysis Procedures..181
4.12.1 Qualitative data analysis 181
4.12.2 Quantitative analysis 185
4.13 Trustworthiness of the research...187
4.13.1 Qualitative data collection 189

4.13.2 Quantitative data collection 192
4.14 Researcher Positionality 193
4.15 Ethical considerations in the research 196
4.16 Summary 198
5. Chapter Five: Qualitative Data: Results and Findings 199
5.1 Introduction 199
5.2 First question: How is Digital Mind Mapping being employed at present to support the learning process? 201
5.2.1 First School Experimental Group (CLDMM Method) and Control Group (Traditional Method) 203
5.2.2 Second School Experimental Group (CLDMM Method) and Control Group (Traditional Method) 208
5.2.3 Third School Experimental Group (CLDMM Method) and Control Group (Traditional Method) 212
5.2.4 Comparing Between Two Groups: Experimental Group (Collaborative Learning with Digital Mind Mapping) and Control Group (Traditional Method) 216
5.3 Second question: What are Participants' Perspectives? 219
5.3.1 Teacher Perspectives on Collaborative Learning with Digital Mind Mapping .221
5.3.2 Students' Perspectives on Collaborative Learning with Digital Mind Mappin 231
5.3.3 Comparing the Three Schools according to Teachers' and Students' Views ...237
5.4 Third question: What are the Difficulties and Hindrances Experienced when Employing Collaborative Learning with Digital Mind Mapping in Primary Schools in Saudi Arabia? 242
5.4.1 Main hindrances of using Collaborative Learning with Digital Mind Mapping for teachers 244
5.4.2 Main hindrances of using Collaborative Learning with Digital Mind Mapping for students 247
5.5 Summary 249
RQ2: What are participants' perspectives for both teachers' and students on CLDMM? 250
RQ3: What are the difficulties and hindrances 250
6. Chapter Six: Quantitative Data Analysis 252
6.1 Introduction 252
6.2 Pre-test and post-test scores for the three schools 253
6.3 Statistical analysis of pre-test and post-test 253
6.4 Test reliability 254
6.5 Equivalence of the control and experimental groups 255
The first school 255

The second school 256

The third school 257

6.6 Results 258

6.6.1 First: A comparison was made between the experimental and control groups on the post-test application in each school. 258

6.6.2 Second: A comparison was then made between the scores on the post-application of the Fiqh test for the experimental groups in all three schools (each school separately, schools combined) 260

6.6.3 Third: A comparison was made between the pre-and post-test scores for the experimental groups in the different schools. 261

6.6.4 Fourth: A comparison was made between the pre-and post-test scores for the control groups in the different schools 263

6.7 Comparison of qualitative and quantitative results 266

6.8 Summary 268

7. Chapter Seven: Discussion of the main findings..270

7.1 Introduction 270

7.2 Overarching of answering for research questions: 272

The First Question: How is Digital Mind Mapping being employed at present to support the learning process? What are the key features of CLDMM being used in classrooms? 272

The Second Question: What are participants' perspectives? What are the teachers' perspectives on whether Digital Mind Mapping supports Collaborative Learning and thereby helps students? What are the students' perspectives on CLDMM?............273

The Third Question: What are the difficulties and hindrances experienced in using CLDMM in primary schools in Saudi Arabia? 274

The Fourth Question: What is the difference in learning outcomes between experimental groups, which use CLDMM, in comparison with control groups, which do not use CLDMM? 274

7.3 Overarching discussion of thematic finding of the study 275

7.3.1 Features of CLDMM 275

7.3.2 Teachers' and students' perspectives 280

7.3.3 Hindrances and difficulties in using CLDMM 285

7.3.4 Academic achievement 288

7.4 Summary 290

8. Chapter Eight: Conclusion..291

8.1 Summary of the main themes of this research 292

8.2 Contribution of this research 293

8.3 Strengths and Limitations 295

8.3.1 Limitations 295
8.3.2 Strengths 297
8.4 Implications, recommendations and further research.......................................299
8.5 Practical and Theoretical Implications of this Study...301
Practical Implications 301
Theoretical Implications 303
8.6 Overall conclusion...305
9. Reference 308
10. Appendices...331
Appendix (1): Teachers' and students' semi-structured interviews..........................331
Appendix (2): Observation Classroom 334
Appendix (3): An example of colour coding from some pieces of the Original interview 335
Appendix (4): pre-test and post-test 336
Appendix (5) An example of the interview for both teachers and students.............342
Appendix (6): Research Ethics and Data Protection Monitoring.............................352
Appendix (7): Letter of permission for participants (teachers and students' parents) 361
Appendix (8): Permission of schools..362
Appendix (9): Examples of students Digital Mind Maps..364
Appendix (10): An example for Islamic Education curriculum 366
Appendix (11): Certificate of Mind Mapping from Buzan Center............................367

List of Tables

Table 3.1 Advantages and disadvantages of Digital Mind Map and paper-based mind map 88
Table 3.2 'SAMR' classification 92
Table 3.3 an example of a lesson in Islamic Education according SAMR framework .97
Table 3.4 Summary of previous studies..142
Table 4.1 Schedule of data collection 171
Table 4.2 Aims and content of a typical lesson using CLDMM.................................177
Table 4.3 Example of themes and sub-themes for qualitative data analysis............185
Table 5.1 Participants of data tools 201
Table 5.2 First research question themes and sub-themes 202
Table 5.3 Examples of coding for first research question 202
Table 5.4 Second research question themes and sub-themes.................................220
Table 5.5 Example of coding for second research question.....................................220
Table 5.6 Themes and sub-themes for third research question 242

Table 5.7 Examples of coding for third research question 243
Table 5.8 Summary of findings 249
Table 6.1 Number of students in pre- and post-tests...253
Table 6.2 Correlation between marks awarded by correctors 255
Table 6.3 Equivalence of pre-test scores for experimental and control groups in the first school...256
Table 6.4 Equivalence of pre-test scores for experimental and control groups in the second school on the Fiqh test 256
Table 6.5 Equivalence of pre-test scores for experimental and control groups in the third school on the Fiqh test 257
Table 6.6 Significance of differences between experimental and control groups on post-tests 258
Table 6.7 Significance of difference between experimental and control groups on Fiqh post-test 259
Table 6.8 Significance of difference between experimental and control groups on Fiqh post-test 259
Table 6.9 Descriptive statistics on post-test results for the experimental groups in the three schools...260
Table 6.10 Results of ANOVA test on post-test results for the experimental groups in the three schools 260
Table 6.11 Results of Scheffe Test 260
Table 6.12 Results of Wilcoxon Signed Ranks Test...261
Table 6.13 Results of Paired Samples T-Test 262
Table 6.14 Results of Paired Samples T-Test 262
Table 6.15 Results of Wilcoxon Signed Ranks Test...263
Table 6.16 Results of Paired Samples T-Test 264
Table 6.17 Results of Paired Samples T-Test 264
Table 6.18 Descriptive statistics on post-test results for the experimental groups in the three schools 265
Table 6.19 Results of ANCOVA test on post-test results for the experimental groups in the three schools with the pre-test results as covariate 265
Table 6.20 Results of Scheffe Test 265
Table 6.21 Comparison between qualitative and quantitative results 267

List of Figures

Figure 1.1: Digital Mind Map of the whole thesis 14
Figure 1.2: Digital Mind Map of thesis chapters..14
Figure 1.1 Digital Mind Map of Chapter One..15
Figure 2.1 Digital Mind Map for Chapter Two 30
Figure 2.2 Structure of education administration in Saudi Arabia 31
Figure 2.3 Summary of school stages in Saudi Arabia 38
Figure 2.4 Summary of Islamic Education topics in primary schools in Saudi Arabia .46
Figure 3.1 Digital Mind Map for Chapter Three...63
Figure 3.2 Digital Mind Map with Collaborative Learning (CLDMM) 64

Figure 3.3 Example for a paper-based Mind Map 78
Figure 3.4 Example for Digital 78
Figure 3.5 Example 1 for simple of Mind Map in Islam 85
Figure 3.6 Example 2 for simple of Mind Map in Islam 85
Figure 3.7 iMind Map programme by Tony Buzan 89
Figure 3.8 iMindMap website 89
Figure 3.9 Research area..121
Figure 3.10 Digital Mind Map Model 125
Figure 4.1 Digital Mind Map for Chapter Four...153
Figure 4.2 Process of designing the methodology 154
Figure 4.3 Intervention and pilot study steps..174
Figure 4.4 Example of students' Digital Mind Map 180
Figure 4.5 Comparison of criteria for research quality...189
Figure 5.1 Digital Mind Map for Chapter Five 199
Figure 5.2 Summary of findings 200
Figure 5.3 First example of students' mind map 224
Figure 5.4 Second example of students' mind map 224
Figure 5.5 Third example of a student's mind map 225
Figure 6.1 Digital Mind Map for Chapter Six..252
Figure 7.1 Digital Mind Map for Chapter Seven 270
Figure 7.2 Summary of discussion 271
Figure 8.1 Digital Mind Map for Chapter Eight...291

List of Pictures

Picture 3.1 Brain cells...73
Picture 4.1 Student classroom 178
Picture 5.1 Student classroom 2 244

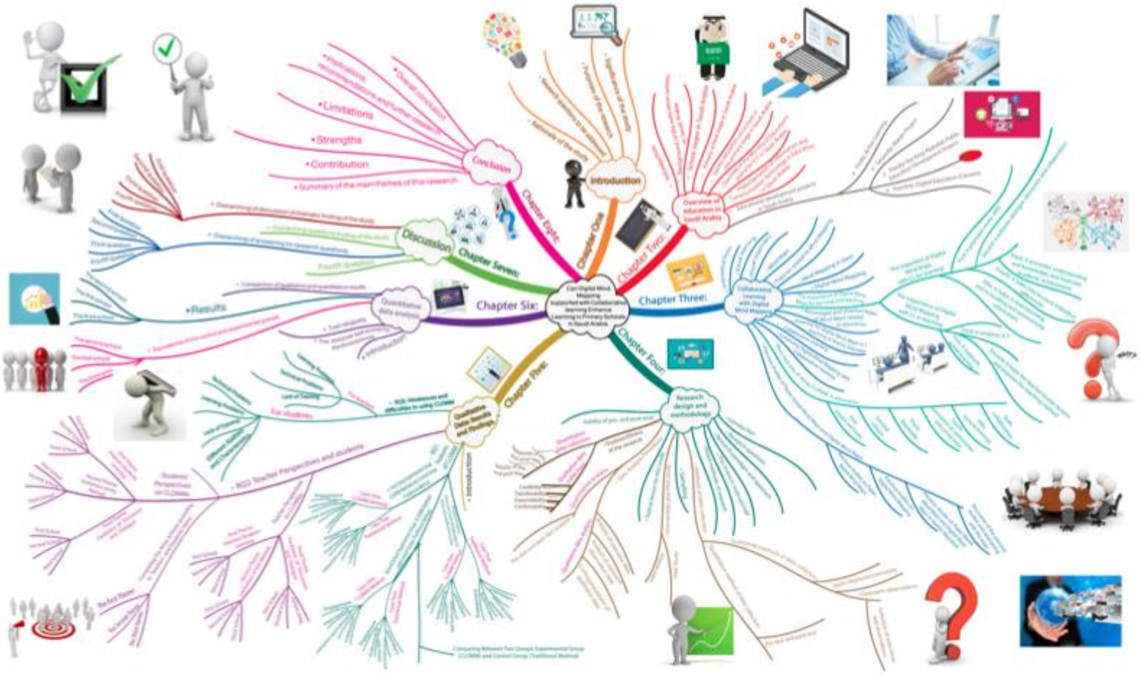

Figure 1.1: Digital Mind Map of the whole thesis

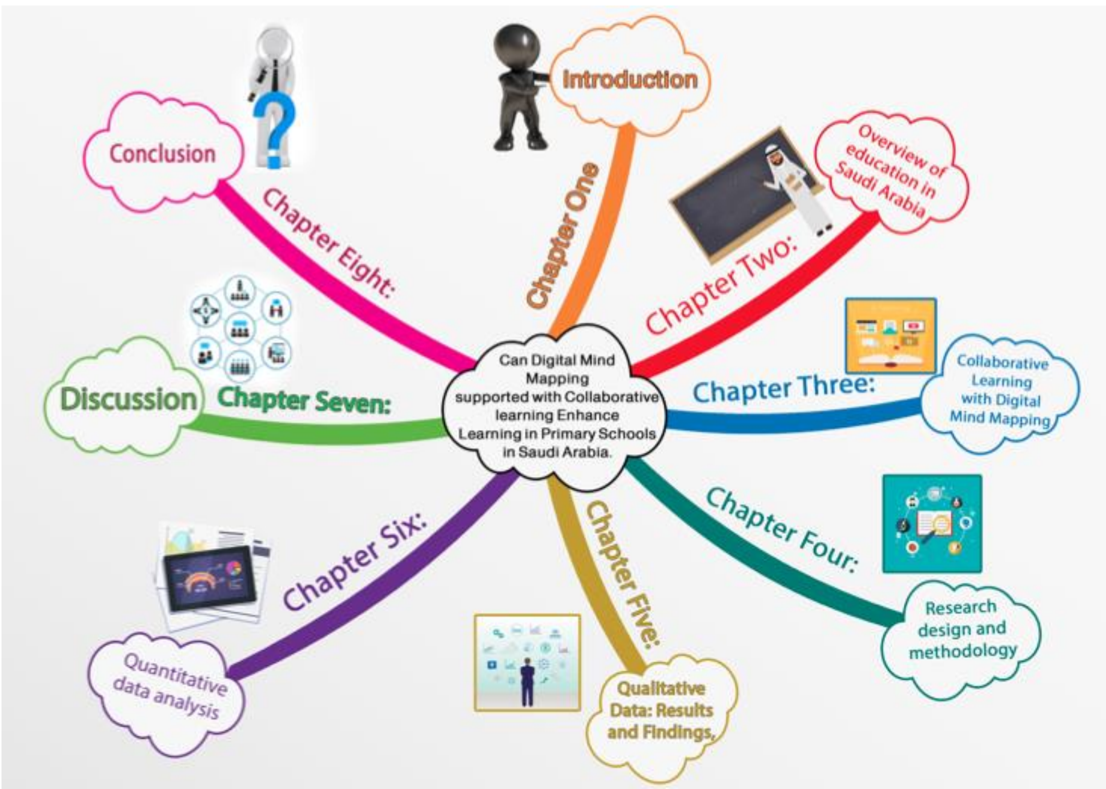

Figure 1.2: Digital Mind Map of thesis chapters

1. Chapter One: Introduction

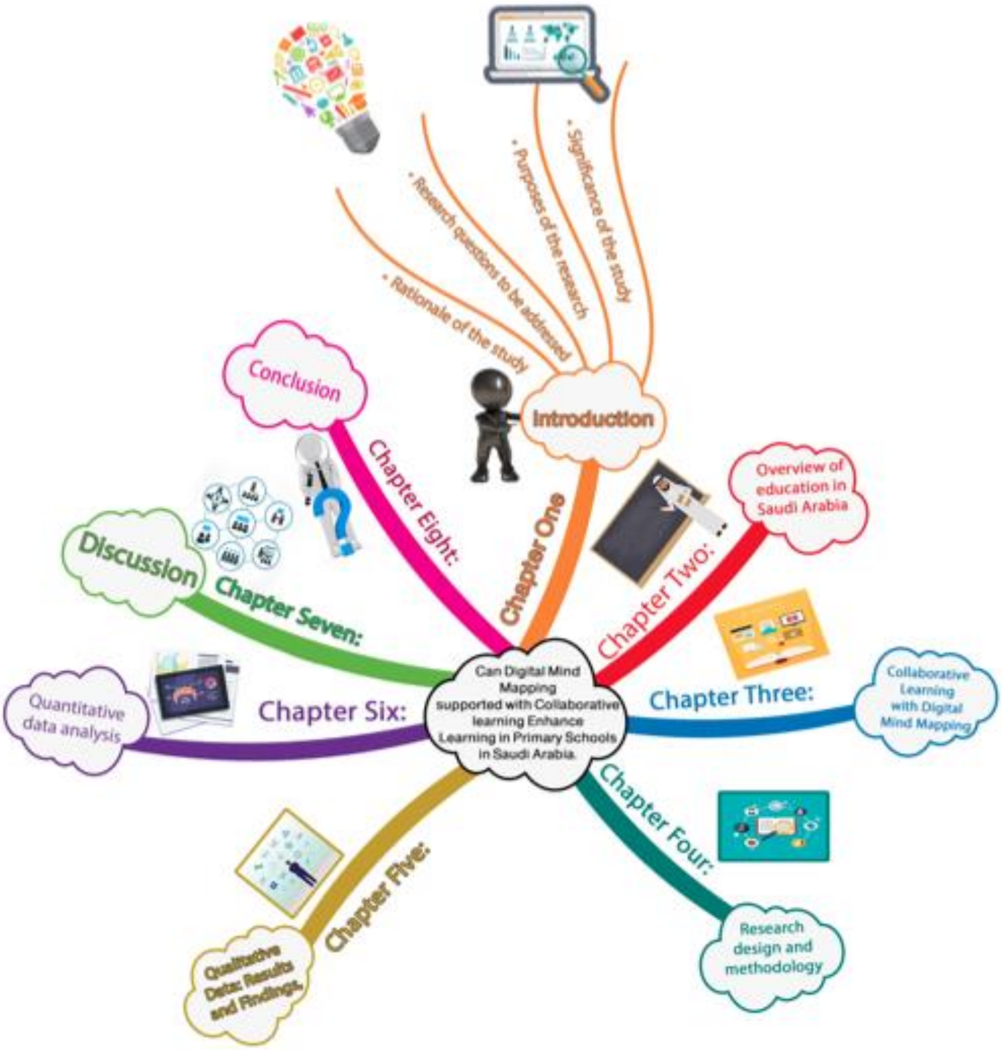

Figure 1.1 Digital Mind Map of Chapter One

1.1 Rationale for the study

A great deal of the recent research on education has focused on teaching and learning in the classroom and on the role that technology plays as a means of support in the educational process. Technology contributes significantly to both education and the dissemination of knowledge, with the digital revolution creating a generation of ‘digital’ students who are looking for the best education available. This does not mean that traditional methods should be ignored, rather it means the combination of traditional and digital methods, according to the needs of the learner, is a necessary part of the learning process. According to Alibrahim (2014), the amount of time that children have spent using technology has resulted in them acquiring new skills from an early age, meaning that, essentially, they can be referred to as digital ‘natives’. Due to their being surrounded by an information environment that has changed their way of interacting, as well as influencing their views of the world, it is natural that this new generation requires a new way of learning (Alibrahim, 2014).

The aim of this study is, therefore, to investigate, as a means of supporting Collaborative Learning, the usefulness of Digital Mind Mapping. This support will be mainly through the promotion of interaction between members of collaborative groups, and this study intends to provide an insight into the process of enhancing Collaborative Learning through Digital Mind Mapping. This will be applied to learning Islamic Education in primary schools in the Kingdom of Saudi Arabia (KSA). An aim of the study will therefore be to demonstrate the effectiveness of using Digital Mind Mapping with Collaborative Learning in Islamic Education materials, and when Collaborative Learning (CL) is used to support Digital Mind Mapping (DMM), it becomes Collaborative Learning with Digital Mind Mapping (CLDMM). It is important to mention that the educational system in Saudi Arabia emphasises the teaching of Islam, and that this subject area is a particular focus of the research.

> *"The main educational goal is to understand Islam in a proper and comprehensive way; implanting Islamic doctrine and propagating it; providing the student with values, Islamic teaching and high principles giving the student knowledge and different skills; development of constructive behavioural attitudes; the development of society in the economic, social and cultural fields and preparing the individual to become an active member of society"* (Education policy in the Saudi Arabia, 1978:5).

The importance of, and need for, this study further stems from the need to investigate whether new methods of teaching, such as Collaborative Learning with Digital Mind Mapping, could introduce benefits for the development of the educational system in Saudi Arabia. Additionally, in my experience as a teacher and a researcher, I am aware of the positive approach that the Ministry of Education (MoE) in Saudi Arabia has towards supporting Collaborative Learning. A common issue, however, is the lack of necessary skills in Collaborative Learning among teachers - this can be a source of limitation on its potential impact on the quality of their teaching.

The promotion of Collaborative Learning with ICT through activities such as Digital Mind Mapping is based mainly on the assumption that this is an attractive and interactive way of learning for students. More and more schools in Saudi Arabia are equipped with computer technology, but it remains to be seen whether teachers are using this technology in collaborative and interactive ways, or whether they require more training to do so. Despite the awareness that the Saudi Arabian government has of the importance of employing technology in education, it has not, according to Al-Ghadeer (2009), been employed enough. As such, this is an important topic and one on which numerous studies should be conducted.

In the present study, a mix of qualitative and quantitative methods were used. Qualitative and quantitative methods enabled extensive data to be obtained from a case study, based on interpretative philosophy. These mixed methods included direct classroom observations, and interviews with teachers and students that helped to clarify the empirical findings. The focus was on the features of Digital Mind Mapping that were actually being used. Pre- and post-tests were administered to two groups, namely an experimental group and a control group, and it was hoped that this approach would help to identify possible difficulties and hindrances in using Digital Mind Mapping in Islamic Education lessons, specifically in Saudi Arabian primary schools.

After analysing the research data, this study therefore intended to provide the Ministry of Education with suggestions as to how to advance their policies in a new direction, but also to provide teachers the necessary information about modern concepts of using technology in education - such as Digital Mind Mapping. Anderson et al. (2001) have argued that, with teachers acquiring a more positive attitude toward this and other new technologies, the number of teachers using modern technology in primary schools could grow. It should be mentioned that the results of the literature search provided initial support for teaching using Digital Mind Mapping, but it was evident that this area needed more attention, and required further study.

It is essential that the policies of the Saudi Ministry of Education, in general, and the policies of the school curriculum, in particular, should be based on the Islamic theoretical framework. The Islamic theoretical framework is deeply rooted in culture, and may be associated with new technologies. Given this, the link between new technologies and the Islamic theoretical framework may be an incentive for Islamic Education teachers and students to use ICT in their teaching and learning. If they can see the relationship between Islam and the new educational practices in their approach to building thinking, both students and teachers may be encouraged to create links between Islamic teachings in the Qura'n and the new technology. The overall effect would be likely to improve traditional educational practices, and raise students' educational levels.

1.2 Statement of the research problem

There were three main reasons for conducting this study. The first related to the current state of education in Saudi Arabia primary schools and the second to recommendations arising from the research literature related to the need to verify teaching practices in Information and Communication Technology learning environments. The third, and final, reason was my interest and experience in this field, as a teacher for four years in Islamic Education, and because I did a Master's degree which has highlighted the importance of this study due to the difficulties I encountered in finding a primary school with active and effective use of ICT in the classroom. Also, there is still a weakness in the use of technology in teaching materials in general, and in Islamic Education in particular, as mentioned in studies by Altwijiry (2017) and Alshahrani (2011), and Islamic teaching has been slow to adopt the use of technology for teaching and learning.

Of particular importance is the concentration on material content in Islamic Education. This subject forms the basis of primary education, and has an abundance of subject matter across the four stages in primary schools, as will be further explained in the next chapter.

It can be questioned whether new technologies are effective in helping primary students to achieve their learning goals (Higgins, Xiao & Katsipataki, 2012). Information and Communication Technology tools require more work to ensure their suitability for developing activities for students in education, as cited with science as the example by Williamson (2006). This may apply to all the other primary school materials.

> *There is much work still to be done to ensure that schools, and the children in their care, are using appropriate new technology resources and tools that can expand children's 'abilities to think and*

> *act creatively in science, rather than using resources which simply replicate the textbook'*. (Williamson, 2006, p. 88)

In a report prepared by Bransford, Brown and Cocking (2000), the authors reported that ICT has the potential to support effective teaching and learning environments, but recommended further research to determine the effectiveness of ICT in the classroom and the extent of compatibility or incompatibility with the features of learning environments and effective teaching. As Al-Gadiri (2006) mentioned, the lack of studies focusing on the impact of the use of new technology in education, especially in specialized areas such as Islamic Education, is an issue that needs to be addressed.

It is worth mentioning that the Saudi Ministry of Education constantly seeks to use technology in the field of education and this is evidenced by the large number of technological projects initiated by the Ministry of Education in recent years, which will be mentioned at the end of the next chapter; albeit with the knowledge that traditional methods are still dominant in the Saudi education system. In recent years, children have begun to use smart devices extensively and spend much of their time either using applications or playing games. The proportion of children who are users of smart devices in Saudi Arabia for accessing the internet has reached 90% (GSMA, 2014). In this study, the aim is to combine the utilization of the Ministry of Education's projects and the children's passion for using these devices, by marrying them and directing them to what is useful and beneficial in educational practice, to reach our educational goals.

To sum up, the research, as mentioned in Chapter Three, in the literature section, confirmed the need for these techniques and particularly Digital Mind Mapping to further research and to evaluate the effectiveness of educational practices, using technology, to raise the academic level of students in primary school Islamic Education classes. This has also been supported by a new study, by Papushina et al. (2017), who noted that there has been a lack of research looking at the real use of the Mind Map. The Ministry of Education has the process under investigation, because it has a current orientation towards the use of technology in education.

1.3 Overview of research methods

To answer the research questions and to help achieve the research objectives, a mixed methods approach is appropriate and will be explained in detail in the fourth chapter. Using both qualitative and quantitative research methods strengthens the design of research in support of a deeper understanding of the research problem (Johnson & Larry, 2008; Yin, 2009), giving a more complete picture of the studied matter (Cohen, Manion & Morrison, 2005). Using mixed methods lies within the interpretive paradigm which aims to give an understanding of the reasons for the current situation (Wellington, 2000; Yin, 2009), and which examines the use of Digital Mind Mapping with Collaborative Learning in education.

Qualitative methods (observation and interview) were used to illustrate the data, while a quantitative method was used with a larger number of participants, and to see if similar responses were obtained in both ways (O'Donnell, 2002). The researcher presented the pilot study before the intervention in order to overcome any difficulties and, if necessary, redesign the programme to reduce the number of processing errors (UNESCO Caribbean Office, 2003).

1.4 School profiles

The three schools, of various sizes, were located in Al-Qassim, in the centre of Saudi Arabia. Further details are presented in the following sections.

Profile of the first school

School One was a small school, with a small number of students, and there was an almost complete lack of technology. While it was a school that supported the use of computers, unfortunately the computer room was full of out-dated devices which were no longer of use. The study was conducted with fifth and sixth grade children of ages 11/12 years. The number of students in the classes ranged from 16 to 20, and the study materials covered the areas of Hadiths and Fiqh from the Islamic curriculum, across four classes. Two teachers were involved: the first teacher had five years' experience and the second teacher had three years' experience; both of them held a bachelor's degree in Islamic Education. The interview sample of students consisted of two students from each class, and the observation sample had around 48 students.

Profile of the second school

School Two was a large school in which the number of students in the classes ranged from 35 to 40. The classes were not arranged for the use of Collaborative Learning, so the researcher had to take two lessons to familiarise the students and make them ready. No technology was used at all; the teacher of Islamic Educational used traditional methods of teaching. There was an interview and observation for one teacher, who had four years of experience, and also a bachelor's degree in Islamic Education. The interview sample of students was two for each class, and in the observation sample had around 76 students.

Profile of the third school

School Three had a resource room, which was equipped with Collaborative Learning tables, which made it easier for the researcher to respond to the students in groups. The number of pupils per class was approximately 36 to 38. This teacher also used traditional methods of teaching Islamic Education. The teacher had a bachelor's degree in Islamic Education, with five years' experience. The sample of students in the interview was two per class, and in the observations there were around 57 students.

The study was conducted on sixth and fifth grade students in the first school and on sixth grade in the second and third schools, in both Hadith and Fiqh, for two classes of each.

1.5 Research questions to be addressed

The researcher created research questions derived from the aims of the study, as mentioned in the Rationale. In addition, the research questions were driven by previous educational research from reading earlier studies for the literature review. This literature focused on the integration of technology in education as a means to support the learning environment in general and, particularly, on Digital Mind Mapping. Other researchers have recommended doing further research on Digital Mind Mapping in education, such as Al Jarf (2009) and Nong et al. (2009). Additionally, Eppler (2006) recommended that students should use software to aid visual learning, particularly Mind Maps, and that further research should use the experimental design to gain accurate results.

It is worth noting that these questions were also based on the previous experience of the researcher using technology and active educational methods to encourage the learning process. Therefore, the researcher created the following research question, which is divided into four sub-questions:

To achieve the aims of the research, the study presents this research question:

<u>To what extent can Digital Mind Mapping, when used with the support of Collaborative Learning, be currently applied to improve academic achievement in the Islamic Education curriculum in primary schools in Saudi Arabia?</u>

The research question can be divided into four main parts:

1) How is Digital Mind Mapping being employed at present to support the learning process?
    a. What are the key features of Collaborative Learning with Digital Mind Mapping being used in classrooms?
2) What are participants' perspectives?
    b. What are the teachers' perspectives on whether Digital Mind Mapping supports Collaborative Learning and thereby helps students?
    c. What are the students' perspectives on Collaborative Learning with Digital Mind Mapping?
3) What is the difference in learning outcomes between experimental groups, which use Collaborative Learning with Digital Mind Mapping, in comparison with control groups, which do not use Collaborative Learning with Digital Mind Mapping?
4) What are the difficulties and hindrances experienced in using Collaborative Learning with Digital Mind Mapping in primary schools in Saudi Arabia?

1.6 Purposes of the research

In light of the above, I would argue that there are gaps in teaching and learning in Islamic Education in primary schools in Saudi Arabia. This project aims to explore how Digital Mind Mapping can be used with Collaborative Learning in primary schools in Saudi Arabia to improve the learning environment for students with respect to the Islamic Education curriculum. In addition, this study intends to provide an understanding of teachers' opinions as to whether Digital Mind Mapping helps to improve students’ learning and support Collaborative Learning.

I chose Islamic Education materials because I have previously studied Islamic Education materials for seven years and I have had experience of teaching in primary schools. I found that traditional teaching methods were widely used, especially in Islamic Education. According to Aljalad (2007), the Islamic Educational teaching materials rely on lecture and memorisation, so students feel bored because there is no change.

I also carried out a pilot study to ascertain the educational situation and to test the success of this new method, namely Collaborative Learning with Digital Mind Mapping. I found that the teachers were still using the traditional approach to Islamic Educational materials and had not changed their methods of teaching. It is important that the primary teacher uses different techniques of teaching Islamic Education to attract the attention of the child, improve understanding of the material, and make lessons more enjoyable. This is important because the primary stage is the key to understanding the Islamic religion, which is essential for life.

1.7 Significance of the study

The importance of this study stems from the need to investigate whether new methods of teaching, such as Digital Mind Mapping, could bring benefits for the development of the educational system in Saudi Arabia. In addition, from my experience as a teacher and a researcher, I am aware that the MoE in Saudi Arabia has a positive approach towards supporting technology. However, one common issue is the lack of necessary skills of using ICT among teachers, which limits the impact of using Digital Mind Mapping on the quality of their teaching. The promotion of a suitable teaching strategy with ICT, such as Digital Mind Mapping, is mainly based on the assumption that this is an attractive and interactive way of teaching for students.

Thus, the focus of this research is on what features of Collaborative Learning with Digital Mind Mapping are currently being applied in Islamic Education to improve students' learning outcomes in primary schools. My interest in this subject stems from my personal experience whilst doing my master's degree, and especially from the difficulty that I encountered when searching for a primary school with an active and effective use of ICT in the classroom. This made me realise the importance of investigating this area. Moreover, as far as I know, no studies have dealt with the issue of combining the use of Digital Mind Mapping with Collaborative Learning in Islamic Education materials. Finally, this study intends to try to encourage Islamic teachers to use new and more effective teaching methods that incorporate technology, as the feasibility of the method as shown by this study can lead to improvement in the level of learning for students.

1.8 Organisation of the thesis

This study contains eight chapters: introduction, two chapters of literature review, research methodology, two chapters of research findings, discussion and conclusion, as outlined below.

Chapter One – Introduction, which presents a brief overview of the study, its rationale, a statement of the problem and an overview of research methods. The chapter continues with the research questions and objectives, and the significance of the study, and concludes with the structure of the thesis.

Chapter Two - Literature Review: this presents the context of this study by examining the literature from fields related to the study topic, including an overview of the education system in Saudi Arabia and the school stages, and focuses on the teaching and learning of Islamic Education in primary schools. The chapter presents an outline of the Ministry of Education's policy for ICT in Saudi Arabia with mention of the implementation of Information and Communication Technology in education in Saudi Arabia. Finally, it presents educational development projects in Saudi Arabia.

Chapter Three – This reviews the literature related to the subject of this study, namely Digital Mind Mapping with Collaborative Learning, looking at visual learning and learning organisers. It presents details about Mind Mapping, which includes Mind Mapping in Islam, Digital Mind Mapping, using digital technology applications for both teaching and learning, the importance and main features of Digital Mind Mapping for learning and teaching, and hindrances to its use. It presents 21st century skills and the roles of teachers and students within technology; it also examines the characteristics of primary students' development, the potential for Digital Mind Maps in the teaching of Islamic Education, and enhancing Digital Mind Mapping with Collaborative Learning. Finally, this chapter concludes by identifying relevant previous studies and discussing them in relation to this topic.

Chapter Four - Research Methodology. This chapter explains the design of the methodology used in this study. This study used a mixed methods qualitative and quantitative approach within the interpretive paradigm, together with an experimental method consisting of pre- and post-tests. It explains the methods of data collection, which were observation, interview and pre- and post-tests. It also sets out the sampling, intervention, pilot study, and typical lesson for Collaborative Learning with Digital Mind Mapping. Further, it explains how the data from both qualitative and quantitative methods were analysed. Finally, this chapter describes the ethical considerations in this research together with researcher positionality.

Chapter Five – Results of Qualitative Data. This chapter presents an analysis of the qualitative data from the interviews and observations in relation to the research questions. It examines the results, comparing the two groups of the study: the experimental and control groups. It also compares results between the three schools according to the perspectives of students and teachers. Finally, it thoroughly reviews the hindrances to using Collaborative Learning with Digital Mind Mapping.

Chapter Six - Results of Quantitative Data. This chapter presents an analysis of the quantitative data from the pre- and post-tests in the three schools, with a comparison of quantitative results.

Chapter Seven - Discussion, which discusses the results in detail and relates them to the research questions and the literature review. It presents, firstly, an overall answer to the research questions, and secondly, an overarching discussion of the thematic findings of the study.

Chapter Eight – Conclusion, which presents the conclusions of the entire thesis and its contribution to knowledge. The strengths and limitations are outlined, together with the research implications, both practical and theoretical, of this study. The chapter concludes by providing recommendations for further research.

2. Chapter Two: Overview of education in Saudi Arabia

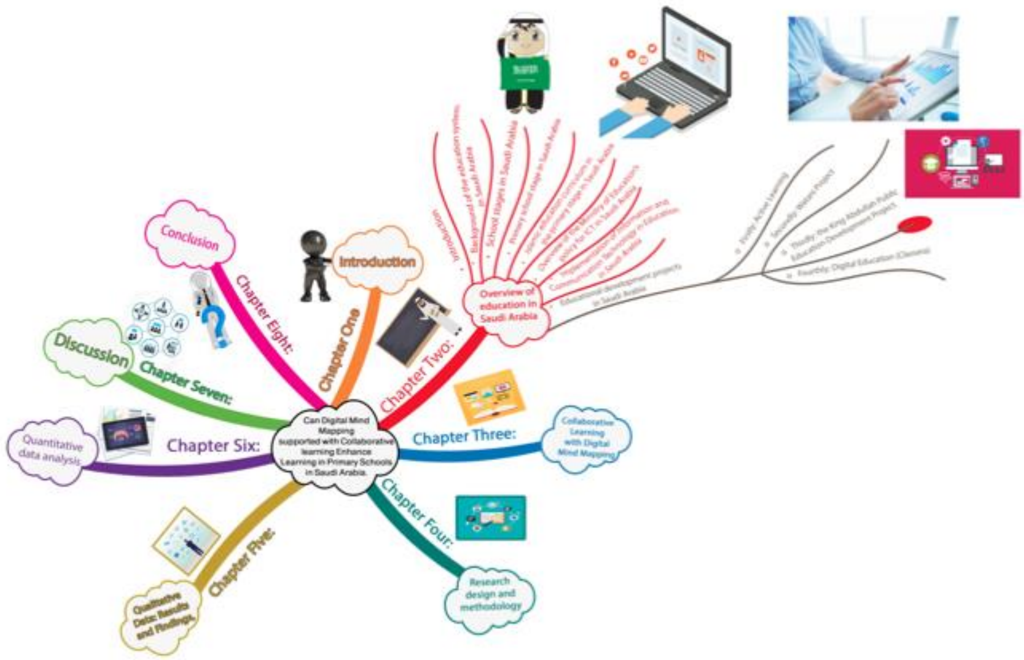

Figure 2.1 Digital Mind Map for Chapter Two

2.1 Introduction

This chapter presents a brief outline of education in Saudi Arabia, in order to clarify the context of the study. It is important for the reader to be aware of and understand the cultural, political and social contexts of education in Saudi Arabia, as well as the structure of the research. A crucial aspect of this enquiry is to understand this study in the context of the difference between the desire for change and the reality of achieving change in educational policies.

The aim of this study is to contribute to the development of education in Saudi Arabian schools and institutions through the teaching and learning of the subject matter of Islamic Education. Thus, this chapter provides a brief background of the education system in Saudi Arabia as well as looking at how the education system is structured in primary schools. This specifically includes a look at ICT and how it is applied within

Saudi education and its use in teaching. This chapter also reviews some existing projects and ends with a summary.

2.2 Background of the education system in Saudi Arabia

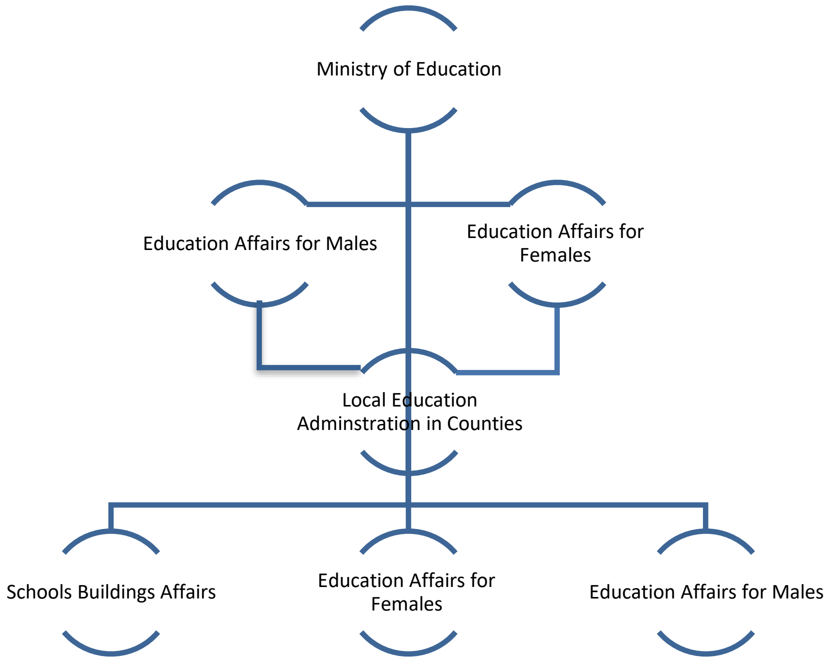

Figure 2.2 Structure of education administration in Saudi Arabia

The main goal of education policy in Saudi Arabia is: "To ensure that education becomes more efficient, to meet the religious, economic and social needs of the country and to eradicate illiteracy among Saudi adults" (Ministry of Education, 2005).

General objectives of the Ministry of Education:

1) To build the Islamic identity of students, as well as to nurture their intellectual knowledge and skills and values.
2) To provide students with opportunities for admission to all levels of education.
3) To develop criteria for teacher selection and qualification, and to develop and stimulate educational competencies.
4) To raise and improve the level of quality of education.

5) To expand the programmes of construction and maintenance of educational buildings and facilities.
6) To produce, disseminate and employ scientific research and knowledge, and to expand the number of graduate programmes.
7) To expand private education in order that developmental goals can be achieved.
8) To raise the level of educational output in order that the requirements of development, and the needs of society, can be achieved.
9) To develop the regulatory environment and to activate governance.
10) To provide external scholarships for students of excellence in order that the needs of development and knowledge transfer can be met.
11) To optimise recruitment of information and communication technology.
12) To diversify the sources of educational finance and investment.
13) To strengthen both local and international partnerships. (MoE, 2017)

The policy of the Ministry of Education in the Kingdom of Saudi Arabia is to:

1) Register all Saudi children to primary education.
2) By increasing enrolment in education, to encourage educational programmes to meet the needs of the Ministry and industry.
3) To improve the skill set provided by the teacher colleges, and those who are on the same level, and also to enrich their experiences through the achievement of educational and training programmes.
4) To increase the minimum educational requirements for those seeking admission to the university for teachers aiming to obtain a bachelor's degree. The Ministry has sought to ensure the enrolment of all primary school teachers
5) To establish a social service centre in the teacher colleges so that their educational and training programmes can be accessed by the entire community.

6) To eliminate illiteracy throughout the Kingdom of Saudi Arabia. This can be achieved by building schools and setting up campaigns and programmes.
7) To implement construction of night schools for adults so that their primary, intermediate and secondary education can be achieved.
8) To develop scientific, cultural, social, sporting, and artistic activities to result in more enhanced skills, abilities and interests of students.
9) To provide those with special needs, such as blindness or other disabilities, with special, catered educational services.
10) To work on the early detection of disabilities, and the effective dissemination of information on how to deal with them.
11) To establish specialised library services, such as a talking library and the publishing of audio books, according to the Ministry's policies
12) To construct historical museums and libraries.
13) To enable citizens of Saudi Arabia to teach at all levels of education in order to achieve self-sufficiency.
14) To raise educational standards across all educational levels to result in a reduction in failure and dropout rates.
15) To exchange, in accordance with the cultural exchange agreements between the Kingdom of Saudi Arabia and other friendly countries and Arab and Islamic countries, cultural and industrial information.
16) To ensure that the Ministry's aspirations are realised and integrated into the general education curricula, with the progress of the teachers' colleges educational plans evaluated accordingly.

17) To introduce both educational and cultural activities of the Kingdom of Saudi Arabia to the public by participating in national and international exhibitions and conferences.
18) To support private education, through effective supervision and technical and material assistance, to improve their systems and procedures, and also, to develop a balanced curriculum that aims at improving national solidarity and integration (Al Shaer, 2007).

The system of education in Saudi Arabia dates to 1926, when the General Directorate of Education was established, drawing up initial plans for an integrated education system as the basis of the present-day educational system in the Kingdom.

In 1928, the Education Management Committee was established, creating a single system of education organized according to different levels. In 1935, the first primary curriculum was designed. Later, in 1953, the General Directorate of Education was replaced by the Ministry of Education, whose most important responsibilities were the establishment of an administrative plan, and overseeing the continuous improvement of educational standards, and the building of new schools (Alshumaimeri, 2003). It was also responsible for providing physical and educational facilities in primary, intermediate and secondary schools, supporting development projects for education, adult education, teacher training, curricula, teaching methods, archaeological research, museums and the library system. In 1960, the Saudi Arabian government introduced the National Education Program for Girls, and by the mid-1970s, nearly half of all girls attended school. Eventually, in 1975, education became available to all Saudi girls (Alakloby, 1999). Then, in 2015, the integration of public education into higher education took place under the supervision of the Ministry of Education (Sak et al., 2016).

The Ministry of Education (MoE, 2002) described Saudi Arabia as having a social system based primarily on religion, the Quran (holy book) and Sunnah (Prophetic Tradition). In Saudi Arabia, all aspects of social and cultural life centre on the teachings of the Islamic religion, which places huge importance on education as a religious duty for all, whether male or female. Indeed, Al-Salloom (1989) confirmed that Islam considers education the duty of every Muslim, whether man or woman. According to the provisions of Islamic law, which underpins the country's constitution, the separation between boys and girls in education at all levels in terms of school buildings and teaching staff is obligatory. In addition, in Saudi Arabia, the educational establishment falls under the jurisdiction of the Ministry of Education. The education system in secondary schools is controlled by the Ministry, which determines both the curriculum and textbooks, which are standardized across the whole of Saudi Arabia (MoE, 2002).

The Islamic religion permeates all aspects of people's lives, and with regard to education, it aims to teach people so that they can make the most of their lives for themselves and society (Mansour, 2008). The roots of education in the Kingdom of Saudi Arabia are enmeshed with Islamic Education, as it began in mosques and was later established in schools and universities throughout the country. When the Ministry of Education was established at the beginning of the last century, its first priority was to set policies that emphasize religious values in society (MoE, 2002). Education in the Islamic context is the process of transferring knowledge and moral values with balance that develop the possibilities of human nature (Ahmad et al., 2006). Similarly, the main purpose of the education development strategies of the projects mentioned later in this chapter was to improve the performance of students in education, such as in Islamic subjects, and for students to acquire guiding principles, values and positive behaviours, along with improved performance in using ICT.

With respect to Islam and its impact on education in Saudi Arabia, it can be said that religious influences can affect teachers' beliefs, as religion is the main point of reference in dealing with most educational issues in the country (Bingimlas, 2010). Hence, Mansour (2008) argued that to understand contemporary classroom practice, researchers must be aware of the teachers' religious influences. The Saudi education system has five different stages, which are presented in the next section.

2.3 School stages in Saudi Arabia

The Saudi Arabian education system is divided into the following stages: pre-primary (kindergarten), primary, intermediate, secondary, and higher, as described in the following paragraphs.

Pre-primary (kindergarten) stage

The pre-primary (kindergarten) stage is the one in which children, from the age of three up to six, are readied for primary school education. At the present time, eligibility and entitlement for entry into primary school for those who study in kindergarten has not yet become part of the formal education ladder. However, according to Saudi Vision 2030, pre-primary educational opportunities will be progressively provided and expanded on and, accordingly, nurseries and kindergartens will be established and associated with the educational system. They will be set up with technical and financial assistance from the government.

Primary stage

The second stage is primary education, which is for all children between the ages of six and twelve years. It lasts for six years, starting from the age of six until the pupils are ready, at thirteen, to move to the middle stage. This stage will be explained in more detail in the next section, due to it being the focus of this study.

Intermediate stage

The third stage is known as intermediate education, and is for students between the ages of thirteen and fifteen years. In order to enter the intermediate stage, they would all previously have achieved a primary education certificate. At this stage, students learn Islamic Education. This includes Arabic and English language, science, mathematics, and social sciences. In order to obtain an intermediate education certificate and move on up to the secondary school stage, students should pass examinations at all levels of the intermediate stage.

Secondary school stage

The fourth and final stage of the general education system is that of secondary school. This is for children from the ages of sixteen to eighteen years, and these school have two tracks - art and literature, or science - which students select after their first year. It is also a mandatory requirement for students to pass examinations at all stages of secondary education in order to obtain a secondary education certificate for any future transition to university education.

Higher Education

Finally, the higher education stage consists of four years in the human sciences or five to six years in the field of medical and engineering sciences. See Figure (2.3) below.

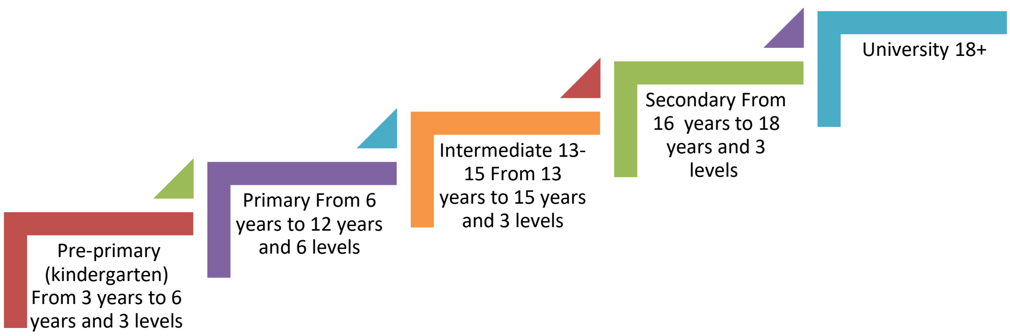

Figure 2.3 Summary of school stages in Saudi Arabia

The first university, King Saud University, was established in Saudi Arabia in 1957, as part of the country's modern higher education system. There are many governmental and non-governmental universities and colleges that offer bachelor's degrees, diplomas, master's degrees, and doctorate programmes, in various scientific, medical and human disciplines, and also provide some distance learning colleges (UNESCO IBE, 2007).

The Ministry of Education now aims to change the above divisions in a new system containing four different levels. The Education Assessment Board revealed the finalisation of a comprehensive, national framework by which the standards of public education curricula could be gauged, with the division of students into four different levels of study. The proposed levels of study are: establishment, enhancement, expansion and concentration. The framework also includes the development of test systems, and the evaluation of students. In addition, it includes the preparation of teachers and curricula to respond to the developmental aspirations of the Kingdom of Saudi Arabia. Further, the provision of various optional programmes of knowledge, skills and application for students was stressed, with preparation of specialised documents noted, for the nine areas of education of students according to levels and classes. It also drew comparison with the allocation of the fourth level of the grades ten to twelve, which allowed focus to be applied to a specific specialty. Further, the importance of the availability of 34 elements in the 'student of the future', was noted, the most prominent being proficiency in language and skills.

The framework draws on a broad range of foundations, including the Islamic religion, Arabic language, and national identity, and is based on the educational and scientific foundations required of the present age, and its characteristics. The framework also translates the axes, themes and objectives underlying the vision of the Kingdom of Saudi Arabia 2030. By the framework taking into account recent global trends that emphasise the role the student plays in building knowledge and skills, the educational system should provide a learning environment which delivers safe, supportive, creative, and diverse learning resources, that take into account individual differences among students.

It also takes into consideration the modern trends in organising educational experiences in the curriculum, according to the nature of each field. This is done in accordance with the needs of the student, and his or her own experiences, the requirements of reality, and the characteristics of the generation. The framework takes into account the level of accelerated scientific and technical progress, and the emergence of a new generation, based on technology.

The next section describes primary level education, the focus of this research, in more depth.

2.4 Primary school stage in Saudi Arabia

The Saudi Arabian Cultural Mission to the U.S.A. (2006) noted that education is compulsory in Saudi Arabia for children aged six to fifteen years. The primary stage is the basic stage in which the students spend six of their study years, and where they obtain the foundation on which the rest of their education is based. The grade stages go from one to three, which are called the early levels, while stages four to six are called the upper levels.

In primary schools, continuous assessment is used for the first, second, and third stages, while the upper stages (junior) employ examinations in the middle and at the end of each semester, with the latter determining whether students can move on to the next stage. Islamic Education in some form is compulsory at all stages.

The Ministry set goals for primary school education:

1: To implant true faith in the heart of the Muslim child;

2: To teach students to perform prayers and observe good morals and rules of good behaviour with others;

3: To improve the basic skills of the students, especially language skills and physical fitness;

4: To give students appropriate information in various fields;

5: To inform students of the blessings that God has given them in their social and geographical environment, in order for them to benefit from their environment and allow them to benefit their environment;

6: To improve the talents of students and for them to be aware of their rights and duties, appropriate for their age and particular situation;

7: To implant the desire to locate useful knowledge for work and leisure time;

8: To prepare the student for the next stages of their life. (MoE, 2015)

Based on the above, it is important to note that the education policy in Saudi Arabia and the objectives of the Ministry of Education focus on developing the skills of the students through new teaching methods and the use of technology, which are investigated in this study via the research objectives.

There are two specific aspects of teaching in Saudi Arabia in primary schools. Firstly, teaching is performed in two types of school building: rented houses (of small size) and government buildings. The Ministry of Education is seeking to abolish rented school premises and replace them with purpose-built schools. Secondly, lectures and memorization methods constitute the cornerstone of teaching in the country (Almuhalel, 2012). This means that the students must carry bags of books, which are often very heavy, whilst the teacher typically lists facts without clarifying their reasons or purposes. She or he then requires students to simply memorize these facts, rather than giving them a scientific method for research, or a means of practising their thinking skills (Al-Mezel, 2017). Finally, the assessment questions often encourage memorizing, so learning depends on the teacher more than on the learner; the teacher is the source of information and life experiences.

With regard to the use of technology in the classroom, computers or smart boards are present in only a very small number of schools and are used by very few teachers. This is in spite of the fact that the Ministry of Education has implemented several projects to introduce technology into education, which will be described in detail in the end of this chapter. Several studies have confirmed that most teachers in public schools in Saudi Arabia continue to use traditional methods and have so far ignored ICT as an educational tool. Alshahrani (2011) found in his study, for example, that technology is not used in the teaching of Islamic Education at the primary stage. In addition, Alnesyan (2012) found that the style of teaching of Islamic Educational is somewhat traditional. Alsenaidi (2012) also found that teachers still practise traditional teaching in Islamic Education. Moreover, Altwijiry (2017), in a study in high schools, found that there was dissatisfaction among students with the methods used in teaching Islamic Education due to teachers' use of traditional methods.

Meanwhile, a study by Al-Shafi'i (2004), entitled "Reasons for the lack of students' desire for studying Islamic Education in Saudi Arabia", supported these findings. The study was based on sending 100 questionnaires to teachers of intermediate and secondary schools in Saudi Arabia. It found there were important problems facing Islamic Education teachers which caused students to drop out of courses. This is significant to the present study because it indicates that the main reason for this drop-out was because teachers used traditional methods of teaching that did not foster student participation.

Another important finding of Al-Shafi'i's study was that teachers did not use teaching aids in their lessons. However, teaching aids are an urgent necessity in Islamic Education, because the writers of the Quran and the Sunnah used a range of methods to clarify Islamic thought (Ali, 1982). Indeed, Israel (2009) confirmed that imagery is a favourite tool in the style of the Quran. Despite this, there are those who believe that otherworldliness should not be subjected to the use of aids, particularly in primary school. Instead, the teacher uses evidence and proof to demonstrate these concepts. Therefore, it is believed that the Quran always pairs hearing and sight with the heart in its teachings, so that the human being can grasp the abstract notions, which cannot be perceived by the senses, such as with otherworldly things. There are examples of images in the Quran that use sensory aids to present Islamic rules, as in the story of the sons of Adam. Here, Cain killed his brother, Abel, and then left him out in the desert and did not know how to bury him. Then Allah sent a crow searching the ground to show him how to hide the disgrace of his brother. He said, "O woe to me! Have I failed to be like this crow and hide the body of my brother?" (Al-Maidah 6:31, Holy Quran). This led to Cain learning how to hide the disgrace of his brother's body through the assistance given by the crow.

Hence, Islam aims to offer an integrated approach to life to prepare the workforce and a population trained and qualified to deal with modern technologies. Therefore, although there are some leading schools, schools for the gifted, and private schools using ICT, this is not the case with schools in general. The personal experience of the researcher during her master’s degree, and especially the difficulty she encountered in finding a school with an active and effective use of ICT, further confirmed the notion of ICT not being used sufficiently in Saudi education. Many studies have endorsed this: Al-Faleh (2009) found that private schools have more technology than public schools; Al Mofarreh (2016) found that relatively few schools and teachers used ICT effectively to improve the quality of classroom learning; and Al-Qahtani (2016) revealed that there was a lack of training or working equipment in Saudi schools.

Here it is important to emphasize that the challenges that teachers encounter when using Digital Mind Maps are similar to those influencing ICT use in general. Alajmi (2011) observed the small classroom space and large numbers of students in Saudi schools, often ranging from 20 to 25 – and at one time reaching 30 – students per class. In addition, there was a lack of ICT provision in many schools, and lack of training for teachers in how to use it. Moreover, teachers have not yet been educated in its importance, which makes it difficult to motivate them. Furthermore, the teacher does not stimulate and encourage ICT use; thus a large burden is entrusted to teachers who are not motivated to use it. Finally, devices require maintenance, and there is a lack of technical personnel able to provide such a service.

It is important to focus on primary school education when attempting to help teachers improve their teaching methods and to solve the problems they face, because the Islamic Education curriculum occupies the largest section in the primary stage.

The next section explains the education materials and the dissemination of these in the primary stage.

2.5 Islamic Education curriculum in the primary stage in Saudi Arabia

Islamic Education in Saudi Arabia derives its basic teachings from the Quran and the Sunnah. It has been defined as an operation intended to illuminate the light of the Islamic law, aiming to nurture the relationship between the student and God, as well as directing the learning of students appropriately (Aljalad, 2007). Therefore, teachers specialize in education accordingly, using suitable content and conventional methods. As this relates to primary schools in Saudi Arabia and focuses on the curriculum of

Islamic Education, it is important to note that Islamic Education occupies the largest part of lessons in primary schools. Furthermore, Islamic Education combines theory and practice, meaning the words and theories of Allah from the Quran are provided to direct the lives of Muslims. *"The Qur'an frequently challenges the reader to reflect, to think and to contemplate to develop understanding. The destiny of human beings is not to be passive but to be reflective, critical and creative; we have been provided with minds to do this"* (Higgins, 2014, p. 568). It worthily to mention that Quran guides humans to develop technology and science, particularly in the verse *"And He has subjected to you, as from Him, all that is in the heavens and on earth: Behold, in that are Signs indeed for those who reflect"* (Al-Jathiya 25:13, Holy Quran). This verse directs humans to understand that all that exists on heaven or earth is for their benefit. Therefore, the Quran leads people to use their minds and open the doors of scientific research, particularly within ICT and computer science.

The following Figure (2.4) shows a brief summary of the Islamic Education topics in primary schools in Saudi Arabia, and the allocation of time for each subject.

Figure 2.4 Summary of Islamic Education topics in primary schools in Saudi Arabia

It is worth explaining the definition of Islamic Education as given by Abdullah (1994), that Islamic Education is *"a purposeful process, based on the principles of Islam, which aims at educating human beings socially, ethically, emotionally, and physically in order to achieve complete submission to God"* (p.8).

It is important to mention that the materials of education consist of five elements:

1: The Noble Quran, which includes recitation of the Holy Book of Muslims, supported with (Tajweed), which guides students to recite the Quran correctly.

2: Tafsir which is interpretation and translation of the meaning of words of the Noble Quran.

3: Tawheed or Aqeedah (Monotheism), which are the fundamentals of the Islamic creed. Within the fundamentals are the heavenly religions, and the need to have to believe in them, and all the prophets, and the attributes of God (Allah), and the true doctrine of the Muslim.

4: Fiqh, which is Islamic Jurisprudence, and is made up of the rulings of Islamic jurists to direct Muslims' lives. This includes transactions, sales, eating, drinking, prayer, Zakat (charity), Hajj (pilgrimage to Mecca), and other provisions related to the life of a Muslim.

5: Hadith (the Prophetic Tradition) are the sayings and deeds of the Prophet Muhammad (peace be upon him), and these guide the way of life of Muslims according to his practices.

These topics are important in the Saudi culture, and are evidenced as such in their making up the cognitive background of the students in the primary stage. These subjects are heavy, and need a deep understanding and focus. As such, the students require the skills of thinking, dialogue, discussion and tools in order to simplify the information through technology and the internet. Consequently, it is not enough merely to be a student receiving information, and instead there should be active participation, engagement and discussion. Students may find this information confusing, since it is presented at all levels of education. Consequently, dialogue and discussion are helpful. Commentary alongside the use of technology with supporting information, plus photo and video recording, are also encouraged.

Further, these studies require many skills, such as summarising and connectivity. They call for the attention of decision-makers, researchers and teachers so that focus can be put on an active learning environment, with new strategies and education technology used to help strengthen those skills.

2.6 Overview of the Ministry of Education's policy for ICT in Saudi Arabia

The goals set by the Ministry of Education include objectives to be achieved through the introduction of computers into education. These goals, as Oyaid (2009) observed, are clearly defined in students' textbooks as follows:

1: To prepare students to live in an advanced technological environment, where computers are the basis for development, and to encourage the expansion of such technology.

2: To use the computer as a teaching tool that leads to creativity and understanding.

3: To promote teamwork among students.

Saudi Arabia offers particular attention to teacher training in computer skills because these are becoming increasingly important for students. The aim here is to provide opportunities for students to acquire and improve their skills in the use of ICT through the development of a new scheme developed by the Ministry of Education designed to enable all teachers to have their own laptop and additional equipment, such as printers, available at a reasonable price and with an easy payment plan. This project seeks to raise awareness of technology among Saudi teachers.

The Ministry of Education prioritizes the development of specialized human resources and technology, and a high-quality curriculum. This new curriculum is based on the notion of a deeper integration of ICT into education, which should encourage students' creativity and analytical thinking, helping them to meet the demands of the modern world (MoE, 2016). Thus, the education system in Saudi Arabia now emphasizes the importance of computer skills training for teachers. This training is essential if teachers are to be able to employ ICT in the classroom to benefit their students. If teachers know how to use ICT effectively, students have a better opportunity to acquire and improve their own skills in the use of ICT. This project also aims to raise awareness of the benefits of using technology among Saudi teachers.

However, despite efforts to date, and the growing awareness of the advantages of using ICT in education, it appears that the Ministry's scheme has not yet fulfilled its aims. The reason for this seems to be the limited range of the project itself, which provides hardware and software to Saudi schools, yet does not account for teachers' lack of knowledge about how to effectively implement these new tools to improve educational processes.

Moreover, there is an absence of reliable statistics showing the number of schools in Saudi Arabia equipped with computers and interactive white boards (IWBs). Several studies have confirmed that the majority of teachers in public schools in Saudi Arabia continue to use traditional methods and have so far ignored ICT as an educational tool. There are many studies investigating this issue, as mentioned above, for example: Al-Faleh (2009), Al Mofarreh (2016), Al-Qahtani (2016) and Al Mulhim (2014) reported that teachers have a low use of ICT; in addition, Albugami and Ahmed (2015) focused on successful implementation of ICT in Saudi schools.

The next section further examines information about ICT in education.

2.7 Implementation of Information and Communication Technology in education in Saudi Arabia

It worth explaining the meaning of ICT in this study. The term Information and Communication Technology (ICT) is defined as "… forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means. This broad definition of ICT includes such technologies as radio, television, video, DVD, telephone (both fixed line and mobile phones), satellite systems, and computer and network hardware and software, as well as the equipment and services associated with these technologies, such as video-conferencing, e-mail and blogs" (UNESCO, 2007, p.3). The Ministry of Education has a long-term vision to deepen the integration of these technologies in the education system in Saudi Arabia by providing ICT, computer labs and learning resource centres in primary schools. The employment of technology in education would include:

- ✓ Insertion of national education website software;
- ✓ Design of programmes as sources of electronic educational content;
- ✓ E-school programmes for the development of vocational education;
- ✓ Development of an electronic management system and infrastructure informatics programme named Noor and Fares;
- ✓ Providing schools and classrooms with electronic equipment;
- ✓ Design of a project to link schools to the Internet (MoE, 2002).

This represents the framework within which Saudi Arabia has sought to modernize the educational process and introduce computers to the field of education.

To achieve this, the Ministry of Education has transformed school libraries into learning resource centres. These provide teachers and students with various educational materials, such as IWBs, books, CDs, DVDs, educational games, graphics, applications, CD-ROMs containing presentations, photos and video clips, educational software and access to the internet. The majority of these resources are linked to the curriculum to improve learning and teaching (Alsalman, 2011).

These resources are also open to all teachers, including Islamic Education teachers. However, some schools do not use computers effectively as teaching tools, but instead use them to teach students computing skills only; in some cases students may use them at break times for recreational purposes, such as gaming (Bingimlas, 2010).

In addition, in 2003, the MoE carried out a talent project to identify full-time teachers in the public education system who could serve as teachers of the gifted. A number of courses were then implemented to offer to gifted individuals. The MoE also opened a school for the gifted (Aljughaima & Grigorenko, 2013). In addition the MoE has instituted programmes to generate a spirit of honest competition among students. A number of such competitions have been established, for example in mathematics, science, teaching aids, special education, scientific research, computers, and so on.

There was a large increase in the number of students benefitting from computer courses between 1999 and 2003, as shown Table (2.1) below:

Table 2.1: Number of student beneficiaries between 1999 and 2003

Number of student beneficiaries	1999	2000	2001	2002	2003
	812	4,362	7,702	17,296	21,066

This table demonstrates that the number of students benefitting from the use of computers has increased over the years. This indicates that students should be able to use technology in their learning.

Moreover, in 2016, the Ministry of Education launched several educational television channels for all stages and specializations. These support the educational process by helping students explain what they have learned, thereby developing their visual education.

According to Vision 2030, education in Saudi Arabia should seek to implement distance-learning platforms to provide educational opportunities to all members of society through programmes of high efficiency and quality. The proportion of higher education students enrolled in distance learning programmes in 2015 was 25%. This improved the learning environment by providing opportunities for digital interaction, as well as active and collaborative learning and dissemination of technology. This enhanced the creativity and innovation of the learners in a distinctive digital educational environment (MoE, 2016).

Moreover, the Ministry of Education has undertaken several initiatives through the Tatweer programme, including the ICT Employment Initiative in teaching. This initiative is based on developing the capabilities of students to engage in technological production. One of its objectives is to employ the skills of teachers who use technology in teaching and learning. Additional objectives are to provide students with technology production skills, and to raise the scientific level of students and teachers in the field of ICT (Tatweer, 2006). It is notable that this scheme aims to encourage Islamic Education teachers to use their learning resources and computer labs in their lessons effectively through applying Collaborative Learning Digital Mind Maps in their classes and presenting the learning results of their students.

Thus, the Ministry has implemented several projects that support the educational process in keeping with technology. The next section explains these projects in more detail.

2.8 Educational development projects in Saudi Arabia

Saudi Arabia is seeking to achieve the effective use of information technology in education. To do so, it has introduced Arabic computer materials in all schools. Abu Hassanah and Woodcock (2006) explained that: *"There are indications that the Saudi authorities will look at the unification of computer curriculums between private and public schools and try to catch up with the more advanced countries in the use of ICT in education"* (p. 6). The most important recent initiatives for improving the state of education in Saudi Arabia are Active Learning, Watani Project, the King Abdullah Public Education Development Project, Digital Education (Classera), Digital Transformation 'Future Gate' and, finally, the National Centre for e-Learning. The following section examines these projects in more detail.

Firstly: Active Learning

In 2000, a project was launched with the logo: "teach me how to learn", which aimed to review the input of the educational pedagogical process after educational supervisors found deficiencies in teachers' teaching skills and their reliance on traditional strategies such as dictation, repetition, and memorization. This led the Ministry of Education to develop teaching strategies through the following objectives:

1: Providing teachers with a wealth of teaching skills and strategies;

2: Raising awareness in the educational community of alternative teaching strategies and demonstrating their importance in the education process;

3: Stimulating teachers' motivation towards professional growth and creating a collaborative atmosphere among them (MoE, 2015).

In order to achieve these objectives, the Ministry of Education prepared a Training Page with a number of new strategies for teaching and teacher training. The most important of these are: Collaborative Learning strategies, brainstorming, concept maps, and communication strategies for learning resources.

Secondly: Watani Project

The third project which supports ICT in education is the Watani project. This scheme was established in 2006 as one of the most important goals for the advancement of computers and internet services in all Saudi schools. It acts as a reference for all students, teachers, parents and educational supervisors because it provides a huge amount of electronic information; for example, e-books, educational internet links, interactive multimedia, tools for designing the websites of schools, e-mail, and chatting (Tatweer, 2006). This is explained in the following quotation from their website:

"The Schools' Net Project will connect all Saudi Schools and Educational Directorate Districts by means of a wide area network covering the entire Kingdom of Saudi Arabia and local area networks within every educational directorate and school. The Schools' Net Project will provide every student, teacher, parent and educator with a multitude of services and a huge source of reference information. The Schools' Net services and content include, but are not limited to, all subjects' curricula, educational references, electronic books, one or more Teachers' Guides, services for students and other users

with special needs, course syllabuses, interactive multimedia, teacher training, school management systems, web design tools for schools, e-mail, chatting, announcements, Internet links, a students' magazine, a teachers' magazine, educational statistics, students' training, students' sites, information technology skills for all, and a Q&A bank. These contents and applications will be mostly in Arabic. The first phase of the School's Net Project will provide one million students with their IT requirements in a ratio of one PC to ten students." (tatweer.edu 2006)

The project aims to achieve several objectives:

1: Preparing students for the future in an effective manner, through the exploitation of technology;

2: Developing the capacity of teachers by employing technology in all educational activities;

3: Ensuring that new generations of students master the use of technology, thus improving the results of the educational process;

4: Disseminating knowledge of ICT in society and raising awareness of the benefits of using technology in education (Tatweer, 2006).

Thirdly: The King Abdullah Public Education Development Project

The last two decades have witnessed significant efforts for the development of education in Saudi Arabia, including teaching methods, assessment and curricula, the training of teachers, research, and modern school buildings. The Ministry of Education has developed a curriculum with cognitive and technical aspects, combining textbook - and technology-based learning. The new curriculum also includes the development of thinking, problem-solving skills, self-Collaborative Learning, and skills in accessing sources of knowledge (Tatweer, 2012), and was disseminated by the Ministry of Education through the King Abdullah Public Education Development Project. Tatweer (2012) explained that the project seeks to improve the performance of students in Islamic Education materials by:

1: Developing curricula and materials according to specific criteria;

2: Integrating information and communication technology to improve learning of Islamic Education;

3: Enriching the schools with digital resources;

4: Expanding the use of technology to connect teachers of Islamic Education within virtual communities to share the best sources concerned with their specialism.

While the above aims are already showing results in Saudi Arabian education in general, the King Abdullah project clarified, in detail, the meaning of 'efficiency in education' for students and teachers, including the following aspects:

- Expansion of the use of appropriate technologies in schools and their continuous maintenance;
- Development of rules for using technology and its dissemination;
- Ensuring consistency between technology use and the objectives of the educational process;
- Ensuring that all schools receive the electronic infrastructure for education and learning; Provision of computers and technological devices in all schools (Tatweer, 2012).

Fourthly: Digital Education (Classera)

The main current project, Digital Education, was established in 2017. Through this project, the Ministry is seeking to develop education, in cooperation with the Tatweer

Company for Educational Services, by moving towards digital education and ceasing the printing of textbooks within two years. The main objective of the scheme is to switch to an electronic environment and remove the burden of the traditional environment. It aims to achieve the digital transformation of books by 2020.

One of the objectives of this programme is to make the student a central focus by creating a learning environment based on:

1: Including the use of technology in delivering knowledge to the student;

2: Developing the scientific and educational capacity of teachers;

3: Increasing the depth of the students' scientific learning (Classera, 2017)

This project will be implemented in several stages until all schools are included. It began in the first semester of the 2017/2018 academic year. It will include training for teachers and administrative staff in schools and education departments, in addition to competitions for students, classes, schools and education departments.

The Tatweer Company for Educational Services will also set up a factory to assemble the computers used in schools during the second year of implementation. This collaboration is being discussed with two companies, Jora and a Portuguese organization called JP.di. Digital Mind Mapping will probably be part of this Digital Education scheme.

Fifthly: Digital transformation (Future Gate)

The aim of Saudi Vision 2030 was to transform the school into an electronic learning environment that would benefit students. This benefit would be in the form of the students having access to the latest technology, and being encouraged to use this in a positive way. In accordance with this, the Ministry of Education sought to follow the initiative of 'Future Gate' in addition, and apply digital transformation in schools throughout the Kingdom of Saudi Arabia for both boys and girls. By doing so, it is hoped that the aim of transforming teaching methods from the more traditional and shift to an overall more interactive learning environment, can be achieved.

The 'Future Gate' programme aims at transforming the current learning environment into one which is more digital, and in order to achieve this, an emphasis should be placed on the promotion of educational strategies and supporting self-learning opportunities that succeed in creating a more independent, student-centred learning environment. In addition to this, modern educational methods can be incorporated and implement, directing the learning environment towards the positive use of technology. Furthermore, one of the aims of this is to enable students to acquire more personal study and discipline skills that will better equip them for studying at university, and managing themselves in the labour market. In general, digital education addresses the needs of the various circumstances of different students, which it does through the use of technology. It can assist in the educational process, and help provide enhanced learning opportunities for students outside the walls of the school. This is particularly so after the end of the official period of study, and even more so in the context of those students with special needs, and the children of expatriates.

Furthermore, when applying this method, the traditional textbooks are perceived as a means, rather than an end, in the studying process. Due to their still being perceived as a source of learning, and with The Ministry of Education still focussing on the development of the basic skills of students in reading and writing, and they will not be targeted through 'Future Gate' in an attempt to have the textbooks removed from the system as a whole. Another of the challenges of the project is to attempt to have relatively high speed internet provided for schools.

This project will be initiated and spread out over several stages; the first of these will be in 2017-2018, during which 150 schools from three educational districts will be selected to test the experiment. Those selected will work for a full academic year, be reviewed in order to assess how successful the experiment has been, and measure the impact of its application by looking at the cognitive levels of the students.

The second phase will commence in 2018-2019, with ten times the number of schools selected (1,500 in total). The programme will be implemented during the first and second terms.

It was decided that the third phase would be launched in 2019-2020, during which the initiative would be implemented in the remaining schools (Future Gate, 2017).

Sixthly: The National Centre for e-Learning

The National Centre for e-Learning is organisationally linked to the Ministry of Education, based in Riyadh. It employs the education, information and communication technologies to increase the adequacy of educational and training processes of all types, and is tasked with controlling the quality of e-learning. In order to achieve the Kingdom of Saudi Arabia's mission to spread knowledge and science. Islamic principles and values will be used as a basis.

The desire to develop the process of science and education, and oversee the transfer from traditional methods of education fits in with some pupils, but not others. With technical means used to explain the educational material, it is necessary for students to choose the method that suits them personally in order to learn.

The National Centre aims to control the quality of e-learning, and to do so, without limitation, needs to:

1. Set regulations and quality standards in the field of e-learning.

2. Quality control the existing e-learning programmes.

3. Grant licenses to companies that provide e-learning programmes in order that they can provide accredited certificates.

4. Qualify for the licenses granted to the entities and companies providing the e-learning programmes.

5. Supervise the national programme of open educational content.

6. Conduct research and studies in the field of e-learning.

7. Provide consultancy in the field of e-learning.

8. Organise the conferences, meetings and workshops required.

9. Positively represent the Kingdom of Saudi Arabia abroad, in the field of e-learning (The National Centre for e-Learning, 2010).

2.9 Summary

From the brief description given above of the context of education in Saudi Arabia in general, and of primary schools in particular, and including the support for ICT given by the Ministry of Education through the establishment of development projects, it is clear that the Saudi Arabian government is seeking to improve the current educational system in the Kingdom and make positive progressive changes in terms of digital learning.

Since culture and education are fundamental to the Islamic religion, and the fact that Saudi education considers religion to be crucially important, its constitution is based on the Quran and Sunnah. Therefore, it is normal to study Islamic Education at all stages of education. Furthermore, the constitution in Saudi Arabia is based on the Islamic values taught within the education sector. It is important that Islamic Educational materials are carefully designed to deliver the information and to address student's Islamic concepts in a clear and understandable way. This will then form the basis of their religious education which will then connect the students to all aspects of their lives. All of these factors may present a challenge to the introduction of new, active learning methods. This includes the Collaborative Learning that this study seeks to achieve which would enable students to enhance their academic achievement.

However, despite the serious intentions of the Ministry of Education's policy to allow primary schools to benefit from the advancement of technology, the lack of use of these new methods by teachers of Islamic Education, as mentioned above, is considered a challenge. The Ministry of Education is interested in the pursuit of better learning and the development of education; this can occur through the establishment of some of the development projects mentioned in this chapter which focus on the integration of ICT in teaching to improve the learning process of the students.

Therefore, this study is important because it helps to further develop an understanding of the use of technology so as to enable more effective use of, and support for, technology in enhancing the achievement and increasing the academic success of primary school students learning Islamic Education. This study aimed not only to support the goals of the Ministry of Education, who established these projects, but also to support teachers and students. This was achieved by observing the teachers' and students' use of technology, as well as the teachers' use of new methods when teaching Islamic Education.

The following chapter discusses Digital Mind Mapping and Collaborative Learning (CLDMM) in a both a broader but also more detailed way.

3. Chapter Three: Collaborative Learning with Digital Mind Mapping

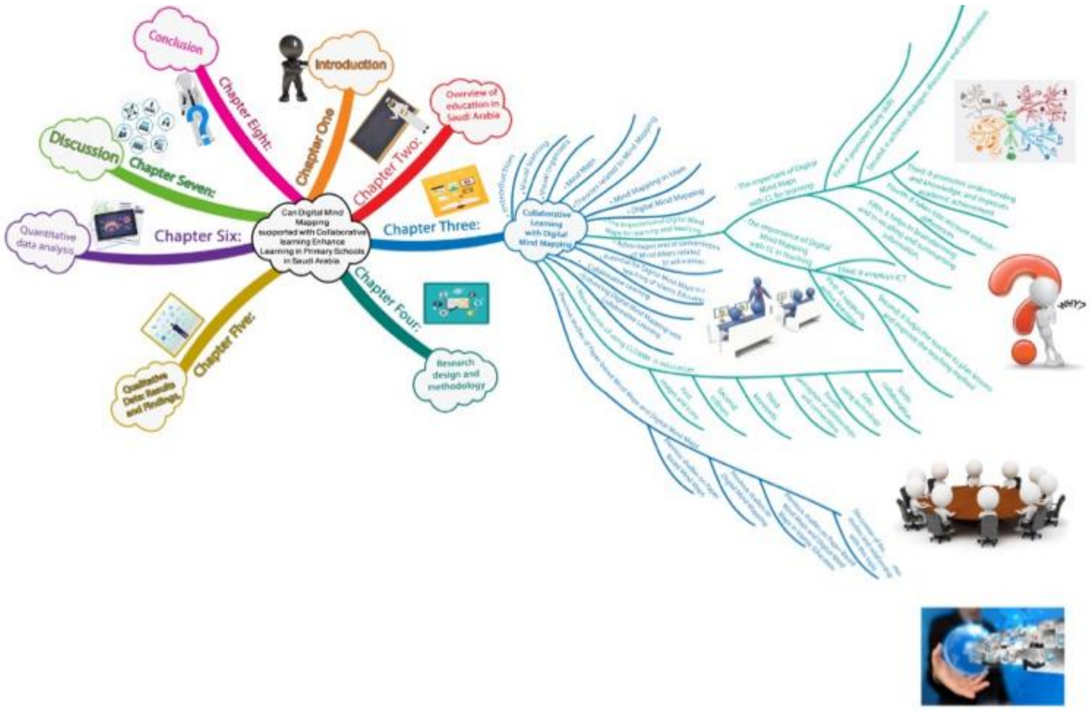

Figure 3.1 Digital Mind Map for Chapter Three

3.1 Introduction

This chapter explains the Digital Mind Mapping strategy and reviews the literature that is currently available about it, as well as providing a brief overview of visual learning and the related visual organisers. Following this, the concept of the mind map as one of these visual tools is reviewed, with the differences between mind maps and concept maps explored, before the mind map in Islam is explained. The chapter then explores, in greater detail, Digital Mind Mapping and its meaning according to this study, as a main focus of this research, and the learning theories that support it. A background on Collaborative Learning (CL) and how it relates to the Digital Mind Maps (DMM) is then presented, and this is illustrated in Figure 3.2 below. This emphasises the importance of the Digital Mind Map in teaching and learning, and it highlights the potential of using Digital Mind Maps with Collaborative Learning (CLDMM). It also discusses 21st century skills and the roles of teachers and students with technology; with an examination of characteristics of primary students' development. Finally, various studies that provide a background and context to this research are examined in detail.

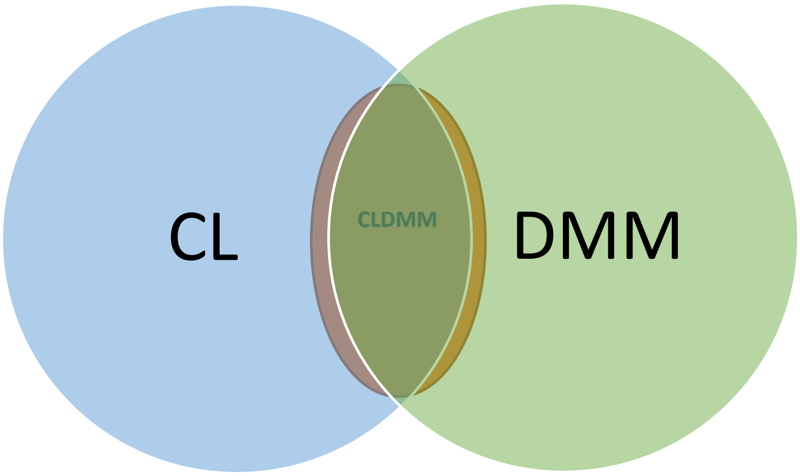

Figure 3.2 Digital Mind Map with Collaborative Learning (CLDMM)

The aim of the above diagram is to indicate the three areas that were focused on in the study, and the central region combining the features of collaborative learning and the features of digital mind mapping. This combination aims to bring deep and effective learning because the features support each other and enhance skills such as creativity, critical thinking and problem solving. The aim is also to promote dialogue and discussion among students and increase their academic achievement, which will be discussed at the end of this chapter.

In this overlapping area, students participate interactively because the digital mind map suits the needs of students through collaborative learning, which includes dialogue and discussion when creating the map by drawing, planning, researching, and making images and summaries.

The dark grey overlapping area aims to show the potential to increase the depth of meaningful learning and the potential to enhance student learning, which is the aim of this study. This will be addressed at the end of this chapter in the discussion on the use of collaborative learning with digital mind mapping; the results that emerged through this study will also be discussed in more depth. Also, this area of overlap is based on the recommendations mentioned in the introduction, in which it was proposed to use digital mind mapping with collaborative learning because of the pedagogical possibilities that this combination offers.

3.2 Visual learning

Many researchers have argued for the importance of visual images and the role of visual learning, Some, such as Laird (1985), have even claimed that the sense of sight has the greatest importance in learning - up to 75% - in terms of creating awareness and long-term retention, with learning by hearing ranked second, at about 13%, and other senses making up the other 12%. Whilst these figures may be hard to validate, they also reflect the common saying, “A picture is worth a thousand words.” Certainly, one of the benefits usually cited for using ICT is its value in presenting visual information (Wall et al., 2005) is therefore making decisions as to how visual approaches can be employed to achieve various learning outcomes.

Integrating multimedia into teaching enhances the learning process, motivates students and encourages them to learn. Trusche (2008) pointed out that multimedia helped learners to build their knowledge more accurately and effectively than if they had learned from text alone. Jiao and Chen (2011) mentioned that the utilisation of multimedia in education enables teachers to tailor the educational material in a manner that suits the learners' needs. As evidence supporting the importance of multimedia in education, Shank (2005) cited the encyclopaedias of information on the Internet, such as YouTube or TeacherTube, which provide videos with links to other relevant topics. It may be noted that Digital Mind Maps are also available online, and they include such resources as photographs, simulations, illustrations and activities. Consequently, Jiao and Chen (2011) highlighted the advantage of multimedia in providing several types of useful resources and offering a wealth of information for learners.

There are different visual forms. Visual representations are also part of the multimedia theory, which will be mentioned later; these visual representations include mind maps that promote flexible learning so that the learners can draw the map, identify the keywords, and insert pictures and audio or video clips, and this encourages the students to express their learning in several ways. This is confirmed by Sidhu and Saleem (2013), who mentioned that the mind map helped learners remember information because it was formed as images, symbols, graphs or keywords. These images and icons are a form of multimedia. Pei-Fen et al. (2001) described the mind map as an approach built into multimedia, noting that it works to create interest and encourage students. Bidarra, Guimarães and Kommers (2000) showed that mind mapping is an effective way to allow learners to control multimedia materials and improve motivation. UNESCO (2002) also pointed out that mind maps play a valuable role in helping the learners to achieve multimedia objectives.

A crucial part of using ICT is therefore making decisions as to how visual approaches can be employed to achieve various learning outcomes. In the next section, visual organisers will be examined in detail.

3.3 Visual organisers

Even though interaction with the use of a computer is considered to be a significant breakthrough in education, it is still important to note that the crucial element in its success is the practice of appropriate teaching methods. As Wolfman (2004) suggests, "Our tools affect our teaching, not only increasing our efficiency at teaching tasks but also opening up different modes of interaction with our students."

Visual or graphic organisers are one type of strategy that can be used to help students organise their knowledge in an accessible way. The terms 'visual' and 'graphic' organisers will be used interchangeably here. Kang (2004) defined visual displays as being forms of organising information and concepts by using maps, charts or diagrams, as well as being the relationship between each of these concepts. The results of one study showed how the decision-making of students, in terms of identifying the main subject, was stronger when they employed visual organisers to use and select relevant information for making a decision (Duggan and Nisbet, 2005).

Visual organisers help both teachers and students alike (Kang, 2004). They can help the teacher plan lessons through arranging concepts in a more hierarchical order. With respect to students, visual organisers help them to engage in the teaching and learning process in a more independent manner, getting them to think of ideas in a different way (ibid). As such, Hattie highlighted, "No way of school reform will be successful until we first face and resolve the engagement problem - and they note that this is not purely an educational problem, but it is a more general barometer of adolescent malaise" (2009, p. 32).

This was supported by Marzano (2007), who discovered that visual organisers provide active engagement during learning, and they are one of the most popular ways for students to represent the knowledge they acquire. Marzano also said that it is possible to impart a deeper level of understanding through drawings, and that they can be used to envision the association of different ideas with each other, such as in the relationship between steps, cause, result and hierarchy. Hattie (2009) emphasised that with visible learning, the probability is that students will reach high levels of achievement.

Marzano (2007) pointed out that graphic organisers combine a language form of representation with non-language form because they allow students to use graphics, words, phrases and symbols when representing new content, and this helps them to understand in more detail and makes it easier to remember (ibid). As such, Hattie (2009) emphasised that visual learning has strong implications for both weak learners and for high level learners in various fields.

In addition to the above, there are other reasons for using visual tools in teaching in primary schools. The first one is that presenting the material to be taught visually makes learning more permanent. Secondly, authors like Laird (1985) have argued for the importance of visual learning for creating awareness and long-term retention; he claimed that the sense of sight has a greater importance, as mentioned in above section in visual learning. To support this in more detail, Chowdhury (2015) mentioned that students learn 83% through visual learning, 57% through active learning, 71% through sensory learning and 68% through sequential learning. As mentioned above, these proportions are hard to validate, but even so, they clearly reflect the perceived importance of the visual medium in education.

This illustrates that visual approaches often provide the most effective way to clarify and achieve understanding in teaching children. Although visual tools make learning easier, they may create barriers to effective education if educators do not have full preparedness and planning in how to use visual tools. It can be said about visual tools that “A picture is worth a thousand words,” as the old saying goes.

Melor et al. (2013) indicated that most teachers had positive perceptions of the use of visual tools in teaching because these tools help students to improve their understanding and increase their focus, and this saves time in teaching. Also, Manoli and Papadopoulou (2012) emphasised that children usually respond interactively to visual aids. Visual tools, such as photos, maps, charts, and boards, are based on the sense of sight.

There are different types of visual or graphic organisers, but will look at two of them in more depth. One is the flowchart, which is a map in which different shapes are used to represent steps of a process or an algorithm, from beginning to end. Several shapes can be used to draw flowcharts, such as the square, triangle, circle or parallelogram, and they may represent different aspects of the process being represented. The advantage of using flowcharts is that they give a clear and complete picture of the steps required to resolve a particular issue in the mind of the user, and they help give access to all parts of an issue in relation to their sequencing before implementation (Data Processing Technique, 1970). The second type of visual organiser that we will examine is the tree diagram, which is a way to represent a series of events; it is particularly useful in probability calculations. The tree diagram presents results in an uncomplicated and clear manner in respect to how the parts (branches) relate to the whole (the tree). In addition to these two, there are other forms of relational diagrams such as Concept Maps and Mind Maps.

The ways of classifying visual organisers depend on structure, purpose, or educational objectives, such as Bloom’s taxonomy (Bloom, 1956). Mind Maps can serve different purposes, and they can be used to achieve the most complex skills in Bloom’s taxonomy. As will be mentioned in the Mind Map section, regarding the study by Jamail and Alsenaidi (2016), Teach Program Designing Effective Projects (TPDEP,

2012) and Office of Continuing and Distance Education (OC&DE, ND), the Mind Map strategy can support teachers' use of Bloom's taxonomy in promoting more complex thinking in the classroom.

It is useful to relate the DMM strategy to the cognitive domain of Bloom's taxonomy (Bloom et al. 1956) because Bloom's taxonomy of learning objectives is the most widely used model for describing levels of cognitive performance (Forehand, 2005). This domain is itself divided into six levels, ranging from remembering (knowledge) through understanding, application, analysis and synthesis to evaluation (Trusche, 2008). These levels are arranged hierarchically so that the trainee teacher and students should aim to work through the levels progressively. A revision to Bloom's taxonomy was published in 2001 by Anderson and colleagues (Anderson et al. 2001), but the original taxonomy is referred to here since it is still more widely used in Saudi Arabia. It is better for pupils to learn how to use one type of visual organiser very well, rather than learning how to use several different types of organisers in Islamic Education, for example. I will give an example of applying the DMM to Bloom's taxonomy, referring to the different cognitive levels:

1) Knowledge: The students first recall the information after the teacher has explained it, then collect keywords and put them on the Mind Map.
2) Understanding: The students convert this information from one form to another by forming links between words on the Mind Map and re-drafting the interpretation of this information by linking it to others.
3) Application: The students use the knowledge or principle in new situations by putting in pictures and references to the application of the information.
4) Analysis: This can be accomplished by having the students design Mind Maps in groups which divide complex information into simpler parts that were learnt in the

previous phases, such as analysing the basic elements and the relationships between keywords, by choosing the best words from their maps to put them on one big map.

5) Synthesis: This is the process of creating something new through the integration of information learned at the lower levels. It enables problem-solving through the Mind Map by designing it and presenting new ideas.
6) Evaluation: This is the highest or most complex level; it consists of judgments about the value of content based on the previous levels of learning. The students evaluate Mind Maps and justify the use of information with their colleagues, using the correct information and with their teacher through collaborative interaction and discussion.

It should be mentioned that the students' level of cognitive development should be taken into account when planning lessons. According to Noble (2004), the cognitive objectives should reach the highest level of thinking appropriate to pupils' current capability because pupils have different levels of development; nevertheless, this should not be at the expense of understanding.

One type of visual organiser that has proved to be particularly popular is Mind Mapping. The Mind Map is a way of learning and teaching that uses colour and visual representation (Novak, 2004). Because these Mind Maps are an example of visual representation, Davies (2011) argues that visual representation leads to an understanding that goes beyond words, and that it is a way of explaining complex subjects and their relationships. He asserted that colour and visual representation have educational benefits that make Mind Mapping a unique representational strategy, so students are able to create a visual image through a Mind Map that enhances their learning (Budd, 2004). The Mind Map allows students to express both linguistic and non-linguistic ideas by creating a graphical representation (Holzman, 2004). The digital

Mind Map lends itself to information visualisation, according to Card et al. (1999, p.7), who defined information visualisation as "the use of computer-supported, interactive, visual representations of abstract data to amplify cognition." According to Eppler and Burkhard (2004), information visualisation helps to exploit our innate ability to handle visual representation more effectively because it explores large amounts of abstract data to discover new insights, and it makes for easier storage of data, especially in the interaction between humans and computers. Therefore, because it has these features, a Digital Mind Map is an example of information visualisation.

In the following section, I will therefore discuss key aspects of the Mind Map as a type of visual organiser.

3.4 Mind Maps

The traditional method of representation is usually a linear presentation, such as a timeline or a storyboard, but this may prevent the learner from making deeper connections and drawing out implications which may impede creativity (Buzan and Buzan, 2006). According to Piolat et al. (2005), nonlinear styles are more effective than linear representations at promoting learning, retaining content, and linking of long-term ideas. In this respect, there are a myriad of different strategies aimed at making learning processes more effective. One of the newer tools helping teachers improve the quality of their teaching is Mind Mapping, which has also proven to be useful in creating a positive learning environment (Keleş, 2012).

A British author and educational consultant, Tony Buzan, developed the technique of Mind Mapping in the 1970s as a way to organise and remember ideas more effectively. This was confirmed in a small-scale study by Goodnough and Woods (2002), which found that a large proportion of students reported that Mind Maps enhanced their learning, increased their attention, and gave more organisation to their ideas and thinking. Buzan preferred to stay away from more traditional note-taking; he found using Mind Maps, which combine words, symbols, imaginative images and colours, to be more effective. Mind Maps, Buzan claimed, require a person to use both the right and left sides of the brain, thereby better exercising the brain and utilising its full capacity (Buzan, 2002). Buzan drew on the work of Sperry (1968), who argued that the more the left and right brain activities are combined, the more the brain performs synergistically, because each cortical skill promotes the performance of other parts of the brain in order for it to work optimally.

Various definitions of the term Mind Map have been suggested; this section will explore three of them. Buzan, the creator of this methodology, interprets Mind Mapping by saying it is “an expression of Radiant Thinking and is therefore a function of the human mind. It is a powerful graphic technique which provides a universal key to unlocking the potential of the brain” (1996, p. 59).

Picture 3.1 Brain cells

He argues that a Mind Map resembles the way in which the human brain functions (as shown in Illustration in Picture 1.3 above) and that as such, it requires learners to involve more of their brain capacities due to its neural network connections.

From another perspective, Rifai (2009) pointed out that Mind Mapping is a means of studying that can link information from books and articles by using drawings and words to map data, and it can even represent the contents of an entire chapter - in summary form - on one sheet of paper. Margulies and Maal (2004) argued that Mind Mapping functions as planning for the mind, rendering it able to generate and organise ideas and communicate them to others. Thus, this suggests there is much to be gained from Mind Mapping, since it helps not only in promoting and arranging concepts but also in gaining the ability to effectively summarise ideas presented by others in conversations, presentations, and meetings.

Gomez (2014) pointed out that "the brain does not naturally work linearly or by simply remembering lists of words to acquire vocabulary." Moreover, he wrote, "Teachers at every level are aware of how important it is to facilitate the meaning of words using contextual information" (p. 72–73).

Adodo (2013) found, in his study, that using the mind map as a self-regulation strategy helped students to connect ideas and improve their performance in science and technology and encouraged them to think creatively. Therefore, there is a potentially beneficial relationship between digital mind mapping and self-regulation, where the mind map can organise information in a way that simulates the mind as the learner is developing the representation of the information. This is consistent with Schunk and Zimmerman's (2007) finding that what raises the academic achievement of students is self-regulation in relation to structured tasks. In terms of the collaborative approach to learning, Järvelä and Järvenoja (2011) showed that socially structured self-regulation appears when students work in collaborative groups to arrange their learning and engagement. The social structure supports group regulation, which in turn supports student's own self-regulation.

In addition, Jones et al. (2012) show how students can use the mind map as a metacognitive tool to relate topics to each other meaningfully. In this regard, the mind map promotes and develops some of the higher cognitive skills in the Bloom Taxonomy by making students analyse and create links between the previous and new information (Jamil & Alsenaidi, 2016). This underlines what the Teach Program Designing Effective Projects (TPDEP) (2012) stated: that there is a relationship between Bloom's Taxonomy and the understanding of metacognitive knowledge.

In relation to the higher levels of Bloom's Taxonomy, encouraging dialogue among students in the classroom reinforces these higher or more complex levels of thinking (Wegerif, 2007). This dialogue is animated by creating digital mind maps in collaborative learning groups. This was confirmed in a study by Mani (2011), who found that the use of digital mind mapping showed better results than with paper mind mapping, especially when it was implemented in cooperation with the activities of the classroom, which include group discussion through brainstorming.

Furthermore, discussing how effective the mind map is in improving learning for ESL / EFL students (English as a second or foreign language), he demonstrated that mind mapping is a good technique for creative thinking and information preservation for better learning as a second language.

Moreover, as it is also considered as a metacognitive tool, the Mind Map is an example of how to support the more complex cognitive levels of Bloom's taxonomy. A study by Jamail and Alsenaidi (2016) found that the Mind Map had an important impact on the development of the higher-level cognitive skills of Bloom’s Taxonomy. They showed that there was an improvement in the students’ analysis and linking between new and previous information when using the Mind Map. The analysis level, which refers to dividing complex information into simpler parts and constructing the relationships between them, had to be used in creating a Mind Map. At the lower or less complex cognitive levels of the Bloom Taxonomy, Churches (2010) concluded that students’ use of the Mind Map in their assignments would probably lead to better learning outcomes. In accordance with Teach Program Designing Effective Projects, TPDEP (2012), they emphasised that there is a relationship between Bloom's Taxonomy and understanding of metacognitive knowledge. Gomez (2014) argued that what helps stimulate billions of neurons in the brain, which connects words, surroundings and ideas, is when memory is energised and also when students use their cognitive skills, which help them to acquire vocabulary to maintain information longer. This was confirmed by Anderson (1985), who referred to “memory works by an activation, which spreads from word to associated word via these links” (as cited in Buzan, 1993 p. 80).

Since this study looks at the use of technology with the Mind Map, it can explore another definition, which is that Digital Mind Maps are a technological means, supported by software, that provides colour, images, and symbols to process information in a clear and effective way to support learning. More importantly, in the digital era, the use of Mind Mapping, together with technology in the form of Digital Mind Mapping, constitutes a way of utilising the benefits of Mind Maps in a new format in order to provide students with an effective way to engage with and process information. The foregoing clearly implies a plethora of uses of Digital Mind Maps in the field of education, and this point can be also seen in Jusoh and Jusoff’s (2009) understanding of Mind Mapping, which emphasised it as a way of note-taking for our thoughts. Also, Mind Maps let teachers know how to give feedback to their pupils because the maps reveal their mind structures, which teachers can help them to develop (Tee et al. 2014). Therefore, Mind Maps are a way to illustrate points and link them together, which is a crucial ability for any student. On the other hand, this may not always be the case because a Mind Maps is a personal representation, which may not always be understood by others as the creator would like it to be portrayed. One of the challenges, therefore, is being clear about how Mind Maps can best be used in relation to specific educational goals.

Although the abovementioned definitions of Mind Mapping clearly demonstrate its potential as an effective tool to be used in learning processes, it is important to also acknowledge the practical framework in which the concept of Mind Mapping is positioned. Doing this will assist in a deeper understanding of the way in which Mind Mapping can help students.

Buzan (1974) and Buzan and Buzan (2000) recommended techniques for creating a Mind Map, stressing the importance of using line thicknesses, colours, pictures and diagrams to aid knowledge recollection. The techniques include the following:

- Starting from the middle of a blank page
- Using images or forms, which help to express a central idea
- Employing a variety of colours
- Connecting main branches with a central image, and also linking between the secondary branches
- Making lines of branches in a ‘zigzag’ manner as opposed to making the lines straight

- Using a single keyword in each line. See the following example (Figure 3.3) of a paper-based Mind Map.

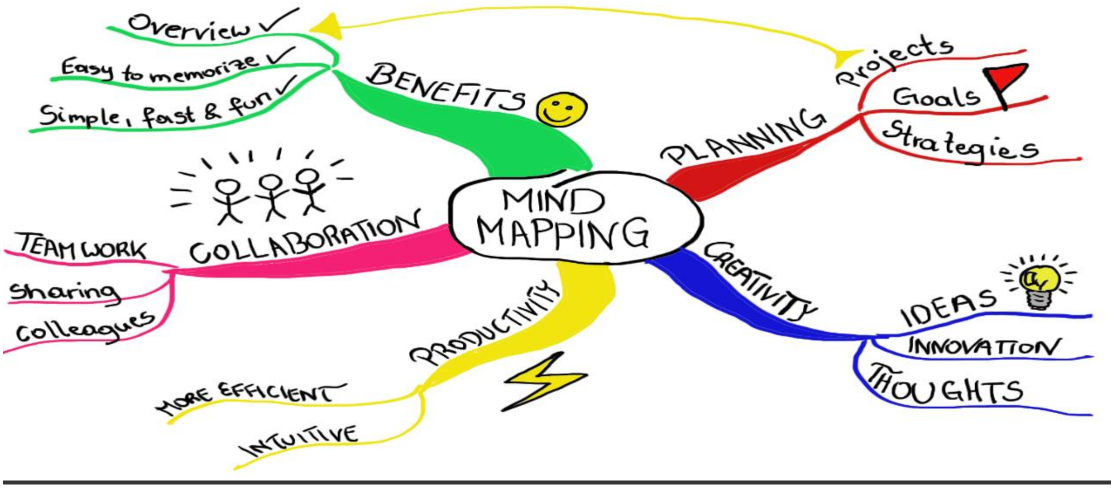

Figure 3.3 Example for a paper-based Mind Map

7. Utilising images when drawing branches. See the following example (Figure, 3.4) of Digital Mind Map according to the above steps.

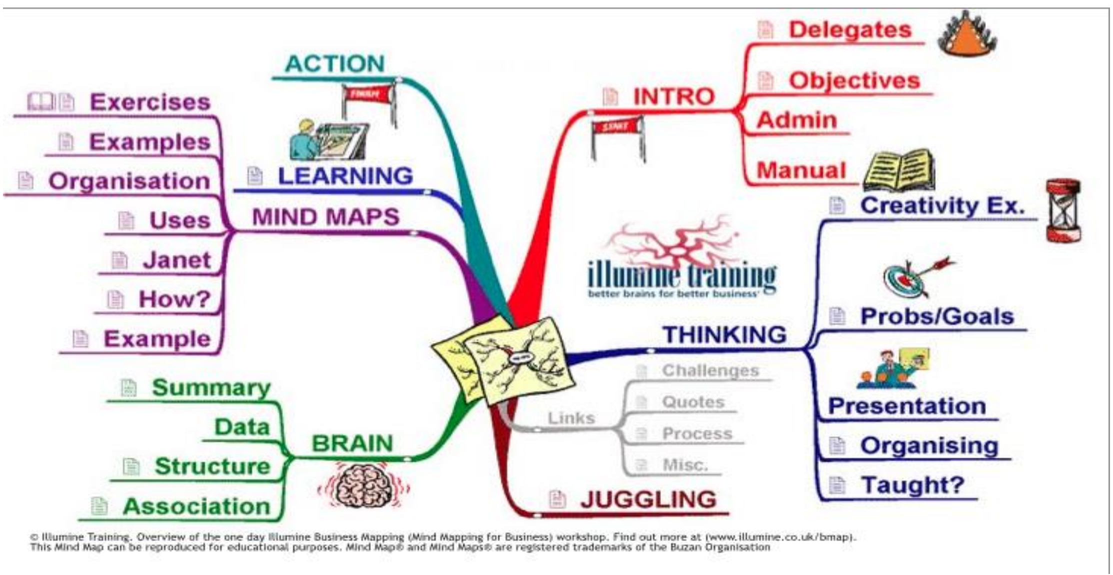

Figure 3.4 Example for Digital

There are different kinds of learning maps, including Concept Maps, Mind Maps, argument mapping, conceptual diagrams, and visual metaphors. However, it may be concluded that a range of mapping structures have been developed, of which Concept Maps and Mind Maps are the most widely used and most widely researched in the field of education. This section looks at their research background in more detail.

Concept Maps were first developed in the early 1970s by Joseph Novak at Cornell University, where he and his team wanted to understand changes in children's knowledge about Science (Novak & Musonda, 1991). This approach drew on the learning psychology of David Ausubel (Ausubel, 1963, 1968; Ausubel, Novak, & Hanesian, 1978), whose key principle was that learning takes place through the assimilation of new concepts and propositions into the learner's existing conceptual and propositional frameworks, drawing on constructivist theory and the work of Jean Piaget in particular. A Concept Map is a visual representation that shows explicit relationships among concepts (expressed verbally) using linking words and propositions among concepts, with the ideas arranged in a hierarchical or relational form. According to Chularut and DeBacker (2004), the Concept Map is a representation of the reciprocal relationship between concepts and is integrated in a hierarchical way. Some of the notable researchers encouraging their use are Plotnick (1977), Taliaferro (1998), Treviño (2005), Makarimi (2006), Buzan (2000), Novak and Cañas (2008) and Novak (1990). A Concept Map can also be a planning tool that displays a set of concepts with linked relationships between concepts listed as hierarchical relationships (Eppler, 2006), so students focus only on the definition of the concept, and they learn the links of these concepts with other concepts (Akinoglu, & Yasar, 2007). It can be said that the main distinction between Mind Mapping and Concept Mapping techniques lies in the ways they are read. Concept Maps are read hierarchically, from the central idea to other related ideas, with the relationships defined by linking terms; Mind Maps, on the other hand, are less structured and more informal (Davies, 2011). Mind Maps have been designed to be similar to the neural pathways inside the human mind (Buzan and Buzan 2000). This, combined with their more informal structuring, may make Mind Maps more easily accessible to the beginner as compared with Concept Maps, which may take more time to learn how to use because they represent propositional relationships. Concepts Maps, however, show information in a way that can be clearly read and interpreted by others, while a Mind Map is often more idiosyncratic and this more difficult for others to understand. However, the Mind Map makes learning more effective by linking a concept to other concepts by placing symbols and images, which makes it easier to remember the information, and they are more flexible in the way learners can use them (Akinoglu & Yasar, 2007).

Indrayani (2014) noted that the technique of mind mapping may serve as an alternative method for students to reach academic success. Correspondingly, it is an interesting alternative technique which may explore other aspects from this study and what it will provide in improving academic achievement. So, a study by Papushina et al. (2017), realised that although mind maps are both a method and an instructional approach, there is a lack of research examining the real use of the mind map by students in their education. In this respect, the following section provides more information about some of the educational theories related to Mind Mapping.

3.4.1 Theories related to Mind Mapping

Mind Mapping is grounded in a number of theories of learning, and one key theory is constructivist learning theory. Students design of a Mind Map depending on previous knowledge and ideas, storing within them ideas from what they are learning.

Constructivist theory holds that learners build their learning on previous experience (Fosnot & Perry, 2005). Hence, it can be supposed that there may be different and varied interpretations of the same information by learners (Marante, 2012). Constructivist researchers mention that learners build their own knowledge and the methods of obtaining and applying it.

This is also related to Ausubel's theory emphasising that learning must be meaningful. He claimed that all educational materials have an organisational structure characterised by other representation (Ausubel, 1962); consequently, Mind Mapping can have a valuable impact on the learning process (Ausubel and Robinson 1969; Novak, 1981). Mind Maps work in the same way as meaningful learning because, as Ruffini (2008) asserted, they provide the learner with a strong visual image that represents connections within complex information and highlights links between previous and new information which the learners themselves take responsibility for.

One source of self-regulation in constructivist accounts is Gestalt theory, a contemporary cognitive theory (Schunk, (2012). In Gestalt theory, knowledge is built by linking it to other knowledge to form a complete picture in which the whole is greater than the sum of its parts (Hamlyn, 2017). Zimmerman (1990) argued that it is important to make clear that self-regulation is a self-directed process that happens through learners transforming their mental abilities into skills related to academic skills. This emphasises the relationship between self-regulation and the Mind Map, since the Mind Map can organise information in a way that simulates the mind as the learner develops the representation of information. Opara (2010) confirmed the effectiveness of the Mind Map as self-regulation in improving student achievement in Chemistry. The research design was in the form of a pre-test/post-test quasi-experimental group design with 320 students (150 girls and 170 boys). She found that students' achievement in applying the concept of atomic mass was enhanced by using mind maps to support the students' regulation of their own understanding. In addition, Adodo (2013) found that using Mind Mapping as a self-regulation strategy helped students connect ideas, think creatively, and improve their performance. This study investigated the effect of mind-mapping as a self-regulated learning strategy concerning students' achievement in science and technology. The research was a quasi-experimental pre-test and post-test design. It showed that mind-mapping strategy as a self-regulated learning strategy helped to improve students' performance in Science and technology while encouraging them to represent their ideas creatively but rigorously. These studies were also consistent with the idea that self-regulation can raise students' academic achievement (Schunk & Zimmerman, 2007). Regarding collaborative learning, socially constructed self-regulation was found to emerge when students worked in collaborative learning groups to organise their engagement and learning (Järvelä & Järvenoja 2011).

Thirdly, in Gestalt theory (Smith, 1988), the general idea serves as a starting point before looking at the details. Also, according to Clark & Dabbagh (1999), Gestalt theory makes it possible to assist in understanding a topic by giving meaning, order and perception of the information by linking the new information with previously held information. In this way, Gestalt theory fits in with the Digital Mind Map strategy because the latter gives the student a complete picture of a subject in a coherent and meaningful way. It is also the case that Gestalt theory is related to visual perception; as Albers (2012) said, one of its principles is that the whole picture is more than its constituent parts. In the field of technological communications, Clark and Dabbagh (1999) stressed that Gestalt theory helps to explain the understanding of visual messages between people. Gestalt theory is also in line with the innate inclination of the mind; Albers (2012) said that the mind tends to find the easiest solution to any optical problem by simplifying it to make it more understandable by forming a set of elements that are related in a common image.

Fourthly, as mentioned at the beginning of this chapter, multimedia learning is one of the ways to support meaningful learning. One of the principles of multimedia-learning theory is that learners can learn more deeply when a word is combined with a picture, rather than having a word alone (Mayer, 2009), although Wyld, Zizka and Nagamalai (2012) mentioned that adding the word to the picture is not necessarily an effective way of achieving multimedia learning because the purpose is "to develop instructional media in the light of how the human mind works." This is the key principle in the cognitive theory of multimedia learning for Mayer (Wyld & Zizka, and Nagamalai 2012, p.309). Mayer and other cognitive researchers argue that multimedia learning supports the way of learning of the human brain (Mayer 2005a), due to their interpretation of working memory theory and the relationship between visual and auditory memory. Based on the above, it is possible to speculate on how the Digital Mind Map might simulate aspects of how the brain works. This is supported by Meyer's other contention that instructional media works by enabling the learner to construct mental representations from these images and words (Mayer, 2005b). One form of these mental representations could be Digital Mind Maps. Mayer (2009) stressed that meaningful learning is evident in the ability of the learner to apply what was presented to new cases. The flexibility of digital representation and how it can be updated could represent new cases, for example.

Finally, the revised version of Bloom's Taxonomy can also help explain how the Mind Map acts as a metacognitive tool. In Anderson and Krathwohl's (2001) reorganisation of the original Bloom Taxonomy, the term Metacognitive Knowledge was added to the previous categories of knowledge (Factual, Conceptual, and Procedural Knowledge) to become four main categories instead of three. It is understood that students can create a visual image through a Mind Map that can enhance learning (Budd, 2004). Students can use the Mind Map as a metacognitive tool to relate subjects to each other meaningfully (Jones et al., 2012).

Another idea supporting this regarding the dialogue aspects of CLDMM is that of Wegerif (2007), who argued that encouraging dialogue among students in the classroom promotes higher levels of thinking and enables students to attain the highest levels of Bloom's Taxonomy. In this way, Wegerif goes beyond Bloom and moves towards a social cultural view of learning. This demonstrates how interaction and the relationships between the students lead to an understanding and acceptance of the views of others.

Since this study focuses on the Islamic Education curriculum in primary schools in Saudi Arabia, it attempts to explore the integration between Collaborative Learning and Digital Mind Maps when used in the Islamic Education curriculum to increase pupils' learning. Now that the main aspects of Mind Mapping from an educational perspective have been presented, the following section will shed more light on the historical role of Mind Mapping in Islam.

3.4.2 Mind Mapping in Islam

Some 1400 years ago, Prophet Muhammad (peace be upon him) sometimes used illustrations to communicate an idea to his companions or to clarify the meaning of his words. Such drawings can be considered simple Mind Maps. For example, it was reported that:

The Prophet (peace be upon him) drew a square, and then in the middle he drew a line, the end of which jutted out beyond the square. Further across the middle line, he drew a number of smaller lines, and then he (peace be upon him) said, “The figure represents man, and the encircling square is the death which is encompassing him. The middle line represents his desires, and the smaller lines are vicissitudes of life. If one of those misses him, another distresses him, and if that one misses him, he falls victim to another.” (Sunan Ibn Majah, 2010, p. 276). (See Figure 3.5, below)

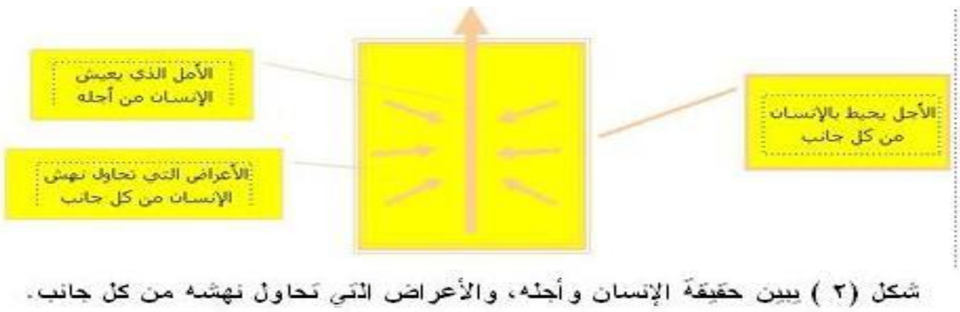

Figure 3.5 Example 1 for simple of Mind Map in Islam

Another time, it was reported: We were with the Prophet (peace be upon him), and he drew a line (in the sand), then he drew two lines to its right and two to its left. He put his hand on the middle line and said, “This is the path of Allah.” Then he recited the Quran verse: “And verily, this (i.e. Allah's Commandments) is My straight path, so follow it and follow not (other) paths, for they will separate you from His path...” (Sunan Ibn Majah, 2010, p. 277)" See Figure (3.6) below.

Figure 3.6 Example 2 for simple of Mind Map in Islam

The importance of the abovementioned Prophetic narration (Hadith) lies in highlighting the position and acceptability of Mind Maps in Islam. This can further motivate students to employ Mind Mapping in Islamic studies as a way of emulating the methods of their Prophet Mohammed, and it can prevent possible objections to the approach on the grounds of its not being an Islamic tradition.

At this point, it is necessary to analyse how Digital Mind Mapping can assist teachers and students in the field of Islamic Education. Recently, Mind Maps have been significantly improved with the use of technology, resulting in the emergence of Digital Mind Maps. Therefore, the next section will elaborate on this new phenomenon in more detail.

3.5 Digital Mind Mapping

3.5.1 Introduction

According to Peng et al. (2009), the process of learning requires multiple interactions during teaching, and these may occur between students and teachers, between students and each other, or between students and educational material. McCormick (2007) stressed that these interactions should be based on the objectives of a particular lesson, and they should take into account the possibility of achieving the goals of lessons in a given time and place. Consequently, scientific and educational technologies have been employed to devise means to assist teachers with planning and developing their lessons. One of the newer tools helping teachers to improve the quality of their teaching is Digital Mind Mapping (DMM), which has proven to be very useful in creating a positive learning environment.

Research suggests that Mind Mapping can improve learning and memory in school subjects (Adodo, 2013; Opara, 2010). There are two basic approaches to creating Mind Maps: traditional Mind Maps, which use paper and pen (paper-based Mind Map, or PMM), and Digital Mind Maps, where computer software is used to facilitate the linking of images and text in a mind map format.

3.5.2 Definition and difference between Digital Mind Mapping (DMM) and Paper Mind-Mapping (PMM)

Al-Jarf (2011) explained the meaning of mind maps supported by technology as “mind-mapping software: can be used to help in connecting spoken phonemes with written forms” (p. 4). She reported that one of the advantages of electronic mind maps is that they allow freedom for teachers to see the mutual relationships between content and concepts in a nonlinear structure that is very visual, in order to be useful for their students.

Both kinds of maps have the same components and content, but the digital map can incorporate a wider range of media and can even link to websites to enrich the information related to the map’s topic.

It is important to distinguish between the advantages of the Digital Mind Map (DMM) and the Paper-based Mind Map (PMM). The general advantages and disadvantages identified in the literature are summarised in Table 3.1, which is based on Tucker et al. (2010). This section also presents studies that support these and that expound upon the differences between the two in the education arena.

Table 3.1 Advantages and disadvantages of Digital Mind Map and paper-based mind map

Kind of maps	Advantages	Disadvantages
Digital Mind Map	• Faster text input • Cleaner representation • Easy to edit • Easily rearranged • Multiple users can work at the same time • Shared easily with others	• Technical problems • Needs computer access • Digital representation may be limiting
Paper mind map	• Created any time, needing only pencil and paper • Each map is characterised by its creator	• Text input takes time • Limited size • Difficult to make edits • Limits information • Hard to collaborate • May be idiosyncratic

3.5.3 Digital Mind Mapping and Learning

The DMM, which depends on software for its design, is the key area in this research and will be examined in detail in this section. Recently, educators have been focusing increasingly on computers and their place within the education process, and as a result, we are seeing the expanded use of computers across teaching and learning processes worldwide. New methods of using computers in education and the development of its implementation in teaching methods, such as DMMs, are being recognised as a significant contribution to the achievement of many curricular, student and education goals (Sharaf al-Din, 2011).

Digital Mind Mapping is possible using a number of computer programmes, and it is an efficient way to save information so that it can be edited and developed over time. Digital Mind Maps can also contain images. These programmes are based on computer designs; one of these programmes is iMind Map, presented by Tony Buzan on his webpage http://www.tonybuzan.com/ (See Figure 3.7).

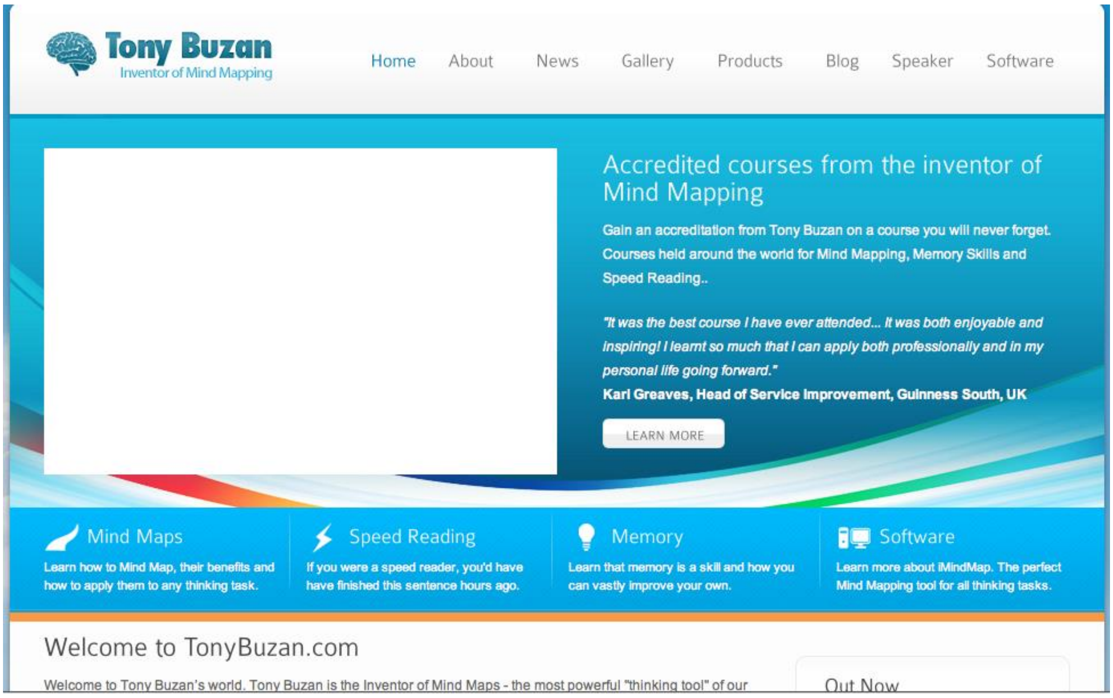

Figure 3.7 iMind Map programme by Tony Buzan

It has its own software download iMindMap: https://imindmap.com/software/ (See Figure 3.8)

Figure 3.8 iMindMap website

Coggle is an online tool that supports Collaborative Learning by drawing DMMs without having to download the programme; instead, one can simply register at https://coggle.it/. In addition, for smart devices there are FreeMind9 (http://freemind.en.softonic.com/) and MindManager (http://mindmanager.en.softonic.com/). Some of these programmes, such as SimpleMind+ and iMindMap, are free.

In recent years, the explosion of knowledge, the access to it, and the rise in the use of technology, have been important trends in education. In this regard, both scientific and educational technology have been employed to create a means of assistance for teachers in planning and developing their lessons. According to Margulies and Maal (2004), Digital Mind Maps help to transfer ideas more clearly because they can express a simple idea in images, and this feature is useful across all subjects. The introduction of technology has had considerable impact on Mind Mapping, which has been transformed into a new digital form. Nong et al. (2009) acknowledged that using computers with Mind Mapping capabilities leads to the activation of students' collaboration and the stimulation of their creativity, thus resulting in an increased flow of original ideas in the class. It may be highlighted that if students attempt to be creative, to freely express their ideas by representing their ideas in a technical way, as Digital Mind Maps work, this helps them to have interactive and active learning.

According to Nong et al. (2009), those who engage in Digital Mind Mapping can demonstrate a significant difference in terms of academic achievement as compared with those using Mind Maps drawn by hand in the traditional way.

Therefore, it should not come as a surprise that there is an increasing number of studies examining the potential benefits of using Digital Mind Maps in different domains of education. For instance, a study by Hariri (2013) showed positive results when female university students used Mind Mapping programmes to raise the level of reading comprehension while learning English as a Foreign Language (EFL). The students enjoyed using these programmes and suggested that they would also use them in the future, although they said that they needed more practice with them. However, the study also showed that there exist obstacles to this goal, mostly due to a lack of adequate technology and computers for each student (Hariri, 2013). In another study, Meier (2007) found that in the participatory work, students preferred to use Mind Maps created by hand, as they offered more flexibility and were more creative. More recent technologies have now enabled Digital Mind Maps that can also offer this option by enabling students to draw, paint or even erase by using a stylus pen on a tablet.

The results of another study show that the use of DMMs has led to better results than those achieved by using paper-based Mind Maps, especially when Digital Mind Mapping was used in collaboration with classroom activities, such as group discussion among brainstorming students (Mani, 2011).

The Digital Mind Map is a part of this digital technology, and several DMM applications are available on smart devices. In the current study, the students' collaborative work was accomplished using iPads that contained mind map applications such as iMindMap. These applications on technology devices have an impact on the educational process, and this point will be discussed in more details in the next section.

3.5.4 Using digital technology applications to support learning and teaching

This section will discuss digital technologies by using applications for learning and teaching through different devices such as tablets (iPads), smartphones and laptops, according to Puentedura's framework. It will be useful to start with the four levels of integration of teaching technology, which were suggested by Puentedura (2006); these have been dubbed the 'SAMR' framework (an acronym made up of the initial letters from the initials of each level), as shown in table (3.2).

Table 3.2 'SAMR' classification

Substitution	Replacing old tools using new technology
Augmentation	Using additional functions (this level is similar to the previous level)
Modification	Adjusting the learning method by using more effective technology, such as redesigning parts of the task
Redefining	Modelling learning and teaching by using high levels of thinking that differ from those where technology is not used

According to the classification above, Puentedura (2013) mentioned that the educational activities fall between two parts, either to be reinforcement of learning as 'substitution' and 'augmentation' work, or the transformation of learning into the 'modification' and 'redefining' classifications. Learning and technology need to be integrated so that the driving forces are pedagogy and educational theories, rather than technology, in order to develop innovative educational activities (Laurillard and Sharples, 2007). This classification is also supported by Cochrane (2014), who argued that this framework shows that adopting technology may create new experiences that may have been impossible in the past, or at least difficult to use with the state of previous technology. Through this model, it is also possible to move student learning from a low stage in integrating technology to an advanced stage.

The following studies are presented according to each of the previous four categories mentioned. In this current study, iPads were used to create Digital Mind Maps in collaborative work because in recent times, there has been a proliferation of tablet devices such as iPads and smartphones (Gartner, 2010). Globally, the sales of tablets and smartphones has exceeded personal computer sales (Bosomworth, 2015). These devices contain many applications that may be used to support the processes of learning and education; therefore, their use will lead to changes when new learning environments and technology become established, and when developers of educational programmes and academics continue to develop an understanding of personal technologies such as tablets (iPads), computers and smartphones (Woodcock et al., 2012).

In contrast, Naismith et al. (2005) noted that there is limited interest in the impact of mobile devices and their applications on the learning environment. This is perhaps because, as Cole, Field and Harris (2004) mentioned, it is necessary to try to link the material with the students' intrinsic motivation and to emphasise the importance of the materials and their application, and this can enhance educational motivation. In addition, they said if the student feels that the learning agrees with their interests and personal goals, their motivation for learning is greater with more personally satisfying goals or career aspirations.

Biggs (2003) found that students are likely to perform better if the educational materials re compatible with their interests and aspirations. It could be said that digital students are the basis of learning embedded technology. A study by Vogel et al. (2007) showed that fewer than ten percent of students buy textbooks for their courses; this means that the general use of mobile applications contributes to the improvement of learning. It is likely that adolescents will not have an interest in any class in which technology is not used, because technology is present in their daily lives (Kenney, 2011). This approach would entail substitution and perhaps augmentation.

In 2007 (Oxford Dictionaries, 2013), the concept of Bring Your Own Device was introduced, whereby institutional staff were allowed to use their own devices for business purposes. The success of this program suggests that the education system should do the same with students, and this concept now exists in schools. It is referred to by MacGibbon (2012) as the BYOD concept – a simple idea whereby students attend school with their own devices, avoiding the duplicate cost of purchasing another device and also saving learning time which would otherwise be wasted by having to navigate the use of limited school devices. This point was substantiated by Song (2014), whose study of Hong Kong, a year after adopting such a BYOD project, confirmed that students, backed up by various applications for learning. In order to create a seamless learning environment to develop their knowledge and increase their learning achievements, students provided their own mobile devices, and this helped them to advance their understanding more than they could have by accessing only what existed in their textbook. It should be mentioned that this is not yet practical in the education system in Saudi Arabia. Perhaps this falls into the categories of 'substitution' and 'augmentation' in Puentedura's (2006) framework.

The following studies refer to the rising use of smartphones and tablets. Communities Dominate Brands (2012), reported that by mid-2013, for the first time in human history, the number of mobile devices would exceed the number of people on Earth. Schnackenberg (2013) pointed out that the popularity of the tablets that emerged in 2010 was still high among members of the general public of various ages, and this was brought about by digital developments. A 2009 study showed that the United Kingdom, the Kingdom of Saudi Arabia, Australia, Norway, the United Arab Emirates, and Sweden had smartphone adoption rates of more than 50%; these smartphones were equipped with a number of applications, such as YouTube, Facebook, Twitter and Wikipedia (Qualman, 2009).

In addition, a recent study revealed that Saudi Arabia's use of smart devices has increased significantly (Guynn, 2015). Thus, the smartphone has come to function as a computer in the student's pocket, especially with its support for many programmes such as Word, PowerPoint, Skype, YouTube and other newer ones. These studies at least may present 'substitution' in Puentedura's framework.

Since these devices are smart technology, they allow educational resources to be accessed anywhere by the students using these devices. The students reported that they appreciated the teacher giving them feedback through audio applications for smartphones (Woodcock et al., 2012). This leads to teaching offering at least ‘augmentation’ and maybe ‘modification’. Educational resources, as Herrington (2009) pointed out, should provide opportunities to collect video data, pictures, or audio data to create digital stories that could be used as a curriculum resource by using smartphones. This offers at least ‘augmentation’, and perhaps ‘modification’, in Puentedura’s (2006) framework.

Zamfir (2008) says that learners who live in the digital age have more ability and experience in information processing than learners who preceded them. If their abilities are not exploited and stimulated correctly in the process of teaching and learning, they become bored with school and lose interest in gaining knowledge. According to Fasimpaur (2011), mobile devices must be used effectively and efficiently so that students can acquire learning experiences. Conole and Culver (2010) pointed out that there are no benefits gained, despite the potential of available technology, if it is still paired with traditional teaching, despite the abundance of diverse opportunities created by digital technology for learning with aspects that are innovative, effective, and proactive (Puentedura, 2006). Carlson (2002) argues that educational technology is not transformational technology which works by itself; it is necessary to help those teachers who are trying to integrate technology into the curriculum, seeking to match the learning goals of students and then use the technology in learning projects. Therefore, after teachers began to use computers in the classroom, researchers tried to assess whether the use of digital technology had a significant impact on student achievement

(Clark, 1994; Kozma, 1994; Tennyson, 1994). It may this acquire transformational learning by using high level of Puentedura's (2006) framework.

Means, Blando, Olson, Middleton, Morocco, Remz and Zorfass (1993) concluded that technology not only can measure students' achievement by completing standardised tests, but can also promote the use of higher thinking skills such as problem solving, critical thinking, analysis and drawing conclusions, These skills may entail 'modification' and probably 'redefinition'.

From the above point, it can be seen that the current study was not based merely on measuring the utility of introducing digital technology through pre-test and post-test. Besides this method, there was also collaboration in groups, discussions, critical dialogues and the use of thinking skills through the results of both the interviews and observations.

It is important to mention that McLoughlin and Lee (2008) recommended Pedagogy 2.0 as having a correlation between user-centred value and the social value of Web 2.0 technologies for education with the ability of a smartphone to facilitate student-centred social constructivist pedagogies. Such approaches would entail 'modification' and perhaps 'redefinition'.

This led the researcher to use mind mapping as a pedagogy supported with technology to create attractive and collaborative activities according to student's digital needs. This point is confirmed by Kimber et al. (2007), who argued that Digital Mind Mapping is preferred by teachers because it gives students the opportunity to work collaboratively, using the tools of electronic knowledge, to become thinkers and innovators who enhance their own learning. When student designers are encouraged to draw their mind schemas and communicate their understanding of verbal and visual linking, they are actively involved in productive, reflective and technological practises. To demonstrate this, it would be of benefit to present an example of a lesson in Islamic education according to Puentedura's (2006) framework: see Table 3.3.

Table 3.3 an example of a lesson in Islamic Education according SAMR framework

"SAMR" Classification	Example of this study
Substitution	In the teaching of jurisprudence (Fiqh) using Paper Mind Maps or any other method, students use the paper, pen and textbook to summarise the elements of the lesson. However, with the method of Digital Mind Mapping and collaborative learning, students use the collaborative devices (iPads) and summarise the main elements of the lesson in the notes using some of the Internet sites provided to them by teacher and textbook..
Augmentation	The students collaboratively use iPads to create a Digital Mind Map, start drawing the map, and write the main idea and key elements of the idea of the lesson using the program tools.
Modification	The students add images, graphics, sounds, and some links. The groups exchange their maps to learn the positive and negative aspects of each map, to share feedback and to benefit from each other in a cooperative way.
Redefinition	The students apply Digital Mind Mapping for different uses, such as organising the school schedule, using them in exams for other subjects, adding their daily tasks and travel schedules to share with their families, and using as games with friends.

The table above explains how Puentedura's (2006) framework can be applied in classrooms by integrating digital technology which can be integrated with teaching approaches through using this method. Therefore, according to the ideas of Conole and Culver (2010), the next section will highlight these effective aspects which are throwing light upon specific aspects of the use of technology in effective learning and teaching.

3.5.5 Aspects of integration of digital technology in education

The arrival of digital technology has led to major developments in various fields, with the current era best described as the digital age. It can be said that there is a close link between technology and education, and this section will endeavour to list all the uses of introducing technology into education. This will take into consideration that some studies have reported that not all cases of the introduction of technology into education have been positive.

One of the positive aspects, however, of introducing technology into education is the evidence pointing towards improved academic achievement. According to Keengwe (2018), technology is an effective tool - one that enhances student learning - and the integration of ICT in education requires that the implementable methods and tools are appropriate to the situations and problems observed in the classroom (Roblyer & Edwards and Havriluk 2004). When educating students using the available digital technology, a different environment to the traditional classroom can be established, and it requires, and pushes the limits of, the teacher's full ICT knowledge and skills (Bonifaz & Zucker, 2004). The use of digital technologies, which are unlike traditional blackboards, textbooks and TV, can have a positive impact on the methods of education (Aduwa-Ogiegbaen and Iyamu, 2005). Unlike with conventional educational methods, technology can allow students to interact much more efficiently, making classroom collaboration much easier.

Willis and Miertschin's (2006) study of visual education forms an approach to active learning. It allows attention to be given to the mapping approach, which is suggested to be a powerful learning tool that can develop critical thinking and problem-solving skills. In a study by Kulik (1994), computer-based education was found to have largely positive effects on the achievement of higher test scores, with students generally learning more quickly. Furthermore, students were found to enjoy their lessons more than they did before computers were used. Schacter (1999) stated that the effectiveness of digital technology or ICT is affected by several factors; these include, among others, the nature of the students and their access to technology.

In another study, Stevenson (1998/1999) found that the use of laptops was related to academic achievement, when developing spelling and writing skills, for example. He also showed that there was interaction with other students, with a good level of academic attainment. Students who were not participants, however, were found to have lower levels of achievement. There are other studies, by Bethel et al. (2007), for instance, finding that schools had "shown improvements in technology integration, use and profitability, in attitudes towards technology and the promise of technology for learning, and to some extent increased engagement and motivation" (p. 5).

In addition, digital technology is able to promote dialogue and emancipatory practice, which enhances the learning within the curriculum and from the teacher. This is based on the evident starting point of the student, and it depends on the knowledge they gain to help build their understanding (Cambridge Assessment International Education, 2017). Teachers are also found to prefer giving their students the opportunity to use digital technology in order to collaborate and communicate with people, outside of the school, in joint projects for exchanging their experiences (Bolstad, 2017). For example, if debating a global issue, such as that of pollution, any number of classes can share their ideas via video link. There can, therefore, be links between different schools when discussing this phenomenon, and cultural differences can be explored – particularly if the internet bandwidth is unlimited (Cambridge Assessment International Education, 2017). This is due to the way in which technology is able to support dialogue when using it with collaboration, according to Lai (2011), who confirmed that, given how collaborative learning supports the learning environment, the use of digital technology could improve the quality of educational experiences and allow it to support collaborative learning. Thus, Punie (2007) suggested that learners in collaborative learning environments can be more motivated, can be more interactive, and therefore can become better educated. Higgins et al. (2012) showed that over the past forty years, there have been approximately forty-five meta-analyses focused on the use of digital technology and the positive benefits seen. It was also found by Higgins et al. (2012) that digital technology is more effective when supported by interaction and collaboration among learners. Meanwhile, Rosé et al. (2008) found that collaborative learning invites and encourages students to learn from each other, resulting in their learning being formed into coherent knowledge. Digital technology can be an active learning tool and one that encourages knowledge, both for the structuring and sharing of data (Cambridge Assessment International Education, 2017).

The use of digital technology in primary schools is limited and is more simplistic. Reports from teachers indicate that the students' use of digital technologies focuses on a few basic activities, such as searching for information or a slide show, but otherwise is not extensive.

Despite the increasing use of computers, some teachers and researchers are sceptical about the value of educational technology in schools (Cuban, 2001). In spite of the known advantages, some teachers still rely on traditional teaching because they are afraid of making the change to technology (Peterson, 1999). Teachers may believe, in those cases, that they themselves are digital 'immigrants', while their students are digital 'natives' (Prensky, 2001), and with some teachers fearing change, they may build up a resistance to the implementation of educational technology (Fullan, 2006). In this regard, most teachers said that while the digital technology provides educational benefits for its recipients (the students), a few of them stressed that technology takes too long to implement and use when compared to the benefits gained (Bolstad, 2017).

One of the important things Higgins et al. (2012) pointed out was that the use of technology was often effective in improving learning if it was used for a short time. However, this was less so if its use was regular and repetitive, because a longer term of use typically was less effective at improving students' achievement (Higgins et al., 2012). This suggests that the teacher's choice is important in deciding when and how to use technology.

Teachers should determine whether students are aware of how to connect to the Internet and access information, because a 'digital divide' may occasionally be observed between the students in terms of their understanding of digital technology. While some of the students may know how to do this, and they use the technology effectively, others may not know how (Cambridge Assessment International Education, 2017).

In understanding the importance of digital technology, however, teachers must have absolute control and responsibility when it comes to using devices, so that they may be sure of their integrity and security when being used. This requires a positive knowledge enhancement, in order to use digital technology to meet these challenges (NetSafe, 2015). It can be understood from this point that digital technology, like other educational methods and pedagogies, may encounter some obstacles when being introduced in teaching and learning. The following section discusses more about these hindrances.

3.5.6 Hindrances to integration of ICT Usage into Teaching and Learning

After having discussed the supporting features of using CLDMM, it is important to mention some of the obstacles that may hamper the use of technology in the effort to improve the quality of education. Before continuing, it should be emphasised that the terms ‘hindrance’, ‘obstacle’, and ‘barrier’ are used interchangeably in this study. These obstacles may be extrinsic or intrinsic. Internal barriers, according to Rogers (2000), relate to the availability of equipment; technical and management support; teachers’ perceptions of technology; and their efficiency and training.

External obstacles may also include time, support, resources, and training (Ertmer, 1999). In addition, Becta (2004) found that a shortage of time is considered a barrier regarding the teacher, and a lack of effective training is considered to be a barrier regarding the school. Muir-Herzig (2004) also stressed that some of the main barriers to the use and integration of technology in schools are: the absence of reasons for using technology, limited access, lack of support, lack of training of teachers, lack of skills, and lack of time.

In light of the fact that technical problems may affect these devices, the availability of technical support is essential, according to Granger et al. (2002), who assert that full-time technical support and opportunities to train teachers in the use of ICT is as important as the availability of up-to-date equipment. It is worth mentioning that these obstacles may be general, at the level of countries, and Saudi Arabia is one of these. Other studies in Saudi Arabia have mentioned some of these obstacles; Al-Showaye (2002), for example, reported in his study that there was a shortage of technical support, lack of time, large classes, an inadequate supply of computers, and old computer facilities.

In another study, Alsenaidi (2012) found that the obstacles were a lack of sufficient devices and limited access, differences in levels of skills of students in the use of technology, as well as the large number of students in the class, which hampered the distribution of students into groups. In addition, the study of Al-Saif (2006) mentioned the lack of Arabic educational software. Finally, Al-Obaid (2002) added the weakness in English proficiency among some teachers, because some programmes with a high educational content may not be available in Arabic.

From this, it may be concluded that the existence of financial support by educational institutions, together with the efficiency of the teacher, may encourage use of ICT in teaching and learning. Training may be important for both the teacher and the student so that they can use technology easily and thereby save time and effort. The teachers' knowledge of ICT should make them effective, and there should be a re-planning of the timetable to reduce the time barrier mentioned above.

It is clear that the lack of financial resources, which is essential in support of technology, causes a lack of learning and a lack of enthusiasm. In addition, the lack of trained teachers weakens the role of technology and frustrates the educational process. It is important to recognise these obstacles that can hinder the use of technology in the educational process, as they need to be overcome before ICT can be effectively implemented.

While the presence of obstacles to digital technology may negatively affect their use, this does not diminish the importance and advantages of its use. This also does not mean that will abandon the technology due to these obstacles. Instead, it must overcome them because of the importance of technology in the learning process; accordingly, the next section will discuss the importance of Digital Mind Maps in both learning and teaching.

3.5.7 The importance of Digital Mind Maps for learning and teaching

It is worth mentioning that many studies have shown the importance of Mind Mapping in the processes of teaching and learning. Several of these have been mentioned in various parts of this study and the main points of importance of using Digital Mind Maps are summarised here.

3.5.7.1 The potential of Digital Mind Maps with Collaborative Learning for learning

First: it can promote a range of skills

The examples of these skills are creativity, critical thinking and problem solving. According to Polson (2003), the Mind Map encourages creative thinking, problem solving, blogging skills, and organising ideas. Gokhale (1995) pointed out that working in groups for learning helps students to use critical thinking, and this is more effective for the student because it accommodates external knowledge. In addition, Al-Jarf (2009) found that the Mind Mapping technique proved to be one of the tools that helps to improve the writing skills in the perception of students generation their ideas, and that their results are better than students whose learning was based solely on absorbing information from the textbook in the traditional way.

Second: it can support dialogue, discussion and collaboration

Frey (2009) contends that CLDMM helps students to accommodate complex information in its design. More studies about these skills will be mentioned in-depth in collaborative learning section.

Third: it can promote understanding and knowledge, and can improve academic achievement

Holland et al. (2003/2004) mentioned that Digital Mind Mapping has a powerful ability to improve the students' ability to visualise and organise their ideas and to improve their academic performance. The Digital Mind Map allows students to develop relationships with their thinking and give them freedom of expression.

Fourth: it can take into account individual differences

Buzan (2005) states that the Mind Map uses learning patterns, where learning patterns vary during the construction of the Mind Map.

Fifth: it can help in brainstorming and in recalling and summarising information

One reported effect of Mind Mapping is in improving the recall of information (Farrand, Hussain & Hennessey, 2002). Also, according to Holland et al. (2003/2004), it is useful in helping to organise and plan articles and projects more effectively.

3.5.7.2 The potential of Digital Mind Mapping with Collaborative Learning in teaching

First: it can support active learning

Budd (2004) stated that drawing a Mind Map involves students' active learning, and according to Chen (2010), the use of Collaborative Learning with Mind Maps is a form of active learning.

Second: it can help the teacher to plan lessons and to improve the teaching method

Boyson (2009) stated that using a Mind Map can help the teacher in planning a lesson. This boosts the confidence of the teacher in the process of teaching, and it facilitates the smooth running of lessons. It also helps teachers to use a variety of teaching methods to reach different learners (Nesbit & Adesope, 2006), in light of the advice given to teachers to operate with several strategies for learning, including cooperative learning and problem-solving discussions, to aid the critical thinking of their students (Jiao & Chen, 2011).

Third: it employs ICT

Technology can be a powerful tool when used in education (Higgins et al. 2012). The Office of Educational Technology (2017) also reported that technology is a powerful tool for transforming learning as a means to help teachers develop their teaching skills. Using ICT positions students to not be mere recipients of information, but it enables them to work cooperatively and with creativity. This is confirmed by Cox et al. (2003), who assert that ICT provides a rich Collaborative Learning environment, allowing learners to contribute their different perspectives in various problem-solving activities. The use of ICT provides opportunities for children to work together and to debate in the classroom. Wegerif (2007) confirms that classroom dialogue benefits from the use of ICT, and therefore ICT can offer students an opportunity for in-depth dialogue. It remains a valuable classroom tool, as it is often applied in the context of a face-to-face discussion.

Wegerif (2007) notes the strengths of using ICT in education as being:

- ✓ Provisionality: the ability to change texts and other outputs with minimum cost
- ✓ Interactivity: the capacity for feedback and response
- ✓ Capacity and range: the capacity to handle large amounts of information and overcome barriers of distance.
- ✓ Speed and automatic functions: enabling routine tasks to be automated
- ✓ Support for multi-modal communication. (p. 180)

Nevertheless, Wegerif (2007) commented that computer-based activities in the school tended to be non-productive either because they were poorly designed or because the programmes functioned as a distraction to the real task. But ICT should enhance communication by providing an interactive environment which works continuously to provide students with information through the different applications. In addition, there are other problems mentioned by subsequent studies, such as the one O'Mahony (2003) referred to, which is that lack of training and lack of time are obstacles that prevent the adoption of technology in teaching. Muir-Herzig (2004) also confirmed that the use of technology in schools encounters the obstacles of lack of training and slow Internet access, while Sicilia (2005) emphasised that a lack of teacher training and skills and a lack of technical support are further barriers.

The next section explains in more detail the advantages and disadvantages of Digital Mind Mapping in education.

3.5.8 Advantages and disadvantages of Mind Maps related to education

Every educational method has both advantages and disadvantages; thus, Mind Maps, too, have advantages and disadvantages. Among their advantages, Mind Mapping can be an effective and clear means of presenting the complex information contained within books, and, furthermore, it works to foster students' interest (Buzan and Buzan, 2006). In addition, Mind Maps may make the process of receiving knowledge more cooperative, resulting in more spontaneous, creative, and enjoyable lessons and presentations, both for the students and the teacher (Eppler, 2006). Consequently, this allows students a greater opportunity to take responsibility for their learning and to succeed academically, because Mind Maps relay textbook material in a manner that is clear, concise, and easy to remember. This can be especially important for students with learning difficulties, particularly when it comes to literacy (Buzan and Buzan, 2006).

There are also no restrictions on the number of ideas that can be created through Mind Mapping, so creative thinking is encouraged. According to Buzan (2005), images can substitute for a thousand words, and this helps the use of the imagination. Also, colours enhance the map and serve as a potent stimulus to creative thinking. Given the aforementioned, it can be argued that Mind Maps allow students to convey unlimited amounts of information and ideas since, as Davies (2011) asserts, Mind Maps encourage and support creative thinking and brainstorming.

In spite of its numerous benefits, Mind Mapping does have its drawbacks. The main disadvantage is the potential difficulty in understanding a map when it is read by someone other than its creator. Furthermore, the links between ideas are not always clear, or the Mind Map may be too complex (Eppler, 2006). In addition, some critics have criticised Buzan for 'restricting' the use of Mind Maps predominantly to learning and memorisation whilst neglecting other areas, such as planning and creativity, organising information for reference, and others (Roy, 2008).

In this regard, it should be emphasised that although Buzan, as the author of the concept of Mind Mapping, provided the essential structure of using Mind Maps, this does not mean that this structure cannot or should not be improved. Neither, as Almula (2011) asserts, should the use of Mind Mapping be seen as an answer to all difficulties in learning processes, as there are areas in which Mind Mapping can be replaced with a more effective educational method.

Another difficulty related to the use of Mind Mapping stems from the time required to teach students how to effectively utilise Mind Maps (Buzan & Buzan, 1996). This has also been confirmed by Erdogan (2008), who stated that Mind Mapping might require a substantial amount of time to develop sufficient skills to use them productively. Furthermore, a study by Pressley, Van Etten, Yokoi, Freebern, and Van Meter (1998) found that learners tend to learn best by focusing on the content of learning rather than on finding a specific style of note taking. In another study, Frost (2008) argued that while using Mind Maps is easier than note-taking in a linear form, the latter could be more effective at times since it represents a translation of key messages into a more durable form and, as such, linear writing is the form of note taking that is closest to the way of speaking. In this context, it can be suggested that a combination of Mind Mapping and linear writing be used, where noted down ideas are summarised through keywords that are put into a Mind Map.

On balance, the evidence to date suggests that there are enough advantages to the use on Mind Maps that they are appropriate for further research in education, but that their disadvantages also need to be taken into account when designing effective activities for learning which involve their use.

Now that the key attributes of Digital Mind Maps have been briefly outlined, the following section explains how Digital Mind Mapping can be used and supported through teaching Islamic Education materials.

3.5.9 Potential for Digital Mind Maps in the teaching of Islamic Education

Islamic Education lessons contain a number of terms and concepts which students are required to both memorise and understand. Additionally, there are a large number of conditions, obligations, and principles, all of which depend on an understanding of these concepts.

Islamic topics such as prayer, pilgrimage, and memorisation of the Quran are part of the Saudi educational curriculum, and therefore effective and efficient methods are required in order to make these easy to learn and retain. It is hoped that the use of Mind Maps will make it easier for students to memorise and remember these terms, concepts, and ideas in the form of main points and sub-points. Such a method is hoped to contribute to a more efficient use of Islamic Education materials. Mind Maps have already been used to aid in Qur'an memorisation; for example, Aldwish (2012) wrote a book to facilitate the memorisation of the longest Surah (chapter) in the Quran, which has a length of 49 pages, by using a Mind Map. His study stressed that many Surahs learned using this technique were retained for a longer time than were those learned using traditional methods, and these successful results spurred him to write another book to cover a second Surah.

Other studies have been conducted to demonstrate the impact of using technology in Islamic Educational materials at the primary level. One of these studies is by Khasawneh (2001), conducted on Year Two students. In his study of two groups, one of them used a website on the computer to study Islamic Education, and the second group used the traditional method. The results showed that those who used the website had significantly more success in learning about and memorising the topic than those who did not.

Several other studies have demonstrated the benefits of technology in learning Islamic concepts. Radwan (2001) analysed the effects of technology in the learning process and found that Year Six students gained a much better understanding of the concepts involved in the annual Hajj pilgrimage with the assistance of technology. Likewise, Mahmoud (2001), in his study of primary level students learning the Quran, found that using computers to read and listen improved the students' skills, helping them to read the Quran with more precision.

In research into multimedia and how it can be used in learning Islamic topics, Jusoh and Jusoff (2009) found that multimedia use in Islamic Education made the lesson more effective and attractive to students. Al-Naajim (2017) emphasised that using effective multimedia in Islamic teaching promoted the process of creative thinking, resulting in an improvement in the understanding of the concepts being taught. In other research, Alsenaidi (2012) studied electronic brainstorming in Islamic Education in Saudi primary schools. He found that the integration of ICT in brainstorming has the potential to improve performance in the Islamic Education curriculum.

Since the subject of my research focuses on Collaborative Leaning with the Digital Mind Mapping, it is logical to highlight in the following section the topic of Collaborative Learning.

As dialogue is an aspect of CL, it is worth mentioning that the use of collaborative learning in Islam is based on the realisation of one of the most important principles in Islam. Allah said, “And cooperate in righteousness and piety, but do not cooperate in sin and aggression.” (Al-Maidah 6:2, Holy Quran) According to Wegerif, dialogic education has historical roots, including in Islamic Education, where it is called “Halaqat al-‘Ilm” (study circles of knowledge), in which small groups sit together in the mosque or other places, in a way that encourages discussion and questioning on different subjects (Makdisi, 1990, p.210, cited by Wegerif, 2017). Indeed, this has existed throughout the history of Islam, from the era of the Prophet Muhammad up to the present day. This tradition also supports CL because the students sit in group sessions discussing topics in order to understand them better, under the guidance of the group’s leader.

Wegerif also noted that “Dialogic education is a relatively new force in educational theory and practice,” and it can open up a dialogue space in which different perspectives can be intertwined and new learning may occur (ibid).

Concerning more educational aspects of using dialogue as aspect of CLDMM, Wegerif (2007) argued that, unlike in Vygotsky's constructivist learning theory, technology might be used as a form of mediation affecting the learning environment. He emphasised that the presence of technology, with the computer as a cognitive tool, supports collaborative learning, which depends on dialogic activities (ibid). The next section explains collaborative learning itself in more detail.

3.6 Collaborative Learning

3.6.1 Introduction

Collaborative Learning is a concept which has a variety of definitions, which reflects the wide range of perceptions among scholars and which has spurred broad debate and research within education (Gokhale, 1995).

In a broad sense, Dillenbourg (1999) described Collaborative Learning as a case of two or more people trying to learn something together. Applied more narrowly within the field of education, Smith and MacGregor (1992) perceived Collaborative Learning as a teaching strategy applied to small groups of students to encourage teamwork as a way of achieving their goals, as well as to maximise learning effectiveness for both the individual and the group as a whole.

In this study, I adhere to the second definition because it offers a clearer, more comprehensive and precise definition of Collaborative Learning. In addition, this definition incorporates a number of distinctive characteristics that can be further examined. For example, Smith and MacGregor‘s definition implies that students should be aware of their individual performance in group work and that, as individuals, they should contribute to the success of the group as a whole. Moreover, creating knowledge is an essential process in education, which often requires discussion in a group. Similarly, Piaget (1977) and Littleton and Hakkinen (1999) pointed out that Collaborative Learning encourages activities related to the construction of knowledge and thinking through externalising knowledge and belief revision. Another important aspect of Collaborative Learning is its focus on work in small groups. In this regard, many studies have supported the claim that working and learning in small groups is more effective than any other methods of teaching, such as lectures or seminars (Johnson, Johnson, & Smith, 1991; Slavin, 1989-90). In small groups, students are more likely to cooperate with each other in their activities, searching for meaning or understanding of the information presented, or looking for a solution to a given task. Gokhale (1995) indicates that learning in groups helps learners to use critical thinking skills and thus absorb any outside knowledge more effectively. Johnson and Johnson (2007) also highlighted, in their definition of CL, the usefulness of learning in small groups where "students work together to maximise their own and each other's learning" (p.73).

3.6.2 Collaborative Learning stages

Brubacher et al., (1990) mentioned five stages of Collaborative Learning, described as:

1. **Engagement (or Input):** Students at this stage interact with other students regarding new information, which may be accessed in several ways, including multimedia, reading, lectures, and other sources.

2. **Exploration:** Teachers give their students the opportunity to explore the comprehensive information and ideas, scaffolding on previous experiences. Students should have the freedom to admit that they do not fully understand, to think aloud, and to make mistakes.
3. **Transformation:** At this stage, after having observed the students' learning process, the teacher has an opportunity to provide the students with additional information so that they can better understand the information.
4. **Presentation:** Students present their findings and report to other groups in their classes in a critical way.
5. **Reflection:** Students gain a deeper understanding of the content they have learned and also of the learning process itself.

It could be said that through these five stages of Collaborative Learning, the roles and efforts of both the teacher and learners are characterised by special educational achievement and objectives of learning.

For these working groups to be effective, as Johnson and Johnson (1998) discussed, that cooperative learning should consist of five key elements:

- ❖ positive interdependence among collaborative groups
- ❖ promotive interaction, which is face-to-face interaction
- ❖ individual accountability
- ❖ collaborative tasks, such as critical communication skills, effective social interaction skills, and leadership skills such as decision making and problem solving
- ❖ group processing, or the participation of students in assessing the academic goals of the group and cooperative interaction.

3.6.3 Features and limitations of Collaborative Learning

Given the number of benefits connected with applying Collaborative Learning, one might assume that it is a straightforward teaching strategy that is easy to implement. However, as has been mentioned, Collaborative Learning is not just about putting students next to each other, sitting at the same table, and leaving them to talk about a task which needs to be accomplished. Indeed, as Johnson and Johnson (2007) argued, many people might believe that they are using Collaborative Learning, but what they are doing is lacking in substance. In addition, they stressed that each student is a unique individual who differs from the others; some may believe that just by being in a group, they are making a positive contribution, but this is not necessarily the case. To demonstrate this point, Johnson and Johnson (2007) used the example of a group of students signing their names to a final report, even though it was actually written by only one of the students. It is clear that, in this case, Collaborative Learning did not occur. By way of illustration, Johnson and Johnson (2007) highlighted that, for learning to be collaborative, it must contain the very essence of CL, which is sharing of resources and information among students as efficiently and effectively as possible whilst the students provide each other with their comments. In addition, the interaction within a group develops the effectiveness of group members' contributions, so that individuals are working in a cooperative effort with one another to achieve the group's objectives. Another important feature of Collaborative Learning activities is their variety. However, these activities share one similarity, and that is the pivotal role of students. In this way, Collaborative Learning steers away from the idea of the teacher being the one who presents and explains material, replacing it with a vision of students who are encouraged to explore and apply the presented material in a creative and constructive way (Smith & MacGregor, 1992). Smith and MacGregor (1992) stressed that learners may have diverse backgrounds and different experiences, ideas, and expectations about the way teaching should be done; hence the authors suggested that “as teachers, we can no longer assume a one-size-fits-all approach.” All of these ideas appear to be incorporated in the Collaborative Learning activities, and their benefits are clear to both teachers and students.

In contrast to the traditional approach to education, Golub (1988, p.1) considered learning to be a social activity. “Collaborative Learning has as its main feature a structure that allows for student talk: students are supposed to talk with each other...and it is in this talking that much of the learning occurs.” While students are communicating, ideas are being created because of the students’ motivation to contribute something of their own individuality in the pursuit of a common goal. This helps students in understanding, and as Smith and MacGregor (1992) pointed out, “This mutual exploration leads to better understanding on the part of students, and to the creation of new understandings for all of us.” Johnson and Johnson (2007) emphasise the development of a new educational model based on CL, and it is one that may incorporate different curricula. Yet the differences in curricula and resulting number of various Collaborative Learning models do not change the main goals of CL; rather, they help teachers to structure learning groups and deliver their lessons, according to the specifics of their subject.

By and large, Collaborative Learning is rooted in Vygotsky’s (1978) constructivism, which viewed education as taking place in a learning environment that allowed learners to build concepts and knowledge through dialogue and discussion (Schifter & Simon, 1992). In this regard, Vygotsky's Zone of Proximal Development (ZPD) became a widely discussed concept relating directly to Collaborative Learning (Thadphoothon, 2002). Vygotsky defined the ZPD as "the distance between the actual development level as determined by independent problem solving and the level of potential development determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978). Moreover, Vygotsky (1978) claimed that the higher intellectual capabilities of learners are promoted in a collaborative environment. The resulting diversity of experiences included in a collaborative environment further enhances learning. Similarly, Bruner (1985) pointed out that the problem-solving skills of learners are strengthened when they are confronted with different views and interpretations on a given topic.

There is another way to describe the approach that Collaborative Learning takes towards teaching and learning, along with the benefits this approach offers. This is based on comparing Collaborative Learning with other significant educational models, namely the individualistic and competitive models. Kelley and Thibaut (1978) defined Individualistic Learning as a way of learning that focuses on the individuality of students and emphasises the quality of their own work, regardless of the performance of other participants. This might indicate that the foremost concern of this way of learning is achieving the student's own interests, without any substantial regard for his peers. In the case of Competitive Learning, individuals realise that accomplishing their specific goals depends on the failure of others (Beatty & Nunan, 2004). However, to make this matter slightly more complicated, Johnson and Johnson (2007) argue that most children believe that school is a competitive environment in any case, so the pattern that often occurs is a combination of collaboration within a group and competition between different groups. Deutsch (1949), on the contrary, suggested that there were cases of pure collaboration and competition. The way to understand this better is to consider cooperative elements as being a subset of Collaborative Learning (Cuseo, 1992). In other words, cooperation means that the student cannot achieve his goal alone, and the success of the group means success for all members of the group. The competitive element can be found in Deutsch's (1949) understanding of cooperative learning, whereby a student is motivated to achieve a better result for his own group.

Collaborative Learning excels in creating a learning environment that can incorporate and 'cater' for students on different levels of academic performance. As several studies (Stevens & Slavin, 1995; Slavin, 1982; Webb, 1982) have demonstrated, Collaborative Learning encourages students of various capabilities to achieve the highest academic levels. Stevens and Slavin (1995) and Webb (1982) ascribed this "get the most out of students" effect to the two elements of a collaborative environment. The first element is based on pursuit of a common goal within the group, and this encourages all members to contribute their best. The second element revolves around individual members of a group feeling personally responsible for the success of their group, thereby using their best abilities to deliver success for the group. Therefore, it seems that the success of Collaborative Learning depends on the implementation of the two aforementioned elements: first, the presence of a common goal; and second, the feeling of individual responsibility.

One should not lose sight of the limitations of CL. One of the challenges, mentioned by Randall (1999), is that it places a great burden on students by making them responsible not only for their own learning but also for that of the other students in the group, particularly if they are graded on what the other students learn or how they perform.

There is also the problem of the difference of personalities (Johnson & Johnson, 1994), where the dominant position of self-confident students may be accompanied by a lack of participation by other members of the team. In addition, according to Király et al. (2003), while the weaker students often benefit from the more advanced students, it is rare for more advanced students to benefit from lower level students.

Also, a burden is placed on the teacher to improve the management of CL by trying to participate in giving important information in dialogue with all group members, because the discussion may deviate from the goal of the lesson. Klimkowski (2006) believes that inappropriate teamwork may be caused by difficulties in coordinating the project with the educational outcomes and therefore in achieving the desired goals. CL therefore may need more control from the teacher or more support in developing collaborative skills in students (Mercer, Wegerif & Dawes, 1999). In addition, Bruffee (1993), who supports and recommends Collaborative Learning, explain the meaning of 'knowledge' as what people build by discussing among themselves and reaching a point of agreement.

This section has presented the main features of Collaborative Learning and its potential benefits within the educational system, as well as its limitations. For the purpose of this study, the most important benefits are CL's focus on group work and its high level of interactivity as a natural part of collaboration. These two areas are the ones where the other subject of this study's observation, the Digital Mind Map, may be applied very effectively. It is worth noting that the prevailing method of learning in Saudi Arabia leans towards individualism, with teachers talking to the whole class but pupils usually working on their own. In contrast, a section below intends to present a model for applying Collaborative Learning, particularly the principles of interaction and discussion, in conjunction with DMM. Digital Mind Mapping, when combined with Collaborative Learning, has the potential to have a beneficial effect on student achievement. It would argue that a combination of Collaborative Learning and technology may enhance a number of areas of a student's learning process. The next section will explore the theoretical background behind the use of the Digital Mind Map (Digital) with Collaborative Learning (CL) to become CLDigital in teaching and learning processes.

3.7 Enhancing Digital Mind Mapping with Collaborative Learning

3.7.1 Introduction

It should be emphasised that Digital Mind Maps are a suitable tool for fostering Collaborative Learning. Therefore, it is the aim of this section to demonstrate how CL, specifically its aspects of interaction and discussion, can be effectively utilised together with Digital Mind Maps - and this is the research area of this study. (See Figure, 3.9).

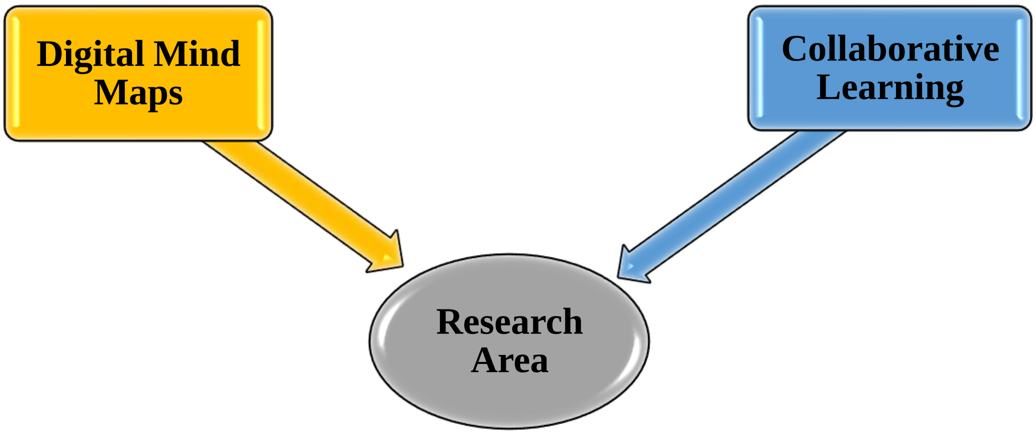

Figure 3.9 Research area

At the beginning, it may be noted that Bandura's (1969) Social Learning Theory emphasises that people can learn new behaviours through reward or punishment or by observing the society around them. If they achieve a positive result with a certain type of behaviour, or if they observe a positive reaction to the behaviour of others, they are likely to imitate, emulate, and adopt this behaviour. Pilkington et al. (2000) suggest that through collaborative activities students are able to improve their 'acquisition' skills. The foregoing implies that human nature inclines towards the company of others, and often the best way to achieve one's objectives is to cooperate with others whilst saving considerable time and effort. It can be said that, whenever children work in groups, they experience an increased level of interaction and collaboration, and this has a positive effect on their academic performance.

Nagasundaram and Bostrom (1995) identified many studies which found that collaboration while using the computer produces a large quantity and high quality of ideas, and that these ideas will not be lost because they will be recorded due to the limitation of the "production blocking". All group members can interact at the same time on computers. Higgins (2003) confirmed that using ICT can be effective in developing students' performance and also in improving teaching effectiveness.

Essentially, the combination of Collaborative Learning and Mind Mapping is believed to have a considerable positive influence on the level of students' performance. This influence is facilitated, according to Budd (2004), who concluded that Mind Mapping in a small group fosters Collaborative Learning activities and helps students in deeper analysis of the topic. In another study, Yan and Wang (2007) found that Mind Mapping is an effective tool to use with Collaborative Learning. Pattanasettakul (2008) mentioned that, from proven experience with primary year four in Social Studies and History, they gain better knowledge and improve their learning after using a Mind Map with Collaborative Learning (CLMM).

Given the aforementioned, it is apparent that a combination of Collaborative Learning and Mind Mapping in this study should be enhanced when Mind Mapping is used with ICT to become Digital Mind Mapping, which may improve all areas of a student's learning process. Thus, it is likely that the benefits of technology are further enhanced when Collaborative Learning is applied. It can be said that the use of ICT provides opportunities for children to work together and debate in the classroom. As previously mentioned, Wegerif (2007) emphasised that ICT can offer students an opportunity for in-depth dialogue.

Wegerif and Scrimshaw (1997) pointed out that in schools, the computer is in an educational environment and is typically used to support collaboration and enhance interaction among students. In other words, Wegerif, Littleton and Jones, (2003), see ICT's contribution as a way to support excellence in learning and collaborative thinking.

Next, I will explain how using CLDMM can achieve effective academic learning. This effectiveness is facilitated, according to Chen (2010), by enabling students to use Digital Mind Maps and Collaborative Learning as a type of active learning that provides both students and educators with an effective means of communication whilst fostering students' ability to think critically. To compare the performance of students when using Digital Mind Maps individually or collaboratively, one can look at the study done by Kwon and Cifuentes (2009). The authors found that students who learn individually created Concept Maps of lower order learning than those created by students who learn collaboratively, whilst the latter's maps displayed deeper conceptual understanding. In addition, Ralston and Cook (2007) mentioned that using Digital Mind Mapping software with children placed in groups played an important role in enhancing purposeful conversation and displaying the children's ideas. Moreover, when Digital Mind Mapping is applied with the principles of CL, a new learning environment is created, described by Peng et al. (2009) as a "collaborative visual learning environment".

The reason why Digital Mind Maps can be an effective learning tool, particularly in combination with CL, stems to a large degree from the way the human brain functions. This was argued by Jensen (2001), who asserted that social interaction, on which Collaborative Learning is based, provides very important stimulation for the brain. Hence, if it is true that students learn better in a team, then the teacher who relies purely on teacher-centred lectures neglects an important principle according to which our brains work. To put it simply, since humans are by and large social beings, we learn and develop our brains best in a socially dynamic environment - a fact that should govern the way teachers conduct their classes. The foregoing was further confirmed by the results of a study by Mani (2011), who found that the use of Digital Mind Maps has led to better results in comparison to using Paper Mind Maps, particularly when Digital Mind Mapping was used in collaboration with classroom activities such as group discussion and brainstorming. In addition, ThinkBuzan (2014) say that a Mind Map is a good tool to collaborate with others because it allows users to develop Mind Map inputs creatively. This is supported by Zampetakis et al. (2007), who found that students prefer to work in groups to create Mind Maps and that creative thinking was improved by using communication amongst themselves.

Furthermore, Paykoc et al. (2004) mentioned that brainstorming sessions render Mind Maps more effective in promoting critical thinking, whilst providing a strong base for collaborative problem-solving by enabling students to express their ideas and suggestions in a comfortable environment.

In conclusion, using Digital Mind Maps together with collaborative activities can create environments conducive to improving educational processes. The next section will explore the main features of using CLDMM in education.

3.7.2 Main features of using Digital Mind Mapping with Collaborative Learning in education

Digital Mind Maps with Collaborative Learning (CLDMM) have several important features related to the earlier sections of this chapter in terms of visual representation and learning. See the Digital Mind Map model in Figure 3.10 below, which explains the features of DMMs.

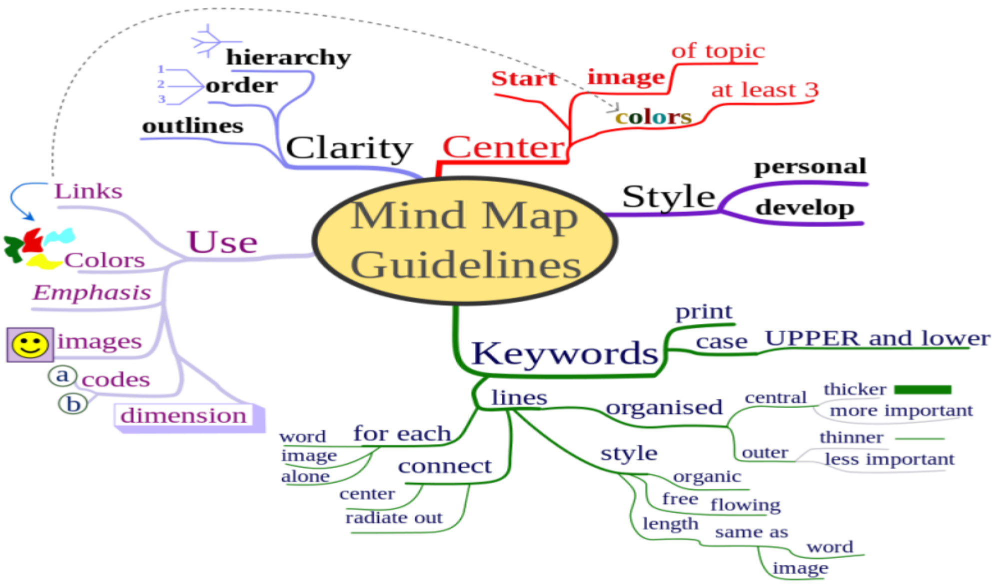

Figure 3.10 Digital Mind Map Model

First: Images and icons

Goodnough and Woods (2002) confirmed that images and symbols made Mind Mapping fun for students and motivated them to learn. Also, Novak (1998) mentioned that because the Mind Maps contain symbols and images, which draw a clear picture in one's mind, this aids memory during the summing up of information. Also, it is important to mention that images mimic the minds of children, who connect concepts to images in their minds, and that when information is only written, this destroys the children's creativity (Margulies, 1991). Therefore, students can create a visual image through a Mind Map that enhances their learning (Budd, 2004).

Second: Colours

The use of colours increases the power of the Digital Mind Maps to enhance student achievement. According to Embry, (1984), colours improve learning from 55% to 78%. Similarly, colour improves understanding by 73% (Johnson, 1992). Psychological researchers have found that colours help people to process and store images in their memory and this makes them more memorable than being in black and white (Wichmann, et al. 2002).

Third: Keywords

Another positive feature of CLDMM is that it uses keywords, leading to greater meaningfulness (Buzan, 2005). Howe (1970) stated that keywords give students more effective understanding and memorisation than writing full notes of text or summary sentences. Additionally, keywords help the mind to focus on analysing and addressing the subject (Tipper, 2008).

Fourth: Perception of relationships and connections

Building associations and linkages among bits of information supports students' learning because these relationships facilitate the learning process by connecting similar ideas to each other. For example, in a study by Brinkmann (2003), teachers reported that Mind Maps were particularly useful for students with a low level of Mathematics because the links on the Mind Map helped them distinguish between mathematical concepts. Moreover, White and Gunstone (1992) emphasised that the Mind Map promotes creative and divergent thinking because it permits links between different ideas and concepts. Lumbsdaine (1995, narrated by Chang, Hsiau and Yeh, 2001) mentioned that the Mind Map encourages divergent thinking by connecting central ideas with other ideas.

Fifth: Using technology

Use of technology can greatly improve students' achievement. In addition, it is efficient because it can store files, images, videos and websites, as well as keeping track of references and resources. Dziuban et al. (2004) pointed out that ICT enables students to express their ideas and to actively participate in classroom discussions, and this enhances social relations among the students themselves and between students and their teachers.

Many studies have been mentioned here which support the effectiveness of technology in learning and teaching, such as those of Higgins (2003), Wegerif and Littleton & Jones (2003) and Cox et al. (2003).

Sixth: Collaboration

Collaborative Learning, which helps both students and teachers to raise their level in learning and teaching, is one of the key elements in this study. Many other studies have looked at the importance of Collaborative Learning in teaching and its promotion of learning.

As mentioned previously, there are many skills provided by technology, including Digital Mind Maps as well as collaborative learning, which encompasses dialogue, collaboration and communication. All these skills are related to the 21st century skills, which require many studies such as study (Sahin, 2009; Trilling and Fadel, 2009) by including them in the learning process. In the following section, it will examine those 21st century skills, as well as the role of teachers and students in this era of technology in the educational process to enhance these skills of the following section.

3.7.3 21st century skills in CLDMM

Trilling and Fadel (2009) noted that around the world, approximately two billion mobile phones were in use at the time of their study, and that Internet access was increasing in schools and homes; these circumstances offer excellent opportunities for learning and skills development.

Some new skills are needed for the 21st century learning environment, which has been defined by The Partnership for 21st Century Skills (p.21) as “the support systems that organise the condition in which humans learn best - systems that accommodate the unique learning needs of each learner and support the positive human relationships needed for effective learning” (p.3). Consequently, such environments support educational communities that allow teachers and students alike to access 21st century skills and integrate them into their classes (The Partnership for 21st Century Skills, 2009). The Pacific Policy Research Center (2010) agreed with this definition and commented that the initiatives of the 21st century were based on emerging research on how to gain access to better learning by taking advantage of emerging technologies, such as mobile devices and Web 2.0, and by embracing the collaborative learning that has become possible through the Internet. Although many of the 21st century skills identified are similar to the skills recognised as desirable for successful learning (Higgins, 2014), the rapid increase in the use of digital technologies has provided an additional impetus to ensure that such skills are included in the curriculum.

It can be said that there are general skills acquired by the student through the teaching process; likewise, there are new and evolving skills that may be needed, based on time, need, and cognitive development. Alsenaidi (2017) mentioned that it is necessary to give the priority for the educational plans and educational programs to be a great role and an effective impact in preparing the student to suit the requirements of the digital era and to keep pace with the scientific revolution and information.

The current study seeks to exploit these skills, which may emerge when using a Digital Mind Mapping technique with the use of collaborative learning, which promotes information sharing and knowledge flow. Sahin (2009) noted that in the 21st century, students require an understanding that is more than simply knowledge of core subjects.

Students must therefore be able to “know how to use their knowledge and skills - by thinking critically, applying knowledge to new situations, analysing information, comprehending new ideas, communicating, collaborating, solving problems, and making decisions” (Sahin, 2009, p. 1465).

These skills of critical thinking, problem solving, communicating and collaborating represent three sets of skills that occupy the top of the toolbox required for learning, work and life in the 21st century (Trilling and Fadel, 2009).

For the above reasons, schools should be looking for way to attract students in the learning environment. The NCREL & Metiri Group. (2003) pointed out that educational decision makers in the 21st century must recognise that yesterday’s academic approaches are inadequate for the current technological era. Going into more depth on this topic, the next section discusses the role of both the teacher and the student, which must change according to this methodology to be able to take education to a new horizon.

Roles of teachers and students with digital technology in the 21st century

Teachers who are enthusiastic about their chosen profession, who feel the seriousness and importance of this profession, who understand how momentous their role is, and who appreciate the influence that they can have on the minds of their students, are dedicated not only to performing their work faithfully but also to developing their abilities and improving their performance so that they can transmit to students the passion they feel for the subject area (Jan, 2007).

In the field of education, the roles of teachers and students in the sphere of learning have changed a great deal due to the existence and proliferation of digital technology. McGhee and Kozma (2001) confirm that the emergence of advanced technology has brought about new responsibilities and new behaviours for both teachers and students, in order to keep up with rapid advances in technology which are evident in wider society. In reality, learning does not refer only to teachers and students; Plomp, Brummelhuis, and Rapmund (1996) describe learning as a process of interaction among four different components, namely: teachers, students, educational material, and the curriculum (including its content and objectives).

It is primarily the existence of this new technology that leads Amin (2016) to argue that the role of educators in the 21st century is more complex than it was in previous times. Teachers will be expected to be competent in using technology; in addition to performing traditional teaching tasks, they will be responsible for creating and maintaining a student-centred environment that allows for dynamic learning. This increases the complexity of the choices they can make about how best to teach and engage their students. Means and Olson (1997) point out that there is a link between the changes in teaching methods and curricula, on the one hand, and new practices that depend on new technology, on the other.

This argument is supported by McGhee and Kozma (2001), who argue that technology has the potential to transform the concept of learning from a focus on rote memorisation to a process that builds knowledge by empowering students as “self-learners” who can access information themselves and utilise tools, such as search engines and other software, that support problem solving, collaboration, and knowledge creation. They describe the teacher as an “instructional designer” who engages in planning in order to use the technology effectively and who tries to integrate it into the classroom in a way that restructures educational roles, practices and curricula (ibid). Johannesen and Eide (2000) point out that while this new technology requires additional efforts from the teacher, such as providing more sensory stimulation, it also requires a wider variety of activities that stimulate students to increase their self-motivation. This new environment has changed the role of teachers but certainly does not render them obsolete; on the contrary, they can be more effective by employing the available technology. According to Weinberger, Fischer, and Mandl (2002), teachers have more responsibility for planning interactive and dynamic lessons because they must encourage active collaboration among learners, guiding them to find out what they want to know and providing scaffolding to build their understanding.

Shah (2014) suggests that there are many opportunities to expand the students' knowledge, as well as the teachers' information and references, by adding digital sources of learning rather than relying on teachers and textbooks. Since students can be in contact with peers at any time, from anywhere within the network, McGhee and Kozma (2001) emphasise that learners in the 21st century expect immediate access to the latest information; thus, teachers and administrators need to re-imagine the role of technology in their classrooms.

A statement that educational librarians should work for changes within the school culture to improve learning and education (Oberg, 2009) underlines the fact that teachers are responsible for developing clear links to electronic resources of integrity, bearing in mind issues such as age-appropriate content, the behaviour of adult predators, bullying and virus protection. To that end, many schools, especially at the primary level, offer lessons on the topic of e-safety, focusing on developing children's digital literacy by enabling them to think critically about which websites to trust and how to use them (Hague & Williamson, 2009).

Every school should have a policy to guide students, teachers and other staff in using online tools and gaining access to various resources and applications. Hague and Payton (2010) referred to the role of the teacher as one of a facilitator and a guide; for instance, when asking students to research information for school tasks, the teacher's role is to give children the skills to search for information by asking relevant questions and directing their efforts.

Blair (2012) states that the teacher acts as an educational catalyst who organises the educational activities, while the student in the classroom becomes the focal point, either working as a designer (such as an artist) or an explorer (such as a mathematician). He adds that teachers who provide valuable resources and change their students' way of thinking will in turn achieve strong and effective technological integration. This integration encompasses new methods of teaching, as explained in more detail by Kozma & Schank (1998), who demonstrate that technology has resulted in new activities, ways, and products, as well as augmenting a variety of teaching methods such as representation of ideas, simulation of complex systems, and communication with others, to an extent that would have been unthinkable in the past.

Papert (1993) writes, "I am convinced that the best learning takes place when the learner takes charge..." (p. 25), and, "Teachers who give so much autonomy to their students are thereby declaring their belief in a radically different theory of knowledge, one that entails far more work for them as well as for their students" (p. 63). This helps students to accept more responsibility for the knowledge they acquire from their schools; ÓMurchú (2005) explains that technology plays a central role in bringing about educational roles, practices and curricula that promote students' active and independent learning as "self-learners". Klopfer et al. (2009) describe an example in New York City where an organisation built a school called "Quest to Learn" for six- to twelve-year-olds. Its learning environments were designed based on games, and the curricula and professional development programs for teachers were designed to use digital media effectively in support of 21st century skills.

The above-mentioned discussion should be received as positive news by the teachers of Islamic education; since technology can be so beneficial to students, the teachers should strive to make the most of it. Al Khalefh and Hashem (2005) propose that it is time for the teachers to extend their traditional educational skills by renewing them and expanding their scope, incorporating new teaching techniques where they could be helpful. By employing technology effectively for routine tasks, they can also free themselves for more creative and interactive endeavours.

According to Al Harbi (2004), the 259 members of the Islamic Education Organisation agreed on the use of the Internet in Islamic education as an effective means of transmission of information, despite the existence of constraints such as teachers' lack of experience using computers as well as the lack of available electronic devices. To conclude this point, Al-Ghamdi (2003) pointed out that the teachers must transcend the role of conveyors who simply pass on the knowledge that they already possess; instead, they must become mediators, guiding students to acquire knowledge independently − and this new role will be reflected in turn by all the stakeholders involved in education. The approaches mentioned above may be required for teachers in all subject areas, but Al Khalefh, and Hashem (2005) noted that the teacher of Islamic education holds a central position in relation to all Islamic fields, covering doctrine, jurisprudence, acts of worship, moderation, ethics, and more. In the end, changing the roles and methods of teachers by adding technology will not diminish their status but will actually strengthen it, increasing their honour and dedication by providing ways to cope with change.

Digital technology skills and 21st century skills are important, as mentioned, but their inclusion in the educational process, in classrooms, and in the curriculum requires knowledge of the needs and characteristics of the students. Each age group has characteristics and needs, and anyone interested in the field of education should be familiar with these characteristics so that the technology chosen will suit these characteristics and skills and achieve excellent progress in education. The next section will examine the characteristics of the ten- to twelve-year-old group associated with the current study.

3.8 Characteristics of primary students' development

This section will address the development of primary school students in relation to the objectives of the study, which focuses on the use of technology, the features of collaborative learning, and the use of mind mapping. It can perhaps be said that the primary stage in all countries of the world is the basis of the ladder of education, and the stronger the foundation, the stronger the building. The importance of the primary stage is that it is the real beginning of the process of comprehensive development of the individual. Al-Ghamdi and Abdul Jawad, (2015) emphasises that primary learning is the foundation of the educational system, and therefore it differs from other stages of education. Moreover, Sammons et al. (1993) showed that primary schools have a greater impact than secondary schools. In addition, Bukac and Studnicka (2012, p. 3) confirmed that children in the age range between 8 and 12 years have enormous potential for learning physical skills; it is called another golden age, or phase of development. This is further supported by Durualp and Aral (2011), who noted that academic success is the focus of primary schools around the world. However, Lipsitz (1984) confirmed that primary education must also respond to the developmental needs of young adolescents.

The primary stage consists of two important phases of human growth: the mid-childhood and the late stage of childhood. Some of following studies mention the children who are sometimes called old young adolescents, who are between 10 and 15 years old. This study will apply to the late stage of childhood, the ages between 10 and 12 years.

It is important to identify the characteristics of the growth of young people in this age group in order to be able to choose what attracts them and is relevant to their personal and social skills within the educational framework. In this way, it can raise learners who have positive emotional responses, and it can prepare them for life in general. This is because, as Sylva (1994) found, the school has direct and indirect effects on the development of students; on their skills, social knowledge, feelings, and emotions; and on their academic achievement.

Consequently, the following studies examine this stage of development. According to Van der Molen and Molenaar (1994) cited in Boyd and Bee (2009, p246), there are two large spurts in brain development in children: once in mid-childhood between the ages of 6 and 8 years, and again in late childhood between the ages of 10 and 12 years.

Also, they describe brain growth between the ages of 10 and 12 years as having a significant effect on the frontal lobes in charge of planning and logic, which are called cognitive or operational functions. Based on this, in the current research, the child is able to plan, encode, and convert the information to be saved into symbols and words for easy preservation. This was also asserted by Manning (2002), who noted that often young adolescents attempt to acquire and develop logical processes, test hypotheses, collect data, and analyse and deconstruct complex concepts. It is important that teachers take into consideration the work of their students' brains by helping them to focus on their learning in different areas, to relate these contexts with their understanding, and to simulate their technological interests.

Another point that must be acknowledged is the importance of using teaching methods that are based on active participation and are also compatible with the use of smart devices, as this study uses digital devices. As Higgins (2018) argued, the nature of knowledge for the next generation of learners has changed with the emergence of new digital data and technological tools. Also, Verenikina et al. (2016) pointed out the increasing availability of devices that support educational or recreational applications aimed at children. These devices have games for children that attract their attention, and this is possible because of the widespread access to digital tablet technology. The use of such devices as playthings with games is, according to Vygotsky (1978), important because playing is a major contributor to children's social, cognitive, and emotional development, so this act of playing helps them reach their developmental potential.

There are two recent studies which have shown the increase in the number of children using digital technology. Kardefelt-Winther (2017) found it noteworthy that around the world, children's interaction with digital technology was increasing. One out of every three Internet users is a child or teenager under 18 years of age (UNICEF, 2017).

This is also related to their learning. UNICEF (2017) reported on a 2017 study called The State of the World's Children, which was conducted on children aged between 11 and 12 years in Nairobi's Mathare slum. It was reported that the children had a greater motivation to learn and attend school, and that there was an improvement in their grades, when digital tools were integrated in their classrooms. This led the following studies to encourage students to create applications to gain more benefit. Lieberman et al. (2009) suggested that digital technology would provide enjoyable, rich, and interactive experiences that would enhance learning, build social skills, and develop cognitive ability among young children - if properly designed.

For this reason, Stålberg, Sandberg, Söderbäck, and Larsson (2016) recommended that since children spend a lot of time using these digital devices, their opinion should be considered in the design of digital products.

Moreover, at this stage, the students have an increased sense of group belonging, which gives them the ability to communicate and interact in groups, as well as the desire to discuss, participate in dialogue, and express what they are thinking.

Raphael and Burke (2012) pointed out that teachers have been reminded that processing the emotional and social needs of young people improves their learning and achievement. Students have a need for belonging and want to form relationships with peers. According to Kellough and Kellough (2008), children prefer educational activities where they interact with their peers, and they prefer active and non-negative learning experiences. They confirmed that teachers must realise the importance of relationships by supporting them with opportunities for positive interactions with peers (ibid).

Scales (2010) pointed out that teachers can design collaborative experiences and cooperative learning activities for young adolescents to foster productive interaction among peers. This may help them to build their experiences, as Piaget (1960) mentioned that young adolescents build on their understanding as learners to understand the world around them, based on their previous knowledge and individual experiences. Also, Bransford, Brown, and Cocking (2000) mentioned that in motivating learning and brain development, experience plays an important role by building meaning based on what children actually understand and believe. Additionally, because the world of children is a curious one, Higgins (2018) mentioned that "one of Lipman's basic convictions is that children are natural philosophers"; it is their nature to look at the world around them with curiosity, and this curiosity leads the teacher to encourage children to ask questions. The teacher should not control students' questions but should seek to exploit this curiosity so that they become vigorously engaged in the classroom through active learning and participation (Kellough & Kellough, 2008, p.12). Scales (2010) stated that intellectual development in young adolescents leads them to develop broad interests and curiosity. This will happen when students work in groups, as in this study when they work to create Digital Mind Maps using collaborative learning. This is reasonable because, as Sylva (1994) stated, new studies should be conducted in cooperative learning because it has the potential for raising academic achievement as well as the potential for developing social responsibility.

It can be said that if schools attempt to equip students with the appropriate kinds of skills according to their development, this will affect their enthusiasm for learning. As Mortimore et al. (1988a) emphasised, schools that are effective have an impact on attendance rates. This was confirmed by Zamfir (2008), as mentioned above, who said that in the process of teaching and learning, digital students become bored with school and lose interest in knowledge if their interests and skills are not exploited and stimulated correctly. Moreover, as in the UNICEF (2017) study mentioned above, students have to be motivated for learning. Finally, Bwayo (2014) pointed out that it must be the owners of educational decisions - teachers and parents, particularly of children in primary schools - to care about and support the development of life skills, whether cognitive skills such as critical thinking and problem-solving, or social skills such as communication or psychological skills. It is necessary to acknowledge that these new technologies, which keep pace with the needs of the students and the characteristics of their development, will contribute to education and learning with a new horizon.

After examining the Digital Mind Map and the features of technology, as well as Collaborative Learning with the Digital Mind Map, and the skills and characteristics of the relevant age group, was required to adapt some of the previous studies related to this area to know the findings and knowledge of the most important results of those studies. A plethora of studies have examined the effectiveness of both Mind Maps and Digital Mind Maps; a review of these studies is the subject of the following section.

3.9 Previous studies of Paper-based Mind Maps and Digital Mind Maps

In this section, a number of studies of Mind Maps will be introduced, some of which have been mentioned in the sections above. These fall under three categories: firstly, studies on the Paper-based Mind Map; secondly, the Digital Mind Map; and thirdly, the Paper-based Mind Map and Digital Mind Maps in the field of Islamic Education. Before this, it is important to describe the steps involved in searching the previous studies.

3.9.1 Process of searching previous studies

The difficulty of collecting previous studies in this field led to the development of the method set out below.

1. Organisational and progressive steps to review previous studies using synthesis:

Identifying sources of information for previous studies through the researcher's experience as well as the supervisor’s guidance, the researcher decided to use the following search engines:

• University of Durham Library

• Libraries of British universities

• Libraries of Saudi universities

• ERIC

• IEEE

• Google Scholar

2. Setting a time frame for the review. Arabic and English keywords were searched in the sources of information by specifying the previous ten years (from 2004 to 2015).
3. Organising studies after obtaining them. These were divided into four sections according to their themes, the assigned names and placed in a special folder.
4. Reviewing and analysing the studies. This involved making tables, containing the following elements, to summarise the studies:

- Researcher’s name and research year
- Research title
- Problem of study
- Study questions
- Study methodology
- Tools used
- Study sample
- Study axes
- Theories or models used
- Highlights
- Link of study
- Documentation of APA study

The studies in these tables were divided into educational and other studies in the various specialised fields. Each one was placed in sections by the year of the study, so that each chapter contained the studies that took place in the mentioned year.

The second stage of analysis involved synthesising the information in tabular form, based on:

- the title of the search
- the problem of the study
- the study questions
- the study methodology and approach, tools used, sample and place of the study
- the themes of the study
- the most important results accompanied by the name of research and the year.

Next, these tables were classified according to the medium used, so that the studies could be distinguished between paper mind maps and Digital Mind Maps, collaborative learning studies, Islamic studies, and studies which combined two or more of these. For each study, the country in which it was carried out was also recorded.

The final stage of the analysis focused on the theoretical framework of the studies, the methodological framework (kind of methodology, data collection tools, place of the study, population and sample type). Finally, the most significant results of the previous studies were recorded according to the study focus. A final summary was then created based on identifying information relevant to the goal of this research, in the form of a narrative story which was divided into several basic elements: the title and place of study, sample, results, and methods. These studies were then discussed in relation to this study. A summary of previous studies is presented in Table 3.4.

Table 3.4 Summary of previous studies

N	Title	Date	Author	Location	Data collection	Outcomes
1	Mind Maps were applied as the learning platform.	2003	Seabrook Primary School in Australia	Australia	Mind Maps were applied as the learning platform and were studied through interviews and site visits at the school with Tony Buzan.	The study achieved great success in building students' self-confidence in their academic achievement and the ease of using paper-based Mind Maps for children with special needs results in higher learning achievement.
2	Mind Mapping in learning and teaching: pupil and teacher perspectives	2003 & 2004	Polson	Scotland	Mixed methodology (field-notes, interview and questionnaire)	The majority of students perceived the paper-based Mind Map as an interesting and enjoyable approach which stimulated their learning.
3	The use of Mind Map software to improve the academic performance of students	2003, 2004	Holland et al	UK	Administered a questionnaire at the beginning and end of a semester to two groups - Digital Media students and History of Computing students.	Using Mind Maps was beneficial for students as it helped them to improve their ability to structure information more clearly. Also, it has improved their academic performance by enabling students to plan their projects more effectively. This study confirmed the effectiveness of using Digital Mind Mapping.
4	Mind Mapping and outlining: comparing two types of graphic organizers for learning seventh-grade life science	2005	Treviño	New Mexico	Quantitative, using a post-test experimental design	Students' attitudes towards using the paper-based Mind Map were generally positive and they enjoyed its application, though the outlining group achieved higher results than either the paper-based Mind Map or the control group.
5	A comparison between concept maps, mind maps, conceptual diagrams, and visual metaphors as complementary tools for knowledge construction and sharing	2006	Eppler		Systematic comparison of the methods mentioned in the title	The main result is enhanced motivation, attention, understanding and recollection of information.
6	Impact of using the paper-based Mind Map on eighth graders in science classes	2008	Abi-El-Mona & Adb-El-Khalick		Experimental approach	Students achieved higher levels of conceptual understanding through paper-based Mind Maps
7	Using multimedia in teaching Islamic studies	2009	Jusoh & Jusoff Sabbah	Malaysia	Classroom observation	The use of Mind Maps as a multimedia tool in presentation slides for students is useful in enhancing their understanding of the topics of Islamic Education
8	To integrate Mind Map into the teaching and learning of psychology for first year students at a Teacher Training	2009	Nong et al	Vietnam	Experimental method, SPSS	There was a significant difference in academic achievement and in attitude towards learning psychology, which was based on whether the teaching and learning were Digital. The study recommended further research on Mind Maps in educational activities, while noting that the

						paper-based Mind Map results were different to those of the Digital.
9	Enhancing freshman students’ writing skills with Mind Mapping software for an English writing course	2009	Al-Jarf	Saudi Arabia	Experimental and control groups at both the pre-test and post-test stages	The group that used mind-mapping software achieved greater improvement in their writing.
10	Digital Mind Mapping: innovations for real-time collaborative thinking in USA	2011	Lin and Faste	USA	Ethnographic approach	Digital Mind Mapping facilitates collaboration and information storage and retrieval whilst enhancing brainstorming.
11	Effect of mind-mapping as a self-regulated learning strategy on students' achievement in basic science and technology	2013	Adodo	Ondo State in Nigeria	Quasi-experimental study	The use of a Mind Map can develop many skills conducive to learning such as creative problem solving, which contribute to the ‘knowledge economy. It also improves the test performance of students.
12	The effectiveness of a proposed program based on a mind mapping strategy in developing the writing achievement of eleventh grade EFL	2014	Sead and Al-Omari	Jordan	Quasi-experimental research using an achievement post-test with a questionnaire for students	There were statistically significant differences in favour of the experimental group and there is no statistically significant relationship between the mind mapping software and attitude of students for their writing.
13	The effect of mind mapping on teaching and learning: A meta-analysis. Standard Journal of Education and Essay	2014	Liu et al.		Meta-analysis of 40 studies and 5,213 participants in both experimental and quasi-experimental.	Positive effect of the mind map on teaching and learning, especially when use software become more influence
14	Increasing student mastery and achievement in Islamic Education through game techniques, memory aid 'The Link' and Mind Maps	2014	Zakaria et al.	Brunei	Questionnaires and interviews both pre-test and post-test.	Through using some strategies, including the Mind Map, it is possible to improve the students' ability to memorise, together with their overall performance, as well as the teaching and learning process in general.
15	The effect of college students’ self-generated computerised mind mapping on their reading achievement	2015	Sabbah	Qatar	Quasi-experimental pre-post-test design	The results were in favour of the experimental group and mind map software improved their level of understanding and it usefulness method.

3.9.2 Previous studies on Paper-Based Mind Maps

Treviño conducted a study in 2005 in New Mexico, entitled “Mind Mapping and outlining: comparing two types of graphic organizers for learning seventh-grade life science.” This study was quantitative, using a post-test experimental design, measuring the attitudes of students in the three designated groups (control, outlining, and Paper Mind Mapping). The result was that students' attitudes towards using the paper-based Mind Map were positive, and they enjoyed its application, although the outlining group achieved higher results than either the paper-based Mind Map or the control group. This indicated that there is no significant correlation between enjoyment of the application and the ability of the application with regard to strategies to improve learning.

In contrast, the following study, entitled "Mind Mapping in learning and teaching; pupil and teacher perspectives" (Polson 2003), examined the combination of user enjoyment when using the paper-based Mind Map, from the perspectives of students and teachers, with improved academic results amongst students. One significant advantage of this study is its use of a mixed methodology, which will also be employed in my research. It was conducted in a secondary school in Scotland employing field notes, interviews and questionnaires. The results were as follows: The majority of students perceived paper-based Mind Mapping as an interesting and enjoyable approach that stimulated their learning. Furthermore, most of the teachers enjoyed using paper-based Mind Maps and praised their ability to enhance students' motivation to engage in learning, even though there were some difficulties with integrating maps into the learning process.

The following study also made use of an experimental approach; this study was conducted by Abi-El-Mona & Abd-El-Khalick (2008) and concerned the impact of using the paper-based Mind Map on eighth graders in Science classes. It was conducted on two groups: the experimental group and the comparison group. Whilst the experimental group students relied on paper-based Mind Maps in learning, the comparison group used notes summarisation. Data analysis indicated that the students achieved higher levels of conceptual understanding through paper-based Mind Maps that they had created themselves, than they did through note summarisation.

Eppler (2006) conducted a study called “A comparison between concept maps, mind maps, conceptual diagrams, and visual metaphors as complementary tools for knowledge construction and sharing.” This study used a systematic comparison of the abovementioned methods. The main results of using a paper-based Mind Map, as well as other visualisation formats, were enhanced motivation, attention, understanding and recollection of information.

This study recommended that in future studies, students should use software to aid visual learning; the Mind Map, in particular, lent itself easily to e-learning. As a result, these programmes enable the student to edit and share their changes with classmates. Additionally, this study asserted that further research should employ an experimental design for more accurate results.

The aim of Adodo’s (2013) study was to examine the “Effect of mind-mapping as a self-regulated learning strategy on students' achievement in basic science and technology” in a junior secondary school in Ondo State in Nigeria. It was a quasi-experimental study which demonstrated the effectiveness of the use of paper-based Mind Maps in improving students’ critical thinking and creative skills, such as in creative problem solving, and also improved the test performance of students. It is widely understood that the use of a Mind Map can develop many skills conducive to the ‘knowledge economy’.

In a study on paper-based Mind Maps, conducted at the Seabrook Primary School in Australia (2003), Mind Maps were applied as the learning platform and were studied through interviews and site visits at the school with Tony Buzan. The study achieved great success in building students’ self-confidence in their academic achievement. In some cases, the use of paper-based Mind Maps for the disabled students resulted in significant improvements in learning. This study demonstrated that the ease of using paper-based Mind Maps by children with special needs results in higher learning achievement. Lastly, Liu et al. (2014) conducted a meta-analysis of 40 studies with 5,213 participants, to identify the effectiveness of mind mapping techniques and to determine how to take advantage of them in teaching and learning, by reviewing studies which were both experimental and quasi-experimental. The results of this meta-analysis revealed that there was a positive effect from the mind map on teaching and learning, especially when supported by software; the mind map was more strongly influenced.

3.9.3 Previous studies on Digital Mind Mapping

The following studies, showing the results of using Mind Maps and their analysis, are therefore key for the purpose of this study.

Firstly, a study by Holland et al. (2003, 2004) examined the use of Mind Map software to improve the academic performance of students. They administered a questionnaire at the beginning and again at the end of a semester to two groups: Digital Media students and History of Computing students. The results showed that using Mind Maps was beneficial for the students as it helped them to improve their ability to structure information more clearly. Also, Mind Maps improved their academic performance by enabling students to plan their projects more effectively. This study confirmed the effectiveness of using Digital technology. However, it should be noted that the study did not compare the two groups, hence the applicability of its results can be questioned. It must also be noted that the digital aspect was not a barrier to them because they were students in the technology department.

The aim of a study by Nong et al. (2009) was to integrate Mind Maps into the teaching and learning of psychology for first year students at a Teacher Training Institute in Vietnam. They divided the students into three groups: the experimental group (which used the Digital), control group 1 (which used the paper-based Mind Map) and control group 2 (which used the traditional method). The results showed that there was a significant difference in academic achievement and in attitude towards learning psychology according to whether the teaching and learning were based on Digital. The study recommended further research on Mind Mapping in educational activities, while noting that the paper-based Mind Map results were different from those of the Digital.

The next study was conducted in Saudi Arabia and therefore has particular relevance for the present study. Al-Jarf (2009) conducted a study called "Enhancing freshman students' writing skills with Mind Mapping software" for an English writing course. The study was performed on experimental and control groups at both the pre-test and post-test stages. The results showed that the group that used mind-mapping software achieved greater improvement in their writing. This study recommended the use of Collaborative Learning with Digital Mind Maps to construct a collaborative Digital Mind Map, which is the research area of the current study.

In addition, Sead and Al-Omari (2014) conducted a study in Jordan on students in the first year of secondary school, using a sample consisting of 91 female students, to observe the effect of the Mind Mapping software on the improvement of writing skills. The researchers used a quasi-experimental approach, using an achievement post-test for writing, sealed with a questionnaire for students to determine their views about their writing. These results indicated that there were statistically significant differences in favour of the experimental group, while finding no statistically significant relationship between the mind mapping software technique used and attitude of students about their writing, or on the general levels of student achievement.

Moreover, Sabbah (2015) carried out a study on 22 students in a community college in Qatar, to examine the effectiveness and impact of the Mind Maps on the achievement of students in the reading comprehension in English. It used a quasi-experimental pre/post-test design, with students divided into two groups: an experimental group who used mind map on computers, and a control group of students who used the whiteboard maps for eight weeks. The results were in favour of the experimental group, who use computerised mind maps. They demonstrated the usefulness and ease of use of Mind Map strategy, improving their level of understanding when using it, and expressing that it is like an interactive game.

The following study confirms the importance of the previous one, as it advocates the use of Digital Mind Maps to facilitate collaborative thinking. “DMM: innovations for real-time collaborative thinking in USA” (Lin and Faste, 2011) used an ethnographic approach; its results indicated that Digital Mind Mapping facilitates collaboration and information storage and retrieval, whilst at the same time enhancing brainstorming.

3.9.4 Previous studies on Paper-Based Mind Maps and Digital Mind Maps in Islamic Education

This section presents two studies conducted in the context of Islamic Education. The first study employed Digital Mind Maps, whereas the second used Paper-based Mind Maps.

A study by Zakaria et al. (2014), entitled “Increasing student mastery and achievement in Islamic Education through game techniques, memory aid ‘The Link’ and Mind Maps,” used questionnaires and interviews both pre-test and post-test. The results showed that by using these strategies, including the Mind Map, it was possible to improve the students’ ability to memorise, along with their overall performance, as well as the teaching and learning process in general. This study, one could argue, yielded positive results because the researcher used several strategies together instead of focusing on Digital Mind Mapping alone.

Another research study, "Using multimedia in teaching Islamic studies," showed that the use of Mind Maps as a multimedia tool in presentation slides for students was useful in enhancing their understanding of the topics of Islamic Education, thus making it an effective tool for the processes of learning and teaching (Jusoh & Jusoff, 2009). This study, similar to the previous ones, used Digital Mind Maps as one slide in the presentation, incorporating it into the multimedia element of the learning. Here, the researcher did not use alternative methods for gathering information, implementing only multimedia strategies as the main method.

3.9.5 Reflections of the previous studies and relationship with this topic

Educational technology is not a pedagogical luxury; it seeks to provide students with the skills, experience and knowledge to reach educational goals. It also includes exercises and training in order to ensure that educational content is delivered in a way that enables students to engage in the learning process, thus creating a stimulating and enjoyable educational environment. Furthermore, it seeks to increase motivation and perseverance and to avoid indoctrination. It encourages students to acquire skills such as critical thinking, creative thinking, problem solving and collaborative working, by enabling students to apply these techniques in an educational context.

These have been numerous previous educational studies on the inclusion and integration of technology in the educational process (Higgins, Xiao and Katsipataki, 2012). In addition, the Ministry of Education in Saudi Arabia has sought to establish a number of projects that promote technology in education, as mentioned in the previous chapter of this study.

Teachers use their knowledge of their students, namely what motivates them and what activities the students enjoy, to inform the way in which they implement the educational process within the classroom. It is important to mention here the role played by technology in helping teachers to decide which practices they will adopt, and Digital Mind Maps are an example of this.

According to Treviño (2005), further studies needed to be conducted on the effectiveness of Mind Maps in various sectors. He also suggested that there was a need to investigate the perspectives of students on the use of Mind Maps in different academic areas. Numerous studies have already been conducted in the areas already mentioned, investigating the effect of using Mind Maps, and particularly Digital Mind Maps, on students' achievement and on the learning process. Based on the results of these studies, it appears that the use of Mind Maps is suitable for all ages, in all sectors of education, across countries and socio-cultural settings.

However, even though studies have focused on the use of Digital Mind Maps in general, no research has been conducted specifically on the application of Digital Mind Maps in Islamic Education, as far as this researcher knows. Whilst there have been studies in Islamic Education which included Mind Maps as one of a number of different strategies, none of them focused specifically on the Paper-based Mind Map or Digital Mind Map as the main tool of their research. It is crucial to state that a meta-analysis of 40 studies, conducted by Liu et al. (2014), examined the practical effectiveness of Mind Maps using software, which led the teaching and learning to be more active.

In terms of methodology, of the fifteen previously conducted studies, the experimental method was most commonly used, while three studies also employed quasi-experimental (Adodo, 2013; Sead and Al-Omari, 2014; and Sabbah, 2015). In addition, three studies used a combination of questionnaires, interviews and observations (Zakaria et al., 2014; Polson, 2003; and Seabrook Primary School, 2003). Two studies could argue that there was no direct correlation between improvement in learning achievement by different methods and how enjoyable those methods were for the student, since the attitudes of the students were largely positive but, unfortunately, the results were not (Treviño, 2008). On the other hand, Polson's (2003) study, in which the opinions of students and teachers coincided, found that they both enjoyed the use of Mind Maps and reported higher academic performance. This result may, in part, be due to the efforts made by the researcher to ensure that the methods enriched the research and provided positive results. Another study found no significant correlation between using Mind Mapping software and the attitude of students toward their writing skills (Sead and Al-Omari, 2014).

The studies conducted by Treviño (2008) and Sead and Al-Omari (2014) made use of a quasi-experimental method, which was required to control the variables, as is the case with any scientific research. Since the researchers were dealing with human nature, they may not have been able to control all of the variables affecting the outcome of the study. Given the findings of the above-mentioned studies, it is clear the strategies based on using Mind Maps to facilitate academic achievement and the learning process can be effective. Nevertheless, it can also be said that there is a lack of research on Digital Mind Mapping in general, and in Islamic Education in particular, especially in relation to Collaborative Learning. Consequently, the importance of this study is its concentration on the use of Digital Mind Mapping in Islamic Education with respect to Collaborative Learning. In addition, since most of these studies chose an experimental method as being the most suitable for examining the effect of using a Mind Map in education, the researcher was encouraged to use an experimental approach in this study. Interviews, in conjunction with observation, have been selected for the purpose of the present study in order to provide accurate results and allow research to occur in its natural environment. This allows a greater depth to the research in order to arrive at a greater understanding of the underlying causes and motives behind the use of technology, or indeed the decision not to use it.

3.10 Summary

This chapter looked at the literature relevant to my research for this study on CLDMM, and it has identified the relevant research fields, such as visual organisers, a definition of the Mind Map, and the Mind Map in Islam. The advantages and disadvantages of Mind Maps were set out, and the differences between Mind Maps, Concept Maps, Paper Mind Maps, and Digital Mind Maps have been presented. Also discussed was the impact that ICT has on the Digital Mind Map in improving student achievement in Islamic Education. The theories that support Digital Mind Mapping were also explained, as was the importance of Collaborative Learning in teaching and learning, particularly in the primary school Islamic Educational system of Saudi Arabia. To explore the issues that arose from the literature review, the research methodology will be explained in more detail in the next chapter.

4. Chapter Four: Research Design and Methodology

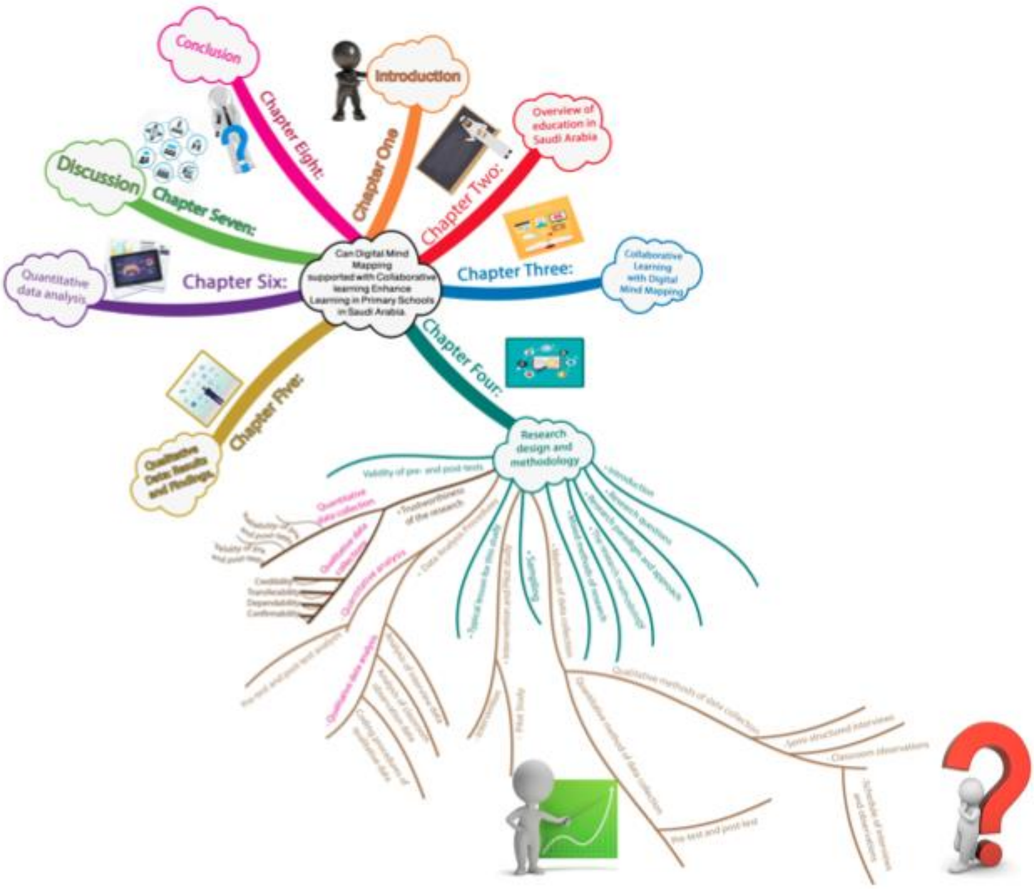

Figure 4.1 Digital Mind Map for Chapter Four

4.1 Introduction

This chapter describes, in more detail, the research methodology employed and as well as presenting the research questions addressed. It sets out reasons for choosing methods from the studies described in the Chapter Three, explains the design of the research methodology, gives justification for the selection of these methods and a description of the data collection process. In addition, it discusses the study's limitations and strengths, as well as detailing the sampling procedure. Finally, it explains the idea of trustworthiness in both qualitative and quantitative research, and ethical considerations. This study adopted an interpretive research paradigm and employed both qualitative and quantitative research methods in order that the research questions could be investigated most effectively. In terms of data collection methods, semi-structured interviews, observations, pre-tests and post-tests of students' learning were used. Figure 4.2, below, demonstrates the process of designing the methodology.

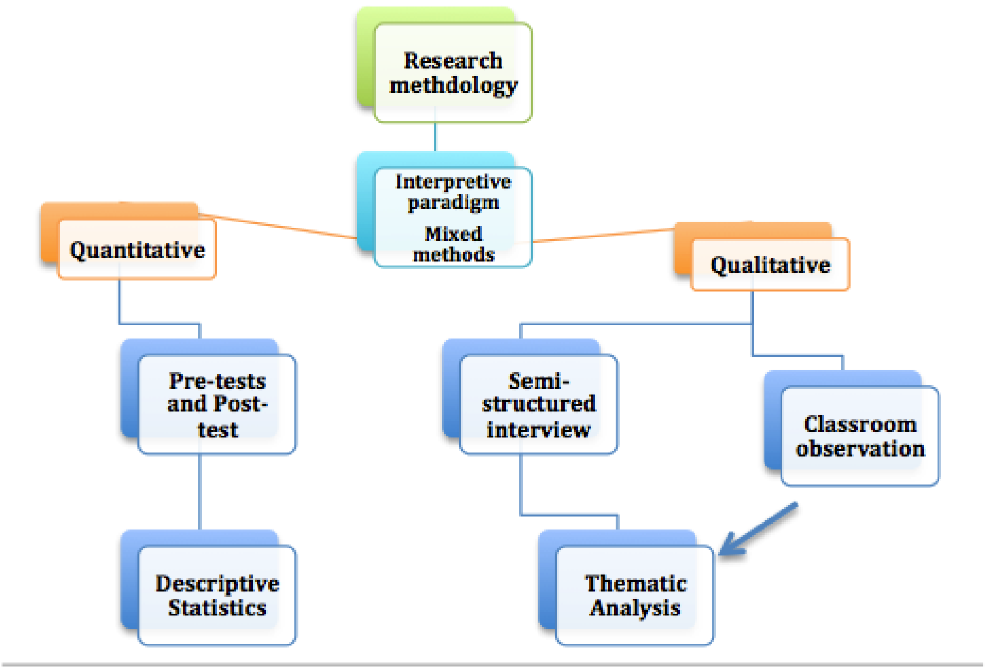

Figure 4.2 Process of designing the methodology

4.2 Research questions

This study aims to improve learning through Islamic Education materials for elementary school students. To reach this aim it used DMM supported with CL and looked at their impact on improving the learning environment.

Due to the lack of research into integration of Digital Mind Mapping with Collaborative Learning in Islamic Education, this paper addresses the following questions.

1) How is Digital Mind Mapping being employed at present to support the learning process?
    a. What are the key features of Collaborative Learning with DMM being used in classrooms?
2) What are participants' perspectives?
    b. What are the teachers' perspectives on whether Digital Mind Mapping supports Collaborative Learning and thereby helps students?
    c. What are the students' perspectives on Collaborative Learning with Digital Mind Mapping?
3) What is the difference in learning outcomes between an experimental group which use Collaborative Learning with Digital Mind Mapping in comparison with a control group which does not use Collaborative Learning with Digital Mind Mapping?
4) What are the difficulties and hindrances experienced in using Collaborative Learning with Digital Mind Mapping in primary schools in Saudi Arabia?

4.3 Reasons for choosing the study methods according to previous study

Research methods are many and varied. Therefore, in order for the researcher to choose an appropriate research methodology, many references, educational articles and previous studies were read to help select the research methodology. The choice of research methodology has a significant impact on determining how a researcher collects, analyses and discusses data. In addition, it helps in determining the quality of the research in relation to its aims. Moreover, it helps in the identification and selection of appropriate research tools to answer the questions of a study and achieve its objectives. In the present study, the chosen methodology contributed to achieving the results related to examining the reality of education in the primary schools in Saudi Arabia for Islamic Education materials. It also highlighted the importance of introducing Digital Mind Mapping with Collaborative Learning to improve the level of academic achievement of students in their natural environment and transform it from a boring environment to an attractive and active environment.

To develop the knowledge of the researcher, methodologies were found and analysed in the studies that were examined in the previous chapter. The researcher then identified some of the tools used in these studies, which varied in terms of use of research methods. The experimental pre-test and post-test design was a method used by seven of the previous studies, and were mentioned in the previous chapter. Five of these studies used the tests alone, while the sixth study used tests with questionnaire and interview, and the last used tests with a quasi-experimental design.

The pre-tests and post-tests were used to identify the level of student academic achievement of a large number of students in the study sample, in order to give depth to the data and make the results more realistic and reliable.

This is one of the reasons that encouraged the researcher to use the experimental design. However, the researcher supported this method with others which were complementary to each other and with more details that may not have been found in previous research. Side-by-side with use of the pre-test and post-test, the researcher tried to support it with using the qualitative methods of observation and interview to strengthen the results of the study by obtaining results in more than one way. Therefore, the results were not just based on measuring the utility of introducing digital technology through pre-test and post-test, but through collaboration in groups, and some skills such as discussion, critical dialogue and the use of thinking skills through the results of both the interviews and observations, as mentioned in Chapter Three on using digital technology. Means, Blando, Olson, Middleton, Morocco, Remz and Zorfass (1993) concluded that technology cannot only affect students' achievement by completing standardized tests, but can promote the use of higher thinking skills such as problem solving and critical thinking.

As a result, the researcher used an overall interpretive method through mixed methods research in order to benefit from the respective advantages of the qualitative and quantitative methods. The mixing of methods was desirable as it was possible to overcome some of the weaknesses of the different tools by using the interview and observation to achieve results to triangulate perceptions with the test data and to access in-depth opinions of the participants. The next section makes it clearer about role of the researcher in choosing the methodology.

4.4 The Role of Researcher

Before starting to explain the rationale for the methodology, it is important to provide an overview of the context of the role of researcher in the collection of data. The researcher in qualitative research is a tool who participates in the study; nevertheless, the researcher should be neutral and logical. Qualitative research must be conducted in a natural environment where the task of the researcher is the monitoring and analysis of the situation and giving a description of it as it is, without any interference from the researcher.

The researcher must be part of the study by interacting closely with the study while taking notes to aid memory so as not to lose any important details in the research (Savenye & Robinson, 2005; Wiersma & Jurs, 2005).

As the researcher I was transparent about the research at the beginning of the study by giving the participating teachers and students a general overview of the research before starting it. The researcher also applied the study in a pilot sample to see whether the study responded or not and in order to avoid errors before the actual stage of study to ensure good quality results of the study and to be of benefit. The pilot was also necessary to ensure the existing educational situation on which the study was based was suitable and feasible.

The goal of this research is to contribute to the improvement of learning using technology in education and not just the implementation of the study and the task of reaching the end of the research, rather the goal is higher and more ambitious, to raise and improve the processes of teaching and learning in Saudi Arabia. The researcher in qualitative research attempts to be impartial and to have internal and external reflections in analysing and explaining all or part of a society or culture (Stake, 1995). This is especially true if this is supported with numbers, as in quantitative research as part of the mixed methods.

According to Johnson et al. (2007), mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of quantitative and quantitative perspectives, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration. (p. 123)

As for the student interviews, they went very comfortably and easily and the students enjoyed the interviews. Everyone wanted to participate, but the choice was random and some felt lucky to be picked for the interview. They felt as if they were in a news interview, as they bragged to their classmates. The researcher was impressed by the students' culture, which is somewhat more open than some of their teachers through their suggestions, enthusiasm and thinking about how to use these techniques quickly and in their school and the freedom to express with confidence and not feel that they are being directed to give particular answers. The next section will explain in more detail about the research design of this study in terms of the underlying philosophy.

4.5 Research paradigm and approach

Broadly, there are two prevailing research paradigms: the positivist and the interpretivist, as outlined by Thomas (2009). This research is based on the interpretive paradigm because it leads to an understanding of the reasons for an existing situation (Yin, 2009), and the purpose of this research is to explore and give an explanation of use of Digital Mind Mapping with Collaborative Learning in education. According to Wellington (2000; p.16), in the interpretative paradigm, "the researcher's aim is to explore perspectives and shared meanings and to develop insights into situations".

Radnor (2001) demonstrated that interpretive educational research has explanatory power and can inspire through offering illuminating insights into human situations" (p.vii). Moreover, the interpretative paradigm has become embedded in many areas and education is one of these areas (Denzin & Lincoln, 2003; Ridenour & Newman, 2008). Radnor (2002) explained that interpretative research "is trying to come to an understanding of the world of the research participants and what that world means to them” (p. 29). Therefore, as the researcher in this present study, I was able to reach an understanding, and interpret the point of view, of students and teachers about the use of Collaborative Learning with Digital Mind Mapping. In this interpretive study, as researcher, I played an active role, because I explained in detail the interview transcript, images and interactions between the participants and new technology, to arrive at explanations and to interpret the meaning of the results. The experience and background of myself, as researcher shaped these interpretations (Creswell, 2003; Neuman, 2003).

This study used the interpretative paradigm because, as researcher, I aimed to understand the perceptions of teachers and students about using Collaborative Learning with Digital Mind Mapping in teaching. I also aimed to understand the impact of this method on the students' attitudes and behaviour and to find out the perspectives of both teachers and students. I began to build my interpretations through observing the interactions between participants and from their knowledge of the students and teachers in exploring the use of this new technology. This helped me as the researcher to elicit the factors which affect learning behind the use of Collaborative Learning with Digital Mind Mapping by interpreting the participants' responses in the interviews, the reflections of the participants in the observations, and the results of the pre-tests and post-tests.

These reflections were communicated in a natural way to people through discussion and interaction. So the interpretative approach was the most appropriate option for this study because, according to Strauss and Corbin (1998), qualitative methods enable a researcher to understand the nature of teachers and students from their emotions, feelings and complex experiences, while in quantitative research it is hard to measure these things (Babbie, 2001; Silverman, 2001).

4.6 The research methodology

Wellington (2000, p.22) defined methodology as "the activity or business of choosing, reflecting upon, evaluating and justifying the methods you use". The methodology helps the researcher to identify the reasons for using certain methods in the study, as confirmed by Crotty (2003, p.7): "methodology is the research design that shapes our choice and use of particular methods and links them to the desired outcomes". This leads the researcher to a careful choice of research methods with justification for using them.

This study aims, as mentioned earlier, to introduce new technology Collaborative Learning with Digital Mind Mapping into primary schools. This introduction of new methods of teaching and learning, and using them with new technology, were the goals of this study. The reason for using this new technology with teaching methods is that traditional methods are no longer appropriate with the new technology (Reigeluth & Joseph, 2002, cited in Reigeluth, 2003).

As a researcher, I attempted to arrive at meanings in this study by undertaking qualitative research; according to Bryman (2012, p.582), qualitative research diverts the researcher's attention from "what actually happened", to "how people make sense of what happened".

In addition, it can be said that the nature of the research questions prompted me, as the researcher to take advantage of an exploratory methodology which seemed best suited to discovering the perspective of teachers and students in detail through interviews and classroom observations. Thus, it can be seen that qualitative methodology was appropriate for this study, which used a case study within the interpretative paradigm.

According to Cohen, Manion and Morrison (2005), a case study examines a particular situation in which the researcher is not in control of the interactions of the participants; so this makes the case study the appropriate methodology for my research. Using a case study methodology in this research permitted a description of the advantages of using the DMM with CL with Islamic Education in primary schools.

The case study approach, in which one particular situation, individual, class or school is studied in depth, often uses more than one method in triangulation to build a more comprehensive picture; use of two or more types of data collection provides access to a more complete perception of the studied matter which strengthens the quality and substance of that particular research (Cohen, Manion & Morrison, 2005). For this reason, the researcher used a case study approach, blending qualitative and quantitative research, as this allowed a thorough and deep examination of the situation being investigated (Yin, 2009). The basic idea in the case study is to examine one example (and perhaps a number of examples) in a detailed and accurate way by using all appropriate methods.

There may be various objectives or questions in a case study, but the overall goal in the case of the current research was to reach an understanding of the situation in three schools in Qassim City in Saudi Arabia. It was intended to achieve comprehension of the particular cases in their natural context, without attempting to generalize the results to other cases. Furthermore, a case study involves an exploration of a given aspect of reality in its context, particularly in cases where the link between this aspect of reality and the context is not so apparent (Yin, 2009). A case study, in other words, is defined as a research strategy for studying a phenomenon that concentrates on understanding the current dynamics within a single setting or context (Eisenhardt, 1989). Moreover, a case study is an analysis of the status quo, which aims to find solutions and address problems. This is also the focus of the current research. Since it is a flexible approach, it allows the researcher to preserve the holistic properties of events in their real-life situations (Yin, 2009). However, since it would be difficult to disseminate the results of a case study, this approach puts increased demands on a researcher’s time and skills (Zainal, 2007).

4.7 Mixed methods of research

This study explored the use of DMM with CL in the classroom and used data collection methods associated with both qualitative and quantitative approaches. The benefit of using mixed methods is that it can blend qualitative and quantitative data in one study to provide a deeper understanding of the research issues (Johnson & Larry, 2008).

It is worth noting that every research methodology has its strengths and weaknesses and the researcher has to choose the most appropriate way to study the designated topic. After taking into account the available resources, and considering the need for ethical research, the researcher decided to use a mixed methodology. Researchers can use more than one method through triangulation to build a more comprehensive picture of a researched phenomenon where the use of two or more types of data collection provide access to a more complete perception of the studied matter, which strengthens the quality and substance of that particular research (Cohen, Manion & Morrison, 2005). For this reason, the researcher blended qualitative and quantitative approaches, as this allowed a thorough and deep examination of the situation being investigated (Yin, 2009). The basic idea in this study was to examine a number of cases in a detailed and accurate way by using all appropriate means.

4.8 Methods of data collection

To answer the research questions, this section focuses on the methods used in data collection, which include the qualitative methods of classroom observation and semi-structured interview, and the quantitative method of pre-test and post-test. These methods stem from the methodology and paradigm and the subject of this study (Silverman, 2001). The aim of this study is to explore the impact of the use of DMM with CL to improve the learning of students in Islamic Education and compare it with a control group using the traditional method. The study also tried to understand the points of view of teachers and students towards the use of DMM with CL through the use of the interview.

The second method is observation which reveals the actual use of the methods in the classroom and shows how participants interact in using this new technology. The quantitative method (pre- and post-test) was used to measure any difference in academic achievement between the two groups. The next section explains these methods in more detail.

4.8.1 Qualitative methods of data collection

Semi-structured interviews

The semi-structured interview is a type of interview which gives participants a great deal of flexibility in the area of response because the interviewer has some pre-determined questions on specific topics (Robson, 2002). According to Wellington (2000), the main feature of the semi-structured interview is that it allows the researcher greater control during the interview than in the unstructured interview. In the semi-structured interview control is shared between participant and researcher. Kvale and

Brinkmann (2009) stated that the semi-structured interview with open-ended questions allows flexibility for the researcher to ask questions and also allows participants flexibility of response.

In this research, interviews allowed the researcher to obtain the insights of the participants and discover their motivations and feelings about the new technology. Wellington (2000) mentioned that the interview is designed to clarify views and opinions and to obtain multiple facts from people in different social positions.

Interviews are a powerful way to provide interaction and clarification between researcher and participants and "might lead to conceptualization of the issues in ways totally different from what you anticipated" (Tashakkori & Teddlie, 1998).

One of my goals in the interview was to deepen my understanding of the issues surrounding the use of DMM with CL and, in addition, to engage with participants in order to identify their expertise in teaching and learning, and to identify the impact of the use of (DMM+CL) in improving academic achievement. The interviews led to a deep understanding by allowing students and teachers to express their views in their own words.

The open-ended questions allowed them to give long responses and gave them space to talk about their own experiences. The interviews were face-to-face with the students and teachers to discover their feelings which could not be identified through observation alone. This led to an understanding through their talking about the intervention and their use of new technology in Islamic Education lessons to get additional information in the interview. This led me as the researcher to know more about their interaction, especially compared to the students who did not use the new technology in their Islamic Education lessons.

The interviews were conducted with teachers in the selected schools. Interviewees were asked questions based on the research questions. The purpose of the interviews was to give the researcher an insight into teachers' and students' perspectives on using CLDMM, the extent and character of issues related to the current use of DMM and CL in the classroom, and to gain an understanding of the degree to which this use supports interaction among students. Additionally, the interviews contained open-ended questions to provide greater flexibility for the researcher to ask extra questions, and for the participants to provide more complex information (Daniel & Turner, 2010). The questions were divided so as to cover the main topics of the study (see Appendix 1). Furthermore, the open-ended questions allowed the teachers to describe what was most important to them and to use their own words rather than being confined by pre-designed answers.

It is important to mention the procedure of the interviews. At the beginning, and after briefing on the objectives of the study, permission to proceed with the interviews was obtained from the participants. Four teachers and sixteen students selected at random were chosen for the interviews. Interviews were conducted with teachers after the intervention, and they lasted for half an hour. As researcher I also interviewed the teachers before the start of the study to take a comprehensive look at their experience with the use of Digital Mind Maps. The interviews with the students also took half an hour. The research used a 'Stimulated Recall' approach whereby I provided the interviewee with an example of a Digital Mind Map that they had created in order to facilitate a more in-depth conversation and inquiry.

After that I immediately wrote up the interviews, in Arabic, to obtain a researcher transcript as precisely as the participant had said, in so far as I could recall this, to enable me to analyze it easily. The interview questions were derived from the study questions and built on previous literature, though the questions were adjusted for participants to bring them closer to the desired meaning and to be clear in purpose and meaning.

Finally, the interview questions were divided into themes that were discovered from the interviews in the Islamic Education classes and which were related to the research questions using the two methods, namely, CLDMM and traditional methods.

Classroom observations

The second research method was observation, which was conducted through attendance at some lessons in Islamic Education by agreement with the schools, according to their convenience. The aim of the observation was to answer the following questions: How is Digital Mind Mapping being employed at present to support the learning process? and the second part of the first question: What are the key features of DMM being used in classrooms? and the third part of the first question: What are the difficulties and hindrances experienced in using DMM in primary schools in Saudi Arabia? These observations focused on the interaction between the students involved in collaborative activities to summarise the information necessary for creating DMM.

Observation is a significant part of a case study (Wellington, 2000). Observation is a more useful method when used with other data collection methods (Tashakkori & Teddlie, 1998). As Cohen, Manion and Morrison (2005) claimed, observation enables the researcher to "to see things that might otherwise be unconsciously missed and to discover things that participants might not freely talk about in interview situations" (p.397). Therefore, data were collected in a natural interactive environment. Bell (2005) asserted that the primary goal of observation is to determine whether participants act like they claim to act. Therefore, observation provides important data to the researcher to build a deeper understanding of the teaching and learning that takes place through engaging in using CLDMM. The aim of the observation is also to investigate the real situation of teaching and learning in the academic environment of students in Islamic Education classes and what kind of impact this method appears to have. Zepeda (2007, p. 96) asserted that "qualitative classroom observation would include the scripted notes of the supervisor or peer coach".

The observation method has positives as well as negatives. Mulhall (2003) mentioned that the positive aspect of this method is that it allows the researcher to see what people actually do rather than relying on what they say they do. Secondly, it can provide information that was not previously known to the researcher. It collects data from the students' behavior not from their spoken words. Moreover, Cohen, Manion & Morrison. (2005) and Merriam (2001) said that observation allows the researcher to have a relationship with the people who he/she is observing. In addition, observation focus on features such as interactions, collaboration and involvement.

On the negative side, one could argue that this method puts considerable demands on a researcher's time in comparison with other modes of data collection and it requires a much more conscious effort on the part of the researcher. The teacher knows that he/she is being observed and participants' responses and the classrooms may become artificial due to the presence of the observer. In addition, some teachers may not use their normal teaching methods as the observer is present, so the presence of the researcher makes their teaching less easy and their performance less than desired.

It is worth mentioning that as a researcher I tried to observe the classrooms for a long enough time to identify the classroom interactions which occurred naturally and spontaneously and to see the evolution of participants' interactions. Additionally, I think that I built a good relationship with the participants by obtaining permission to observe the classroom naturally, and attempting to take the role of participant rather than observer to maintain the natural classroom environment.

It is important to mention the procedure of the observation. Firstly, as researcher I met heads of schools and teachers, and explained to them the objectives of the study and then explained to students and teachers how to use the DMM software during a lesson and gave them an example. The observation period was 45 minutes. In total, I observed four teachers and sixteen students in different schools during a two-term period (see Appendix 2). In addition, the study had two groups. The first was the experimental group which was divided into smaller groups, each with an iPad which download the DMM App. Each group in each school had a special file for the Digital Mind Mapping which the students created and they gave their groups attractive names, such as ‘invention’ and ‘creativity’, rather than numbers, as this would help them excel in the production of their DMM. Data were collected from these files and through observation in the classroom. In each lesson the researcher displayed DMM for students on the interactive white board (IWB) to create a rivalry between the groups and to display the evaluation of their DMM creation.

The second group was the traditional teaching method group. The teachers used these two methods in the three schools, each school containing the two groups. Over the six weeks I observed the classrooms for one lesson a week for each group. Working with the teachers in each class, we informed students of the lesson objectives and our aims to assess the extent to which their adoption of CLDMM was useful. Then I wrote reports on each group covering all the events that had taken place in the classroom, and the interactions between the groups. As researcher I then discussed the results with the teachers and initially analyzed some of the observation results to make sure no important aspects of the observation had been missed.

4.8.2 Quantitative method of data collection

Pre-test and post-test

The aim of this method is to answer the third question: What is the difference in learning outcomes between an experimental group which uses Digital Mind Mapping in comparison with a control group which does not use DMM? The reason for choosing pre-test and post-test was because the researcher used an experimental method to examine the students' learning before and after using Digital Mind Mapping in order to determine whether the technique was effective in improving students' learning. In addition, the reason for choosing these methods was based on the fact that the subject of the research constituted a form of social interaction.

Experimental research, as Gay (1987) mentioned, is the only research method which can be used to test hypotheses on whether relationships are of the cause and effect type. In other words, the aim of experimental research is to examine the relationship between cause and effect.

Regarding the procedure for pre-test and post-test, the pre-test was administered before the intervention for the whole student sample in the first school in week two of the first semester of 2016, and the same test was also used as a post-test after the intervention six weeks later. The same process was carried out with the second and third schools in the following semester.

The questions were selected to be comprehensive and appropriate and were presented to experts in Islamic Education and assessment to ensure that they were suitable for the students. These questions were the same in both pre-test and post-test for all schools, though the researcher attempted to change the order of the questions and their numbering. Bloom's taxonomy (1956) was used in the design of the questions which covered the levels: knowledge, comprehension, application, synthesis, analysis and evaluation. The tests were marked by two markers and then analyzed with statistical procedures.

Schedule of data collection

Table 4.1 Schedule of data collection

<table>
<tr><th rowspan="4">Weeks</th><th colspan="2" rowspan="2">Participant</th><th rowspan="4">Data collection</th><th colspan="6">Design of interviews and observations</th></tr>
<tr><th colspan="2">Semester one</th><th colspan="4">Semester two</th></tr>
<tr><th rowspan="2">Teachers</th><th rowspan="2">Students</th><th colspan="2">First School</th><th colspan="2">Second School</th><th colspan="2">Third School</th></tr>
<tr><th>C group</th><th>Ex group</th><th>C group</th><th>Ex group</th><th>C group</th><th>Ex group</th></tr>
<tr><td rowspan="2">Week 1</td><td colspan="9">Explained the objectives to gain the support of the school's head teacher and teachers involved.
Organised the classroom.
Described the method for teachers and students.
Trained students and the teachers to use Digital Mind Mapping.</td></tr>
<tr><td colspan="9">Pre-test</td></tr>
<tr><td rowspan="2">Week 2-7</td><td rowspan="2">4 teachers for all schools</td><td rowspan="2">205 Students for all schools</td><td>Classroom observation</td><td>10 lessons for two grades (5 lessons per class</td><td>10 lessons for two grades (5 lessons per class) Celebrative Learning Lesson</td><td>7 lessons per class</td><td>7 lessons per class Celebrative Learning Lesson</td><td></td><td>7 lessons per class Celebrative Learning Lesson</td></tr>
<tr><td>Interviews</td><td colspan="2">Interviewed two teachers
Interviewed 8 students</td><td colspan="2">Interviewed one teacher
Interviewed 5 students</td><td colspan="2">Interviewed one teacher
Interviewed 4 students</td></tr>
<tr><td>Week 8</td><td colspan="9">Post-test</td></tr>
</table>

4.9 Sampling

Johnson and Larry (2008, p.223) defined the sample as "a set of elements taken from a larger population according to certain rules". The study was conducted with a sample of almost 200 students and four teachers in three schools; sixteen of the students and four of the teachers were interviewed. Since the quality of research depends on the appropriateness of the sample, Cohen, Manion and Morrison. (2005) and Wellington (2000) stated that decisions of sample size will depend on the data to be collected, the style of the research, cost, resources and representativeness of the population. Selection of the interview sample was random, as Gay (1987, p. 104) confirmed that "the best single way to obtain a representative sample" was to select it randomly.

Usually, samples in quantitative research are larger than in qualitative research (Ritchie and Lewis, 2003). Therefore, the number of interviewees was 16 students and four teachers, and observation sample was six classes, while the pre- and post-tests were for all 200 students. Hoepfl (1997) and Wellington (2000) mentioned that selecting a random sample in quantitative research is important, but in qualitative research selecting of sample requires a purposeful strategy. Because qualitative research focuses on the goals of the investigation, it gets the most important information linked to those goals, and can finally achieve a high level of credibility even with small samples.

As already mentioned, the researcher collected data through interviews, observations, and pre-tests and post-tests in order to address the research questions. Purposive sampling was used to select the school and teachers. Johnson and Larry (2008) pointed out that, in purposive sampling, a researcher identifies characteristics of people in terms of interest and then looks for those individuals who are characterized by the desired properties. In this study, the three girls' schools were selected by the local department of the Ministry of Education. These schools were chosen according to the following criteria:

1) A selected school has to have a teacher using Collaborative learning.
2) A selected school has to have a computer lab.
3) Students and teachers of a selected school have to have basics skills of using technology.
4) Classrooms of a selected school contain a diverse spectrum of students' ability.
5) A selected school should be located in the city of Qassim to help the researcher to gather data in a limited time.

The two groups in each school, experimental and control groups, and the number of each group in each school ranged between 30 and 38. In making comparisons between two groups the researcher attempted to ensure the same conditions, with the same teacher and students of similar ability and the same subject of Islamic Education.

4.10 Intervention and Pilot study

See the following Figure (4.3) which sets out the intervention steps

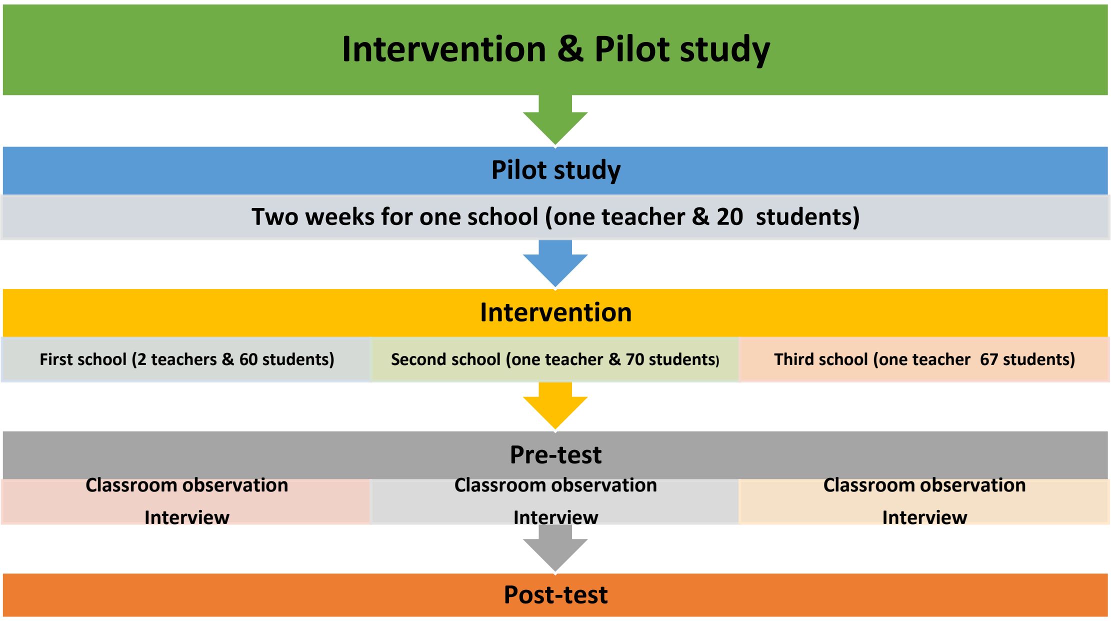

Figure 4.3 Intervention and pilot study steps

4.10.1 Pilot Study

Before beginning this study, the design had to be tested for authenticity and reliability; this is termed a 'pilot study' and can be defined as a mini study, which aids in the design of later versions (Arnold, et al. 2009).

The pilot study was conducted prior to the initiation of the main study to estimate error handling; according to The UNESCO Caribbean Office (2003), pilot studies reduce the number of processing errors significantly as unexpected problems are often revealed by a pilot study, most of which can be overcome by redesigning the programme or workbook.

The researcher worked with a school for two weeks and, subsequently, they agreed to participate in the pilot study. Through classroom observation the researcher tested whether the DMM was suitable for the Saudi educational context. Interviews were conducted with teachers and the head teacher of the school with regard to the possibilities, the effectiveness and the testing procedures of the study, as well as the suitability of the age of the students, the appropriateness of the questions to be asked in the interview, and the nature of the material selected, both in the pre-test and post-test stages.

The researcher notes that these actions allowed a two-way engagement in the feedback process between the interviewer and the participating students and teachers. This contributed to enabling the researcher to produce a final version of the pre- and post-questions, as it allowed questions to be clarified and typographical errors corrected. Further, regarding the pilot study, this process led to a change in the age of the participating students from Year 4 to Years 5 and 6; these students were considered more active and their comprehension greater when asked to use a Digital Mind Map. Furthermore, it also resulted in a change of subject from Tawheed to Fiqh and Hadith, as Tawheed does not include hypertext or information, which can be drawn on a Digital Mind Map. The aforementioned explains that this pilot study is presented as a feasibility trial, which means that it explored whether it was practical to use an experimental method to investigate whether Digital Mind Maps are good to use with Islamic Education.

4.10.2 Intervention

An intervention, prepared in advance by the researcher, may improve the actual practice of teaching in a real situation of education in Saudi Arabia. To start with I obtained permission from the Ministry of Education. After that I visited three schools, and then I met the head teacher and teachers, and I trained the students and the teachers to use DMM. I did the pre-tests and post-tests for all the schools. I divided my work in the schools into two semesters.

In the first school I took fifth grade and sixth grade (control group and experimental group). The number of students was almost 60, with two teachers. I observed in all classrooms for around 45 minutes per lesson, which is two lessons for each grade, and then I interviewed two teachers and a random selection of eight students. This lasted approximately eight weeks, and the subjects were Jurisprudence (Fiqh) and Hadith.

In the second school I worked with two classes of fifth graders (control group and experimental group), for the subject of Jurisprudence (Fiqh). The number of students was nearly 70; I interviewed four of these students (randomly selected), with their two teachers. I also did an observation in both classes for eight weeks, around 45 minutes per lesson, and two lessons for each grade.

In the third and last school I took two classes of sixth graders (control group and experimental group), 75 students in total, also in Jurisprudence (Fiqh). The interview was conducted with their two teachers and with four students (randomly selected). I also did the observation over eight weeks with a control group and an experimental group, around 45 minutes per lesson, which is two lessons for each grade.

Finally, the importance of the pilot study was to assure the researcher that the intervention was not too complex. Therefore, the pilot study was employed and will be described in more detail in the next section.

4.11 Observation of a typical lesson for CLDMM

In this section, an example is provided for a typical lesson in using CLDMM, which was a sixth-grade lesson, lasting 45 minutes.

4.11.1 Design of resources to support activities

This lesson dealt with the topic of ‘Charity (Alzzakat)’ from the Islamic Education textbook (page 8) which was explained through use of the CLDMM. The objectives and content of this lesson are stated in Table (4.2) below.

Table 4.2 Aims and content of a typical lesson using CLDMM

Lesson objectives	Lesson content	Instructional methods, aids and activities
1. Explaining the concept of charity in Islamic tradition. 2. Describing the provisions of charity. 3. Types of people who deserve the charity.	• The charity rules. • He/she must have paid charity. • What is the charity which is not obligated? • Types of people who deserve the charity.	• Collaborative Learning. • Digital Mind Mapping. • iPads. • Electronic resources and textbook.

4.11.2 Lesson procedure

The teacher divided her students into five groups taking into account their ability levels, as determined by the teacher, with each group having an iPad as shown in picture 4.1 below.

Picture 4.1 Student classroom

The teacher used principles of Collaborative Learning in the first part of lessons; after that, she used Digital Mind Mapping as an instructional activity with an iPad using the Mind Map application. These groups used a technique whereby a group tries to gather the information in Mind Map spontaneously through contributions by its members. Therefore, the teacher presented a particular issue for students within groups to summarise the various related issues and put them as key words and key information in Mind Mapping. Finally, the teacher and all the groups discussed the content of Mind Map and evaluated their information and the DMM procedure. The next section describes the different activities that took place during the lesson.

4.11.3 Lesson activities

The teacher put some issues on the whiteboard for the students to use DMM in a collaborative method requiring dialogue within a group. The following is an example of such issues:

➢ With your group, discuss these issues with the help of the textbook and electronic resources (website) and use DMM to draw your ideas and your information:

- The main types of people who deserve charity.
- Mention the kind of food that is given to poor people.
- Time of mandatory and non-mandatory charity.
- The importance of charity in Islam.
- The benefits of charity.

4.11.4 Group work

After the teacher described these issues in the first part of the lesson, the groups started their discussion, and began to work on gathering and summarising these issues by using DMM.

There was a competition between the groups where the students presented the results and then discussed the correct answer with the teacher. The teacher was active during the lesson and tried to simplify the presented information and make it easily understood through a combination of teamwork and activities using DMM.

Meanwhile, the teacher was walking around, assessing whether the groups were following the appropriate course of debate, and was ready to answer students' queries. To find out about the given correct key words and key information to draw DMM, students read the textbook together with the information found on the website. In addition, they started to write the key words and key information related to the main issues mentioned above. Finally, they came to an agreement and drew the finalised DMM as shown in Figure 4.4 below.

Figure 4.4 Example of students' Digital Mind Map

After working within groups, the teacher requested that the groups discuss these issues between themselves, whilst she would manage and control the dialogue itself and showed them the DMM for each group. Also, the teacher ensured that all groups had followed the instruction to make a DMM drawing and had covered all the issues in their DMM. Following this, the teacher evaluated the group work and summarised the lesson.

Throughout the lesson, the students were enthusiastic about using DMM. During the lesson, the teacher walked around the groups to follow the debates and respond to queries from students.

4.11.5 Assessment and evaluation

The teacher used both summative and formative assessment because, in Saudi Arabia, summative assessment is used to determine final grades, while formative assessment is continuous throughout the year and serves as a form of feedback for parents. In addition, the teacher used questions to assess the students' understanding of the lesson material.

4.12 Data Analysis Procedures

Quantitative (pre-test and post-test) and qualitative (classroom observation and interview) data collection were used in this study. The study was conducted over two semesters with a sample of almost 200 students and four teachers in three schools. Each school was analysed separately and each school had a control group and an experimental group. These groups were compared in each school separately.

To answer the first question, “How is Digital Mind Mapping being employed at present to support the learning process?” I used observation and my learning process data. To answer the second part of the first question “What are the key features of Collaborative Learning with DMM being used in classrooms?” and the third part of the first question “What are the difficulties and hindrances experienced in using Collaborative Learning with DMM in primary schools in Saudi Arabia?” I used classroom observation and interview data. Finally, to I used interview data answer the second question: What are participants’ perspectives? This is broken down into two sub-questions:

a. What are the teachers’ perspectives on whether Digital Mind Mapping supports Collaborative Learning and thereby helps students?

b. What are the students’ perspectives on Collaborative Learning with Digital Mind Mapping?

The process of data analysis is summarised below.

4.12.1 Qualitative data analysis

Bogdan and Biklen (1982) define qualitative data analysis as "working with data, organizing it, breaking it into manageable units, synthesizing it, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others" (p. 145). The goal of content analysis is “to provide knowledge and understanding of the phenomenon under study” (Downe-Wamboldt, 1992, p. 314).

Analysis of interview data

The comparative method used in this study was important for understanding the perspectives of teachers and students on the use of DMM in schools within the Islamic Education curriculum. These views were used in the data analysis.

To answer the second part of first question, the second questions and the fourth question I used the interview data. Analysis of the interview data began by listening to the participants on the recording and then writing a transcript of the interview. Then, since the participants were native Arabic speakers, the transcripts were translated into English. Following this, topics (themes) and categories (sub-themes) were selected in both deductive and inductive ways. The deductive categories were the original questions from the interview, whilst the inductive categories emerged through analysis of the transcripts. Radnor (2001) clarified the idea of inductive categories: “You do not start with readymade categories within the main topics but allow them to emerge from the data as you become more and more familiar with the content” (p.70). Thus careful reading of the transcripts of the interviews ensured identification of all relevant topics and categories. The data from the transcripts were then coded according to these topics and categories.

This method relies on taking one piece of data, for example from an interview, and comparing it with other pieces. There may be different or similar ideas, and this enables the researcher to develop concepts and establish relationships between different parts of the data.

This study is based on the exploration of participants' experiences with using Digital Mind Mapping in a school context Therefore, this qualitative data is based on the researcher's interpretation, as Denscombe (1998) argued that researchers collect data through what they hear or see of the participants and then interpret this data.

In this study there are three sources of textual data, namely: interview transcripts, observational reports, and developments in the digital map.

Analysis of classroom observation data

In the classroom observation I was keen to write reports immediately after each lesson and try to do a basic analysis while still collecting observation data. Therefore, to remember important information and make sure the question was sufficiently covered, I kept my focus specifically on the aims of my research. This agreed with Ezzy's argument:

> *If you have been collecting your data carefully you have already begun to analyse the data...This provides the beginning of data analysis...if data analysis begins only after the data have been collected, researchers will have missed many valuable opportunities that can be taken only at the same time as they are collecting their data*. (Ezzy, 2002, pp. 60-61)

To answer the first question I used observation, and the second part of first question and the fourth question used observation data. Cohen, Manion and Morrison (2005) confirmed that observation helps researchers: *"to see things that might otherwise be unconsciously missed and to discover things that participants might not freely talk about in interview situations"* (p. 397).

The research analysis was based on a qualitative approach towards the observation of the four teachers, A, B, D and C. This observation consisted of 12 lessons for each teacher. The qualitative analysis of the data for this study followed these steps:

Firstly, I observed the students and their interactions during their work in collaborative groups while they created their Digital Mind Maps. The topics were from the Islamic Education curriculum and each observation period lasted 45 minutes.

I then prepared and organized the information from the observation. The next step was to review and explore the observation data and, following that, to create themes and codes from the information. It was noticed that the observation codes supported the interview codes but some new codes were also created from the observation. The data codes were next arranged into categories and, finally, they were displayed in a coherent manner.

Coding procedures of qualitative data

Data analysis followed the procedure of coding, reflection, rereading and sorting of codes to explore themes.

The main focus of this study was to obtain a deep understanding of the perspectives of teachers and students about the use of Collaborative Learning with DMM in teaching Islamic Education. After the completion of the texts, manual techniques were used by using hard copies of the texts to select the codes manually. This included writing notes in the margins of the texts, using coloured highlighters, and referring to the field memos.

Then organization of the categories was achieved by focusing on how to understand the relationships between the categories and examining the relationships between categories. For instance, what is the relationship between the development of academic achievement and using CLDMM with Islamic Education material? Finally, codes were selected and linked to other categories; the validity of these relationships was verified and relationships were put into categories (themes and subthemes).

Charmaz (2006) explained that, from the interview texts, the researcher can identify relevant themes through coding the data. So I colour-coded the interview texts on responses which were related to the study questions. After that, I collected the same colour of texts and put them under the relevant research question (See Appendix 3).

This stage produced many codes, which were divided as shown in the table as example (see table 4.3).

Table 4.3 Example of themes and sub-themes for qualitative data analysis

Research questions	Themes	Sub-themes and Categories
What are the key features of CLDMM being used in classroom?	Features of CLDMM	• Engagement • Increased motivation • Understanding • Collaboration

In the classroom observation I used almost the same procedure as with the interview data analysis. From the observation data I linked useful text units with the themes and sub-themes from the interviews, which were relevant to my research questions. Firstly I collected text units, which were related to codes. Then I ordered these texts based on the interview data. Finally, to support the interview, I added information from the observation data.

4.12.2 Quantitative analysis

To answer the third question (What is the difference in learning outcomes between an experimental group which uses CLDMM in comparison with a control group which does not use CLDMM?) quantitative data from the pre-test and post-test were used.

Pre-test and post-test analysis

The importance of using quantitative data analysis is to compare the development of academic achievement between the experimental and control groups by comparison of their pre-test and post-test results. In addition, the purpose of the quantitative analysis was to investigate the development of students' comprehension skills when using CLDMM within the Islamic Education curriculum. In order to answer the third question, quantitative data for pre-test and post-test were used (see Appendix 4). This data was analysed through the application of the appropriate SPSS programme (Statistical Package for the Social Sciences). The tests were marked and the scores recorded. Then the appropriate statistical tests were applied. Therefore, the quantitative analysis was carried out with the help of the SPSS statistical package. Once SPSS processed this information, the data were further coded into categories which related back to the original research questions. It is important to mention that this study did not aim to produce a definite conclusion, but to present an exploratory study of the quantitative impact.

Statistical methods of pre-test and post-test

Based on the nature and objectives of the current research, the data were analyzed with the Statistical Package for the Social Sciences (SPSS), using the statistical methods detailed below.

First: To check the statistical properties of the test data for application in the cases of parametric tests, in particular homogeneity and normal distribution, the following was used:

1) Pearson Correlation: To ensure internal consistency of the test, which is a measure of test reliability, as well as the correlation between the marks awarded by the two assessors who marked the tests.

Second: To answer the research questions, the following were used:

1) Independent Samples T-test to ensure the equivalence of the experimental and control groups in the pre-test application, and detect any significant differences between the experimental and control groups in the post-test application in the second and third schools.
2) Mann-Whitney Test to ensure the equivalence of the experimental and control groups in the pre-test application, and detect any significant differences between the experimental and control groups in the post-test application in the first school.
3) One Way ANOVA, and Scheffe test for post hoc comparison, was used to detect significant differences in the post-application of the Fiqh test for the experimental groups in the three schools.
4) Paired Samples T-test to detect significant differences between the mean scores of students in the experimental group in both the pre- and post-test application in the second and third school.
5) Wilcoxon Signed Ranks Test to detect significant differences between the mean ranks of the experimental group in the pre- and post-test application in the first school.
6) Cohen's d for repeated measures with Hedges' g corrected was used as an indicator of the effect size.

4.13 Trustworthiness of the research

In qualitative research it is difficult to address validity and reliability in the traditional approach of quantitative research. Le Compte and Preissle (1984, cited in Wellington,

2000) stated that it is not possible to have the same results in research into human behaviour as in research into the natural world.

To look at the concepts of validity and reliability in quantitative research, firstly, validity is “the degree to which the researcher has measured what he has set out to measure" (Smith 1991: 106, cited in Kumar, 2011).

Secondly, according to Creswell (2012), reliability “means that scores from an instrument are stable and consistent. Scores should be nearly the same when researchers administer the instrument multiple times at different times. Also, scores need to be consistent” (p. 159). This is supported by Field (2009) who affirmed that, if an instrument is reliable, then it can be interpreted from various parts of the scale.

However, with qualitative research, different quality criteria are used. The quality criteria which are instituted by qualitative researchers are concepts such as trustworthiness and authenticity, instead of validity and reliability (Creswell, 1994; Lincoln and Guba, 1985, cited in Wellington, 2000). Merriam (2001) noted that trusting the results of a piece of research depends on how its validity and reliability have been ensured.

In this context, Seale states that "the trustworthiness of a research report lies at the heart of issues conventionally discussed as validity and reliability" (Seale, 1999, p.266). Trustworthiness was divided into four aspects by Lincoln and Guba (1985): credibility, transferability, dependability and confirmability. Trochim and Donnelly (2007) compared the criteria of Lincoln and Guba with those of quantitative research in the following figure (4.5).

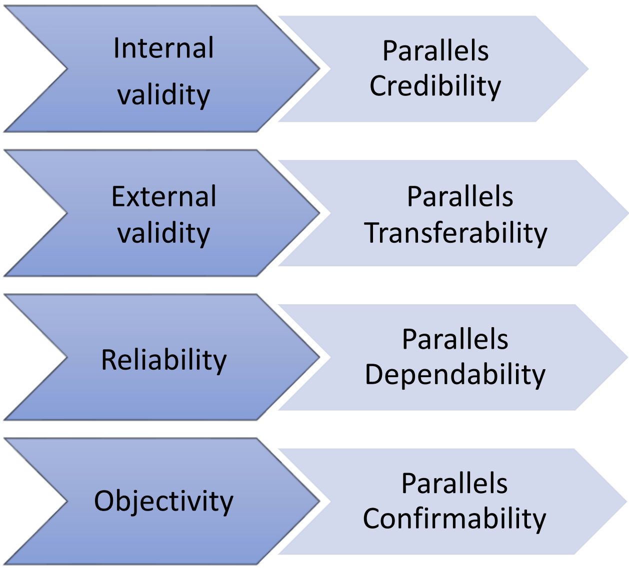

Figure 4.5 Comparison of criteria for research quality

These criteria will be addressed separately in the next sections.

4.13.1 Qualitative data collection

4.13.1.1 Credibility

Credibility in qualitative research is parallel with validity in quantitative research; it can be assured through triangulation and member validation (Bryman & Teevan, 2005). Triangulation is a process which helps the researcher to see the data from different angles. Shenton (2004) states that credibility in qualitative research is equivalent to internal validity in quantitative research. Therefore, in analysis and data collection the researcher should make attempts to meet these standards.

When the researcher finished transcribing the interviews from the recordings, she presented a copy of the interview transcript to the respondent for them to check the contents (Lincoln & Guba, 1985). This helped to verify the students' interview contents and add to the study's credibility and transparency (Bryman & Teevan, 2005; Marrack, 2006).

In addition, accordingly to Lincoln and Guba (1985), the researcher should check with the participants in terms of the data categories, interpretations, and conclusions from the data analysis. The analysis of the results was discussed with my supervisor, Professor Higgins, and then given to two academics from Qassim University and Jouf University to get their comments regarding the following aspects: clarity appropriateness, suitableness and suggestions. Minichiello et al. (1995) suggest that, to clarify any apparent problems, cross reviewing should be used to check with participants to avoid misunderstandings during the interviews.

4.13.1.2 Transferability

Transferability is the standard of trustworthiness in qualitative research which is analogous to external validity in quantitative research (Shenton, 2004). This research has supported transferability by providing detailed explanations of the participants (students and teachers), their lessons and the context of this study. As researcher I provided a full explanation of the data and participants' quotations in order to paint a clear picture of the original data for the reader. Because aspects of this study are qualitative, it refers to very specific data in context and time, and since data transfer requires transferability of the data into a different time or context, that could be problematic (Donmoyer, 2000). Therefore, this study has provided descriptions of the research design, data collection and analysis, to aid its transferability. This detailed description should enable readers to judge whether they can transfer the results to other contexts which may or may not be similar to that of this research (Creswell, 1998).

It should be noted that, in order to keep the voices of the participants as close to the original as possible, quotes will be given in the outcome report and only after that will the texts be translated (see Appendix 5).

4.13.1.3 Dependability

Dependability is the standard of trustworthiness in qualitative research which is the parallel of reliability in quantitative research. To ensure dependability, it is necessary to maintain a record of the process of data collection. Hence, the data from the interviews and observations and the results of the pre-tests and post-tests have been stored so that others can confirm whether the procedures were followed appropriately (Bryman & Teevan, 2005).

It should be noted that: “as qualitative research advocates flexibility and freedom, it may be difficult to establish unless you keep an extensive and detailed record of the process for others to replicate to ascertain the level of dependability” (Kumar, 2011, p.185).

4.13.1.4 Confirmability

Cohen, Manion and Morrison (2005) stated that the credibility of research can be enhanced by using triangulation or mixed methods. Similarly, Wellington (2000) suggested, that to increase accuracy and validity, two or more methods should be used so that the strengths of one method cover the weaknesses of the other method.

Triangulation contributes with trustworthiness to achieve confirmability (Lincoln & Guba, 1985) which parallels objectivity. Objectivity is the ability to visualize the issues without being affected by personal feelings, attitudes and beliefs; the researcher has tried to be objective in her research to maintain its trustworthiness. In this regard, Kumar (2011) believed that the participants’ responses are the best way to judge if the study results are accurate reflections of their feelings and thoughts. Since this research is interpretive, the data depend on the concepts and perceptions of the researcher; so the readers will also build their understandings based on the perceptions of the researcher when interpreting the data.

In this study data were collected through the separate research instruments of interviews, observations and pre-test and post-test. This was so that the results from each of the instruments could be triangulated by the other instruments. According to Yin (2006), triangulation uses different sources for measuring one phenomenon, which can be used to verify the validity or credibility of research.

Wolcott (1994) states that, to prevent confusion and decrease the impact of random elements that may influence the rigour of data collection, the researcher should make sure that his/her research procedures and aims are comprehensible after reading his/her interpretations clearly to the participants. The researcher discussed her interpretations of the interviews and observations with the participating teachers and with other researchers in the same field. This was because, according to Cohen and Manion (1984), that to become valid, the participants must have a common understanding of the facts that the researcher presents to them.

To make the results more valid, this study used the technique of constant comparison; this technique aims to gain critical insights into the data and make the results more organized and therefore more valid (Silverman, 2001).

4.13.2 Quantitative data collection

4.13.2.1 Reliability of pre- and post-tests

Cohen, Manion and Morrison (2005) and Bell (1999) explained reliability by saying that if an instrument is reliable, when it is re-applied in similar conditions it should give the same result. Thus, it is important to check the reliability of the achievement test. On the pre-test and post-test each correct answer was awarded one mark and each wrong answer was awarded zero. Then the tests were marked twice, by the researcher and by a specialist in Islamic Education from the Qassim University, to ensure reliability of the results. To be more reliable the test used Cronbach's alpha. According to Cronbach (1984), alpha is an important indicator of reliability and it is used for measuring internal consistency. The internal consistency gives an idea of the consistency of the questions with each other and with all questions in general that are related with the subject.

4.13.2.2 Validity of pre- and post-tests

To check the validity of the pre-test and post-test, they were shown to several academics from the Department of Psychology, as well as to lecturers in curriculum and teaching methods, ICT, assessment, and Shariah in the Islamic Department. They were provided with the content material, behavioural objectives and general aims. Some of the statements were re-worded based on their comments to be convenient and clear for students.

4.14 Researcher Positionality

It is vital that a researcher is aware of the lens through which they analyse their research, as this will necessarily influence how they interpret and interact with their work (Cousin, 2010). In light of this, it is important to note that my own position arose from my personal experience with the subject matter and context of the research insofar as I was an Islamic Education teacher for seven years. During this time, I spent a three years teaching in primary schools prior to moving to university, which enabled me to gain familiarity with the culture and context of the research. There was a lack of teaching aids and materials in the schools where I taught so, as I was keen to use technology, as a teacher I was always looking for suitable technology that could be adapted and used to assist and enhance my teaching. However, my lack of experience and limited knowledge was a barrier to finding appropriate approaches and resources. Therefore, when I started the Master's degree programme, many horizons were opened, including using the interactive whiteboard in primary schools. However, I also discovered that it was hard to find teachers who were using ICT in Islamic Education, whilst in other subjects such as the sciences it was more commonly used; therefore, I decided to conduct my study working with teachers who specialised in science subjects. It seemed clear to me that using technology had many advantages which might increase the effectiveness of lessons, especially in Islamic Education where a traditional approach to pedagogy can sometimes include an understandable level of cautiousness about introducing ICT, because of the need for appropriate respect, and this may make change more challenging, but it might also enhance students' learning. When I started my study for my PhD, I wanted to avoid taking any precipitous action so I undertook a small-scale exploratory pilot study to ascertain whether this approach had potential in a new cultural context, and whether it might be of value educationally so that schools might need it. Subsequently, I tried to find a new technology-supported approach, as technologies are continually being renewed, developed and accelerated. Hence through extensively researching into previous studies and reading in this field, I searched for a new method that could be used with smart devices, and the use of Digital Mind Maps provided an opportunity which could be used in different curriculum subjects. My background as a teacher provided me with an insider view but, at the same time, trying to take an outsider research perspective, as Ebrahim (2016) describes when working as a Muslim in developing Muslim early years education.

With the aim of reaching a deeper understanding of the method of Digital Mind Mapping, as a researcher I used several tools in the research, namely observation, interview and pre-test and post-test, so that the techniques could be triangulated to help me understand the teachers' and students' perspectives. A depth of understanding was achieved through this mix of quantitative and qualitative approaches, where the quantitative methods sought to establish 'what they say' whilst the qualitative methods sought to explain 'why they say that' (Sutton & Austin, 2015). By mixing the methods, this increased the credibility of the research and provided a more complete picture of what was happening. Based on the use of these tools, which aimed to avoid researcher bias, the research produced transparent results about the use of a classroom approach to promote Collaborative Learning using Digital Mind Maps. This should also encourage future researchers to use different methods of data collection to better understand the subject of their own research (Creswell, 2003).

In order to produce credible results and reduce any bias from myself as the researcher in the analysis, it was necessary to maintain an open mind towards the participants and to constantly verify and validate their views without dependence on any preconceptions. As the researcher, I was keen to ensure that the results were an accurate reflection of the participants' views, and I tried to ensure that there was no interference in the views of participants in any form, even if this was at the expense of the research (Merriam et al., 2001). As the researcher I was also keen to use interview questions such as 'what do you think could be explained more?' and this encouraged participants to provide in-depth information about the issues of the research (Bryman, 2012; Creswell, 2003) based on their opinions and perceptions. The use of this collaborative method of Digital Mind Mapping encouraged interaction between the female teachers and the female students in my study.

As the researcher in this study, I also discussed my own position through interaction with the participants (both teachers and students), explaining what I was trying to do and why, which was intended to help the participants express themselves openly. Furthermore, I have reported my approach to support the transparency of the process to select and present the comments and responses of participants in the presentation of the research. The underlying purpose was to avoid bias in conducting the research and to ensure that the results were reliable and ethical. I cannot guarantee that my background and experiences have not influenced me in ways that I am unaware of, so I have set out my own position as I see it in relation to the research to that the reader can understand and take this into account when interpreting the study.

4.15 Ethical considerations in the research

It was important to take into account ethical issues so that the research complies with the criteria advised by BERA (BERA, 2004; Wellington, 2000), the University of Durham (See Appendix 6) and the British Educational Research Association (BERA) because any unethical actions in the study may lead to low credibility of the research among participants. Regarding ethical issues, Wellington (2000) confirmed that researchers must focus on ethical issues during their research project and continue until the final stages of the study.

Some ethical issues taken into account in this study came out of the literature review. The teachers and students' families were informed of the purpose of the research by the researcher verbally and through a letter handed out before the interview. This letter included details of the research aims and questions (See Appendix 7). It was important to ensure that participants' identities were not revealed, so pseudonyms were applied. According to (BERA 2004), participants' data is confidential and not to be disclosed throughout the duration of the research. Approval for the recording of interviews was obtained from participants, and all participants were given freedom to decide on the time and place of their interview. Furthermore, the data were processed in absolute confidence and were not used for any other purpose. All participants were told that they had the right to cancel their participation in the study at any time and, in that case, all collected materials would have been discarded, including contact details. When the observations, interviews and pre- and post- tests had been conducted, participants were offered a draft of their transcript and observational data, which was discussed with them, giving them the opportunity to correct inaccuracies. This assured all participants that there was no confusion or ambiguity, and also helped them to fully understand the research process and give them the right to comment on the completed study. The researcher informed participants of the possible risks of participating in the research and obtained their informed approval from the beginning. Researchers and organizations such as the Wellington (2000) and BERA (2004) have emphasized the importance of informing participants about the goals, objectives and procedures of the research, because it is their prerogative to know what they are to be engaged with and what the consequences and possible risks are for them. Finally, permission was obtained from the Ministry of Education in Saudi Arabia for the school to collaborate with the researcher. In addition, since Saudi people are not as familiar with social science research as people in the West, steps were taken to provide explanations for the people concerned of the reasons for conducting the research. Consequently, the school principals were informed of the aims of the research and permission was obtained from the teachers. More details would have been provided for those who may have wished to have further information about the study. Ethical approval was granted by the School of Education Ethical Committee (See the e-mail in Appendix 6).

4.16 Summary

This chapter has been used to provide a detailed explanation of the design of the research methodology that was followed in this study. Further, the chapter starts by outlining the background philosophy of the research, which includes discussing the various components of the methodology, including the research methods, data collection, and data analysis. The chapter concludes by providing evidence that highlights the trustworthiness of both the qualitative and quantitative research, while the rigour of the associated ethical issues of the research that were considered were discussed.

In light of the methodology above, the researcher believes that these methods can be shown to be useful in determining the effectiveness of Digital Mind Mapping when combined with Collaborative Learning in learning environments in Islamic Educational materials in the Kingdom of Saudi Arabia.

The next section presents the analysis of the data and, based on the methodology used, discusses the relationship between the data achieved and the study questions.

5. Chapter Five: Qualitative Data: Results and Findings

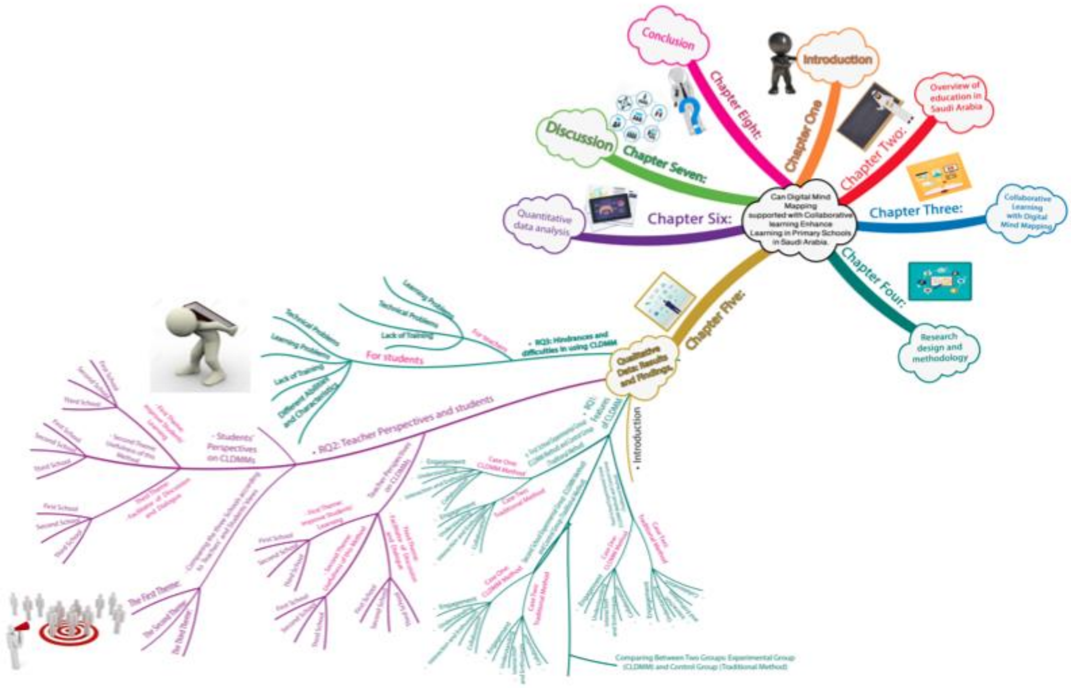

Figure 5.1 Digital Mind Map for Chapter Five

5.1 Introduction

"Qualitative researchers must choose not only what story they will tell, but also how they will tell it" (Wolcott, 1990, p. 18). Taking this quote into consideration, it can be seen that this study has sought to achieve its aims through employment of the qualitative methods of interview and classroom observation, and the quantitative experimental method of pre-test and post-test in order to collect data from which to analyse results. This chapter presents the qualitative findings and shows how they answer the research questions, with a summary of these presented below in Figure 5.2.

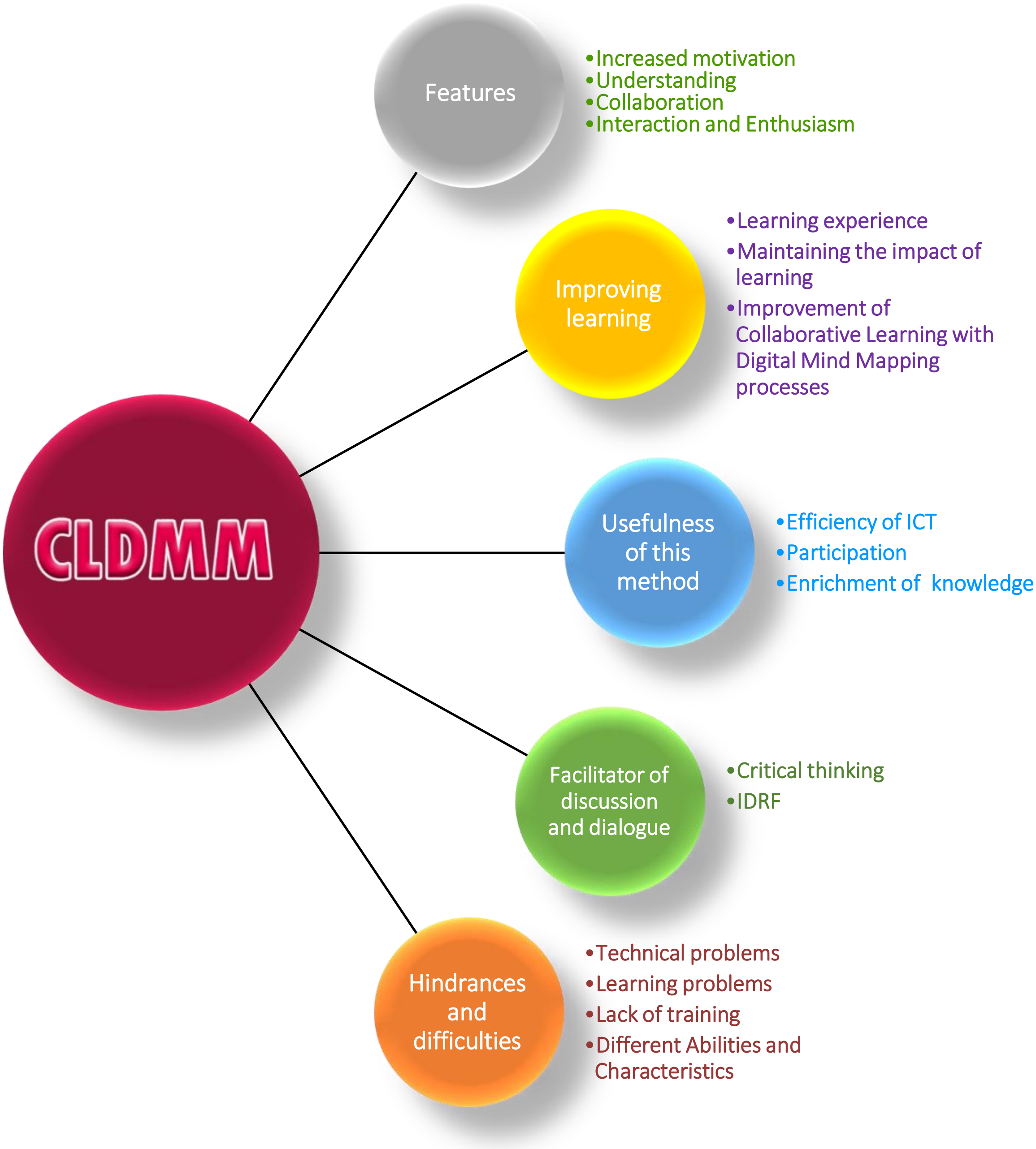

Figure 5.2 Summary of findings

This chapter will attempt to analyse the outcomes and conclusions, as deduced from the qualitative data. The data in question was obtained through interviews with four teachers and sixteen students, as well as by the direct observation of the classrooms of these teachers, and 181 students across three primary schools (see Table 5.1).

Table 5.1 Participants of data tools

Schools	Data collection		
	Interviews		Observation
	Teacher	Students	
First	2	8	4 classes (48)
Second	1	4	2 classes (76)
Third	1	4	2 classes (57)

It should be noted that the study sample contained teachers with an approximately equal number of years of experience. For example, in the first school, the first teacher had three years of experience, while the second teacher had five years. In the second school, the teacher had four years' experience, while in the third school, the teacher had five years. All of the teachers were educated to a minimum level, with all holding a bachelor in Islamic Education.

This chapter is divided into sections which aim to address the three main research questions. These are, in turn, divided into themes and sub-themes; beyond this, there will also be an analysis of the interviews and the findings of the classroom observations. In this study, the two types of case classes used were CLDMM, and traditional. Each school was composed of two cases. The findings will be presented alongside a sub-theme, with the categorised findings of each school shown to support comparisons drawn between them.

5.2 First question: How is Digital Mind Mapping being employed at present to support the learning process?

a. **What are the key features of Collaborative Learning with Digital Mind Mapping being used in classrooms?**

Themes and their sub-themes as they relate to the first research question (Table 5.2):

Table 5.2 First research question themes and sub-themes

Features of CLDMM	**Engagement**
	Increased motivation
	Understanding
	Collaboration
	Interaction and Enthusiasm

The key features of Collaborative Learning with Digital Mind Mapping revolve around its effect on the learning engagement, on the learning process, and the observed differences in learning. The table above presents the themes derived from a qualitative analysis of the data, related to the first research question and divided into sub-themes. See Table 5.3 and the Appendix for examples of what was coded in each category.

Table 5.3 Examples of coding for first research question

Theme	**Code**	**Data Source**		**School**			**Groups**		**Examples**	**Key word**
		Int	Obs	1	2	3	CO	EX		
Features of CLDMM	Engagement	✓		✓			✓		Teacher, "students in the traditional method are often involved at the beginning of the explanation, and then have a lower engagement"	"...involved at the beginning .... lower engagement"
	Increased Motivation	✓				✓		✓	Students ...motivation levels regarding Islamic Education were altered... Student ...this may be due to the increased interaction, as "lessons became more interactive, and that's what encouraged me to learn"	"...motivation ... were altered ... increased interaction,.... Encouraged ..."
	Understanding	✓			✓			✓	Teacher "some of the students could demonstrate full knowledge, supported with examples, and that this was the first time they had encountered this in three years"	"... full knowledge, supported with examples,..."
	Collaboration		✓		✓		✓		Researcher ... the teacher is the only speaker and there is little to no activity and interaction, with the exception of book reading and answering teacher questions.	"... teacher is the only speaker..."

	Interaction and Enthusiasm	✓		✓				✓	Student "the role of interaction in Islamic Education ....become more important because modern education uses a diversity of methods, especially when combining technology and manual drawing to create a digital map."	...interaction in Islamic Education ....become more important...”

The following sections set out a series of interpretations of these themes and categories across the different settings.

5.2.1 First School Experimental Group (CLDMM Method) and Control Group (Traditional Method)

5.2.1.1 Case One: Collaborative Learning with Digital Mind Mapping Method

This section describes the findings about, and transcripts of, the characteristics and qualities of the teaching method of Collaborative Learning with Digital Mind Mapping. It also presents the interviews with all of the teachers and students, backed with the field study. It is important for educators to understand the developments and the consequential use of these technological opportunities to make the best of the education process. According to Lai et al. (2007), technology interacts with pedagogical practices, and together they have a high potential of enhancing the learning process.

It is important to mention that the sub-themes and categories were not identical across all schools, since the analysis showed that the context was different and each school produced different sub-themes and categories. In the next section, more about each theme is explained in detail.

Engagement

The current study found that there was positive engagement in the classrooms when employing the method in question, alongside student-to-student interaction and active participation in the classroom. Teacher A noted that the students' “involvement in the participation was due to the use of DMM with CL”, and Students A and C supported this stance, stating that their “participation was better when we used the DMM, especially within the group”. This finding was strengthened by the researchers’ own observations, as it was noted that student interaction within groups created a ‘beehive’ of engagement during the use of the DMM in the Fasting (Alseyam) lesson. For example, the teacher divided the class into five groups which worked together in the activity; this led to a harmony of voices as they discussed with each other and at the same time asked the teacher while collaboratively creating their DMM.

Understanding

Using Collaborative Learning with Digital Mind Mapping required a higher level of understanding of the subject matter; this was confirmed by Teacher A, who viewed the use of the digital map as “an effective way to learn, and [one] that will help students understand the subject matter better and in an accurate manner”. Teacher B shared this view, adding that the digital map “helps students [to] know the exact, more understandable information”, adding that when students work as a group to create DMM, it helps them to revise together. Students A and B also confirmed that CLDMM could be used as a shortcut to a review, and rendered the material more understandable. This could occur where the students were trying to summarize the lesson in Digital Mind Maps, working collaboratively through what they had understood as well as using the textbook and what was written on the blackboard. In sixth grade, and in the Hadith lesson about how the Prophet deals with children, I observed that the students exhibited excitement at the prospect of participating in group work and they provided the teacher with a summary revealing a comprehensive understanding of the main points.

Interaction and Enthusiasm

Interaction in the classroom is a key element of effective coordination between the characteristics of Digital Mind Mapping and concepts of Collaborative Learning (Bryman, 2012) to answer the second question. For instance, the observations conducted by the researcher revealed that Digital Mind Maps may be used to present a lesson which students then attempt to summarise in one page or less by initiating discussion and employing critical thinking skills in groups, where collaboration, enthusiasm, interaction and the exchange of views can be facilitated. Teacher A explained that “a number of the benefits reported through use of Collaborative Learning with Digital Mind Mapping are due to the encouragement these methods give students when interacting in the classroom; consequently, this supports the students' ability to learn not only from the teacher, but also from their peers”. Student C emphasised that “the role of interaction in Islamic Education lessons has become more important because modern education uses a diversity of methods, especially when combining technology and manual drawing to create a digital map”. This was supported by Student D, who asserted that “I am reluctant to miss classes, particularly Hadith classes, even if I’m unwell”.

Collaboration

Collaboration, in this case, refers to the process by which students work together in small group to create Digital Mind Maps. The researcher noted that, amongst the students, there was a high level of interaction and vitality when the teacher encouraged collaboration through questioning, discussion and workshops.

Teachers A and B also acknowledged this change, arguing that collaboration aids students in understanding the lesson by allowing them to discuss the key elements of creating a Digital Mind Maps in groups. Students A and C believed that when one examined individual learning, when compared with Collaborative Learning, it is clear that “Collaborative Learning gives us a chance to debate” and exchange with their peers to arrive at a satisfactory answer.

5.2.1.2 Case Two: Traditional Method

This section presents the advantages and future potential of traditional teaching, by considering both teachers and students without Collaborative Learning with Digital Mind Mapping, with the researcher’s observations considered.

Engagement

Using this method, I noticed that the engagement of students was high during the first five minutes, hereafter experiencing a gradual decline, until the few still participating faded away. According to Teacher B, “students in the traditional method are often involved at the beginning of the explanation, and then have a lower engagement”; a lack of diversity in the teaching methods has been suggested as the reason for this, while teacher A argued that engagement may be low due to the focus on working individually. Two students supported this belief, with Student E stating that “there is no chance in the lesson process to engage", with Student G adding that they “prepare for the lesson in advance to be engaged and participate according to my preparing”.

The researcher noted that too much information was presented to students in a traditional way, and believes that poor organization of the material led to a lack of focus and the reluctance of students to participate. This happened in the prayer lesson on duties and on Sunan prayer, which are similar to some extent.

Understanding

During the interview, Teacher A noted that lessons were “easy to understand as they’re relevant to their lives, and the students have learned this information before, either at home or in previous years”. Teacher B, however, argued that “even if students have little experience, the focus should be on helping them reach a higher level of understanding” as “the information is not given to all students, and in all subjects, and some exams, I found that low marks result”. Also, she added that “students may also have no interaction in their classes, and every student learns alone”. Students F and H disagreed with teacher A, as student H said that “it is sometimes difficult to understand where differences exist, such as between the ‘duties’ and ‘Sunan’ of the prayer. This was echoed by student F, who said that “they failed to understand or to differentiate between them”. My observations agreed with the students’ opinion as, though the teacher attempted to introduce the information in a way that could be practically applied, about half of the students' answers still demonstrated a lack of understanding regarding the differences. For instance, “between Sunan and duties of prayer and also between Eman billers and Islam billers”.

Interaction and Enthusiasm

I noted that there was a noticeable lack of interaction in this classroom, and there were expressions and body language on the part of the students which indicated a feeling of tiredness or even boredom, a view which was supported by student testimony in this class. In one class, the teacher was active, assumed a number of roles, and changed the tone of her voice frequently, in order to hold the attention of the students. In this instance, though students were more interactive in the classroom, the interaction ratio remained lower than that observed in cases where the students’ interaction was aided by technology. Student E explained that the “teacher usually takes control of the lesson and speaks for the majority of the allocated time; this does not give us enough time to discuss and interact”. Teacher B suggested that levels of engagement (she talked about boredom and enthusiasm) in the classroom differed depending on the kind of lesson, and explained that the "student may be interested in the specific subject, which determines a high level of interaction regardless of the method employed".

Collaboration

Teacher A believed that, "in my experience, the experimental classes reveal that collaboration increases the motivation and responsiveness of a student body", while a class which relies on independent study places more importance on recitation. Student H claimed that "she has experience in the past year with CL, and this term was boring because the teacher is the only source of information". Student G agreed, stating that "I do not know the point of view of my partners about the lesson". On a more positive note, I noticed that this class was more orderly and disciplined than the CL classes.

5.2.2 Second School Experimental Group (CLDMM Method) and Control Group (Traditional Method)

5.2.2.1 Case One: CLDMM Method

Engagement

Generally, engagement was much as described in the first school; Teacher C pointed out a "correlation between engagement and the use of CLDMM when compared with my other class that did not use it, instead working individually". Student 'I' mentioned, however, that "engagement was at the same level", but may have changed in nature; they attributed this apparent change to factors of motivation and enthusiasm in the classroom. This supports the observation that the students were engaging as group members, particularly when creating the DMMs, which encouraged each student's comprehension.

Understanding

Teacher D said that their students knew all of the information required of them for the first time. For example, with regard to teaching a lesson on charity (Zakat), teacher D said that "some of the students could demonstrate full knowledge, supported with examples, and that this was the first time they had encountered this in three years". In addition, Student 'I' said they "understood the lesson quickly, and this encouraged me to learn"; Student J concurred, arguing that this method creates more stable and less forgettable information. One could argue that because CLDMM as a technology provides images and colours, there exists the opportunity for students to understand the lesson clearly as they can work together to support each other.

Interaction and Enthusiasm

Teacher C also stressed the element of interaction as CL with DMMs allows students to interact among themselves. From the observation, it can be concluded that Teacher C was more wholehearted in her application of DMMs with CL to facilitate interaction among students. She encouraged her students to discuss how they could best create maps among themselves, while Student J put forward that lessons of Islamic Education are now hugely interactive and there was previously an absence of enthusiasm, which aids the preparation of Digital Mind Maps. When also incorporating the IWB, Student I mentioned that "I postponed my family travel" as she did not wish to travel if it meant missing classes; this decision may have been influenced by the subject of Fiqh and the use of Digital Mind Maps to teach this class.

Collaboration

As with the first school, Teacher C stated that she usually noticed the presence of "critical thinking through groups and when using the Digital Mind Maps"; this may be considered an example of a student proposed answer and particularly when the answer was discussed through student cooperation, as well as the suitability of the headline selection and branches for the Digital Mind Maps. The student also argued that collaboration is key to learning and it “encourages us to get involved”. Indeed, this is what I observed from Student I, whose teacher also said that “student participation was improved by employing collaborative techniques”.

5.2.2.2 Case Two: Traditional Method

Engagement

In Case Two, with traditional methods, the level of student engagement remained more or less the same, but may have changed through the use of alternative techniques, such as through explaining prayer in a story. The teacher and their students agreed that there was no interaction during these lessons because, as one student said, they “learn in the same routine”.

Understanding

The view of Teacher C is in concurrence with that of Teacher B in the first school, who argued that, even though students may know this information, there are plenty of topics that require further understanding; some subjects provide more information, “depending on the stages".

In the classroom, it was clear that students were not engaging with their teacher, and after 15 minutes I observed that most of the students had become distracted. Student L suggested that the reason for this was that they “dismissed [the lesson] for not having a lot of opportunities to participate or interact with my friends”. For example, I noted that, after 15 minutes of the fasting lesson, some students were playing with a box of pens and the teacher had to remind the students to pay attention to the lesson, and after a brief period there were conversations going on in the back row of the class.

Interaction and Enthusiasm

Student K believed that "traditional methods of conducting lessons can feel tired" and that there is not enough motivation for students to participate in the lesson. In fact, the research reveals that most of the lessons in the three schools which were reliant on traditional methods demonstrated a lack of enthusiasm in the student body, not least because the lessons were entirely devoid of interaction.

Teacher C spoke out in opposition to Teacher A (as I mentioned on understanding in the traditional method in the first school), stating that student interest in a particular subject area "will not necessarily increase their interaction", but may increase the attention and reduce boredom; the method, they argue, may not be as influential as first thought.

Collaboration

Using the traditional method, the teacher is the only speaker and there is little to no activity and interaction, with the exception of book reading and answering teacher questions. Although Student L expressed a preference for this method, instead praising "individual learning as more comfortable", it is true that without collaboration and interaction there is "no chance to express one's opinion" and the teacher monopolises the lesson. Teacher C discussed CL in terms of enriching the information for the students, "though this requires additional management on the part of the teacher".

5.2.3 Third School Experimental Group (CLDMM Method) and Control Group (Traditional Method)

5.2.3.1 Case One: Collaborative Learning with Digital Mind Mapping Method

Increased Motivation

Motivation to learn is a necessary prerequisite for the success of the learning process and, therefore, it is important to consider that using the CLDMM can be a source of motivation for students to learn. According to Teacher C, using Collaborative Learning with Digital Mind Mapping "has many positive benefits, increasing the motivation of students, and helping to speed up the learning process". The researcher posits that the teacher held this belief due to their use of, and familiarity with, technology. This has facilitated the introduction of CLDMMs in the classroom, where the students were often not familiar with its use alongside Islamic Education. The students also stated that their motivation levels regarding Islamic Education were altered. For example, Student M suggested that this may be due to the increased interaction, as "lessons became more interactive, and that's what encouraged me to learn". Observations revealed that CLDMM classes were very active, and it was noted that most of the students came in early, competed in the first stages, created the Digital Mind Maps and developed a healthy rivalry between the groups. For instance, in prayer lessons, students competed to write their main topic, which was then supported by pictures.

Understanding

In this class, the researcher observed a positive effect on students' understanding of when to use the Digital Mind Mapping, and demonstrated skill in the selection of appropriate images using the iPad, facilitated by the exchange of experience. This was illustrated by students pointing out the image in order to link it to the subject, which was conducive to increased understanding, and information absorption.

Teacher D thought that students understood most of the topics, and that this was because she used a way that helped them to summarise their ideas by having the points provided with pictures.

Student P argued that, in the Fasting (Alseyam) lesson, information was obtained more easily and quickly, and the main ideas and sub-ideas were summarised by peer-to-peer sharing to aid understanding. An example was provided as to 'who is allowed to break the fast during Ramadan'; this was understood far better than previously observed.

Interaction and Enthusiasm

Through observation, the research indicates that the interaction of the students when preparing for the lesson and during the lesson, when done effectively, leads to students answering teacher questions with far more confidence. Moreover, there was a noticeable level of enthusiasm among students in the classroom as they were keen to answer questions or to participate in activities. Teacher D pointed out that Digital Mind Mapping encouraged students to involve themselves in the educational process and bear a greater responsibility for their own learning. Discussions with Student M regarding Collaborative Learning with Digital Mind Mapping led the researcher to consider a number of questions, especially when creating the maps and when discerning the focus of the words chosen. This is supported by Student N, who expressed hope that "we use the programme of Digital Mind Maps in the iPad in all Islamic Education subjects, as well as in all subjects".

Collaboration

The researcher found, through observation, that collaboration brought with it a number of positives; it allowed the students to be creative in creating Digital Mind Maps. Student N confirmed that the group work was easier than individual work, as it reduced the time taken to create the Digital Mind Maps. In addition, Student M said that she preferred collaboration because it "makes the relationship between me and the students become the best, also I understood the lesson in the biggest way". Teacher D also believed that cooperation may have helped the students with lower level abilities to work with their peers to create clear maps, in which they can summarise information and improve their own academic achievement.

5.2.3.2 Case Two: Traditional Method

Increased Motivation

In the prayer of the same lesson, the researcher observed was that the classroom was silent, though the lesson was familiar and the students were experienced. Here, teacher D admitted that there was a problem in motivating students to learn using traditional Islamic Education materials, particularly when compared with classes that implement Collaborative Learning with Digital Mind Mapping. He asserted that general education staff in Saudi schools may be reluctant to use Islamic Education materials, however, and argued that the teacher has to make efforts to change their way of teaching.

The issue of lacking motivation for interaction in the classroom was confirmed by students O and P, with one suggesting that they struggled with dozing off during classes due to the methods by which they were being taught.

Understanding

Despite the fact that understanding is required in Islamic Education, according to Teacher D, the problem still existed that it was difficult for teachers to change their method of explanation due to the students and the teacher being accustomed to the traditional way. Furthermore, in some subjects, Teacher D found it difficult to deliver the ideas to students, suggesting that learning in groups may help the students to understand more easily. Students O and P stated that they usually took a long time to prepare for examinations. It was evident, however, that the students in the charity (Zakkat) lesson, although able to understand, seemed to forget the fundamentals shortly following the lesson; their comprehension was brief and limited.

Interaction and enthusiasm

Student O confirmed that which had been expressed by her peers, that students were not given the opportunity for dialogue and interaction; this resulted in repetitive and stilted lessons. Teacher D expressed that the interaction between students in the classroom closely simulated the realities of critical thought, with the use of technology in teaching being among the most useful tools available. The researcher notes that in the Zakat receivers, when asked about the receivers of Zakat, the majority of the students could give no answer. Only three students were able to contribute, while the rest were busy preparing for their subsequent art lesson.

Collaboration

Student P stated that they did not feel that the traditional method improved their minds in any way; the researcher notes that the information taught was limited to existing literature, unlike experimental classes involving Collaborative Learning, which a number of students found more enriching. Teacher D believed that there should be diversification between the use of individual and Collaborative Learning methods according to the needs of the students across different classes.

5.2.4 Comparing Between Two Groups: Experimental Group (Collaborative Learning with Digital Mind Mapping) and Control Group (Traditional Method)

When comparing findings of the themes of the experimental group (Collaborative Learning with Digital Mind Mapping Method) and control group (Traditional Method), it is clear that they differed from one another regarding engagement, motivation, understanding, collaboration, interaction and enthusiasm. The results for schools in a similar environment to one another have been found to be very similar. Consequently, there is an increased engagement with the use of CLDMMs in Islamic Education lessons, as students reported that participation increased, especially with group work, and this was reinforced by the observations of the researcher. Also, teachers found a difference in outcome between control classes and those for the experimental method; these engagements are related to the Digital Mind Map and Collaborative Learning.

On the other hand, for the traditional method, the researcher noted that students were participating in classes for the first five minutes, then gradually losing focus unless the teacher changed their method; this observation was supported by the teacher's notes. Sometimes these classes were silent when compared to the classes using CLDMM; the students had become used to learning in the same routine. This decline in attention could perhaps be attributed to the teacher and a lack of acknowledgement that students must learn both individually and as part of a group.

In the third school, there emerged a theme of increased motivation rather than participation and the teacher stated that few teachers of Islamic Education use these methods and almost none introduces technology into the classroom; she attempted to change her way of teaching to increase student motivation.

Regarding understanding, students mentioned that they understood the information more quickly and were less likely to forget because it brought the information together in one image alongside the main points; this method helped them to summarize the ideas. The teacher also found that, in examinations, students were able to complete a piece of information backed with examples, which was not the case during previous periods of teaching. Therefore, this method is an effective way to learn the lessons in more accurate way.

In contrast, in the control group (traditional method), students were distracted after 15 minutes of the lesson and bemoaned the lack of opportunity to interact and share with their colleagues. The students also explained that it was difficult for them to distinguish between some of the lessons because they expressed similar points. This was supported by the teacher, who mentioned that some students had low scores in the test. The teacher also found it difficult to convey the ideas to students, which may mean that learning in groups made it easier to understand information. In addition, preparing for the lesson also took a long time because student understanding of information had to be achieved in a limited time, after which they appeared to forget the key points.

Furthermore, in terms of interaction and enthusiasm, the students stressed that interaction had become more important in Islamic Education classes due to the importance of introducing technology and fostering drawing skills in the creation of a digital map. Islamic Education lessons were now far more interactive, and this led to greater enthusiasm on the part of the students, as they enjoyed using the Digital Mind Map and experimenting with technology.

On the other hand, in one of the control classes, the students were bored despite the fact that the teacher tried to change her teaching methods frequently to combat this; student responsiveness was still lower than that of CLDMM classes. One student said that for the majority of the lesson the teacher was the only speaker, which decreased interaction and limited discussion; there was no motivation for students to participate. One student, notably, suggested that interaction in lessons may sometimes depend on the interests of the students and their engagement with relative subjects. Sometimes students did not engage with the material until the very end of the lesson, if they were energised for a break or the next lesson.

Collaborative Learning gives students the opportunity to interact and cooperate peer-to-peer through workshops in order to reach a satisfactory answer; students also noted that cooperation was the key to learning and that it encouraged them to engage. Some students mentioned that they found learning in groups easier than individual learning as it could be done quicker via Digital Mind Mapping and it may also have improved the relationship between a student and his/her peers. The teacher also noted that the integration between the different levels of student abilities which occurred in Collaborative Learning helped them achieve more highly. In the third school, students were excited and encouraged to attend class early if they were not familiar with using technology in Islamic Education. Through these means, lessons became more attractive, encouraging retention and motivation.

The teacher said that, compared with the experimental group, she found that the control group, with almost exclusively individual learning, exhibited lower learning interaction and motivation to learn. One of the students reported that individual learning made the teacher the sole source of information, which meant that they felt they understood little about their own views and perspectives on the lesson. Although CL enriched the information and gave students more of a chance to express their opinions, it required good management by the teacher of the student groups. The researcher believes that the learning in the control classroom was limited as it was based on a reliance on the textbook and the teacher, unlike CLDMM, which was more enriching; this was stressed by one of the students, who said that the traditional way was not contributing to the evolution of his thinking.

Interestingly, I found higher levels of behaviour and discipline in the control classes, than in the Collaborative Learning with Digital Mind Mapping classes. However, one of the students expressed a preference for individual learning and praised this method, as it made her feel more comfortable than with interaction. Eventually, teachers may make use of diversification between individual and Collaborative Learning methods according to the needs of the students in their classes and begin to move away from traditional approaches.

5.3 Second question: What are Participants' Perspectives?

a. **What are the teachers' perspectives on Digital Mind Mapping regarding Collaborative Learning and the effect on learning?**
b. **What are the students' perspectives on Collaborative Learning with Digital Mind Mapping?**

Themes and sub-themes related to the second research question are presented in the following table (5.4).

Table 5.4 Second research question themes and sub-themes

Theme	Sub-themes and categories
Improving learning	Learning experience
	Maintaining the impact of learning
	Improvement of CLDMM processes
Usefulness of this method	Efficiency of ICT
	Participation
	Enrichment of knowledge
Facilitator of discussion and dialogue	Critical thinking
	Initiation and Discussion Response Feedback (IDRF).

The nature of this question focuses on the schools, teachers and students who had used Collaborative Learning with Digital Mind Mapping previously; they were asked about their views on the use of this method. The researcher that it was necessary to limit the study, regarding this question, to the teachers who had employed Collaborative Learning with Digital Mind Mapping in their classes. Consequently, classes using traditional methods did not share in the answer to this question, as they had not used CLDMM. It is important to give examples of what was coded in each category (see Table 5.5).

Table 5.5 Example of coding for second research question

Theme	**Code**	**Data Source**		**School**			**Examples**	**Key word**
		Int	Obs	1	2	3		
Improve learning	Learning experience	✓				✓	Teacher said that CLDMM "as a 'force multiplier' for the teacher rather than the only source of information for the students. The map helped students to think independently and to build their experience...."	"... force multiplier' .... build their experience...."
	Maintaining the impact of learning	✓				✓	Student N pointed out that "information is more firmly established ....., as the information undergoes many stages (writing,	"... more firmly established.."

							drawing, searching and discussing in a group)"	
	Improvement of CLDMM processes		✓		✓		Researcher observed that .. at first, students had created simple maps of the basic points ..... Eventually, this evolved into attractive DMMs, supported with pictures and colours..	"...This evolved into attractive DMMs....."
Usefulness of this method	Efficiency of ICT	✓		✓			Teacher "..... students often participated in CLDMM activities ...... teacher, who assumed the role of a supervisor rather than a leader in these activities.."	"...Teacher .. role of a supervisor rather than a leader..."
	Participation	✓		✓			Student said about production of the DMM she ".... felt more productive and eager to participate during lessons."	"...more productive and eager to participate.."
	Enrichment of knowledge	✓				✓	Teacher "...that CLDMM can help students to acquire research skills, such as searching for suitable images and discussing in groups.."	"... acquire research skills.."
Facilitator of discussion and dialogue	Critical thinking		✓	✓			Researcher noted heated debate among students regarding the addition of points to the DMM..... students stated their opinion with their own reasons ..... This triggered the curiosity of the rest of the groups for discussion at this point....	"...Debate........ opinion ...their own reasons ..... discussion....."
	Initiation and Discussion Response Feedback (IDRF).	✓			✓		Student, "It was allowed to discuss more with the teacher because I create the DMM so brought to mind questions which I got answered right away. Without the map, how can I know about the information? I will go home without asking her because I did not see the contents of the lesson".	Discuss Questions asking

5.3.1 Teacher Perspectives on Collaborative Learning with Digital Mind Mapping

This section will introduce the views of teachers based on the three main themes, including their respective sub-themes. The first main theme is 'improving learning', which includes the sub-themes ‘learning experience’, ‘maintaining the impact of learning’ and ‘improvement of Collaborative Learning with Digital Mind Mapping processes’. The second main theme is ‘usefulness of this method’, which includes the sub-themes ‘efficiency’, ‘fluency’ and ‘participation’. The third and final main theme is ‘facilitator of discussion and dialogue’, which includes the sub-themes ‘critical thinking’ and ‘IDRF dialogue’.

The First Theme: Improving Students’ Learning

First School

The point of view of teachers A and B on using the Collaborative Learning with Digital Mind Mapping method was that, as mentioned by teacher A before the lesson, there would not be a large influence on the improvement of learning through the use of CLDMMs. This was because, she asserted, “it depends on the keenness of the students” and whether that student felt engaged or bored in their Islamic Education classes. However, after being interviewed post-experiment, the same teacher responded that the “Collaborative Learning with Digital Mind Mapping helped the teacher to support students in retaining the information”, as the teacher could remember the students’ maps for each lesson. Both teacher A and teacher B responded that the methods in question led to a noticeable increase in knowledge and experience amongst the students. They noted that students chose the map elements cooperatively by reading the book and through the use of their previous experience; this is evidence of the process by which students receive information from the teacher, read and discuss with their peers and begin to write. This process improves memory and recall in students and allows them to retain information for longer.

Secondly, regarding map development, teacher B noted that the groups were in competition; students were able to write more elements than before and with a conservation of words. This allowed them to choose the most important words for the lesson, with more information expressed more concisely. Teacher A added that this method "encouraged the students to learn and improve their memory skills", even those who were previously non-active in the classroom. It was reported that students competed to participate in lessons; before using this method, very few students offered answers to teacher questions. As Digital Mind Mapping contain keywords, the student remembers the meanings of these short words as they "represent the information in a visually attractive medium".

Second School

The teachers agreed that the use of the Collaborative Learning with Digital Mind Mapping method had a number of benefits, including improvements to the learning process, from the creation of the map to the cooperative summary of the lesson. This enhances the experience of learning by exchanging ideas through suggestions about the main and secondary branches, which are essential in building the Digital Mind Maps. Teacher C stated that "this mutual experience enhanced learning and allowed them a greater degree of influence over the students over a longer period of time". This was confirmed when she noticed the retaining of information when students were tested before and after the CLDMM process; the majority of students were able to recall the basic points of the first lesson, regarding fasting, four weeks later.

There are certain factors which have been noted to enhance the learning process, centring on improvements to the CLDMMs processes. To begin with, the maps were presented by myself as the researcher to the students and teachers during the interview; at first, the students had created simple maps of the basic points without pictures and colours, as in Figure (5.3), below.

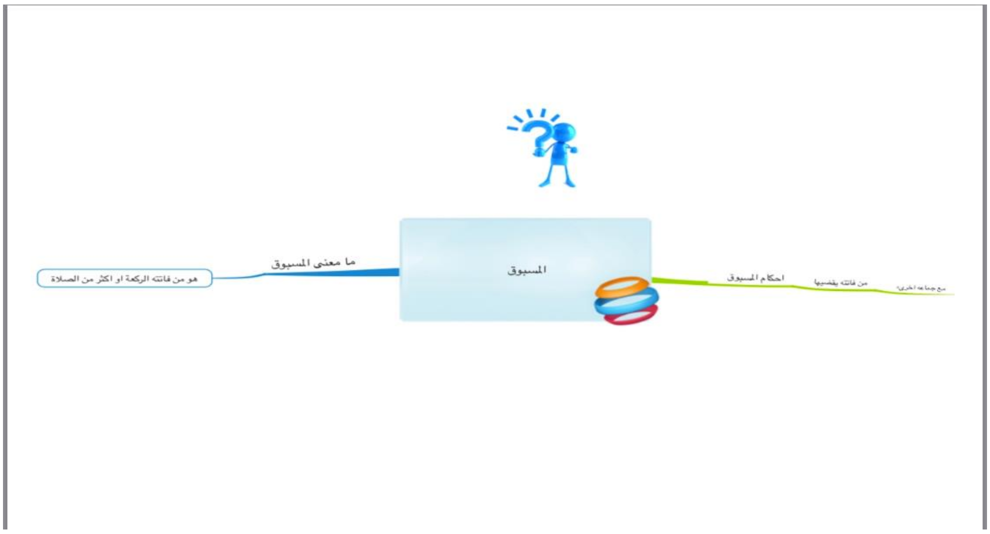

Figure 5.3 First example of students' mind map

Eventually, this evolved into attractive Digital Mind Maps, supported with pictures and colours; this was the case with the sixth-grade classes during the Fiqh module Figures (5.4 and 5.5), below. For more Digital Mind Maps see Appendix 9.

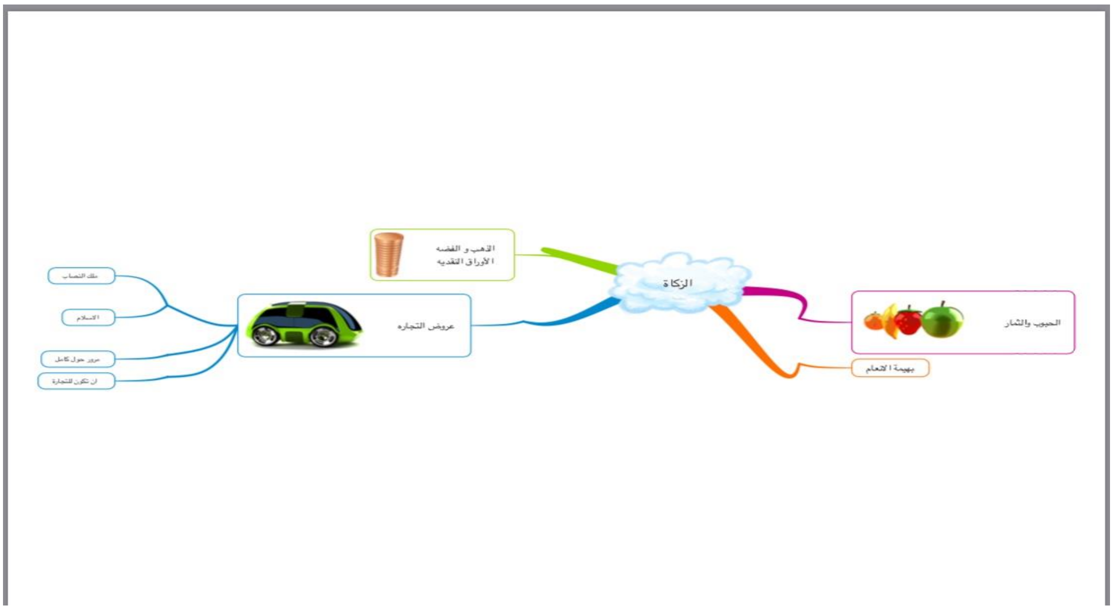

Figure 5.4 Second example of students' mind map

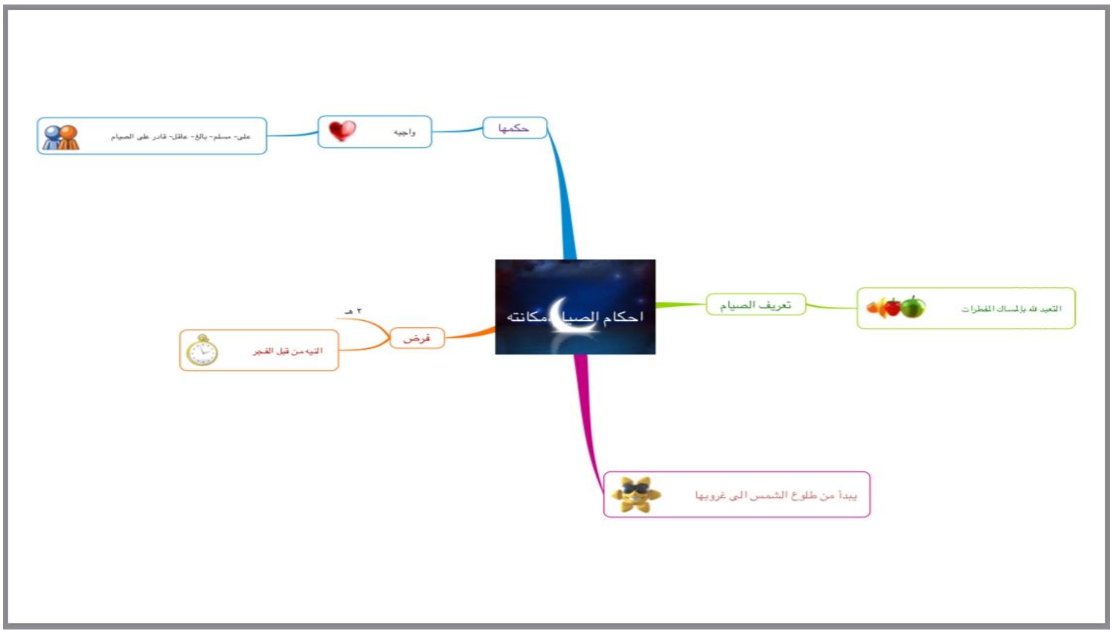

Figure 5.5 Third example of a student's mind map

Third School

Teacher D believed that "Collaborative Learning with Digital Mind Mapping can develop students' learning capabilities due to the Digital Mind Mapping acting as a 'force multiplier' for the teacher" rather than the only source of information for the students. The map helped students "to think independently and to build their experience regarding research through the selection of appropriate images for ideas points" and through peer-to-peer cooperation when selecting the information presented in the Islamic Education materials. In the case of Collaborative Learning, the learning experience of students was enhanced through contact and interaction with their peers, who may have had different experiences and upbringings. Additionally, using colours and images when making maps created a correlation between lesson ideas, which may have helped them remember information and maintain meaningful connections between words and images.

Further, using this program on iPads or on a laptop meant that work could be saved and emailed; students could then participate in modifying the map collaboratively, as well as saving photographs and maps to use at a later date.

The teacher also noted the “difference between the first map and those created after, in terms of the selection of images and the act of drawing the map”. Although the maps “still lack depth”, this has been explained as due to a lack of material in the actual Islamic Education lessons and the relative inexperience of the students with the approach. Finally, it is important to mention that drawing the maps took less time as the students got used to the process.

The Second Theme: Usefulness of this Method

First School

Both teachers A and B mentioned that they tried to incorporate the benefits of Collaborative Learning with Digital Mind Mapping into their teaching style, such as participation and creativity. This is evidenced by the fact that students often participated in Collaborative Learning with Digital Mind Mapping activities, such as discussion and problem solving, with the teacher assuming the role of supervisor rather than leader in these activities. As a result, students were able to cover the subject matter with greater speed, thus reducing the effort and time spent by teachers in delivering the information.

When asked about the effect of Collaborative Learning with Digital Mind Mapping, teacher A commented that “CLDMM [is] useful and efficient, therefore I look at Collaborative Learning as a continuous learning strategy in all subjects and this will appear strongly when students create Digital Mind

Maps". Teacher B also noted that the “efficiency of CLDMM was manifested in students’ higher level of understanding”.

Teacher B reported that this method has enabled students “to review lessons easily and smoothly”, particularly as it was stored in devices. At the end of the unit, the researcher opened the device and presented the student maps as a PowerPoint for review; this reduced the time spent on the study and made the results easier to peruse.

Using Collaborative Learning with Digital Mind Mapping, teacher A noted that it enriched student knowledge; for example, in the Hadith (Prophet Traditions) lesson, in which it is explained how the Prophet treats the young, students noted just four out of seven points, before Collaborative Learning with Digital Mind Mapping. Once the students began creating maps, the completion of seven out of seven points was recorded through research and collaborative thinking.

Second School

Teacher C thought it very positive that students “were more active participants in the learning process” by being able to extract collaboratively the main points and conclusions from the lesson material. It was also noted that students wrote independently, later sharing their new ideas, which facilitated the exchange of ideas quickly.

In addition, one teacher said that the use of Collaborative Learning with Digital Mind Mapping “allowed students to learn faster”; for example, the researcher was able to send the map to students via an App to a number of social media platforms such as WhatsApp and Facebook; these maps could then be reviewed. This was useful for students who may have missed classes so that they were familiar with the main points, supplementing the lesson outline with the work of their peers.

Furthermore, she stressed that the Collaborative Learning with Digital Mind Mapping had encouraged students to enrich their own knowledge by linking more than one lesson in the same map. For instance, prayer classes spread over four lessons, and students were found to be collecting the points of these lessons in one map between the group members to make it easier to memorise.

Third School

In this school, teacher (D) asserted that there was a difference between Collaborative Learning with Digital Mind Mapping and traditional teaching methods. She found Collaborative Learning with Digital Mind Mapping to be "far from the traditional teaching methods where a “student is a listener and only a recipient of information, whilst Collaborative Learning enables students to participate” especially when they used ICT such as Digital Mind Maps which gave them more participation.

In addition, she reported that the creation of digital maps alongside Collaborative Learning was “efficient in the development of education methods” as it organized overlapping information and allowed the flow of ideas to be written in a clear and easy manner. Using this method, students worked together and this was time efficient; in prayer lessons, students were able to write collaboratively through the map, which allowed them to memorise information over a short time. She added, “Collaborative Learning with Digital Mind Mapping can help students to acquire research skills, such as searching for suitable images and discussing in groups”.

The Third Theme: Facilitator of Discussion and Dialogue

First School

Both teachers said that IDRF dialogue structure (Initiation and Discussion Response Feedback) was used between students as a supporting method rather than a main method during Collaborative Learning. When teacher B was asked about her preference, which swayed towards collaborative activities over IDRF, she said that the former developed social skills between students and “gives them the opportunity to talk to each other while making them aware of their ability to interact and participate in the classroom”. Teacher A mentioned that the map had “helped students with their critical thinking skills”, as each student presented their ideas through group debate; they then either accepted or rejected this idea and gave their reasons for the decision.

For example, in the lesson on Fiqh, the researcher noted heated debate among students regarding the addition of points to the Digital Mind Maps from the lessons of Zakat (charity); every student stated their opinion with their own reasons until the group agreed to write this point. This triggered the curiosity of the rest of the groups for discussion at this point, who also gave their opinions.

Second School

Teacher C mentioned that using Collaborative Learning with Digital Mind Mapping “improved student ability to communicate”, which consequently “makes dialogue IDRF easier for them”. She confirmed that this method gave students an opportunity to express their ideas in a more comprehensible way. She added that she asked students general questions at the beginning about new concepts relating to Fiqh, which were then discussed in groups while other groups tried to find answers through their DMMs. After creating a map, each member in each group gave feedback about their points, presenting the final draft of the map. “The same level of dialogue and discussion was not recorded in other classes and other modules”.

Additionally, she believed that using CLDMMs “led students to interact with their peers using Islamic Education materials, which helped them to debate critically” when choosing images and branching or plotting points. This helped strengthen their skills of inference, review and evaluation.

Third School

Teacher D mentioned that this method demonstrates the capacity of Collaborative Learning with Digital Mind Mapping to give students an “opportunity for dialogue and broader discussion”. In addition, this method is based on the attributes of Collaborative Learning regarding IDRF dialogue and discussion.

She went on to note that “some of the less confident students were more forthcoming with answers after CLDMMs”. She also praised the process of presenting slides of the digital maps from the iPad to the projector, as this allowed the teacher to acknowledge everyone's opinion and debate each group alone with their members. This eliminated boredom as “it makes a link between students of differing ability and develops critical thinking techniques”.

In this regard, the researcher posits that dialogue and critical thinking are part of understanding Collaborative Learning with Digital Mind Mapping. When conducting her own classes, the researcher allowed students, when using Digital Mind Maps, to discuss amongst themselves and with the teacher, to allow the opportunity for critical thinking in problem-solving activities.

5.3.2 Students' Perspectives on Collaborative Learning with Digital Mind Mapping

The First Theme: Improving Students' Learning

First School

The views of the students were revealed by conducting interviews regarding improvements in learning. The questions can be divided into three categories: the learning experience, maintaining the impact of learning and improvement of the Collaborative Learning with Digital Mind Mapping process. One student, Student A, claimed that, with regard to the learning experience, the use of previous experience in retaining information "could be used alongside Collaborative Learning with Digital Mind Mapping to aid understanding". Student B stated that both previous experiences and new experiences "reinforced learning through the use of Digital Mind Maps".

Student B stated that learning information using Digital Mind Maps made for easy retrieval and recall. Student A supported this view, stating that it was "easy to remember information at any time by using Digital Mind Maps"; she added that the information had become more usefully arranged in her mind due to her experiences with learning collaboratively through CLDMMs. Regarding the improvement of CLDMM processes, Student A recalled seeing her first DMM which she then compared to the latest version; she noted that the latest map was far more professional. Student B reported "experiencing difficulty when first using the map", but noted that, with practice, the process became "easy, fun and fostered improvement".

Second School

Student I reported on the learning experience through the use of this method comprised of Collaborative Learning with Digital Mind Mapping, as "information was learnt by placing it in a Digital Mind Map". Student J indicated that this method "contributed to an increase in the effectiveness of the learning experience" as, due to the design of Digital Mind Maps, students worked together as a group.

In addition, Student J reported that "using the Digital Mind Maps contributed to the stability of information", while Student I stated that they were able, through the Digital Mind Maps, to present the information from their minds with clarity, and that it aided group discussion. During the set of questions addressing the improvement of the Collaborative Learning with Digital Mind Mapping process, Student J mentioned that "Digital Mind Maps enabled us to feel like a professional student through the design of maps"; they also taught their sisters about Digital Mind Maps. Student I reported that "the use of Digital Mind Maps gradually evolved as they were training together in groups and using this method during every lesson". She went on to say that it became easier and clearer than when she first began.

Third School

In regard to the learning experience, Students M and N agreed that Collaborative Learning with Digital Mind Mapping helped them to increase their intake of information by exchanging their experiences when discussing main and sub-branches. In maintaining the impact of learning, Student N pointed out that "information is more firmly established using this method, as the information undergoes many stages (writing, drawing, searching and discussing in a group)". Student M agreed that this method "facilitated rapid comprehension" and improved the recall of information dramatically.

According to Student N, “the first time we used a Digital Mind Maps we did not know the basics of designing the maps but that, with time, this became much easier”. On the other hand student M stated that they struggled to develop their Digital Mind Map design, as there was little opportunity within the group for more practice.

The Second Theme: Usefulness of this Method

First School

The usefulness of this method refers to the efficiency of ICT, participation rates and the enrichment of knowledge; the views of the students which fall within these brackets are discussed in this section. Student E reported that the use of the map through the application “increased their ability to conduct an image search in the Internet and log in to educational sites, which increased their efficiency”. Student F mentioned that their group learned how to “insert pictures and draw clear maps together through the use of CLDMM by supporting each other, contributes to the efficiency of using DMM”.

Student B mentioned lessons were “very interactive across the groups”, as there were friendly competitions across the class in completing the production of the Digital Mind Maps, which encouraged student participation. Student A supported this view, and felt more “productive and eager to participate during lessons”. However, Student E claimed that their participation depended on the interaction of a group leader in the activation of member participation.

Regarding the enrichment of student knowledge, Student F stated that they contributed to the information of the map and that reviewing the textbook and the sites suggested by the teacher “increased their intake of knowledge”, particularly in the charity lesson.

Second School

As for the efficiency of ICT based methods, students pointed out that their proficiency with technology had increased and that this was due to the creation of Digital Mind Maps using the iPad. In addition, student J said that this method "allowed me to learn through technology, which increased my mastery of a number of technical skills". She added that she used the "iPad to play only after employing this method"; she began looking on the internet for information on how to design the map correctly during the charity lesson. In terms of participation, Student J noted "more active participants than before in map-lessons". Student I mentioned that she engaged in positive participation within the group, acting as the leader and as a "spokeswoman", as well as searching for images. As for the enrichment of knowledge, Student I also noted that the use of this method had increased the breadth of information, as she benefited from the ideas of the whole group. Furthermore, she stated that "the design of the Digital Mind Map contributes to the search by using more than one source; in prayer lessons, for example, students are allowed to log in to educational sites to search for information". On the other hand, student J did not find this method useful, as she indicated that it distracted their focus and caused a loss of concentration.

Third School

Under this theme, Student M believed that it was "imperative for the design of the map to incorporate the iPad, which requires the use of some technical skills, including writing, cutting, pasting, inserting pictures and research", all of which increased group efficiency. Student N concurred that the use of a Digital Mind Map contributed towards "training in the use of technology".

Addressing the effect on participation, Student N said that this method made them more involved in the class; in the lesson focusing on etiquette for outside the home, they shared their thoughts, as well as some photos. Student M indicated that participation in lessons was “improving and that teachers were becoming aware of this”. She added that she designed the Digital Mind Map in a prayer calling lesson on behalf of her group. In terms of the enrichment of knowledge, students N and M reported that using Collaborative Learning with Digital Mind Mapping resulting in the collection of more information from more than one source.

The Third Theme: Facilitating Discussion and Dialogue

First School

The views of students pertaining to the facilitation of discussion and dialogue, and the promotion of critical thinking and IDRF (Initiation and Discussion Response Feedback) are outlined below. Students E and F reported that the use of the CLDMM helped each group through discussion and dialogue to reach a final presentation in the form of the digital map. Student A reported that “using the map helped us to debate with our group and allowed us to listen to the opinions of others within the group” and those in other groups. Student B stated that “this method, with the help of teacher guidance, has helped us to guide our notes in relation to the group map”. She also stated that discussion with the teacher about DMM allowed the opportunity for feedback to revise any errors. such as "sometimes we put the key words in the wrong place and this led us to understand more about these words because we did not distinguish between them because they are similar".

Second School

Increased discussion and dialogue between the students was reported by Student J, who went on to assert that the “dialogue between the students was enhanced due to attempts at designing more accurate Digital Mind Maps”; through this process, there was a discussion of ideas and opinions between group members. In spite of this, Student I reported that some members of the group “did not allow an opportunity for discussion and dialogue”. Nevertheless, Student J and Student I both agreed that this method provided instant feedback, which stimulated productivity and interactivity. Student J point out: “It allowed me to discuss more with the teacher because as I created the DMM it brought questions to my mind which I could get answered right away. Without the map, how could I know about the information? I would go home without asking her because I did not see the contents of the lesson as a whole”.

Third School

In terms of discussion and dialogue, Students M and N mentioned that CLDMMs stimulated debate, and that discussion had become more extensive than before as groups could work together to create the DMM. Student M added that the “use of this method and the design of the map allows everyone to discuss with the teacher and peer-to-peer”.

With regard to critical thinking skills, Student M mentioned that one “can discern a good DMM from a bad DMM”, and turn the latter into the former; N added that this method contributed to “decision-making” through the design and selection of contributory information. Student N also noted that the “feedback had become more frequent using this method”, and Student M supported this view, observing that feedback came first from students, then from groups and, finally, from the teacher.

5.3.3 Comparing the Three Schools according to Teachers' and Students' Views

First Theme: Improvement of learning

In the first theme, improvement of learning, there are sub-themes of the learning experience, maintaining the impact of learning and improvements in Collaborative Learning with Digital Mind Mapping processes. The teachers noted that learning improved through the use of Collaborative Learning with Digital Mind Mapping in their experience and there was a uniformity between the three schools in terms of improved learning, though differing in improvement type. In the first school, the improvement was in helping the teacher in student support, in maintaining the information and remembering the lesson in a short time. However, the teacher had predicted that, before they used Collaborative Learning with Digital Mind Mapping, there would not be a significant improvement in learning when using this method. The improvement, this teacher thought, depended on the students' keenness for Islamic Education subjects and their content. Nevertheless, the students reported that this method had enhanced their learning, their memory had become faster, and they had become more organised.

In addition, in the third school, the teacher stressed that improving learning and the overall educational process would be possible using this method. This improvement was close to that of the first school in terms of 'remembering' for exams; students remembered information when comparing their test scores with the previous test before using the CLDMM. Students remembered key points from the first lesson, which was a month before the examination, and students stated that it helped them retain the information. A teacher in the third school said that the CLDMM offered a double strength for her teaching and in improving learning. This improvement arose from helping students build their experience by selecting images and collaborating among members of their group. One of the students suggested that the information was retained because it passed through several stages: writing, drawing, research and collaborative discussion.

Those at the first school added that there was an improvement in memory, as students were able to retain information for a longer period. This also encouraged active learning and the challenging of answers, as students could access the related images in their minds. In terms of map creation, the students of the first school, based on previous experience and information, created the map in a collaborative manner, a process which became easier, more useful and more fun as time went on.

The second school demonstrated a noticeable change in the creation of maps and their evolution; these maps were more attractive and were backed by colours and images, while their first maps were very simple. The students noted that this process had become more professional. The third school, in spite of the evolution of the map, created maps very quickly but without depth, perhaps due to the lack of academic content in the actual lessons of Islamic Education. In this school, there were two different views of the group work; while one of the students was able to draw the map attractively, another student said she could not develop her map because she had not been given opportunity to contribute creatively within the group.

Second Theme: Usefulness of this Method

The second theme pertains to the usefulness of this method in terms of efficiency of ICT, participation and enriching knowledge. The identified benefits of this method varied from school to school; the first school allowed the teacher to integrate the benefits of CLDMM with their own teaching method while overseeing the activities of the students as a guide rather than a dictator. This reduced the excess time and effort exerted by teachers in motivating students to understand the lesson. The teacher also found that CL supported the creation of DMM and increased their effectiveness in raising the level of achievement among the students and their grasp of scientific knowledge as students could access educational sites to acquire information.

The second school experienced a higher level of participation amongst students and the methods allowed them to learn faster. Some students reported that increased efficiency in the use of technology and gaining technical skills had raised their ambitions; iPads helped them to search more than one source from the educational sites to create their maps.

As for the third school, the teacher realized that Collaborative Learning allowed participation and interaction unlike the traditional way, in which the student was a merely a listener; however, one of the students noted that productivity depended on the enthusiasm of the leader of the group. In contrast to this view, one student from the second school said that, despite some members ignoring her wish to contribute, this method increased their productivity and their interaction.

Also, in terms of the efficiency of the technology, there were differing uses of ICT between the schools. In the first school, the teacher was able to show students maps using PowerPoint to facilitate the review of lessons. The second school was more efficient and enabled teachers to discuss students' maps through social media; this was useful for students who were unable to attend so that they did not miss out on learning. One student mentioned that participation was better than before and that they had improved their knowledge through listening to ideas across all groups. One of the students, on the other hand, reported that it had scattered her knowledge and weakened her focus on academic materials. In the third school, students were able to collaboratively participate in modifying the map by using the map programme in the computer or on their iPads, after which they could send it via e-mail, illustrating an increase in the use of technology among students. The teacher also mentioned an important point, which was that the CLDMM helped them to organize information, see the connections between it, and facilitate the flow of thinking in an easy way which was clear within the group.

Third Theme: Facilitation of discussion and dialogue

The third theme includes the facilitation of discussion and dialogue, which includes critical thinking, and Initiation and Discussion Response Feedback (IDRF).

It can be said that Collaborative Learning with Digital Mind Mapping in the first school increased social skills among students and gave them a chance to speak, as the students had discussed and formed a dialogue in the creation of the DMM; this helped them to listen to the views of others. In the third school, trust was reported as having increased between students when providing their answers, giving them a chance for a more in-depth dialogue, fostering debate and strengthening the link between students. This view is support by students, who reported stimulated dialogue and debate; one student said that she had become more daring due to the group work, and that this had encouraged her to participate in discussion with the teacher and her peers. One student in the same class argued that productivity depended on the interaction of the leader of the group. This illustrates the impact on the group of participants' strength of character.

In the second school, the level of dialogue and discussion between members of the group was perceived to have increased and this was not evident in the other modules of the Islamic Education module. Regarding Initiation and Discussion Response Feedback (IDRF) in the first school, this was used for the first time among both teachers and students, who reported that Initiation and Discussion Response Feedback dialogue was used between students as a supporting method rather than a main method during Collaborative Learning. The teacher here said that the use of Initiation and Discussion Response Feedback with Collaborative Learning developed students' capacity to interact and participate in the classroom. In the second school, the use of CLDMM improved the students' ability to communicate, making Initiation and Discussion Response Feedback easier between students and teachers.

A teacher in the third school reported that this method was based on the attributes of Collaborative Learning regarding IDRF dialogue and discussion. This method also developed a number of skills, as evidenced by the first and third schools, such as critical thinking skills. Along with critical thinking skills, the third school also developed research skills and discussion by asking questions and encouraging discussion, as well as the art skills required in designing the map. The second school, in addition, strengthened the skills of inference, review and evaluation and allowed students to express their ideas so that they could be easily understood.

I believe that there is some discrepancy between the three schools, as the degree of improvement and the type of improvement seems to vary. The type of participation also differed, as did the usefulness of CLDMM, from one school to another. When the researcher presented DMM to the students, the various benefits were evident in terms of enriching knowledge and promoting the evolution of the design of maps. Students were also able to develop their technical skills, confidence with discussion and their dialogue skills. Students also developed the ability to assess the quality of maps.

Decision-making was also influenced, as students became more responsive to feedback; the students received feedback from their peers as well as from the teacher.

It important to mention that a simple similarity between the schools may be due to the fact that these schools have the same culture, environment, and curriculum as the Ministry of Education in the Saudi Arabia has unified the curriculum. Furthermore, the years of experience of these teachers was very similar, as was the ages of the students (between 11 and 12 years old). Finally, the difference between the reactions of the students between groups illustrates that impact of the group on its members in terms of strength of character and positions of leadership.

5.4 Third question: What are the Difficulties and Hindrances Experienced when Employing Collaborative Learning with Digital Mind Mapping in Primary Schools in Saudi Arabia?

Themes and sub-themes, as they relate to the third research question, can be found in the following chart (see Table 5.6):

Table 5.6 Themes and sub-themes for third research question

Theme	Sub-themes and categories
Hindrances and difficulties in using Collaborative Learning with Digital Mind Mapping	Technical problems
	Learning problems
	Lack of training
	Different abilities and characteristics

As for this theme within the context of primary schools in Saudi Arabia, the three schools had similar educational environments; the researcher was keen that the schools closely resembled each other to produce consistent data. As a result, findings pertaining to this question will be close to those indicated in the samples and observed by the researcher without drawing a comparison between the schools, as with the previous elements. It will also be divided into three elements for both teachers and students: technical problems, learning problems and lack of training. Students added a fourth element which is different abilities and characteristics. It is important to give examples of what was coded in each category (see Table 5.7).

Table 5.7 Examples of coding for third research question

Theme	Code	Data Source		School			Examples	Key word
		Int	Obs	1	2	3		
Hindrances and difficulties in using Collaborative Learning with Digital Mind Mapping	Technical problems	✓				✓	Teacher pointed out that "ICT may suddenly cease to function properly during a discussion or activity while attempts are being made to focus students' attention".	May suddenly cease to function properly
	Learning problems		✓		✓		Researcher observed that teachers found that each lesson was being cut short due to the time consumed by arranging the students across the classroom into groups because the number of students was much larger at 36.	Each lesson was being cut short due to the time
	Lack of training	✓		✓	✓		Teacher pointed out "a lack of proper training for teachers in the use of the CLDMM" Teachers, A and B in particular confirmed that they trained in the field of concept maps only.	"....Lack of proper training.." "...field of concept maps only.."
	Different abilities and characteristics	✓				✓	Student acknowledged that "DMM programming .....requires time to become collaborative, as some students have a higher level of experience .... when using the DMM.... for drawing and writing"	Some students have a higher level of experience

5.4.1 Main hindrances of using Collaborative Learning with Digital Mind Mapping for teachers

Learning Problems

On the whole, teachers agreed that the biggest obstruction encountered when learning to use CLDMMs was time management, as well as the space constraints of classes when teaching with Collaborative Learning methods. In practice, I observed a number of drawbacks; in the first school, for example, the number of students was so few that the division of groups was easy. This aided students and teachers in the accomplishment of Digital Mind Maps and allowed them to cooperate effectively and in record time. In the second school, the number of students was much larger, at 36, and was made up of small groups. Therefore, it was difficult to divide the students easily and teachers found that each lesson was being cut short due to the time consumed by arranging the students across the classroom into groups. The third school, despite its large student body, contained an area appropriately prepared for Collaborative Learning and equipped with tables (see Picture 5.1)

Picture 5.1 Student classroom 2

Despite the physical requirements having been met, the numbers remained a problem. Teacher C observed that “staff needed more time, as the lesson duration allocated was not sufficient for teaching by this method”, adding that teachers must allocate a further ten minutes of their own time in order to prepare the programme and arrange students in groups. Teacher B put forward the use of “iPads as a time-saving method, easing the pressure on teachers”. Computers were suggested as an alternative for schools without iPads, though these devices need time to boot up and some students may need to be taught how to use them.

In addition, teacher D suggested that some lessons and topics failed to encourage the use of technology, particularly Digital Mind Maps, though this may only benefit the teaching of Fiqh and Tajweed subjects. Teacher A, from the first school, disagreed with this, arguing that a teacher with an adequate level of skill should be able to create appropriate maps for all lessons. Finally, one of the teachers from the second school mentioned that “Digital Mind Maps require a good base knowledge and so it is important to consider that students in the class have different abilities”, which may cause delay when constructing the map and related production elements.

Technical Problems

Firstly, according to teachers and students, some difficulties in using the Collaborative Learning with Digital Mind Mapping stemmed from technical malfunctioning of the ICT associated devices. These technical problems could manifest themselves in a number of ways; Teacher D, for example, posited that “ICT may suddenly cease to function properly during a discussion or activity while attempts are being made to focus students’ attention”. According to Teachers A and C, these interruptions may confuse students, distract their thoughts, and thus hinder the learning process. Indeed, Teacher

B mentioned that “technical problems are the most serious obstacle in pursuing group work in class”.

Generally, the existing services in the participating schools were outdated and required maintenance; many could not even access the internet. It was noted that the lack of internet in schools, and the prevalence of old hardware and poor internet speeds was high, demonstrated by the need on my part to download the required software at home rather than while at the school.

Teacher A added that if one needed to use the computer lab, an assistant would be required to resolve technical problems; however, the assistant “is often busy in their own studies”, as they are rarely a full-time member of maintenance staff. Teacher D agreed, arguing that “schools often have lack of specialist maintenance”.

Lack of Training

A lack of adequate training for teachers is a major weakness in the complex process of implementing ICT applications and Digital Mind Mapping programmes into the education system. This research has indicated that the lack of training was reflected in a general decrease in efficiency when using ICT applications in learning; teachers often abstained from employing modern technologies, believing them to be too complicated, and so these technologies had not yet been applied, at least not to their full potential. During the research interviews, all teachers acknowledged that they did not feel they had enough training with regard to DMM or MMs. Teachers A and B, in particular, confirmed that they had only been trained in the field of concept maps, while teacher C pointed out “a lack of proper training for teachers in the use of the CLDMMs”. It is clear, then, that teachers did not feel that they could employ the DMM programmes fully, or were unaware of the numerous possibilities brought about by DMM when supporting CL. In addition, teachers stressed that this lack of training “slowed down the learning process”, which had a detrimental effect on student understanding and progress.

5.4.2 Main hindrances of using Collaborative Learning with Digital Mind Mapping for students

One significant problem reported by students was their lack of training in using the devices. For example, due to students' limited experience in dealing with the devices, student N mentioned that “teachers sometimes move from one device to another to help the students and, as a result, this may mean the lesson remains unfinished, delaying the curriculum”. Here, the researcher suggested running two consecutive lessons in order to remedy time constraints and accomplish more across the lessons.

Student C mentioned that “classes rely on the use of iPads, as computers are not particularly efficient; the computers are located in the IT lab and are rarely used other than during computer lessons as these devices are time-consuming and it is labour intensive to relocate from the classroom to the computers lab and vice versa”. Further, some of these devices were faulty or connected slowly, which retarded the educational process.

One student stated that the iPads reminded her of when she was in the UK school system. She added that, in order to benefit from the Digital Mind Mapping programme, she would prefer to apply the processes of her previous school, which replaced the computer lab, which employed a transport trolley on wheels for ease of movement, with a shelving unit which contained over 30 laptops.

Student J suggests that “the small size of the classroom reduces movement and the large number of students increases the time needed to design the map, which also hinders the teacher’s ability to provide direction”. The drawbacks of the internet also reduced the effectiveness of the Digital Mind Maps; often one needed to add new photos, which was made difficult due to internet connectivity problems.

Initially, I noted that students struggled with the Digital Mind Mapping programme, but map-making improved significantly during the second meeting. This may have been due to the familiarity many students felt with being online, as they had the internet at home and were able to train others who were not familiar with the device on how to navigate a web browser. Students added a fourth hindrance and that was the different abilities and characteristics of their classmates. With regard to the English language, students A and D argued that ability played an important role as some programmes were not entirely supportive of Arabic when teaching in other languages; some students demonstrated a weakness in the English language, which limited the use of some technological programmes, and time should be given to these students to learn the programme. Student A also mentioned “this Digital Mind Mapping programme is more supportive of Arabic with the presence of very simple English terms”.

Student M acknowledged that “Digital Mind Map programming is easy to use but requires time to become collaborative, as some students have a higher level of experience and control when using the Digital Mind Map programme for drawing and writing”. I observed that group maps were often disorganised and most groups finished the lesson without completing their map, especially in the earlier lessons. It is worth mentioning that, with this age of students, the enthusiasm and quality of output from the group was high, in part due to the collaboration demonstrated in the creation of the map.

5.5 Summary

This chapter has presented the results of the qualitative analysis of both the interviews and classroom observations. As well as answering the main research questions, the sub-questions were also answered concerning the application of CLDMMs in Islamic Education lessons in primary schools. A summary of the results are shown in Table 5.8 below.

Table 5.8 Summary of findings

Research questions	Data Collection	Main findings		
		First school	Second school	Third school
RQ1: How is DMM being employed at present in order to support the learning process?	Both observation and interviews of students and teachers.	This method supports learning. This is not only from the teacher's perspective, but also from their peers, and the collaboration between the different groups involved. All parties were therefore given the opportunity to discuss. Students were able to understand the work on a deeper, more precise level.	Students were better able to recall information and support it by using relevant examples. There was also a correlation between engagement, and the use of CLDMM. Areas that showed improvement were critical thinking, attendance, and enthusiasm for learning.	The motivation of the students increased substantially because of the CLDMM method. Students also learned the material more quickly, and held a better understanding of the topics. This is because the method included representations where students provided pictures for each point. Collaboration helped lower level students to better interact with their peers through activities such as creating clear maps.

RQ2: What are participants' perspectives for both teachers' and students on CLDMM?	Both observation and interviews of students and teachers.	Teachers were more able to help students retain the information. Through this method, learning could be enhanced and, in addition, increased memory speed and higher levels of organisation could be observed. The teacher oversaw and guided students during activities and hence students were more independent in their learning. The teacher also found that CL supports the creation of DMMs and increases its strength in raising the level of achievement among the students. CLDMM improved the students' ability to communicate, with critical thinking skills developed also.	The students felt that the process of creating maps became more professional, while their participation and speed of learning increased. Both dialogue and group discussion increased, which especially contrasted with other modules of the Islamic Education module, where it was minimal. It was also shown that efficiency in the use of technology increased, and that students had gained technical skills that raised their ambitions.	Teachers mentioned that CLDMM not only improved the learning process for the students, but also the overall teaching process for the teacher. Students, meanwhile, said that information was better retained because it passed through several stages: writing, drawing, research and collaborative discussion. Students also developed research skills and discussion through the asking of questions and encouragement of dialogue. Students were able to discuss their maps through social media, and collaboratively participate in modifying their peers' maps (such as by sending e-mails). Hence there was an increase in their use of technology.
RQ3: What are the difficulties and hindrances experienced when employing CLDMM in primary schools in Saudi Arabia?	Both observation and interviews of students and teachers.	Teachers had limited training, both in using the devices and creating concept maps. It could be seen, also, that some devices were faulty or connected slowly, which, in turn, slowed down learning. Students' abilities and characteristics varied, and where some had higher levels of experience and control when using the DMM program to create mind maps, other students needed more time to familiarise themselves with the programme, particularly as it did not fully support Arabic. Technical problems were the biggest obstacle in pursuing group work in class, such as where, for example, some schools had poor internet speeds.	Time management when using M was a problem, and in this school, the number of students was much larger. As such, it was difficult to divide the students easily, and teachers found that each lesson was being cut short due to the time consumed simply in arranging the students, inside the classroom, into groups. DMMs require a good base knowledge, and so students in the classroom had different abilities. This was shown to cause delay when constructing the map, and related production elements. Interruptions of the internet may confuse students, distract their thoughts, or otherwise hinder the learning process.	Teachers needed more time, as the lesson duration allocated was not sufficient for teaching effectively via this method. Teachers said that, "ICT may suddenly cease to function properly during a discussion or activity while attempts are being made to focus students' attention. Most of the schools often have a lack of specialist maintenance." A lack of training slowed down the learning process, and this was shown to have a detrimental effect on both the students' understanding and progress.

Since the above table presents a summary of the main results taken from the three schools. It shows that several interesting results were found. Firstly, teachers and students showed a great interest in the use of Collaborative Learning with Digital Mind Mapping in the classroom. Secondly, neither the teachers nor the students were reluctant to use DMM, and this use facilitated CL. This chapter has drawn out many benefits of the application of CLDMMs in Islamic Education, and CLDMMs was shown to have raised students' levels of understanding of topics. It was also seen to have promoted interaction between students, encouraged and facilitated discussion with critical thinking, enhanced collaboration among students, and, if used properly, facilitated the maintenance of a high level of student engagement.

However, there were also cases observed of ineffective use of the DMMs, or their use was on too basic a level. Thus, the first conclusion made is that a training programme should be put in place to properly support teachers to implement new methods, while simultaneously supporting and rewarding them for their efforts.

The qualitative analysis revealed several obstacles to achieving the full range of benefits of the CLDMMs, and the main reason for these obstacles was found to have been inadequate financial and technical support, and the absence of comprehensive and appropriate training for teachers. The second conclusion that can therefore be made is that the potential of both CLDMMs is high, and that they mutually support and enhance each other. Yet, if the obstacles presented in this chapter are not dealt with, any apparent potential could remain unfulfilled.

6. Chapter Six: Quantitative Data Analysis

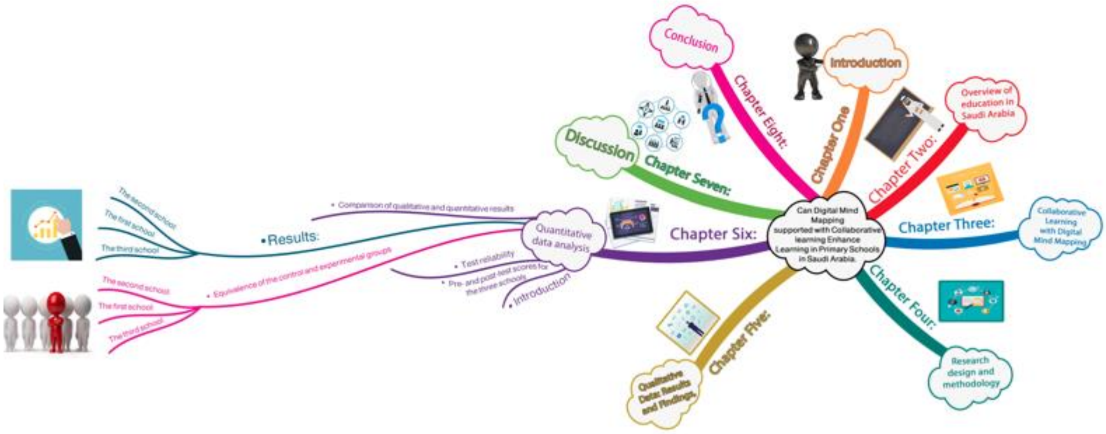

Figure 6.1 Digital Mind Map for Chapter Six

6.1 Introduction

In this chapter, the findings of the quantitative analysis are presented. This analysis compares the academic achievements of students between the experimental and control groups by pre-test and post-test. These results are used to answer the third question, which is "What is the difference in learning outcomes between an experimental group which uses Collaborative Learning with Digital Mind Mapping in comparison with a control group which does not use Collaborative Learning with Digital Mind Mapping?" These tests were administered to almost 200 year five and year six students in a primary school.

6.2 Pre-test and post-test scores for the three schools

Table 6.1 Number of students in pre- and post-tests

School	Number of students				
	Control group		Experimental group		
	Pre-test	Post-test	Pre-test	Post-test	Total
First	12	11	13	12	48
Second	37	39	36	37	76
Third	30	30	26	25	57

6.3 Statistical analysis of pre-test and post-test

Based on the nature and objectives of the current research, the data were analyzed with the Statistical Package for the Social Sciences (SPSS), using the statistical methods detailed below.

First: To check the statistical properties of the test data for application in the cases of parametric tests, in particular homogeneity and normal distribution, the following was :used

1) Pearson Correlation: To ensure internal consistency of the test, which is a measure of test reliability, as well as the correlation between the marks awarded by the two assessors who marked the tests.

Second: To answer the research questions, the following were used:

1) Independent Samples T-test to ensure the equivalence of the experimental and control groups in the pre-test application, and detect any significant differences between the experimental and control groups in the post-test application in the second and third schools.

2) Mann-Whitney Test to ensure the equivalence of the experimental and control groups in the pre-test application, and detect any significant differences between the experimental and control groups in the post-test application in the first school.
3) One Way ANOVA, and Scheffe test for post hoc comparison, was used to detect significant differences in the post-application of the Fiqh test for the experimental groups in the three schools.
4) Paired Samples T-test to detect significant differences between the mean scores of students in the experimental group in both the pre- and post-test application in the second and third school.
5) Wilcoxon Signed Ranks Test to detect significant differences between the mean ranks of the experimental group in the pre- and post-test application in the first school.
6) Cohen's d for repeated measures with Hedges' g corrected was used as an indicator of the effect size.

6.4 Test reliability

By calculating the correlation coefficient between the marks awarded by the first and second correctors on the pre-test, the reliability of the test marks was confirmed. The correlation coefficients are described in the following table (6.2):

Table 6.2 Correlation between marks awarded by correctors

In the first school		In the second school	In the third school	In all the schools
Hadith	Fiqh			
0.997	0.986	0.996	0.998	0.992

The table above shows the extent of correlation coefficients and therefore indicates a high level of consistency between the marks awarded by the two correctors on the tests. This demonstrates that the scores used in the analysis were reliable.

6.5 Equivalence of the control and experimental groups

A comparison of the results of pre-test and post-test for experimental groups was performed, as well as the comparison between the results of the experimental group and the control group in the post-test to determine the rate of progress in the cognitive learning of the experimental groups, which gives a clearer and more reliable picture of the impact of Digital Mind Mapping. The equivalence of the pre-test grades was confirmed for the experimental and control groups in the three schools. The results were as follows:

The first school

The Mann-Whitney Test was used to test for the equivalence of the pre-test scores for both the experimental and control groups on the topics of Fiqh and Hadith. The results are clarified in the table below (6.3).

Table 6.3 Equivalence of pre-test scores for experimental and control groups in the first school

Topic	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z
Fiqh	Control	12	10.75	129.00	51.00	1.472
	Experimental	13	15.08	196.00		
Hadith	Control	11	10.64	117.00	51.00	0.629
	Experimental	11	12.36	136.00		

The above table shows:

-No statistically significant difference between the mean ranks on the Fiqh pre-test for the experimental and control groups in the first school.

-No statistically significant difference between the mean ranks on the Hadith pre-test for the experimental and control groups in the first school.

The second school

An Independent Samples T-Test was used to test for the equivalence of the pre-test scores for the experimental and control groups on the Fiqh test in the second school. The results were as follows table (6.4):

Table 6.4 Equivalence of pre-test scores for experimental and control groups in the second school on the Fiqh test

Group	N	Mean	Std. Deviation	t
Control	37	3.608	1.528	1.248
Experimental	36	3.125	1.774	

The above table shows that there was no statistically significant difference between the means of the control and experimental groups on the Fiqh pre-test for experimental and control groups in the second school. This indicates that the control and experimental groups were equivalent.

The third school

The Independent Samples T-Test was used to test the equivalence of pre-test scores for the experimental and control groups on the Fiqh test. The results are shown in the table (6.5) below.

Table 6.5 Equivalence of pre-test scores for experimental and control groups in the third school on the Fiqh test

Group	N	Mean	Std. Deviation	t
Control	30	4.117	1.606	3.250**
Experimental	26	2.798	1.400	

$^{**}p \leq 0.01$

The table above indicates a statistically significant difference in favour of the control group at the 1% level ($p \leq 0.01$) between the mean scores on the pre Fiqh test for the experimental and control groups in the third school.

From the above results for all three schools, it is clear that the experimental and control groups in the first and second schools were equivalent on the Fiqh test, while the control group in the third school had a higher mean than the experimental group. This did not invalidate the experimental design since the experimental group was the lower one, so that if differences did appear in the post-measurement in favour of the experimental group, this would then be regarded as in favour of the programme and further indication of its effectiveness.

6.6 Results

6.6.1 First: A comparison was made between the experimental and control groups on the post-test application in each school.

The first school

The Mann-Whitney Test was used to detect any significant differences between the experimental and control groups' mean ranks in the post-test application. The results are shown in the following table (6.6).

Table 6.6 Significance of differences between experimental and control groups on post-tests

Topic	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z
Fiqh	Control	11	7.73	85.00	19.00	3.066**
	Experimental	13	16.54	215.00		
Hadith	Control	11	7.41	81.50	15.50	3.120**
	Experimental	12	16.21	194.50		

** $p \leq 0.01$

From the previous table, we find:

- A statistically significant difference ($p \leq 0.01$) between the mean ranks of the experimental and control groups in the first school on the post application of the Fiqh test, in favour of the experimental group.
- A statistically significant difference ($p \leq 0.01$) between the mean ranks of the experimental and control groups in the first school in the post application of the Hadith test, in favour of the experimental group.

The second school

The Independent Samples T-Test was used to detect any significant difference in mean test scores between the experimental and control groups in the post-application of the Fiqh test. The results are clarified in the following table (6.7).

Table 6.7 Significance of difference between experimental and control groups on Fiqh post-test

Group	N	Mean	Std. Deviation	t
Control	39	3.968	1.812	2.394*
Experimental	37	5.034	2.067	

* $p \leq 0.05$

The above table shows that there was a statistically significant difference ($p \leq 0.05$) between the mean scores of experimental and control groups in the post-application of the Fiqh test, in favour of the experimental group.

The third school

The Independent Samples T-Test was used to detect any significant difference between the mean scores of experimental and control groups in the post-application of the Fiqh test. The results are clarified in the following table (6.8):

Table 6.8 Significance of difference between experimental and control groups on Fiqh post-test

Group	N	Mean	Std. Deviation	t
Control	30	4.267	1.911	3.445**
Experimental	25	5.940	1.641	

**$p \leq 0.01$

From the above table, it is clear that there was a statistically significant difference ($p \leq 0.01$) between the mean grades of experimental and control groups in the post-application of the Fiqh test in the third school, in favour of the experimental group.

6.6.2 Second: A comparison was then made between the scores on the post-application of the Fiqh test for the experimental groups in all three schools (each school separately, schools combined)

A One-Way ANOVA was used to detect any significant differences in the post-application of the Fiqh test for the experimental groups in the three schools. The results are shown in the following table (6.9):

Table 6.9 Descriptive statistics on post-test results for the experimental groups in the three schools

School	N	Mean	Std. Deviation	Minimum	Maximum
1	13	8.1154	1.91653	4.00	10.00
2	37	5.0338	2.06674	1.00	9.50
3	25	5.9400	1.64139	3.00	9.00
Total	75	5.8700	2.18733	1.00	10.00

Table 6.10 Results of ANOVA test on post-test results for the experimental groups in the three schools

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	91.538	2	45.769	12.553	.000
Within Groups	262.507	72	3.646		
Total	354.045	74			

** $p \leq 0.01$

From the previous table (6.10) we can see that there were statistically significant differences ($p \leq 0.01$) in the post-application of the Fiqh test for the experimental groups in the three schools. To identify where the differences lay, a Scheffe test for Multiple Comparisons was performed. The results are given in the following table (6.11).

Table 6.11 Results of Scheffe Test

Mean Difference		
School	1 (M= 8.115)	2 (M= 5.034)
2 (M= 5.034)	3.08160**	
3 (M= 5.940)	2.17538**	0.90622

** $p \leq 0.01$

This table shows that, among the three schools, the experimental group in the first school had the highest mean score on the post-application of the test, and that the differences between school 1 and the other two schools were statistically significant ($p \leq 0.01$).

6.6.3 Third: A comparison was made between the pre-and post-test scores for the experimental groups in the different schools.

First school

The Wilcoxon test was used to detect any significant differences between the mean ranks of the scores of the experimental group on the pre-and post-applications of the test. The results are clarified in the following table (6.12):

Table 6.12 Results of Wilcoxon Signed Ranks Test

Test	Ranks	N	Mean Rank	Sum of Ranks	Z	Effect size
Fiqh	Negative Ranks	1	1.50	1.50	3.077**	3.170
	Positive Ranks	12	7.46	89.50		
	Ties	0				
Hadith	Negative Ranks	2	2.00	4.00	2.582**	2.387
	Positive Ranks	9	6.89	62.00		
	Ties	0				

** $p \leq 0.01$

From the previous table it is clear that there were statistically significant differences ($p \leq 0.01$) between the mean ranks for the students of the experimental group on the post-application of the Fiqh test compared to on its pre-application, in favour of the post-application, with a large effect size. The same holds true for the scores on the Hadith tests.

The second school

A Paired Samples T-Test was used to detect any significant difference between the mean scores of the experimental group on the pre-application of the Fiqh test and on its post-application. The results are presented in the following table (6.13):

Table 6.13 Results of Paired Samples T-Test

Test	Mean	Std. Deviation	Differences		T	Effect size
			Mean	Std. Deviation		
Pre-	2.750	1.494	2.313	1.509	9.196**	1.277
Post	5.063	2.089				

** $p \leq 0.01$

The above table shows that there was a statistically significant difference ($p \leq 0.01$) between the mean score of the experimental group on the pre- and post-applications of the Fiqh test, in favour of the post-application, with a large effect size.

The third school

A Paired Samples T-Test was used to detect any significant difference between the mean scores of the experimental group on the pre- and post-application of the Fiqh test. The results are presented in the following table (6.14):

Table 6.14 Results of Paired Samples T-Test

Test	Mean	Std. Deviation	Differences		T	Effect size
			Mean	Std. Deviation		
Pre-	2.879	1.399	3.163	1.239	12.497**	2.080
Post-	6.042	1.594				

** $p \leq 0.01$

The above table shows that there was a statistically significant difference ($p \leq 0.01$) between the mean score of the experimental group on the pre- and post-applications of the Fiqh test, in favour of the post-measurement, with a large effect size. This indicates the overall progress made by the experimental group.

6.6.4 Fourth: A comparison was made between the pre-and post-test scores for the control groups in the different schools

First school

The Wilcoxon test was used to detect any significant differences between the mean ranks of the scores of the control group on the pre-and post-applications of the test. The results are clarified in the following table (6.15):

Table 6.15 Results of Wilcoxon Signed Ranks Test

Test	Ranks	N	Mean Rank	Sum of Ranks	Z
Fiqh	Negative Ranks	5	6.30	31.50	0.133
	Positive Ranks	6	5.75	34.50	
	Ties	0			
Hadith	Negative Ranks	6	5.08	30.50	0.967
	Positive Ranks	3	4.83	14.50	
	Ties	2			

From the previous table it is clear that there were no statistically significant differences between the mean ranks for the students of the control group on the post-application of the Fiqh test compared to on its pre-application, the same holds true for the scores on the Hadith tests.

The second school

The Paired Samples T-Test was used to detect any significant difference between the mean scores of the control group on the pre-application of the Fiqh test and on its post-application. The results are clarified in the following table (6.16):

Table 6.16 Results of Paired Samples T-Test

Test	Mean	Std. Deviation	Differences		T
			Mean	Std. Deviation	
Pre-	3.608	1.528	0.414	1.250	2.030
Post	4.022	1.787			

The above table shows that there was no statistically significant difference between the mean score of the control group on the pre- and post-applications of the Fiqh test.

The third school

A Paired Samples T-Test was used to detect any significant difference between the mean scores of the control group on the pre- and post-application of the Fiqh test. The results are clarified in the following table (6.17):

Table 6.17 Results of Paired Samples T-Test

Test	Mean	Std. Deviation	Differences		T
			Mean	Std. Deviation	
Pre-	4.117	1.606	0.150	1.475	0.557
Post-	4.267	1.911			

The above table shows that there was no statistically significant difference between the mean score of the control group on the pre- and post-applications of the Fiqh test.

A One Way ANCOVA was used to detect any significant differences in the post-application of the Fiqh test for the experimental groups in the three schools with the pretest results as covariate. The results are shown in the following tables (6.18) and (6.19):

Table 6.18 Descriptive statistics on post-test results for the experimental groups in the three schools

School	N	Mean	Std. Deviation	Minimum	Maximum
1	11	8.568	2.377	4.00	10.00
2	36	5.063	2.088	1.00	9.50
3	24	6.042	1.594	3.00	9.00
Total	71	5.627	2.046	1.00	10.00

Table 6.19 Results of ANCOVA test on post-test results for the experimental groups in the three schools with the pre-test results as covariate

Source	Sum of Squares	df	Mean Square	F	Sig.
Covariate	1.564	1	1.564	0.394	0.532
Scholes	25.901	2	12.950	3.261	0.045
Error	266.078	67	3.971		
Corrected Total	292.984	70			

** $p \leq 0.01$

From the previous tables we can see that there were statistically significant differences (p=0.045) in the post-application of the Fiqh test for the experimental groups in the three schools. To identify where the differences lay, a Scheffe test for Multiple Comparisons was performed. The results are given in the following table (6.20)

Table 6.20 Results of Scheffe Test

Mean Difference (Based on estimated marginal means)		
School	1	2
1	1.506*	
2	0.527	0.979

This table shows that, among the three schools, the experimental group in the first school had the highest mean score on the post-application of the test, and that the differences between first and second schools were statistically significant (p=0.05).

The next section is a summary comparison of qualitative and quantitative results.

6.7 Comparison of qualitative and quantitative results

In this section, a comparison between the results of the qualitative and quantitative methods will be conducted. Given that quantitative tools were used in the pre-test phases and post-test phases of this research, whereas qualitative tools were used in the observation and interview phases, this is important. This is also closely related to the results of the specific qualitative data, which are connected to the sub-theme.

By exploring the underlying causes of the phenomenon in a natural environment, the qualitative method provides a richer quality of data for the analysis and interpretation of results. During the interviews, the viewpoints of teachers as well as students indicated that they though that Collaborative Learning with Digital Mind Mapping increases the academic achievement of students which in turn helps to support the educational process. Moreover, the researcher was able to observe the level of engagement and interaction in classes in order to discover the viewpoints of teachers and students about the effectiveness of this method.

The function of the quantitative method is to confirm and strengthen this, using tangible evidence, combined with exploration, interpretation, confirmation and prediction, to support the results. The results showed that students and teachers noticed the efficiency of this method, with increased understanding by the students which helped to enhance their learning experience. Furthermore, it was demonstrated that the lesson content was retained for a longer period through the improvement and higher grades of students on the post-test compared to the pre-test. The following table summarises the aforementioned comparison in Table 6.21:

Table 6.21 Comparison between qualitative and quantitative results

	Themes & sub-themes	Groups			
		C Group		X Group	
		Result of quantitative method	Result of qualitative methods	Result of quantitative method	Result of qualitative methods
First school	Maintaining the impact of learning, understanding, efficiency of ICT, and the learning experience	In the post-test, the mean score was less than X.	Students also explained that it is difficult for them to distinguish between some of the lessons because they express similar points.	In the post-test, the mean score was higher than that of the second and third schools.	Allows students to retain information for longer, with the exam (which is run by the school) being an example of this.
Second school	Maintaining the impact of learning, understanding, efficiency of ICT, and the learning experience	In the post-test, the mean score was less than X.	The learning was limited as it was based on a reliance on a textbook and the teacher.	In the post-test, the mean score was higher than C.	Has a greater degree of influence on the students across a longer period of time.
Third school	Maintaining the impact of learning, understanding, efficiency of ICT, and the learning experience	In the post-test, the mean score was less than X.	Students appeared to forget the key points due to being merely listeners.	In the post-test, the mean score was higher than C.	Helps students to remember information, with the post-test being an example of this.

The table above demonstrates that, when looking at improved academic achievement in the themes and sub-themes, little difference exists between the qualitative and quantitative results. Nevertheless, when it came to the post test, the first school's results were higher than the second school's and third school's. This shows that Collaborative Learning with Digital Mind Mapping had a greater impact on the first school, further emphasizing the difference between the schools.

Moreover, the results show that there is a correspondence between the quantitative data and some themes of the qualitative method. This is evident from the interviews and observations and presented in the themes mentioned in the table above. All schools appreciated the importance of the Digital Mind Mapping with Collaborative Learning, but their expressions and details differed.

In all of the control groups, it is evident that students obtained a lower score than in the experimental groups. The reasons for this differed according to each school. Firstly, even though the experimental group of the first school scored highest out of all three schools, the control group on the other hand explained that it was difficult for them to distinguish between some of the lessons because they seemed to cover similar points. As for the second school, the control group scored less than the experimental group and the reason for that may be that the approaches to learning were limited as it appeared to be based on a reliance on the textbook and the teacher's exposition. Lastly, interviews and observations suggested that the students in the third school control group appeared to forget the key points due to being merely listeners. On the other hand, the experimental group results on the Collaborative Learning with Digital Mind Mapping method showed that it helped students to remember information, which improved their academic achievement.

6.8 Summary

This chapter has collected together the main findings of this quantitative analysis of the study for both the pre-test and post-test, which were analysed by using the Statistical Package for the Social Sciences (SPSS).

Emerging from this analysis is the potential usefulness of Collaborative Learning with Digital Mind Mapping in increasing the achievement level of the students. Three key points may therefore be highlighted. First, Collaborative Learning with Digital Mind Mapping helped students to construct their learning and thereby to raise their post-test score, when compared with their pre-test score. Secondly, a significantly greater increase in score of the experimental groups could be seen when compared with that of the control groups. Third, there were a number of similarities between the three schools.

This illustrates the value of Collaborative Learning with Digital Mind Mapping in helping students to construct knowledge and raise their achievement in Islamic Education.

The qualitative and quantitative results of this research are able to provide valuable information that feeds into answering the main research questions and sub-questions, as mentioned at the beginning of this chapter. This will be dealt with in greater detail in the discussion chapter, where these results will be combined with the literature to reinforce their strength.

Finally, it should be pointed out that this study reveals valuable information that should support the building and further development of Islamic Education in Saudi Arabia.

7. Chapter Seven: Discussion of the main findings

Figure 7.1 Digital Mind Map for Chapter Seven

7.1 Introduction

This study sought to explore how Digital Mind Mapping could be combined with collaborative learning to improve academic achievement in the context of the Islamic education curriculum within primary schools in Saudi Arabia. Historically, it has been shown that consistent scholastic benefits can be achieved through: the use of mind maps, either digital or on paper; the use of collaborative learning; a combination of technology with collaborative learning; a combination of mind mapping with collaborative learning; or an approach that combines some of the above with Islamic educational materials. Unfortunately, up until now, it has been difficult to evaluate the impact of various approaches when implemented with Islamic education materials because there were very few studies available on this topic, particularly related to Digital Mind Maps and collaborative learning for Islamic education. Thus, the results of my study have varying concordance with reported literature.

I will discuss these results by linking them with the literature review in the following sections. See Figure 7.2:

Q1: What are the key features of COLLABORATIVE LEARNINGDIGITAL MIND

Summary of discussion

- ✓ Improve the participation of students and in the improvement of students' understanding
- ✓ Feature of Collaboration that helped the groups improve interaction between students and make them more active
- ✓ Interaction and enthusiasm seen during the study

Examples of related studies

Wegerif, Jones & Littleton, (2003)	Polson (2003)	Marzano, (2007)	Zampetakis et al. (2007)	Kwon & Cifuentes, (2009)	Lin & Faste, (2011)	Higgins et al. (2012)

Q2: What are participants' perspectives for teachers' and students?

Summary of discussion

- ✓ CLDMM had some educational benefits in improving learning in some combination of the Islamic Educational materials.
- ✓ Provides a rich collaborative environment that allows students to build experiences and exchange views
- ✓ Information is connected with pictures that the students identified as meaningful, which in turn contributed to the enrichment of students' knowledge
- ✓ Efficiency of CLDMM and its combination with technology when used with Islamic Educational materials
- ✓ Facilitating discussion and more dialogue which support critical thinking.
- ✓ Developing creative skills in composing their Digital Mind Maps

Examples of related studies

Cox et al. (2003)	Paykoc et al. (2004)	Mayers, (2009)	Aldwish, (2012)	Adodo, (2013)	Wegerif, (2017)

Q3: What is the difference between experimental groups and control groups?

Summary of discussion

- ✓ The possibility of using CLDMM raise the students' level of academic achievement compared to the traditional method was demonstrated.
- ✓ Statistically significant differences in the students' academic achievements were found between the experimental groups and control groups.

Examples of related studies

O'Mahony, (2003)	Al-Ajami, (2004)	Sicilia, (2005)	Erdogan, (2008)	Alnesyan, (2012)	Alsenaidi, (2012)	Altwaijri, (2017)

Q4: What are the difficulties and hindrances experienced in using COLLABORATIVE

Summary of discussion

- ✓ Four obstacles were identified:
- ✓ Technical problems
- ✓ learning problems
- ✓ lack of training and practice
- ✓ students' different characteristics and abilities.

Examples of related studies

Khasawneh, (2001)	Radwan, (2001)	Holland et al. (2003, 2004)	Schunk & Zimmerman, (2007)	Nong et al. (2009)	Opara, (2010)	Adodo, (2013)

Figure 7.2 Summary of discussion

7.2 Overarching of answering for research questions:

The findings of this study have been divided into four sections, corresponding to each of the four research questions, and then a brief overview of the discussion is presented.

The First Question: How is Digital Mind Mapping being employed at present to support the learning process? What are the key features of CLDMM being used in classrooms?

The study discussed the features of CLDMM as reviewed in the literature and subsequently identified their use with Islamic educational materials. This latter data was mainly obtained through direct observation by the researcher, as well as through interviews conducted at three primary schools over the course of two semesters. The preliminary findings showed a difference in the ability of Digital Mind Mapping to improve the students' understanding and participation in the context of the educational material. They also highlighted the significant role of collaboration, which was shown to improve interactions among students and encourage active participation by all parties involved. Theoretically, this increased interaction and participation is what supports the development of their understanding, especially when compared to traditional, less active methods. In fact, the interaction and enthusiasm seen in the participants during the course of the study indicated that collaboration may be an important element in the effective coordination between the characteristics of the DMM and the concepts of CL.

The Second Question: What are participants' perspectives? What are the teachers' perspectives on whether Digital Mind Mapping supports Collaborative Learning and thereby helps students? What are the students' perspectives on CLDMM?

Interviews were conducted with teachers of Islamic education classes and their students in the above-mentioned three schools. The main findings from these interviews showed that the participants believed that use of the CLDMM had some educational benefits in improving the learning and understanding of Islamic education materials.

As previously discussed, in our observation environment, CLDMM provided a rich, collaborative atmosphere that allowed students to build experience and exchange views. This was achieved by maintaining the impact of activity, while also supporting access to information and ease of recall. In addition, separate units of abstract information were connected by words that the students identified as meaningful, and this in turn contributed to enriching their knowledge. The results showed that teachers and students found the combination of CLDMM with technology to be effective when used with Islamic educational materials in primary schools; they believed that it improved both teaching and learning. Through the facilitation of discussion, the underlying pattern of classroom discourse shifted from Initiation and Discussion Response Feedback (IDRF) to a pattern that was more dialogue-driven, which inspired more critical thinking. In addition, students were able to develop creative skills in the course of composing their Digital Mind Maps. It can be inferred that CLDMM in the educational process serves as a "force multiplier" of the teacher.

The Third Question: What are the difficulties and hindrances experienced in using CLDMM in primary schools in Saudi Arabia?

Teachers and students alike agreed that several factors hindered the smooth use of the Digital Mind Maps and the collaborative method in their Islamic education lessons. The results highlighted four major obstacles: technical issues, learning issues, lack of adequate training and practice for the teachers, and varying levels of abilities and characteristics among the students themselves. These obstacles may impact and reduce the effectiveness and thus the importance of the digital map.

The Fourth Question: What is the difference in learning outcomes between experimental groups, which use CLDMM, in comparison with control groups, which do not use CLDMM?

Data for this question were obtained from a combination of qualitative data (from interviews and observations) and statistical analysis of the quantitative data (analysing scores on a pre-test and post-test). Results showed statistically significant differences in the students' academic achievements in experimental groups when compared to the control groups, which suggests, at least preliminarily, the feasibility of using Digital Mind Mapping with Collaborative Learning to raise the students' level of academic achievement.

After summarising the results of this study, it is worth mentioning the most notable themes that were extracted from these results. In the next section, we will discuss them by linking them with the literature review and previous studies.

7.3 Overarching discussion of thematic finding of the study

The next sections will examine the most notable themes which were extracted from the results. As before, they will be linked with further literature review and previously-mentioned studies, following the sequence of the four research questions.

7.3.1 Features of CLDMM

A major sub-theme found within the features of CLDMM is that of engagement. Specifically, any modality that increased engagement had an exponential effect on student understanding and knowledge retention. This was especially evident in the first and second schools, in which the high level of engagement made classes resemble beehives because the students were so actively participating in their lessons and engaging in intra and inter group discussions as well as discussions with their teachers. Teachers also found that students had better engagement when using this method as compared to classes that relied on the traditional lecture-style method instead. Students cited vastly improved engagement with the use of the Digital Mind Map, especially in group work, because it helped them to break complex ideas into separate parts that they could tackle more easily.

Furthermore, according to teachers, the Digital Mind Map seemed to be a large factor contributing to effective learning in that it helped students understand and comprehend lessons in a clearer and more accurate manner. One teacher noted that "…the students creating maps in groups stimulated students reviewing together". Students commented that the "…DMMs helped… in the group to review a topic more easily and with more understanding, especially when summarising its main points". They also discovered that writing collectively in a Digital Mind Map that incorporated colour and images provided additional support relating to the keywords in the Islamic education lessons, and this further expanded their understanding and assimilation of information.

This concurs with a study done by Kwon and Cifuentes (2009); like the current study, they showed that collaborative learning with conceptual maps deepened students' understanding when compared to individualised learning. Polson (2003) reported similar findings, indicating that mind maps helped students and teachers engage in learning, and it has been reported that students prefer to work in groups to improve creative thinking (Zampetakis et al., 2007). This coincides with students' developmental needs for belonging and their desire to form relationships with peers; as Kellough and Kellough (2008) confirmed, children prefer to interact with their peers.

Digital Mind Mapping has been considered an example of a visual organiser as well; according to Kang (2004), visual organisation helps teachers and students to engage in teaching and learning. Marzano (2007) additionally observed that it fosters active engagement among students.

With respect to the efficacy of Islamic education, although the studies are limited, the results so far have been positive. Radwan (2001) supported the use of technology to understand Islamic educational materials, and Al-Naajim (2017) used media in Islamic education to aid in the understanding of complex themes. Alsenaidi (2012) appropriated electronic brainstorming, a precursor to the Digital Mind Map, in Islamic education. Studies more specific to mind-mapping, like those of Abi-El-Mona and Abd-El-Khalick (2008) and Sabbah (2015), resulted in higher levels of understanding for students using the mind-mapping method, and Eppler (2006) found that the mind maps supported understanding and memory. It is hypothesised that the act of drawing to create mind maps may be what brings to students a deeper level of understanding (Marzano, 2007). Emphasising keywords promotes more effective retention and understanding through recalling the connections among different concepts (Howe, 1970).

A second important sub-theme was collaboration, which increased the interaction among the students and teachers involved, in addition to raising the level of vitality in the classroom via student activity. Teachers were especially partial to this after seeing that collaboration helped students to understand more by allowing them to discuss the essential elements of Islamic education materials while they were also creating their Digital Mind Maps. Working together, they were actively engaged as they considered and selected keywords and sub-titles as well as repeating and clarifying key terms.

Students found this collaborative method to be less time consuming than individual learning, and thus more satisfying as they were accomplishing more. This agrees with the finding reported by Higgins et al. (2012), who emphasised that collaboration in using technology is usually more effective than individual use. Similarly, the Pacific Policy Research Center (2010) suggested that collaborative learning is a benefit when using technologies to attain better learning. As the students remarked, collaborative learning encouraged them to engage because it is the key to learning. This point agreed with Kimber et al. (2007), who found that teachers preferred to use Digital Mind Mapping because it gives students an opportunity to work collaboratively to enhance their learning.

Collaboration also improved intergroup and intragroup relations for both teachers and students. According to Scales (2010), teachers found that designing collaborative experiences and cooperative learning activities for young adolescents encouraged productive interaction among other members of their group. Chen (2010) indicated that the use of digital maps and collaborative learning provided students and teachers alike with an effective means of communication. Teachers likewise remarked that collaboration on digital maps improved the students' level of academic achievement through the facilitation of better ways to remember facts. According to a study by Lin and Faste (2011), Digital Mind Mapping facilitates collaboration and the storage and recall of information. Nong et al. (2009) and Mani (2011) similarly found that supporting digital mapping with collaboration had better results than paper mind mapping.

Observations and interviews showed that creating a Digital Mind Map and discussing its construction increased interaction, enthusiasm, and information exchange within and among groups. One student reported that "…the enthusiasm and interaction in the Islamic education classes occurred because the teacher was using methods that were closer to their reality, such as the use of iPads when creating the Digital Mind Maps, and also because they worked together and helped each other".

In fact, a number of students were strongly motivated to attend classes because the teacher used this form of technology with them when creating the map on iPad devices. Some postponed travelling too far out of town, attended class even when they were sick, and avoided unnecessary absences. Interestingly enough, there were instances where students did not want to miss their Hadith lessons, for these were the lessons which used CLDMMs. This phenomenon corresponds with development needs of students; since Digital Mind Mapping is a kind of technology, and Zamfir (2008) noted that digital students became bored with school and lost interest in knowledge when technology was not exploited and their minds were not stimulated appropriately in both teaching and learning. Referring to Digital Mind Map strategy, Eppler (2006) also suggested that mind mapping enhanced motivation for learning and paying attention. Polson (2003); Bidarra, Guimarães and Kommers (2000); and Pei-Fen et al. (2001) also found that the mind map was an effective means of stimulating learning and was deemed interesting by the students. According to the study by Manoli and Papadopoulou (2012), children respond well to visual organisers that are interactive. Students in the study of Goodnough and Woods (2002) confirmed that mind mapping increased their attention span. According to Wegerif and Scrimshaw (1997), having side-by-side computers enhances student interaction, as do table top computers (Higgins et al. 2012) where students can work on tasks jointly. In essence, where digital mapping is available, the children actively follow.

Before concluding this section, I would like to address a couple of studies that were slightly contradictory to my results. Wegerif, Littleton and Jones' (2003) study of mind-mapping, technology, and education came to the conclusion that technology contributed to teaching only by promoting and supporting collaborative thinking; this seems to suggest that the Digital Mind Mapping does not have any special contribution of its own. In fact, research conducted by Meier (2007) found that students enjoyed drawing by hand more than Digital Mind Mapping because it provided them with greater creativity and personal involvement, but this involved more solitary engagement as opposed to the collaboration provided by Digital Mind Mapping. Correspondingly, Sead and Al-Omari (2014) found no statistically significant relationship between the mind mapping using technology and the attitude of students towards their writing.

Based on my research and experience, I continue to believe that digital mapping is an excellent tool in its own right. These studies are very few in terms of knowledge of the researcher limit, compared to those studies that support this method in all parts of this research, including these areas: the suitability of technology, especially when dealing with a generation born and raised in an age of technology and information; the compatibility of mind mapping and the functions of the human brain; and support for collaboration, which fulfils the developmental needs of students by empowering them to share maps with their peers by using different devices. What these studies do show us, however, is the importance of our sub-themes of collaboration and engagement, which can help serve as objective standards to measure the effectiveness of tools such as digital mapping, etc.

7.3.2 Teachers' and students' perspectives

Overwhelmingly, teachers and students found this method to be helpful in improving their teaching and learning. This is consistent with findings from Seabrook Primary School in Australia (2003), where the mind map was successful in building students' self-confidence in their academic achievements. These improvements occurred through the exchange of experiences among students during group work and the increased impetus to read their textbooks more closely than usual in order to select and arrange the appropriate information to create accurate Digital Mind Maps. Cox et al. (2003) reported that the use of technology fosters a rich collaborative educational environment that allows students to exchange different views and perspectives. This agreed also with the conclusion of Bransford, Brown and Cocking (1999) that experience plays an important role in building meaning based on what children understand and believe when motivate learners and brain development. In the current study, the mind map likewise helped students to build their expertise in Islamic education materials by doing the research needed to build their Digital Mind Maps, whether in selecting topics or discussing them with their peers.

Another interesting aspect of this method was that it assisted students in preserving the experience of the learning process; in other words, they were better able to retain the information they learned and recall it later when they took exams. Both teachers and students highlighted this benefit, with students describing how they were still able to remember the basic words from the first lessons because they had been more engaged and involved in learning. These findings correlate with Buzan and Buzan (2006) and Sidhu and Saleem (2013), who posited that the mind map offers an easy way to comprehend and remember information. The fact that this mind map as planning for writing information this comes according to the development needs of student’s brain as mentioned Van der Molen and Molenaar (1994) cited in Boyd and Bee (2009, p246) and Manning, (2002), who refer to that young adolescents or may between 10 to 12 years old attempt to analyse and deconstruct complex concepts.

According to Aldwish (2012), the mind map assists students in memorising texts such as the Quran, which is a primary source material for Islamic education. Zakaria et al. (2014) also noted an improvement not only in the students’ ability to memorise but also in their performance overall. Since this method enabled students to connect the words with pictures, the abstract words in their memory were now directly translated and transformed into something visual, which made the words more meaningful and thus easier to understand and retain. This finding coincides with that of Mayers (2009), who discussed how words with pictures tend to help students learn more deeply than if they were exposed to information presented merely as written text. Al-Jarf (2009) agreed that students who created mind maps obtained better results than those who simply read the same information from textbooks in the traditional way.

Due to the reasons listed above, CLDMMs seem to succeed in making the information more concrete for all the parties involved. This is because they pass through a number of specific stages, namely: drawing, writing, searching for suitable images, and finally, discussing to what extent the structure of the DMM is appropriate for the topic.

Furthermore, this method empowers students to be more independent and pro-active in the learning process. The teacher's role becomes that of a supervisor and supporter, rather than being the sole source of information for correctly transmitting and developing ideas that are relevant to the subject. Therefore, both time and effort on the part of teachers are reduced, for they no longer carry that responsibility. Instead, information is exchanged collaboratively between the students and the teachers and then expressed in a complex, visual way, making it easier for any of them to refer to it when needed. This observation is similar to that of Boyson (2009), who found that mind mapping facilitated the smooth running of lessons for teachers. According to a study by Pattanasettakul (2008), using mind maps led to better knowledge gains and improved learning.

It is important to mention during their Islamic education lessons, using technology (namely DMM) helped students to better understand the topics. This result is supported by Higgins (2003), who confirmed that the use of ICT could be effective in developing students' performance and results. Lieberman et al. (2009) also stated that digital technology enhanced learning cognitive ability by providing enjoyable, rich and interactive experiences. In addition, a study by Jusoh and Jusoff (2009) argued that the combination of technology with Islamic education lessons made learning and teaching more effective. One example of the successful, efficient usage of ICT in DMM was a case where some students managed to store their maps in the electronic devices and then send them to their friends through social media and communication platforms such as WhatsApp, Mail or Facebook. Aside from sharing knowledge about the subject area, this also allowed the students to practise basic research skills and to expand their technological skills and usage. Furthermore, it provided them with a broader scope of information since they were able to access additional educational sites to search for suitable images regarding Islamic education materials, which they then used to build up their Digital Mind Maps. In above examples of students using in classroom are present at least augmentation and may modification in Puentedura's (2006) framework. Additionally, it trained them to use technology in a more positive and educational manner. This was discussed by Cox et al. (2003), who established how technology could provide a rich, collaborative educational environment. Kozma and Schank (1998) demonstrated that technology augmented a variety of teaching methods, such as the representation of ideas, simulation of complex systems, and communications.

The results indicated that CLDMM facilitated discussion and dialogue that centred around initiation and discussion response feedback (IDRF), as well as critical thinking. Teachers discussed how the method of dialogue was used among students and how it was further supported through collaboration. This process developed students' social skills and gave them opportunities to connect with their peers on an educational level, as well as increasing their levels of individual participation. Consequently, students were able to sharpen their ability to express opinions in a constructive, convincing way. Critical thinking was exercised during the use of CLDMM when students presented and defended their ideas in group discussions and had them either accepted or rejected, with explanations given as to why. This process improved their overall experience of the activity. Students also collected feedback from each other and used that feedback to collaboratively create a Digital Mind Map, choosing topics through mutual agreement; thus they were better able to formulate and organise their ideas. These findings aligned with those of Chen (2010), who highlighted how the Digital Mind Map with collaborative learning promoted critical thinking. Paykoc et al. (2004) and Adodo (2013) also noted that maps improved critical thinking, while Gokhale's (1995) study indicated that learning in groups enhanced critical thinking skills. Gomez (2014) pointed out that mind mapping is a good technique for promoting creative thinking and preserving information because activating the memory in this way stimulates billions of neurons in the brain that are involved in connecting words and ideas. These skills are compatible with student development needs in the 21st century according to Sahin (2009). Trilling and Fadel (2009) noted that in the 21st century, students must not only acquire knowledge but also develop skills such as critical thinking, problem solving, and collaboration. These skills will help reinforce the Islamic education subjects in the students' minds, and as a result of the dialogue, they will be better equipped to distinguish between the main subject and its branches and relevant knowledge. This method also fosters trust among students through discussion and constructive interaction.

Traditionally in Islam, people gathered in Halaqat al-'Ilm (circles of knowledge), small groups that encouraged discussion and questioning (Makdisi, 1990, p.210, cited by Wegerif, 2017). In this regard, both dialogue and the initiation of discussions are crucial to understanding CLDMM, beginning with creating the map; then selecting the main topics, sub-sections, colours and appropriate images for the map; asking other groups about them; and finally discussing them with the teacher and receiving feedback from the teacher and from other groups of students. This supports Wegerif's (1996) idea that using a structure of Initiation and Discussion with Response and Feedback (IDRF) with integrated technology and with specific learning strategies allows students to enhance their interaction in class.

The results found in regard to the teachers' and students' perspectives were not supported by the literature review; instead they related more to improvements in the CLDMM's processes. The students' skills improved through the creative process of developing the mind maps, which included colours, pictures, drawing, describing elements with few words, and abbreviations to save time and effort; hence one student remarked that she felt “professional” when designing the DMM. Through this, it can be concluded that CLDMM enables a more pro-active approach to learning, where the teacher is not the only source of information; students are instead encouraged to engage with their materials and collect and create their own resources, thus making them feel independent and responsible.

7.3.3 Hindrances and difficulties in using CLDMM

Despite this study broadly supporting results that show a considerable number of advantages of using CLDMMs in the Islamic education learning environment, it must be acknowledged that there are several factors that might prevent it from being used effectively and to its full potential, not giving teachers and students its full benefit. Both teachers and students agreed that they came across several issues that hindered the use of the CLDMMs in Islamic education lessons in their classrooms. The challenges faced by the teachers and students in the use of the digital maps were: the constant need for technical maintenance; learning problems; their lack of skills in employing and fully benefitting from the CLDMMs due to inadequate training; and students’ differing abilities and characteristics.

One of the most important differences was with regard to English language proficiency, since most programs do not fully support the Arabic language. There was an obvious disparity in the completion of these maps; therefore training is required, as mentioned earlier. The students felt that, although the DMM program was easy to use, they needed enough time to interact, and therefore learn how to cooperate, with peers who may have contrasting personalities. The strength of some of the students’ personalities empowered them in controlling the technology and acquiring information. Vygotsky (1978) discussed how students’ higher capacities are enhanced in a collaborative environment. This setting facilitates learning rather than impeding it, and the diversity of students' abilities should in fact support learning. Nong et al. (2009) also acknowledged that using the map on the computer promotes collaboration among different students and stimulates the flow of ideas. However, Kiraly et al. (2003) disagreed with Vygotsky's view in one respect; they pointed out that it is rare for more advanced students to benefit from lower-level students.

The students nevertheless demonstrated their progress by creating more complex levels of DMM in later lessons. This echoes the obstacle mentioned previously in the results of this research: that the students need enough time for training before they can fully take advantage of DMM. It can be argued that less time does not necessarily mean less learning, since teachers can instead be taught to raise the level of students' achievements through the designing of maps. Students should first practice by creating easy forms of the maps, gaining basic skills which would later facilitate the process of collecting information and developing advanced skills that would speed up their creative designing and thus enable them to reach their full potential.

It follows that a key problem is a lack of training, on the part of both teachers and students; both agreed that their lack of training and confidence with the software and the technology slowed the educational process. According to Buzan and Buzan (1996), students should first be given the opportunity and time to learn how to use and understand mind maps. This is consistent with the teachers' position that they also need adequate training in how to use mind maps. In addition, teachers agreed that the biggest obstacle causing learning problems was a shortage of time, and there were a number of reasons for that, including: the short duration of the lesson itself; the restricted physical space in the classrooms; and the large number of students, which didn't allow much one to one interaction, especially between teachers and students. These points were also noted in studies by Buzan and Buzan (1996) and Erdogan (2008), who suggested that the mapping approach required enough time to allow students to learn how to use them. (Regarding the current study, it is important to mention that using iPads solved the problem to some degree. The computers in the schools were not always ready to use, whereas the iPads could be distributed to students quickly and easily, thus reducing the time required.) Al-Showaye (2002) reported a shortage of technical support, a lack of time, large classes, an inadequate supply of computers, and outdated computer facilities.

Another issue is that the CL environment requires enough space to allow the teacher and students to move around easily during the process. If this area is too small, it will impede the teachers' ability to provide guidance to CL groups; this will hinder progress and result in learning problems. This potential problem was also mentioned by Alajmi (2011), who discussed how a large number of students within a small classroom space causes delays in developing a more interactive student environment, which is an important element in DMM. This point was also made by Alsenaidi (2012), who found that a large class size interfered with the division of students into groups.

Another difficulty was that of poor Internet connections at the school. This proved problematic insofar as it was difficult to connect to the Internet, on which Digital Mind Mapping is heavily dependent, so students struggled to search for images or information. As a result, the effectiveness of the CLDMM was reduced, and the students' frustration grew when they were unable to achieve their objective.

Of all the obstacles encountered, technical malfunction was considered the biggest concern. A teacher explained that when these devices suddenly stop working, the classroom is disrupted, the flow of ideas is stopped, and students become distracted; consequently, the learning process is impeded. If the devices in question are old or obsolete, they require constant maintenance, which interrupts learning. Moreover, one teacher stated that “school computing devices often do not provide any access to the Internet’. The inability of the teacher to connect the device or to provide any form of technical maintenance correlates with O’Mahony’s (2003) statement that the lack of training and lack of time are obstacles that prevent the efficient use of technology in a teaching setting. Becta (2004) agreed that teachers perceive a shortage of time as a barrier. Sicilia (2005) emphasised that a lack of teacher training and skills and a lack of technical support are hindrances and barriers. Muir-Herzig (2004) stated that the use of technology in schools is confronted by the barriers of lack of training and slow Internet access.

Furthermore, it has been observed that teachers ignore ICT in their teaching, especially in teaching Islamic education. This aligns with the results of several studies based in Saudi Arabia: Al-Shafi‘i (2004), Al Harbi (2004), Alshahrani (2011), Alnesyan (2012), Alsenaidi (2012), and Altwaijri (2017).

7.3.4 Academic achievement

The method of teaching (CLDMM) played a focal role in raising students’ level of engagement and achievement. Based on interviews with teachers and students, and also on the researcher’s classroom observation, the possibility of using Digital Mind Mapping with a collaborative learning approach to teaching has been demonstrated to be both feasible and effective from the participants’ perspective. CLDMM has made a positive difference, according to the teachers and students. It has brought about good results, and students have progressed in their learning, while the traditional method does not increase pupils’ level of achievement any more than what was usually attained. Traditional classes had little interaction for the majority of the lessons because the teachers taught the subject in the style of a lecture, leaving little to no time for discussion, except perhaps in the last few minutes. This is not sufficient time for the students to review the information being taught, or to reinforce their learning, especially in the case of young children who require different methods and ways of being taught and often several means of learning something new. It is important to mention that the above findings are supported by the quantitative results. The SPSS analysis revealed that there were statistically significant differences in the achievement of the experimental groups compared to the control groups. The teachers believed that the traditional method did not help students to raise their level of academic achievement, even though it was the same teacher using both the traditional method and the CLDMM method.

This gives the reader a tangible result, in that the advantage of collaborative learning with the Digital Mind Map, which led to improvements in the students' academic level in relation to Islamic educational materials, was demonstrated in the quantitative analysis. In a number of studies, the mind map's effectiveness in self-regulation has been shown to improve students' academic achievement and overall performance (Schunk & Zimmerman, 2007; Opara, 2010; Adodo, 2013). Indrayani (2014) also reported that using mind mapping led students to reach higher academic success, and Gomez (2014) agreed that mind maps improve learning.

Digital mind mapping showed a difference in students' academic achievement (Nong et al., 2009). In his study, Radwan (2001) explored the impact of technology on the improvement of the learning process. The Bring Your Own Device (BYOD) project, which let students use their own devices, advance their understanding more than they could have by simply studying from a textbook (Song, 2014). Likewise, Mahmoud (2001) found that the use of technology in Islamic education positively developed the learning skills of students.

Khasawneh's (2001) findings showed that there was a high level of success when students used a computer to learn Islamic education, in contrast to the traditional teaching method. Holland et al. (2003, 2004) found that the mind map program increased students' educational performance and achievement. It can therefore be concluded from the results of these discussions that both the Digital Mind Map and collaborative learning are effective tools for teaching. This corresponds to some of the recommendations and results of the previous studies, which were obtained from several methods, qualitative and quantitative, in different places.

7.4 Summary

This chapter discussed the main findings of the study in relation to the possibility of using the CLDMM method as a technique for teaching Islamic education materials in primary schools in Saudi Arabia. The most important issues highlighted were those of the method's educational abilities, the features of which were seen to positively influence the teaching process, according to the views of teachers and students, and subsequently to raise the students' level of academic achievement. This chapter has also discussed a number of obstacles that make the use of the CLDMM difficult in this environment. It should be noted that both the quantitative and qualitative data was considerably aligned in the research presented, and this has been justified in my discussion of the literature in relation to the results. This discussion explored the answers to the research questions in detail. The general perception regarding the use of Digital Mind Mapping with collaborative learning was also reported, as was its ability to positively influence the processes of both teaching and learning.

The next chapter will discuss proposals to enhance the use of the CLDMM in Islamic education. In addition, it will address the obstacles mentioned above.

8. Chapter Eight: Conclusion

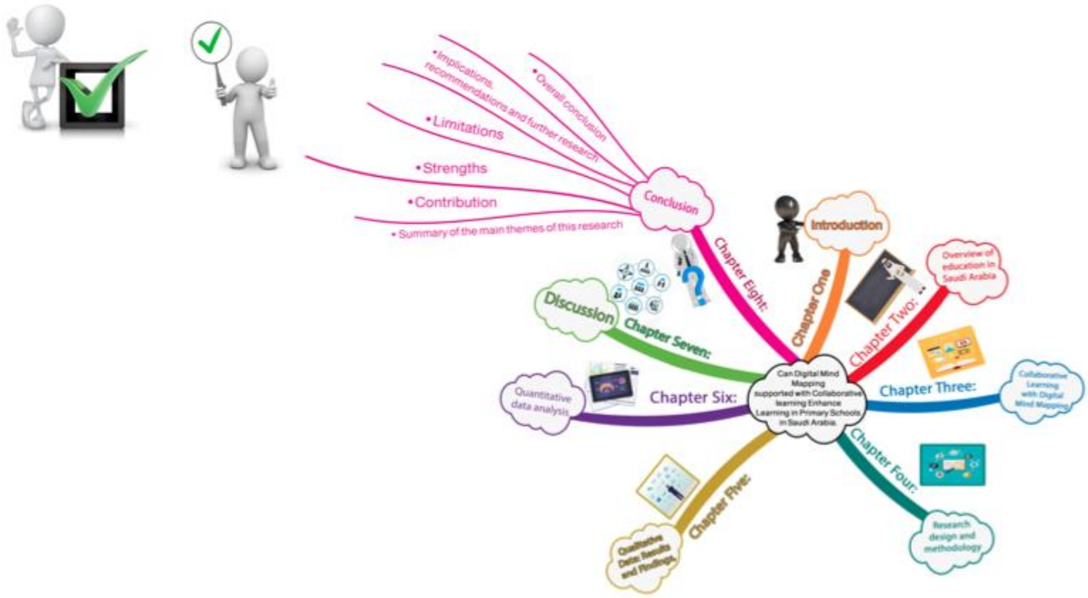

Figure 8.1 Digital Mind Map for Chapter Eight

This study has reached several conclusions related to the use of Digital Mind Mapping with Collaborative Learning in Islamic Education in primary schools in Saudi Arabia. The importance of implementing Collaborative Learning with Digital Mind Mapping as a way to improve the educational process was examined and confirmed. Based on this study, there are several recommendations that may be useful for the Saudi government in their effort to systematize the integration of technology in the education system; and for researchers, as it points out the weaknesses of this study and encourages further research in this area; and for teachers in showing a way to improve the quality of the learning process provided to their students.

8.1 Summary of the main themes of this research

The present study has dealt with issues related to the experience in integrating technology into modern teaching strategy in Islamic Education in primary schools in the Kingdom of Saudi Arabia. It looked at how this experience affected the students' level of academic achievement. It took place within a specific social and cultural context.

This study has yielded several findings on the factors and challenges that affect teaching and learning and the improvement of the students' understanding of Islamic Education materials through the use of Collaborative Learning with Digital Mind Mapping. It was able to give answers to the questions in the following four areas: the advantages of using CLDMM in Islamic Education; the views of teachers and students on the use of this method and on how it improved the academic performance of students and improved the performance of teachers; the impact of CLDMM on students' understanding of Islamic Education; and, finally, the obstacles and difficulties in the use of CLDMM and how to overcome them. This study was applied in three schools with a sample of nearly 180 students.

The most obvious result is that students' academic achievement in Islamic Education was higher when using CLDMM compared to the traditional method without using CLDMM. The observations, interviews, and pre- and post-test results revealed differences between the use of Collaborative Learning with Digital Mind Mapping and the traditional method. The Collaborative Learning with Digital Mind Mapping method stimulated student engagement, enhanced learning motivation, and improved students' understanding of their lessons and their interaction and collaboration within the classroom environment, especially between fellow students. Moreover, the results indicated that the educational opportunities provided by Collaborative Learning with Digital Mind Mapping included promotion of critical thinking, dialogue, Initiation and Discussion Response Feedback, the exchange of experiences among students, enrichment of knowledge, and faster memorization of information combined with greater long-term retention and understanding.

However, there were some difficulties and barriers encountered in the use of Collaborative Learning with Digital Mind Mapping, such as learning problems, technical problems, lack of training, and problems arising from the different abilities and personalities of the students in their groups.

Collaborative Learning with Digital Mind Mapping was successfully adopted in these schools and led to the improvement in the students' level of achievement as indicated by the schools' tests. It is also expected that this method will support new teaching strategies to meet the needs of students for digital learning and also to change the educational environment in Islamic Education in primary schools in Saudi Arabia. However, further research should be undertaken as this study is just a starting point in the promotion of technology and its integration in new teaching methods in Islamic Education in the primary stage, in particular, and in other stages in general.

8.2 Contribution of this research

The purpose of this study was to find out the feasibility of using the Collaborative Learning with Digital Mind Mapping to improve the level of students' academic achievement.

This study offers the following contributions:

- This study contributes to mixed-methods research in the Kingdom of Saudi Arabia through its use of both quantitative and qualitative methods. This improved the results of this study because it gave the researcher in-depth data by combining the positives of quantitative and qualitative research. Janesick (2003) confirmed that mixed methods research provides more information about a situation than quantitative research alone, and allows for obtaining detailed accounts of participants' ideas. Therefore, pairing qualitative and quantitative approaches provides more valuable information about an issue.
- It presents a critique of the methods currently used in teaching Islamic Education in primary schools in Saudi Arabia.
- It proposes an enhanced role for ICT and emerging digital technologies by integrating such approaches with modern teaching methods by combining Collaborative Learning with Digital Mind Mapping; this should help those interested in the development of education and particularly of Islamic Education.
- It encourages teachers to use Collaborative Learning with Digital Mind Mapping, which supports students' interaction with Islamic Educational materials and the provision of an effective educational environment.
- This study provides an insight into the development of methods of teaching Islamic Education based on Western contexts (from the literature review).
- It provides a practical way to promote the student-centred learning that is called for in new educational studies, whereby students are more interactive and engaged. When the features of digital learning are merged with the features of Collaborative Learning, students become more focused on the educational process and thus enhancing dialogue and discussion between students.

- It introduces the idea of 'force multiplier' to capture the idea of the relationship between the teacher's role, the use of collaborative learning and the use of digital technology in supporting students' learning.

Therefore, based on these research results, the use of new technology for the development of education should be seriously taken into consideration.

8.3 Strengths and Limitations

8.3.1 Limitations

Some major limitations of this study are that its results cannot be generalized because it did not use a large random sample in its quantitative phase. Additionally, because it was based on an interpretative approach, it does not reveal universal laws. Thus the wider reality of the educational issue is not demonstrated.

It is important to take note of the circumstances that influenced this research to begin with and, consequently, its findings. The most important of these were the obstacles which were faced when trying to find suitable primary schools in the Saudi Arabian city of Qassim in which I could conduct my research. A long period of time was spent searching for appropriate schools for the study, since very few schools were found to be using ICT in conjunction with the principles of Collaborative Learning, and none of the Islamic Education facilities were using Digital Mind Maps. Some teachers were aware of the use of maps, but these were Concept Maps that differ in principle from Mind Maps, as mentioned previously in the literature review.

As for the limitations of the sample involved, the study focused on Islamic Education in the fifth and sixth years of three primary schools, instead of a range of stages. Perhaps other year groups would have responded differently to Collaborative Learning with Digital Mind Mapping if they had been included in the research conducted. Since the educational system in Saudi Arabia exhibits gender separation in the school setting, the researcher was unable to extend her examination to male-only schools. This is crucial to note as boys may have been more interested in the digital approach than girls were, which would have provided a wider range of results to analyze. Regarding confidentiality and to avoid any privacy concerns, data was kept within a safe place, and archived. However, the most restrictive limitation of this study was that the study is based on the use of the Digital Mind Mapping software in computers. This in itself was a setback due to the researcher's inability to load the software onto the school equipment due to the lack of WiFi in the school buildings where the study was conducted. Due to this, it became necessary for the researcher to buy iPad devices in order to conduct this study successfully.

Taking into account that my observations examined the reality of the situation and considering the aforementioned, it must be stressed that it was not an easy task trying to control the classes, with the students having different responses and behaviour.

The fact that there are no schools using Digital Mind Maps could be attributed to a number of reasons. Firstly, teachers are generally insufficiently trained in the use of ICT. This was brought up in the interviews, during which all teachers mentioned that they had not heard of Digital Mind Maps prior to this, and only one teacher had knowledge of Mind Maps. Therefore, during the implementation of Collaborative Learning with Digital Mind Mapping in lessons they were only able to cover a basic level of the Digital Mind Mapping application.

Secondly, even though the principles of Collaborative Learning have been known in

Saudi Arabia for 14 years, it proved to be very difficult to find any teachers or schools that applied Collaborative Learning with ICT at the primary level of education. Four teachers were later found not to have practiced Collaborative Learning and not to have used Digital Mind Maps.

Another possible reason as to why there are no schools using Digital Mind Maps that was mentioned during the interviews revolved around the lack of incentives for teachers to apply new technological methods, such as Digital Mind Mapping, in their lessons. This absence of incentives was demonstrated by the lack of impact on the teachers' salaries, and the large volume of administrative work that both precedes and follows the introduction and implementation of any new teaching method or technology into a class. This is most likely due to the fact that the curriculum still predominantly follows the traditional methodological framework that allows the teacher no flexibility when deciding on what is best for their students, or most suited for the subjects they teach.

Inadequacy in the schools' equipment presented another big challenge, where, in the case of Digital Mind Mapping, teachers must 'compete' to use the devices, thereby hindering their enthusiasm to employ it in their lessons.

8.3.2 Strengths

Being the first piece of research that focuses on the integration of Collaborative Learning with Digital Mind Mapping in Islamic Education in Saudi Arabia, the main strength of this research is its novelty. This is because only a limited number of studies have been carried out on the use of ICT, in general, in education. Therefore, this study presents the most current information about the advantages of using Collaborative Learning with Digital Mind Mapping, particularly in Islamic Education. This study attempted to change the teaching methods of Islamic Education from the current, traditional style, to the new style which is technology based. In order to benefit from the advantages of the new sources of learning, and the attractive study environment that included iPads, the resources learning room also featured an interactive whiteboard for presenting the Digital Mind Maps, a tool which is rarely used by teachers of Islamic Education in Saudi Arabia. This is particularly so when considering the way interaction and collaboration in the classroom are supported. This study intends to draw this particular method of enhancing the learning environment to the attention of the Ministry of Education in Saudi Arabia, so that they may eventually decide to encourage teachers and schools to support the use of Digital Mind Mapping.

A further strength of this study stems from the ability of the three research methods - interviews, observations and pre- and post-achievement tests - to offer credible findings in a relatively short time. This suits the circumstances in Saudi Arabia because most Saudi studies (such as Alassem, 2001; Almofada, 2000; Al-Shafi'I, 2004) have employed only one method.

A further strength of Collaborative Learning with Digital Mind Mapping is that it is derived from several Western educational theories, such as constructivist learning, meaningful learning, Gestalt and multimedia-learning, which were discussed in the literature review. These fit well with the findings of this study. In particular the idea of ‘force multiplier’ is introduced as a way of understanding the complementary roles of teacher, pedagogy and technology in supporting students’ learning. The interaction between these roles appears to provide a more productive space for development that examining each role separately.

Another of the strengths of the study was that it obtained results from three schools from a sample of 180 students in the pre- and post-tests and also in the observations. The research has clearly demonstrated the feasibility of the approach in the Saudi context. Even though the study did not have a randomly selected sample nor was it able to randomly allocate classes to the condition, it still provides indicative evidence of the value of the Collaborative Learning with Digital Mind Maps approach which could be tested more rigorously and at greater scale.

The results of this study will be reported to officials in the Department of Education of Saudi Arabia, providing them with the current perception of teaching, and encouraging primary school teachers to use Digital Mind Mapping in Islamic Education lessons.

8.4 Implications, recommendations and further research

Research findings provide initial support for Digital Mind Mapping as a strategy, but do require further study. With regard to the current study, the results lend support to the research objectives, and show that the use of Collaborative Learning with Digital Mind Mapping has a positive effect on student academic achievement in comparison to traditional educational methods in two subjects of Islamic Education in the primary stage of education, namely Fiqh and Hadith.

The findings of this research offer several points that can serve as suggestions and recommendations for other researchers and future studies. Also, the findings of this research offer several suggestions that the Ministry of Education should consider. These are as follows:

- It is necessary to improve the methods of teaching Islamic Educational from the traditional way to more effective and attractive methods, such as method of Collaborative Learning with Digital Mind Mapping, especially to keep pace with the present reality of primary students' use of technology.

- There is a need to rejuvenate educational practices in primary education with digital innovations. In order for this to happen, the curriculum needs to be reviewed to provide enough time for activities related to the use of Collaborative Learning with Digital Mind Mapping and to the application of the principles of collaboration and interaction in the classroom.
- An effort needs to be exerted to set up simple courses for students so that they are more confident in using new technologies in the classroom setting.
- Intensive workshops for teachers should be put in place, including courses increasing teachers' competence in using technology in an effective manner, together with courses presenting the possibilities that technology and new teaching methods can offer to teachers that enhance the importance of technology in the educational process.
- It is essential that the policies of the Saudi Ministry of Education, in general, and policies on the curriculum, in particular, are based on the development of new technologies by providing sufficient time in lessons to allow for the use of these methods. If the Ministry of Education showed such an interest, it may act as an incentive for Islamic Education teachers and students to use ICT in their teaching and learning.
- The results of this research provide a future vision. This could be a catalyst for further studies in primary education, and therefore it is recommended to conduct further research on this subject. Such research should preferably be conducted in a larger number of schools in the KSA as well as within boys' schools.
- It is crucial for schools to be equipped with new, quality computers with access to internet connection, or iPads, and their implementation in the classroom

should be supervised by experienced professionals.

- This study has verified that Islamic Education lessons are suitable for the use of technology within the lesson and this new strategy in teaching; this could lead to breaking the barriers that exist to breaking away from traditional methods in education. Teachers could use technology and collaborative teaching strategies in their teaching, which would encourage students to use and interact with technology in a positive manner.
- It would be helpful if schools were provided with paper materials and electronic devices when using Mind Maps in Islamic Education lessons.

In conclusion, given the numerous benefits of using Collaborative Learning with Digital Mind Mapping, I would suggest having tables in the classrooms so that collaborative and individual learning could be mixed, especially in primary schools, in order to make it easier for the teacher to use collaborative activities as part of their teaching approach. This is in addition to using Digital Mind Mapping to promote interest in using ICT, and thereby to reach a higher level of understanding and improve academic achievement.

8.5 Practical and Theoretical Implications of this Study

Practical Implications

This study can contribute to the development of education, especially in light of the results concerning the use of Digital Mind Mapping with Collaborative Learning in Islamic Education. It can contribute to the positive development of technological classroom practices which can help to create an effective and attractive learning environment in schools in the Kingdom of Saudi Arabia.

This study found that the classroom teaching methods used in Islamic Education are traditional and non-technological and that lecture methods are used in which students receive information; however, these do not provide effective results. Therefore, it is necessary to use modern technologies, especially with Islamic Educational materials, for example the use of Digital Mind Mapping to improve teaching environments and the learning experience in Islamic Education classes in Saudi schools.

Regarding the results of my study, the use of the Digital Mind Map supported by Collaborative Learning in the teaching of Islamic Education gave students room to participate, interact and engage in lessons, and gave them the enthusiasm and motivation to attend Islamic Education classes without absence.

In addition, it improved students' understanding as demonstrated by the increase in their test grades compared to those of control groups. Moreover, it improved learning through the retention of information for a longer period than of the traditional method in addition to information being remembered in more detail. Furthermore, this method showed its efficiency through enriching the information through educational sites, links and images.

In order for teachers to be able to use new teaching techniques effectively, they must develop themselves by undergoing development training courses that are concerned with how to use these new technologies and how to incorporate them into new teaching strategies. Teachers should no longer rely on traditional blackboard methods, but instead should include modern teaching techniques that are compatible with the digital age and its requirements.

It is also important for the Ministry of Education to train teachers and supply incentives to raise their level of education through the use of digital learning to come up with an interactive, attractive and collaborative approach to teaching and learning. This in turn allows for a better teaching experience, allowing for greater results from the students. This emerged from the results of this study, where teachers used Digital Mind Mapping with Collaborative Learning in Islamic Education, to get students actively involved in the educational process as explorers, to understand instead of merely receiving information without dialogue, discussion or participation.

Accordingly, the Ministry of Education should encourage the practice of these strategies and the integration of technology in the context of the development of teachers' practices in effective learning environments. It is important to note that teachers of Islamic Education must be aware of the fact that new technologies should be introduced in their teaching and that they are required to raise both their level of teaching and technical skills, resulting in raising the academic level of their students.

Theoretical Implications

There are a variety of new technologies available today and Digital Mind Mapping is one of these. The literature review suggests that Digital Mind Mapping can be used to promote good learning and teaching environments in the teaching of Islamic Education in primary schools. The fact is that ICT plays an important role which cannot be ignored as it is crucial part of modern society around the world.

As for the theoretical implications, it is necessary to think about the usefulness of the theories mentioned in the literature. The results proved the validity of dialogue and cooperation in groups in the use of technology (Wegerif, 2007). The discussion and dialogue were in the collaborative groups when discussing the topics of the Digital Mind Map, which increased the exchange of experiences, critical thinking and interaction. These results were obtained from the use of mixed methodology. During the interviews with teachers and students, they informed me of the existence of interaction, dialogue, discussion and cooperation during the application of this method in Islamic Education classes, and was confirmed by the researcher through observation of classes. In addition, the results of the quantitative and qualitative methods complemented each other to reach the above findings.

Mayer (2005a) mentioned that multimedia learning supports the way of learning of the human brain. This theory makes it clear that students can learn more deeply when integrating a picture with a word. Indeed, this is clearly demonstrated when students linked their information to the Digital Mind Map and remembered this information in detail.

The results of the study contributed to the realization of one of the principles of the theory of Gestalt, namely Gestalt theory (Smith, 1988), that the general idea acts as a starting point before looking at the details.

Students were able to make sense of the lesson information by obtaining a complete picture of the meaning of each word which is detailed by reference to the book or the use of links assistant or teacher. This is because the innate inclination of the mind is to simplify any visual problem to make it understandable (Albers, 2012).

According to the strategy of self-regulation, it was found that using the Digital Mind Map supporting with Collaborative Learning helped students to represent information. The Islamic Education lessons were creative because they were supported by images and symbols which were found by working collaboratively, researching on the internet, and finding examples which students can easily remember, which simulates the mind, that transforms the mental abilities of students into academic skills (Zimmerman, 1990). This improves the academic achievement of students, which is evident in the results of this study.

Digital Mind Mapping and Collaborative Learning are likely to play a role in raising students' academic achievement and in serving the school environment. Also, the Ministry of Education’s projects mentioned in the second chapter that they expect schools to seek and activate the use and integration of technology to become part of Saudi education and make it more widespread in the future.

In short, this study investigated the use of Digital Mind Mapping with Collaborative Learning in order to help understand modern digital learning environments that are supported by technology in primary school Islamic Education classes. This was studied through the qualitative methods of observation and interview, and the quantitative method using pre-test and post-tests, which were useful in exploring the results of this study in several ways.

Nevertheless, there were some obstacles that should be addressed in the development of the method of this study. In particular, the Ministry of Education in Saudi Arabia is currently seeking to use technology and introduce it into education, which should help to diminish or reduce these obstacles.

8.6 Overall conclusion

It is essential that the Saudi Ministry of Education’s policies in general, and policies of the school curriculum in particular, should be based on the Islamic theoretical framework. The Islamic theoretical framework is deeply rooted in Saudi culture and may be associated with new technologies.

This link between new technologies and the Islamic theoretical framework may be an incentive for Islamic Education teachers and students to use ICT in their education and learning, where they can see the relationship between Islam and the new educational practices in its approach to building thinking. Encouraging students and teachers to create links between Islamic teachings in the Qura'n and the new technology is likely to help improve traditional educational practice and raise students' educational level.

The aim of this paper was to answer the question of whether the Digital Mind Map supported by Collaborative Learning would enhance academic achievement in primary classrooms in Islamic Education in Saudi Arabia.

To provide the answer, this work firstly examined previous studies related to the topic, as well as other literature, which all indicated numerous benefits to using Collaborative Learning with Digital Mind Mapping. Secondly, in order to obtain empirical data, research was conducted using mixed qualitative and quantitative methods. The findings of this research largely confirm the conclusions of the studies presented in the literature review, and reveal that applying the principles of Collaborative Learning with Digital Mind Mapping has the potential to be beneficial for teachers as well as students.

It is important to mention that one of these finding is the idea of a "force multiplier", which means the Digital Mind Map with Collaborative Learning helps the teacher supports the teacher' by providing additional information' by promoting his/her students in thinking independently and building experiences through peer-to-peer communication and interaction among colleagues who may have different experiences and upbringings.

The "force multiplier", as previously mentioned by a teacher in the results, is another source of student support, because a teacher who uses the digital mind map with collaborative learning will not be the only source of information for students. Using the digital mind map helps students to think independently and build their experiences.

This method acts like a teaching assistant that can be used to support the teacher in the performance of his/her teaching duties in class. As some of the students and teachers said, the digital mind map promotes higher-order thinking skills such as composition, analysis and summarisation, as well as technological and collaboration skills, teamwork and acceptance of other viewpoints. This helps to consolidate students' knowledge and comprehension of the lesson and serves as a guide, facilitator and support for enhancing these 21^{st}-century skills.

On the other hand, despite these positive aspects of technology in raising the level of academic achievement, it is not possible to ignore the existence of obstacles preventing this potential being fulfilled, such as technological problems and lack of training in its use by both students and teachers. Finally, although these research results provide initial support for the teaching strategy of Digital Mind Mapping, the area still requires more investigation. This study confirms the need for further research into this topic, as mentioned in the problem statement in the introduction.

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10.Appendices

Appendix (1): Teachers' and students' semi-structured interviews

1.1 Islamic Education teachers' interviews

BACKGROUND INFORMATION

Teacher's Code:	Date of the interview:	Duration:
Level:	Subject:	Experience:

Themes	**Suggestion questions**	Notes
Teacher perspectives on MM	Do you consider MM useful in your classrooms? If so, why? To what degree are you familiar with using MM in the classroom? Have you ever used MM in the classroom? If yes, can you specify in what way?	
Teachers perspectives on DMM	Do you consider DMM useful in your classrooms? If so, why? To what degree are you familiar with using DMM in the classroom? Have you ever used DMM in the classroom? If yes, can you specificy in what way ?	
Improve learning process	To what extent do you believe that DMM or MM could help to stimulate students' interest in learning subject matters related to Islamic Education? To what extent do you believe that DMM or MM could help to stimulate students' understanding of lessons in the context of Islamic Education?	
Collaborativ e learning enhancing	Do you include any activities in your lessons when using DMM or MM in which students can work collaboratively? If so, how often? Do you consider CL useful in your lessons when using DMM or MM? If so, why?	
Difficulties and Hindrances of using DMM	Do you face any barriers or difficulties when using DMM or MM in Islamic education lessons? If yes, how do you deal with such difficulties or hindrances?	
Features of DMM and comparison with MM	What are the opportunities for using MM or DMM in Islamic education? How effective is the use of MM or DMM in Islamic education? What are the main differences between using DMM and MM? What are the changes in which the experimental group supported with DMM in comparison with MM?	

1.2 Students' interview

BACKGROUND INFORMATION

Student Code: Date of interview:

Start Time ___________ End Time ____________ Level:

Class: Group: Subject:

I will use 'Stimulated Recall' whereby I will provide the interviewee with an example of DMM that they created in order to facilitate a more in-depth conversation and inquiry.

Themes	**Suggestion questions**	Notes
Students perspectives on MM	Do you consider MM useful in your classrooms? If so, why? To what degree are you familiar with using MM in the classroom? Have you ever used MM in the classroom? If yes, can you specify in what way Do you think that it takes up too much time and it is not helpful? What are the most attractive/unattractive aspects of MM?	
Students perspectives on DMM	Do you consider DMM useful in your classrooms? If so, why? To what degree are you familiar with using DMM in the classroom? Have you ever used DMM in the classroom? If yes, can you specify in what way? Do you think that it takes up too much time and it is not helpful? What are the most attractive/unattractive aspects of DMM?	
Improve learning process	To what extent do you believe that DMM or MM increase you interest in learning in the context of Islamic Education? To what extent do you believe that DMM or MM could help you to understand Islamic Education lessons? To what extent do you feel that with this method your teacher can help you to understand the lessons better?	
Colaborative learning enhancing	To what extent CL activities during your lessons facilitate discussion between you and your peers when using DMM or MM? To what extent are CL activities useful in your lessons when using DMM or MM? To what extent do you think that with this method (DMM, MM) your teacher can provide you with more opportunities for discussion?	
Difficulties and Hindrances of using DMM	Do you face any barriers or difficulties when using DMM or MM in Islamic education lessons? If yes, can specify them? Do you think that these difficulties affect your understanding?	

Features of DMM and comparison with MM	What are the opportunities for using DMM or MM in Islamic education? How effective is DMM or MM in the context of Islamic education’ To what extent do you think that with this method your teacher can help you to increase your performance? To what extent do you think that learning by using DMM or MM will help you in your future professional and private life? To what extent do you think that the use of DMM or MM by your teacher provides you with more opportunities to construct your own knowledge?	

Appendix (2): Observation Classroom

BACKGROUND INFORMATION:

Teacher Code: Date of Observation: Start Time ____ End Time_____Date:
Level: Class: Group: Subject:

- **Questions before observation:**

✓ What subject (topic) has your class been engaged in recently with respect to Islamic Education?
✓ What unit are you working on at the moment?
✓ What instructional materials are you using?
✓ What do you hope that the students will learn as a result of the work (lessons) that you have planned?
✓ What strategies will be employed in these lessons?
✓ Is there anything particular that I should know about this group of students before I commence my observation?

Section one: <u>Classroom Description:</u>

Section two: <u>Lesson Characteristics:</u>

1- **Lesson Purpose:**

2- **Instructional Materials:**

Section three:
<u>Description of observational notes related to the aims of the study and events in the classroom:</u>

- Did this lesson encourage students to use DMM collaboratively as a way of assisting them in learning?
- Did the teacher encourage students to use DMM to support their learning?
- Were there opportunities for using DMM in Islamic education?
- Do DMM include features usable in the context of Islamic education? Is there a difference in learning or learning outcomes between the experimental group in comparison with the control group?
- Were there difficulties and hindrances in using DMM with Islamic education in the observed classroom?
- Did the students interact with this teaching method (DMM)?
- Did the instructional strategy DMM manage to promote students' learning?

Section four: Other impacts:
Section five: Barriers and difficulties:
Section six: Other Information:

Appendix (3): An example of colour coding from some pieces of the Original interview

1) **<u>in Islamic education lessons? If yes, how do you deal with these difficulties or obstacles?</u>**

Hindrance

Hindrance

Hindrance

Yes, there are some difficulties, such as various technical problems, including a failure to turn on the device or sudden shut downs, which negatively affects the usability of the DMM. In addition, this needs more training for both teachers and students. These difficulties show the need to establish courses to support teachers to use it and maintain it continuously.

2) **<u>What are the opportunities available to use CLDMM in Islamic education?</u>**

Features

There are opportunities available, for example, PowerPoint presentations, Interactive Whiteboard and these may be sent by email or social media to have group work and online discussion to develop their maps.

3) **<u>How effective is digital mind mapping with collaborative learning in the content of Islamic education?</u>**

Features

It helps students to learn and apply what they learn and contribute to the development of skills such as dialogue, critical thinking and exchange of knowledge. Because Islamic educational materials are part of their lives and the students have different backgrounds, they support each other.

4) **<u>What changes were seen in the experimental group, which used collaborative learning supported with digital mind mapping, compared to the control group that did not use it?</u>**

Understanding

Advantage

Academic achievements

For the experimental group, the students remembered the information with more emphasis and detail, with ease of recall of the information, compared to the control group that did not. Also the competition, activity and enthusiasm shown by students during the Islamic education classes was greater than in the control group.

Appendix (4): pre-test and post-test

4.1 (ENGLISH VERSION)

4.1.1 Jurisprudence (Figh)

Fifth school year of primary

(Pre and post-test)

Student name ___________________________

Group ___________________________

Answer the following questions

1) What is the definition of the call to prayer (Athan) and what is the ruling of it?

Definition:

____

Ruling:

____

2) What are the words which are added in the call to Fajr prayer (Athan)?

____

3) List three examples of the Sunnan of the prayer ?

1. ____

2. ____

3. ____

4) What is the meaning of there is no God worthy of worship but ALLAH (*LA ELAH ELLA ALLAH*)?

____

5) Name one etiquette of when hearing the second call to prayer (Eqamah)?

____

6) There is a phrase used in the second call to prayer (Eqamah) which is not found in the first call to prayer (Athan). What is it?

____

7) What is the etiquette of leaving the house?

____

8) Circle the correct answer

• The first thing the slave is held accountable for is:

Zakaah Prayer Fasting

• Prayer is the ___________ pillar of Islam

Third Fourth Second

• The ruling of the prayer is that it is

Sunnah Obligatory Preferred (Mustahabah)

4.1.2 Prophet's Biography <u>(Hadith)</u>

<u>Fifth school year of primary</u>

<u>(Pre and post-test)</u>

<u>Student name</u> ___________________________

<u>Group</u> ___________________________

<u>Answer the following questions</u>

1) How did the Prophet (peace and blessings of Allah be upon him) treat children?

____

____

2) *It was narrated that 'Abd-Allaah ibn' Ommer (may Allaah be pleased with him) said: The Messenger of Allaah (peace and blessings of Allaah be upon him) said: "Anyone who does not show mercy to our children nor acknowledge the rights of our Elders is not one of us."*

What is the meaning of the “mercy to of our children”:

____

3) Give one example of how the Prophet peace be upon him guided children

____

____

4) Is the following statement true or false? True / False

“Keeping the ties of kinship with relatives is an act of good which can be in the forms of giving money, visitation, physical help and kind treatment”

5) Mention two qualities of the Prophet Mohammad peace be upon him in how he treated his guests

1. ____

2. ____

6) What do you know about Aisha, may Allah be pleased with her?

Her name is ______________________________

Her husband ______________________________

7) Can you mention two examples of the Prophet's good treatment of his neighbours?

1. ____

2. ____

4.2 Pre and post-test (Arabic VERSION)

<u>(Hadaith and Figh)</u>

<u>Fifth and Six school year of primary</u>

<u>(Pre and post-test)</u>

اختبار مادة الحديث للصف الخامس
الاختبار القبلي والبعدي
اسم الطالب: ________________________________
الصف: ________________________________

اجب على الاسئلة التالية:
١) *كيف كان هدي الرسول صلى الله عليه وسلم في التعامل مع الاطفال؟*
كان يتعامل معهم بــ ____

٢) *عن عبدالله بن عمر رضي الله عنه قال: قال الرسول صلى الله عليه وسلم ((ليس منا من لم يرحم صغيرنا ويعرف حق كبيرنا)).*
"من خلال الحديث السابق ما معنى "من لم يرحم صغيرنا"؟

____

٣) *اعطيني مثالا واحدا عن كيفية توجيه الرسول صلى الله وسلم للأطفال:*

____

4) *هل العبارة التالية صحيحة ام خاطئة؟*
الحفاظ على اواصر القرابة هو عمل جيد ويمكن ان يكون هذا العمل اما مالا او زيارات او مساعدة مادية او حسن تعامل"
صح - خطا
٥) *عددي اثنين من آداب النبي محمد صلى الله عليه وسلم في تعامله مع ضيوفه؟*
١. ____
٢. ____
٦) *ما ذا تعرفين عن عائشة رضي الله عنها؟*
اسمها هو ________________________________
زوجها ________________________________

٧) *هل يمكنك ذكر مثالين توضح حسن معاملة الرسول لجيرانه*
١. ____
٢. ____

اسئلة مادة الفقه للصف السادس الابتدائي

اسم الطالب: ______________________________

الفصل: ______________________________

اجب على الاسئلة التالية:

١) *ما هو تعريف الاذان وما هو حكم الاذان؟*

تعريف الاذان هو ______________________________

حكمه ______________________________

٢) *ما هي الجمل التي تضاف لآذان صلاة الفجر*

الجمل هي ______________________________

٣) *حددي ثلاثة امثلة من سنن الصلاة؟*

1) ______________________________

2) ______________________________

٣) ______________________________

٤) ما معنى لا إله الا الله؟

____

٥) *هناك آداب عند سماع النداء الثاني للصلاة (الاقامة) حددي واحدة من تلك الآداب*

____

٦) هناك جملة تضاف لصيغة الاقامة لا تذكر في صيغة الاذان ما هي؟

____

٧) *عددي آداب الخروج من المنزل؟*

____

٨) *ضع دائرة حول الاجابة الصحيحة*

- **اول ما يحاسب عليه العبد هي:**

الزكاة - الصلاة - الصيام

- **الصلاة هي الركن .... من اركان الاسلام**

الثالث - الرابع - الثاني

- **حكم الصلاة؟**

سنة - واجبة - مستحبة

Appendix (5) An example of the interview for both teachers and students

5.1 An example of the interview for teachers (ENGLISH VERSION)

5.1.1 Teacher (D) interview:

BACKGROUND INFORMATION
Date of interview: 10/12/2015
Duration: 20 minutes
Level: 5th and 6th Grade
Experience: 5 years

1) **Have you taken any course or training in the use of mind mapping in teaching?**

   No, but, I attended a one-day training course about using concept mapping.

2) **To what extent are you familiar with using mind mapping in general and particularly digital mind mapping in the classroom?**

   As I said before, I did not have any experience about it, but I just used paper mind maps once in Quran memorising.

3) **Do you consider digital mind mapping to being useful in your classrooms? If so, why?**

   Yes, it is useful and beneficial for students, especially seeing the interest of students in technology, so linking technology to lesson material is necessary. For example, to distinguish between Sunan and Duties and Ruken in the Fiqh curriculum. Also, I saw that the students loaded the DMM program to use it in other lessons to help them not to forget their information.

4) **Have you ever used paper mind map or digital mind mapping in the classroom? If so, can you give me an example?**

   No, I haven't; this is the first time I've heard about it.

5) **To what extent do you think that using the digital mind map can help you in stimulating student interest in learning subjects related to Islamic education? And also in motivating students to understand Islamic educational lessons?**

   a) I agree it is really stimulating student interest in Islamic education. Especially that the student mentioned the full information and retained the information; this is the first time the students mentioned the full information. Because, in Islamic educational materials we have main and branches of knowledge, and when using the digital mind map it is *impossible to forget the differences between them. An example is that some of the students could demonstrate full knowledge, supported with examples, and that this was the first time they had encountered this in three years.*

b) Yes, because the information is too much and the same, and this needs concentration, so I put it in one page as a DMM to help remind the students and to help them memorise it.

6) **<u>Do your lessons include any activities when using a digital map that enables students to work collaboratively? If yes, how often?</u>**

Yes, I use CL when I use DMM, and it is good *to learn very collaboratively. If it was individually, every student would be slow to get the information. Because the students share ideas and words in a collaborative manner it also reduces time and effort. And learning by comparing information between their groups meant they learned more than by the teacher.*

In addition, it takes into account individual differences among students in terms of their level of activity, calmness, courage, and focus.

And CLDMM helps students with lower level abilities to work with their peers to create clear maps, in which they can summarize information and improve their own academic achievement.

In addition, the participation between students determines both the role each member has in the group as well as their duties.

7) **<u>Do you believe that using collaborative learning supported by digital mind mapping improves learning? If so, how?</u>**

Yes, I believe it does as it is an effective way of learning which helps students to understand the subject matter better and in a proper way.

8) **<u>Do you consider DMM to be useful in supporting CL? If so, why?</u>**

Yes, they are very useful and effective to display the information in a better way, to increase the focus of students and make the lessons generally more attractive for them as they prefer working with modern devices and together to exchange their ideas.

9) **<u>Do you believe using the DMM with CL has any positive benefits for your lessons and your students? If so, what kind of benefits?</u>**

Yes, it is useful and effective and therefore I look at collaborative learning as a continuous learning strategy in all subjects because it develops cooperation among students and increases an inclination towards community consultation, which is in line with Islamic teachings. Also, collaborative learning with digital mind mapping encourages students to speak fluently by discussion and dialogue to create their DMMs with an appropriate style whilst teaching them how to obtain correct information to understand what they've learned.

10) **Do you encounter any obstacles or difficulties when using the digital map in Islamic education lessons? If yes, how do you deal with these difficulties or obstacles?**

Yes, there are some difficulties, such as various technical problems, including a failure to turn on the device or sudden shut downs, which negatively affects the usability of the DMM. In addition, this needs more training for both teachers and students. These difficulties show the need to establish courses to support teachers to use it and maintain it continuously.

11) **What are the opportunities available to use CLDMM in Islamic education?**

There are opportunities available, for example, PowerPoint presentations, Interactive Whiteboard and these may be sent by email or social media to have group work and online discussion to develop their maps.

12) **How effective is digital mind mapping with collaborative learning in the content of Islamic education?**

It helps students to learn and apply what they learn and contribute to the development of skills such as dialogue, critical thinking and exchange of knowledge. Because Islamic educational materials are part of their lives and the students have different backgrounds, they support each other.

13) **What changes were seen in the experimental group, which used collaborative learning supported with digital mind mapping, compared to the control group that did not use it?**

For the experimental group, the students remembered the information with more emphasis and detail, with ease of recall of the information, compared to the control group that did not. Also the competition, activity and enthusiasm shown by students during the Islamic education classes was greater than in the control group.

14) **Do you have any comments; or do you want to add anything?**

Yes, please. I would like to say that I really enjoyed this method because it facilitated access to the information and will be adopted and activated in my lessons. I would like to say that, for the Islamic education teachers who cannot change their method of explanation due to the students and teacher being accustomed to the traditional way, they should try to adopt CLDMM in their lessons, And taking into account training courses to use it in a better and more effective way.

5.1.2 An example of the interview for teachers (ARABIC VERSION)

- **هل سبق ان اخذت دوره تدريبية في استخدام الخريطة الذهنية في التدريس؟**

لا ولكنني حضرت دورة تدريبية لمدة يوم واحد حول استخدام خرائط المفاهيم.

- **إلى أي درجة انت على دراية باستخدام الخريطة الذهنية عامة والرقمية بشكل خاص في الفصل؟**

كما ذكرت سابقا، لم يكن لدي أي خبرة عنها، ولكني استخدمت مره واحده للخرائط الذهنية الورقية في درس حفظ القرآن.

- **هل تعتبر الخريطة الذهنية الرقمية مفيدة في فصولك الدراسية إذا كانت الاجابة بنعم، لماذا؟**

نعم مفيدة للطالبات، ولا سيما اهتمام الطالبات اليوم بالتكنولوجيا، لذا من الضروري ربط التكنولوجيا بموادهم الدراسية. على سبيل المثال، للتمييز بين السنن والواجبات والاركان في منهج الفقه. أيضا، رأيت أن الطالبات قاموا بتحميل برنامج DMM لاستخدامه في الدروس الأخرى لمساعدتهم على تذكر وعدم نسيان معلوماتهم.
هل سبق أن استخدمتِ الخريطة الذهنية الورقية أو الرقمية في الفصل؟ إذا كان الجواب نعم هل يمكنك ذكر الطريقة بالتحديد؟
للأسف لم استخدمها وللعلم هذه هي المرة الاولى التي اسمع بها.

- **إلى أي مدى تعتقدين ان استخدام الخريطة الرقمية يمكن ان تساعدك في تحفيز اهتمام الطالبات في تعلم المواد الدراسية ذات الصلة بالتربية الاسلامية؟ وايضا في تحفيز الطالبات على فهم الدروس التربية الاسلامية؟**

أ) نعم أوافق على أنها تحفز اهتمام الطالبات في مواد التربية الاسلامية.
خاصة أن الطالبة ذكر المعلومات الكاملة واستطاع ان يحتفظ بالمعلومات بذاكرته؛ وللعلم هذه هي المرة الأولى التي يذكر فيها الطالبات المعلومات كاملة. لأنه في مواد التربية الإسلامية لدينا فروع وأصول، وعند استخدام الخريطة الذهنية الرقمية، من المستحيل نسيان الفرق بينهما. ومن الأمثلة على ذلك أن بعض الطالبات استطاعوا أن يثبتوا معلوماتهم مدعومة بالأمثلة، وأن هذه هي المرة الأولى التي أواجه فيها هذا الأمر خلال فترة تدريسي منذ ثلاث سنوات.
ب) نعم، لأن المعلومات كثيرة ومتشابهة، فهذا يحتاج إلى التركيز، ولذلك أضعها في صفحة واحدة الخريطة الذهنية الرقمية كمثال لمساعدة الطالبات في التذكر والحفظ.

- **هل تشمل الحصص أية انشطة في الدروس الخاصة بك عند استخدام الخريطة الرقمية تمكن الطالبات من العمل بشكل تعاوني؟ إذا كانت الاجابة بنعم، كيف يكون ذلك غالبا؟**

نعم، أستخدم التعلم التعاوني عند استخدام الخريطة الذهنية الرقمية، ومن الجيد التعلم بشكل تعاوني. حيث إنه إذا كان كل طالبة على حدة، سيكون بطيئًا في الحصول على المعلومات. نظرًا لأن الطالبات يتشاركن الأفكار ومعلوماتهم بطريقة تعاونية، وهذا يقلل أيضاً من الوقت والجهد. والتعلم من خلال مقارنة المعلومات بين المجموعات الاخرى يقصد به أنهم تعلمن أكثر من كونه من المعلمة فقط.
بالإضافة إلى ذلك، فإنه يؤخذ في عين الاعتبار الفروق الفردية بين الطالبات من حيث مستوى نشاطهن، والهدوء، والحماس، والتركيز. ويساعد استخدام الخريطة الذهنية الرقمية مع التعلم التعاوني الطالبات ذات القدرات الأقل على العمل مع أقرانهن لإنشاء خرائط واضحة، حيث يمكنهن تلخيص المعلومات وتحسين إنجازهن الأكاديمي الخاص.
بالإضافة إلى ذلك، المشاركة بين الطالبات تحدد دور كل عضوة في المجموعة وكذلك واجباتهن.

- **هل يعتبر التعلم التعاوني مفيد في الدروس الخاصة بك عند استخدام الخريطة الرقمية إذا كان الجواب بنعم، لماذا؟**

نعم اعتقد أنه مفيد، لأنه طريقة فعالة للتعلم تساعد الطالبات على فهم الموضوع بشكل أفضل وبطريقة مناسبة.

- **هل تعتبر الخريطة الذهنية الرقمية مفيدة في دعم التعلم التعاوني إذا كان الجواب بنعم، لماذا؟**

نعم، فهي مفيدة للغاية وفعالة لعرض المعلومات بطريقة أفضل، وايضا لزيادة التركيز لدى الطالبات وجعل الدروس بوجه عام أكثر جاذبية، لأنهم يفضلون العمل مع الأجهزة الحديثة وتبادل أفكارهن.

- **هل يعتبر استخدام التعلم التعاوني مفيد عند استخدام الخريطة الرقمية في الدروس الخاصة بك؟ إذا كان الجواب بنعم، لماذا؟**

نعم، إنها مفيدة وفعالة، ولذا فإنني أنظر إلى التعلم التعاوني كاستراتيجية تعلم مستمرة في جميع المواد الدراسية لأنها تطور التعاون بين الطالبات ويزيد استخدام التشاور في مجتمعاتهن، وهو ما يتماشى مع التعاليم الإسلامية. بالإضافة إلى ذلك، يشجع التعلم التعاوني مع استخدام رسم الخرائط الذهنية الرقمية الطالبات على التحدث بطلاقة عن طريق الحوار والنقاش لإنشاء خرائطهن الخاصة بهم بشكل مناسب في حين يعلمهن كيفية الحصول على المعلومات الصحيحة حتى يفهمن ما تعلموه.

- **هل تواجهين أي عوائق أو صعوبات عند استخدام الخريطة الذهنية الرقمية في دروس التربية الاسلامية؟ إذا كانت الاجابة بنعم كيف تتعاملين مع هذه الصعوبات أو العوائق؟**

نعم، هناك بعض الصعوبات، مثل المشاكل التقنية المختلفة، بما في ذلك الفشل في تشغيل الجهاز أو التوقف المفاجئ، مما يؤثر سلباً على امكانية استخدام الخريطة الذهنية الرقمية. بالإضافة إلى ذلك، يحتاج هذا إلى مزيد من التدريب لكل من المعلمات والطالبات. وهذه الصعوبات توضح مدى الحاجة إلى إنشاء دورات تدعم المعلمات لاستخدامها بشكل مستمر وكيفية التعامل مها عند تعطلها.

- **ماهي الفرص المتاحة لاستخدام الخريطة الذهنية الرقمية والتعلم التعاوني في مواد التربية الاسلامية؟**

هناك فرص متاحة، على سبيل المثال، العروض التقديمية، السبورة التفاعلية، ويمكن إرسال هذه الخرائط عن طريق البريد الإلكتروني أو عن طريق وسائل التواصل الاجتماعي للقيام بعمل جماعي للمناقشة عبر الإنترنت لتطوير خرائطهن.

- **ما مدى فعالية الخريطة الذهنية الرقمية في محتوى التربية الاسلامية؟**

يساعد الطالبات على تعلم وتطبيق ما يتعلمونه ويساهم في تنمية المهارات مثل الحوار والتفكير النقدي وتبادل المعرفة. لأن مواد التربية الإسلامية هي جزء من حياة الطالبات. ولدى الطالبات أيضا خلفيات مختلفة، وهذا يدعم بعضهن البعض في تبادل الخبرات.

- **ماهي التغييرات التي دعمت المجموعة التجريبية مع الخريطة الذهنية الرقمية التعاونية بالمقارنة مع المجموعة الضابطة التي لم تستحدمها؟**

بالنسبة للمجموعة التجريبية، الطالبات يتذكرن المعلومات مع مزيد من التركيز والتفاصيل والفهم، مع سهولة استرجاع المعلومات، مقارنة مع المجموعة الضابطة التي لم تفعل ذلك. كما كانت المنافسة والنشاط والحماس التي أظهرتها الطالبات خلال الفصول التجريبية في مواد التربية الإسلامية أكبر من المجموعة الضابطة التي لم تستخدمها.

- **هل لديك أي تعليقات. أو هل تريدين إضافة ملاحظة؟**

نعم من فضلك. أود أن أقول إنني استمتعت حقا بهذه الطريقة لأنها سهلت الوصول إلى المعلومات وسيتم تبنيها وتنشيطها في دروسي القادمة. وأود أن أقول إنه بالنسبة لمعلمات التربية الإسلامية الذين لا يستطعن تغيير طريقة شرحهن بسبب اعتياد الطالبات والمعلمات على الطريقة التقليدية، يجب عليهم محاولة تبني هذه الطريقة في دروسهن، مع الأخذ بعين الاعتبار أخذ دورات تدريبية لكيفية استخدامها بطريقة أفضل وأكثر فعالية.

5.1.3 An example of the interview for students (ENGLISH VERSION)

Student interview:

BACKGROUND INFORMATION
Date of interview: 3/Apr/2016
Duration: 20 minutes
Level: 6th Grade

1) **To what extent are you familiar with using the mind map in general and particularly the digital mind map in the classroom?**
   I have not any background of mind mapping and we did not use it.

2) **Is the paper mind map or digital mind map useful for your classes? If so, why?**
   Yes, of course, because it gives us the chance to remember information easily.

3) **Do you think DMM takes a lot of time and it's unhelpful?**
   It does not need more time if we know how to use it and when we got used to using it, and honestly it is very helpful.

4) **What are the most attractive and unattractive aspects of the digital mind map?**
   Attractive - such as, summary of information and makes it easier in exams when you recall information.
   There are no unattractive ways in DMM. I do not know.

5) **To what extent do collaborative learning activities through the use of the digital mind map facilitate discussion between you and your colleagues?**
   Activities happen when creating the maps. There will be discussions, problem-solving, and sharing experiences when selecting the map's elements, colors and images. Students extract the information by discussing with their colleagues, and to make sure such information is correct.

6) **To what extent do you think the digital mind map with collaborative learning increases your interest in learning Islamic educational materials?**
   I am enthusiastic and stimulated about the Hadith material and I think that it is different from the other materials which did not use CLDMM. It also increased my interest in the materials because it became cooperation between my friends in the collection of information. In addition, using iPads and programs of the digital mind map.

7) **To what extent do you think the digital mind map supported with collaborative learning can help you understand lessons in Islamic Education?**
Quite frankly, it helped me to understand lessons and also memorize and organize ideas. The information has become well established and we remembered easily and quickly in tests, more than just the teacher explaining.

8) **To what extent do you feel that this method CLDMM can help your teacher of Islamic Education to explain your lessons better?**
I think this method makes the teacher summarize information to make it easier for us to understand and the *teacher can explain the information faster than before.*

9) **To what extent do you think using CLDMM can provide your teacher with more opportunities to discuss and understand lessons?**
Collabor*ative groups helped the teacher to explain the information among the members of groups quickly, so we have a discussion, dialogue and critical thinking in the groups.*

10) **Did you face any barriers or difficulties when using CLDMM in Islamic education lessons? If so, why?**
Yes we faced technical problems; also it was sometimes difficult to agree in the group to choose a particular image, or mistakes in writing; also some students are sometimes uncooperative, negative and the difference of abilities between us leads to a fight; and it needs enough training.

11) **Do you think these difficulties affected your understanding?**
It may have affected it if I did not know how to create the maps, but now I am excellent in creating the maps and so it does not affect my understanding. I really understood through the summary in the map. I am very excited for the lessons of Hadith.

12) **Do you believe that there are any opportunities and positive benefits from the use of CLDMM in Islamic education? If so, what kind of benefits?**
Yes, it has many positive benefits. It increases the motivation of students, helps to speed up the learning process, increases curiosity among us to gain knowledge, and encourages us to be active participants in the classroom. Using the CLDMM also helps to facilitate teachers for teaching, as the teacher is able to display information and explain the lesson material in clear way to all students and make it more attractive.

13) **How effective is the digital mind mapping with collaborative learning in the *content of Islamic education?***
It is Summarized information and easy to review at the time of exams because the information is many similar and at the same time important and need to remember and understand.

14) **To what extent do you think learning through the use of CLDMM will help you in your professional and independent life?**

It is possible to use it to organize trips, take advantage of vacations and economic matters such as money. I also used them to review other lessons in the exams to make it easier to remember the information.

15) **<u>To what extent do you think using the CLDMM by your teacher gives you more opportunities to build your knowledge and progress in academic achievement?</u>**

Yes, it helped me a lot in building knowledge because I was able to summarize the information in a better way and link it to images and saw sites that increased my knowledge and understanding more than before. I also discussed it with my friends. There was an exchange of experiences and I used it in the rest of the material and also in my private life.

16) **<u>Do you have any comments; or do you want to add anything?</u>**

This method impressed me a lot because it enriched my knowledge and facilitated the preservation and recall of the information because of its association with images. Also, I was more enthusiastic about the Hadith material because I used the technology and I hope that all the teachers use it in the other material. And I will also, when I become a teacher in the future, I will use it for my students.

5.1.4 An example of the interview for students (ARABIC VERSION)

- **الى أي درجة انت على دراية باستخدام الخريطة الذهنية عامة والرقمية بشكل خاص في الفصل؟**

ليس لدي أي خلفية عن الخرائط الذهنية ولم نستخدمها

- **هل تعتبر الخريطة الذهنية الرقمية مفيدة بالفصول الدراسية إذا كانت الاجابة بنعم لماذا؟**

نعم، بالطبع، لأنها تمنحنا الفرصة لتذكر المعلومات بسهولة.

- **هل تعتقدين أن الخريطة الذهنية الرقمية تستغرق الكثير من الوقت وأنها غير مفيدة؟**

لا يحتاج الأمر إلى مزيد من الوقت إذا عرفنا كيفية استخدامها واعتدنا على استخدامها، وبصراحة هي مفيد للغاية.

- **ما الجوانب الأكثر جاذبية وما الجوانب غير الجذابة في الخريطة الذهنية الرقمية؟**

الجذابة - مثل تلخيص المعلومات وتسهيل الامتحانات عندما تتذكر المعلومات.
لا توجد جوانب غير جذابة فيها.

- **هل أنشطة التعلم التعاوني مع الخريطة الذهنية الرقمية تسهل المناقشة بينك وبين زميلاتك؟**

الأنشطة تحدث عند إنشاء الخرائط. وستكون هناك مناقشات وحل المشكلات ومشاركة في الخبرات عند اختيار عناصر الخريطة والألوان والصور المناسبة. يقمن الطالبات باستخلاص المعلومات من خلال المناقشة مع زملائهن، والتأكد من صحة هذه المعلومات.

- **إلى أي مدى تعتقدين أن الخريطة الذهنية الرقمية مع التعلم التعاوني تزيد من اهتمامك بالتعلم في مواد التربية الاسلامية؟**

أنا جدا متحمسة ولدي دافع حول مادة الحديث وأعتقد أنه يختلف عن المواد الأخرى التي لا تستخدم هذه الطريقة. كما زاد اهتمامي بالمواد لأنه أصبح هناك تعاون بين صديقاتي في جمع المعلومات. بالإضافة إلى ذلك، استخدام أجهزة iPad وبرامج الخريطة الذهنية الرقمية زاد من حرصي.

- **إلى أي مدى تعتقدين أن الخريطة الذهنية الرقمية المدعومة بالتعلم التعاوني يمكن أن تساعدك على فهم دروس التربية الاسلامية؟**

بصراحة، ساعدني ذلك على فهم الدروس وحفظ الأفكار وتنظيمها. وأصبحت المعلومات راسخة واتذكرها بسهولة وبسرعة في الاختبارات، أكثر من شرح المعلمة.

- **إلى أي مدى تشعرين أن هذا الاسلوب يمكن أن يساعد معلمتك على فهمك للدروس بشكل أفضل؟**

أعتقد أن هذه الطريقة تجعل المعلمة تلخص المعلومات لتسهل الفهم لدينا ويمكن للمعلمة شرح المعلومات بشكل أسرع من ذي قبل.

- **إلى أي مدى تعتقدين أن استخدام الخريطة الذهنية الرقمية يمكن ان توفر لمعلمتك المزيد من الفرص لمناقشة وفهم الدروس؟**

ساعدت المجموعات التعاونية المعلمة على شرح المعلومات من خلال أعضاء المجموعات بسرعة أكبر، لذلك كان هناك مناقشة وحوار وتفكير نقدي في المجموعات.

- **هل تواجهين أي عوائق أو صعوبات عند استخدام الخريطة الذهنية الرقمية في دروس التربية الاسلامية؟ إذا كانت الاجابة بنعم هل يمكن تحديدها؟**

نعم واجهنا مشاكل فنية. كما كان من الصعب أحيانًا الاتفاق في المجموعة على اختيار صورة معينة أو أخطاء كتابية؛ كما أن بعض الطالبات يكن أحيانًا غير متعاونات وسلبيات ويؤدي اختلاف القدرات بيننا إلى النقاش والشجار؛ وتحتاج إلى التدريب الكافي لاستخدامها.

- **هل تعتقدين أن هذه الصعوبات تؤثر على فهمك؟**

ربما يكون قد أثر على فهمي إذا لم أكن أعرف كيفية إنشاء الخرائط، ولكنني الآن اصبحت قادرة على إنشاء الخرائط، وبالتالي لا يؤثر ذلك على فهمي. أنا افهم حاليا من خلال ملخص الخريطة. فأنا متحمسة جدا لدروس الحديث.

- **ماهي الفرص المتاحة والمزايا الإيجابية لاستخدام الخريطة الذهنية الرقمية التعاونية في التربية الاسلامية؟**

نعم، لديها العديد من الفوائد الإيجابية. إنها تزيد من دافعية الطالبات وتساعد في تسريع عملية التعلم وتزيد الفضول بيننا لاكتساب المعرفة وتشجعنا على أن نكون مشاركين نشطين في الفصل الدراسي. كما تساعد المعلمات في تسهيل عملية التدريس، حيث أن المعلمة قادرة على عرض المعلومات وشرح مادة الدروس بطريقة واضحة لجميع الطالبات ويجعلها أكثر جاذبية.

- **ما مدى فعالية استخدام الخريطة الذهنية الرقمية في محتوى التربية الاسلامية؟**

تقوم بتلخيص المعلومات وتسهيلها لنا عند المراجعة في وقت الامتحانات لأن المعلومات متشابهة كثيراً وفي نفس الوقت مهمة ونحتاج إلى تذكرها وفهمها.

- **إلى أي مدى تعتقدين أن التعلم من خلال استخدام الخريطة الرقمية سوف يساعدك في الحياة المستقبلية والمهنية الخاصة بك؟**

من الممكن استخدامها لتنظيم الرحلات، والاستفادة من تقسيم وتنظيم الإجازات والمسائل الاقتصادية مثل المال. لقد استخدمتها أيضاً لمراجعة الدروس الأخرى في الامتحانات لتسهيل تذكر المعلومات.

- **إلى أي مدى تعتقدين أن استخدام الخريطة الذهنية الرقمية من قبل معلمتك يوفر لك المزيد من الفرص لبناء المعرفة الخاصة بك والتقدم في التحصيل الدراسي؟**

نعم، لقد ساعدتني كثيراً في بناء المعرفة لأنني تمكنت من تلخيص المعلومات بطريقة أفضل وربطها بالصور ورأيت المواقع التي زادت من معرفتي وفهمي أكثر من ذي قبل. لقد ناقشت أيضا مع صديقاتي. وكان هناك تبادل للخبرات واستخدمتها في بقية المواد وكذلك في حياتي الخاصة.

- **هل لديك أي تعليقات. أو هل تريدين إضافة أي شيء؟**

أثارتني هذه الطريقة كثيراً لأنها أثرت معرفتي وسهّلت على الحفاظ على المعلومات واستدعائها بسهولة بسبب ارتباطها بالصور. أيضا، كنت أكثر حماسا حول مادة الحديث لأنني استخدمت التكنولوجيا وآمل أن تستخدمها جميع المعلمات في المواد الأخرى. وسأستخدمها لطالباتي أيضًا، عندما أصبح معلمه في المستقبل.

Appendix (6): Research Ethics and Data Protection Monitoring

6.1 Ethic application form 1

Durham University

School of Education

Research Ethics and Data Protection Monitoring Form

Research involving humans by all academic and related Staff and Students in the Department is subject to the standards set out in the Department Code of Practice on Research Ethics. The School of Education Ethics Sub-Committee will assess the research against the British Educational Research Association's *Revised Ethical Guidelines for Educational Research* (2011).

It is a requirement that prior to the commencement of all research this form be completed and submitted to the School of Education Ethics Sub-Committee. The Committee will be responsible for issuing certification that the research meets ethical standards and will, if necessary, require changes to the research methodology or reporting strategy.

The application should contain:

a. This completed (and signed) application form;
b. Completed **appendix A**:
    a. A summary of the research proposal. This should be no longer than one A4 page that details:
        i. objectives of the study,
        ii. description of the target cohort / sample,
        iii. methods and procedure of data collection,
        iv. data management, and
        v. reporting strategies;
    b. Outline of the interview schedule / survey / questionnaire / or other data collection tools (if applicable depending on the methodology you plan to employ);
c. Completed **appendix B**: the participant information sheet (if applicable), and
d. Completed **appendix C**: the consent form (if applicable).

Templates for the summary of the research proposal, the participant information sheet and the consent form are provided on pp.5-7 as **appendices A-C.**

Please include all the relevant documents above within one combined document

Notes:

- As all applications should be submitted electronically, electronic (scanned) signatures should be used.
- You will be informed of the outcome of your application within two weeks of submission. If a specific application deadline has been notified, and this is missed, then the turnaround time will be 4 weeks from date of submission.
- No research should be conducted until ethical approval is obtained.
- Incomplete applications will be returned without consideration.
- **Please send all documents to ed.ethics@durham.ac.uk, School of Education Research Office, tel : (0191) 334 8403.**

Application for Ethics Approval

Name of applicant	MONA ALWAZZAN
Email address	m.salwazzan@durham.ac.uk
Category *[choose from list]*	Postgraduate student - Research programme
If "Other" please specify	
Programme *[students only – choose from list]*	PhD
If "Other" please specify	
Name of supervisor *[students only]*	Steve Higgins
Title of research project	Can Digital Mind Mapping Enhance Learning in Primary Schools in Saudi Arabia
Date of start of research *[must be a future date]*	01/10/2014
Is the research funded *[staff only – choose from list]*	No
Name of funder *[staff only]*	
Name of Co-Is if applicable *[staff only]*	
Is this application subject to external ethical review? *[choose from list]*	No
If "yes" please specify who	

FOR OFFICE USE ONLY

REVIEWER RESPONSE

REVIEWER COMMENTS

Date of reviewer response – click here to select

Reviewer to complete – click here to select

1) a. Does the proposed research project involve data from human participants (including secondary data)? *If 'no' please provide brief details in Section 10 of this form.*	Yes
b. Is the research project *only* concerned with the analyses of secondary data (e.g. pre-existing data or information records). If yes then please continue with Q6-10	No
2) Will you provide your informants – prior to their participation – with a participant information sheet containing information about the following: a. The purpose of your research?	Yes
b. The voluntary nature of their participation?	Yes
c. Their right to withdraw from the study at any time?	Yes
d. What their participation entails?	Yes
e. How anonymity is achieved?	Yes
f. How confidentiality is secured?	Yes
g. Whom to contact in case of questions or concerns? *Please attach a copy of the information sheet (template available at **appendix B**) or provide details of alternative approach in Section 10 of this form.*	Yes
3) Will you ask your informants to sign an informed consent form? *Please attach a copy of the consent form (template available at **appendix C**) or provide details of alternative approach in Section 10 of this form.*	Yes
4) a. Does your research involve covert surveillance?	No
b. If yes, will you seek signed consent post hoc?	Click here to select
5) a. Will your data collection involve the use of recording devices?	No
b. If yes, will you seek signed consent?	Click here to select
6) Will your research report be available to informants and the general public without restrictions placed by sponsoring authorities?	No

7) How will you guarantee confidentiality and anonymity? *Please comment below.*

I will follow the Code of Ethics of Durham university and conduct the research according to the rules set out by the British Educational Research Association (BERA, 2004). Issues regarding respect, confidentiality, informed consent and safeguarding will be carefully considered as detailed below.

The following procedures will be applied to satisfy ethical concerns. Firstly, all data will be kept anonymous to maintain the participants' privacy. Secondly, all collected data will be used for educational purposes only and will not be used to earn any benefit. Thirdly, the names of the participants will be replaced with pseudonyms and their real names will be excluded from any report material. However, despite the greatest efforts to assure complete anonymity, it cannot be guaranteed due to the possibility of a third party disclosure. Lastly, any necessary modifications to the report will be made, based on the objections from participants before allowing the public to look at the report.

8) What are the implications of your research for your informants? *Please comment below.*

No detrimental effects are expected, there will be no disruption to the normal classroom activity and students will be able to participate equally. However, should any participant become distressed during the observation or interview, the needs of the student or teacher will take precedence and the interview or observation will be stopped. In such case, counselling or care will be offered.

9) Are there any other ethical issues arising from your research? *Please comment below.*

During the data collection, data analysis and writing process, the data (audio recordings, observation records, interview data, etc.) will be securely stored in a locked cabinet in a secure building. As was previously mentioned, electronic information will only be accessed by the researcher after verifying their username and password. Electronic information will also be sorted by a secure system, within a locked building with recognised virus protection. It will be destroyed when it is no longer required. Also, the data will be encrypted, i.e. password protected, and the security contact details will be stored away from the data.

10) Please provide any additional information relevant to your application

N/A

Declaration

I have read the Department's Code of Practice on Research Ethics and believe that my research complies fully with its precepts.
I will not deviate from the methodology or reporting strategy without further permission from the School of Education Ethics Sub-Committee.
I am aware that it is my responsibility to seek and gain ethics approval from the organisation in which data collection takes place (e.g., school) prior to commencing data collection.

Applicant signature*	Date 1st February, 2016
Proposal discussed and agreed by supervisor *[students only]* Supervisor signature*	Date 2nd February, 2016-02-02 S.G. Higgins

**To enable electronic submission of applications, electronic (scanned) signatures will be accepted. Please note that typed signatures cannot be accepted*

6.2 Ethical approval by the School of Education Ethical Committee:

Durham University

School of Education

Shaped by the past, creating the future

11 February 2016

Mona Al-Wazzan
PhD

m.s.alwazzan@durham.ac.uk

Dear Mona

Can Digital Mind Mapping Enhance Learning in Primary Schools in Saudi Arabia

I am pleased to inform you that your application for ethical approval for the above research has been approved by the School of Education Ethics Committee. May we take this opportunity to wish you good luck with your research.

P. M. Holmes

Dr. P. Holmes
Chair of School of Education Ethics Committee

6.3 An example for participant information sheet

Durham University
School of Education

Shaped by the past, creating the future

01/11/2015

Participant Information Sheet

Title: [illegible]

You are invited to take part in a research study of "Can Digital Mind Mapping Enhance Learning in Primary Schools in Saudi Arabia". Please read this form carefully and ask any questions you may have before agreeing to be in the study.

The study is conducted by MONA ALWAZZAN as part of her PG studies at Durham University. This research project is supervised by Steve Higgins s.e.higgins@durham.ac.uk from the School of Education at Durham University.

The purpose of this study is to examine how Digital Mind Mapping (DMM) can be used with collaborative learning (CL) in primary schools in Saudi Arabia to improve the learning environment for students with respect to Islamic education.

If you agree to be in this study, you will be asked to answer questions in interviews and observe a lesson in a classroom. These activities are designed to achieve the objectives of the research to guide the future of education on the use DMM with collaborative learning in Islamic education.

Your participation in this study will take approximately 45 minutes.

You are free to decide whether or not to participate. If you decide to participate, you are free to withdraw at any time without any negative consequences for you.

All responses you give or other data collected will be kept confidential. The records of this study will be kept secure and private. All files containing any information you give are password protected. In any research report that may be published, no information will be included that will make it possible to identify you individually. There will be no way to connect your name to your responses at any time during or after the study.

If you have any questions, requests or concerns regarding this research, please contact me via email at MONA ALWAZZAN, m.s.alwazzan@durham.ac.uk or by telephone at 0538129999

This study has been reviewed and approved by the School of Education Ethics Sub-Committee at Durham University (date of approval: 01/11/05)

MONA ALWAZZAN

* delete if not applicable

Leazes Road
Durham City, DH1 1TA

Telephone +44 (0)191 334 2000 Fax +44 (0)191 334 8311
www.durham.ac.uk
Durham University is the trading name of the University of Durham

Declaration of Informed Consent

- I agree to participate in this study, the purpose of which is to examine how Digital Mind Mapping (DMM) can be used with collaborative learning (CL) in primary schools in Saudi Arabia to improve the learning environment for students with respect to Islamic education.
- I have read the participant information sheet and understand the information provided.
- I have been informed that I may decline to answer any questions or withdraw from the study without penalty of any kind.
- I have been informed that all of my responses will be kept confidential and secure, and that I will not be identified in any report or other publication resulting from this research.
- I have been informed that the investigator will answer any questions regarding the study and its procedures. MONA ALWAZZAN, School of Education, Durham University can be contacted via email: m.s.alwazzan@durham.ac.uk or telephone: 0538129999.
- I will be provided with a copy of this form for my records.

Any concerns about this study should be addressed to the Ethics Sub-Committee of the School of Education, Durham University via email (Sheena Smith, School of Education, tel. (0191) 334 8403, e-mail: Sheena.Smith@Durham.ac.uk).

٤٣٧/٣/٥

Date Participant Name (please print) Participant Signature

I certify that I have presented the above information to the participant and secured his or her consent.

16/12/2015

Date Signature of Investigator

Appendix (7): Letter of permission for participants (teachers and students' parents)

Dear participant,

Peace be upon you and God's mercy and blessings.

First of all I would like to express my gratitude for your participation in this research project, which is a part of my PhD thesis 'Can Digital Mind Mapping Enhance Learning in Primary Schools in Saudi Arabia? This project aims to explore how Digital Mind Mapping (DMM) can be used with collaborative learning (CL) in primary schools in Saudi Arabia to improve the learning environment for students with respect to Islamic education.

Before commencing with the interview process, I would like to detail what the interview will include and what will be discussed in case of your participation on the project.

The interview comprises four main parts: 1. What are the teachers' perspectives regarding whether digital mind mapping supports collaborative learning which helps students, and what are the students' perspectives on CLDMM? 2. How is digital mind mapping being employed to support learning process, and what are the key features of CLDMM being used in classrooms? 3. What is the difference in learning outcomes between experimental groups, which use CLDMM, in comparison with control groups, which do not use CLDMM?
4. What are the difficulties and hindrances experienced in using CLDMM in primary schools in Saudi Arabia?

Accurate knowledge of these topics is important to achieve the objectives of this research which can guide the future of education on the use digital mind map DMM with collaborative (CL) in Islamic education.

All information will be kept confidential and used only for the purposes of this project.
Thank you for your cooperation.
In order to indicate your willingness to participate in this research, please tick the appropriate box bellow:

Agree
☐

Disagree
☐

Mona Alwazzan
University of Durham

Appendix (8): Permission of schools

بسم الله الرحمن الرحيم

Kingdom of Saudi Arabia - Al-Gassim
Al-Arabi Office For Translation & Typing
LICENSE NO. 151
C. C. No. : 6919
Date

A.O.T.T.

المملكة العربية السعودية - القصيم
المكتب العربي للترجمة والطباعة
ترخيص رقم : ١٥١
عضوية الغرفة التجارية ١٩١٩
التاريخ

2 3 DEC 2015

١٢ ربيع الأول ١٤٣٧

Kingdom of Saudi Arabia
Ministry of Education
General directorate of Education in Qassim
Department of Planning & Development

With regard to facilitating the job of Mrs. Mona Al-wazan

Circular for all primary schools in Buraydah (Girls)

Dear principal of Venerable,

Peace and blessings of Allah,

Upon the letter of college of Education dean at Qassim university dated 10/11/2015 with regard to facilitating the job of the graduate student Mrs. Mona Saleh Alwazan, who is pursuing her PhD with her research titled (Can Digital Mind Mapping Enhance Learning In Primary Schools In Saudi Arabia) .

Acting Director of Planning & Development
Abdulrahman Abdulaziz Al-Fawzan
Signed

تصادق على صحة الترجمة دون أدنى مسؤولية عن محتويات الوثيقة
We approve the correctness of the translation without any responsibility of the contents

Lice No.: 151 ALGASSIM AL-ARBI TRANSLATION OFFICE

00573

٠٠٥٧٣

بريدة:طريق الملك عبدالعزيز(الخبيب سابقاً) شمال النقل الجماعي القديم تلفون ٠١٦٣٢٤٢١٧٤ فاكس ٠١٦٣٢٤٦٣٢٥ - عنيزة:شارع الضليعة جوار شركة المصباح تلفون ٠١٦٣٦٢٠٧٠١ فاكس ٠١٦٣٦٤٠٥٧٠

Buraidah Office: King Abdul Aziz Rd. (ALKHOBIB in the past)North SAPTCO- Tel. : 0163242174 Fax: 0163246325
Onaizah Office : El Dola'a St. near Al-Mosbah Company Tel: 016 3620701 Fax.016 3640570

بسم الله الرحمن الرحيم

المملكة العربية السعودية
وزارة التربية والتعليم
الإدارة العامة للتربية والتعليم بمنطقة القصيم
إدارة التخطيط والتطوير
البحوث

وزارة التربية والتعليم
Ministry of Education

الادارة العامة للتربية والتعليم بمنطقة
التخطيط والتطوير الاداري
الرقم: ٣٧٢٤٣٧٩٧
التاريخ: ١٤٣٧/٠١/٣٠
المرفقات:
Ministry of Education

بشأن تسهيل مهمة الباحثة : منى الوزان

تعميم خاص بمدارس المرحلة الابتدائية في مدينة بريدة - بنات

المكرمة / مديرة مدرسة وفقهـا الله

السلام عليكم ورحمة الله وبركاته

بناءً على خطاب عميد كلية التربية بجامعة القصيم رقم بدون وتاريخ ١٤٣٧/١/٢٨هـ ، بشأن تسهيل مهمة طالبة الدراسات العليا بمرحلة الدكتوراه/ منى بنت صالح الوزان لبحثها المعنون بـ (استخدام الخرائط الذهنية الرقمية في تعزيز التعليم لدى طالبات المرحلة الابتدائية ببريدة في المملكة العربية السعودية)

والسلام عليكم ورحمة الله وبركاته ..

مدير إدارة التخطيط والتطوير المكلف

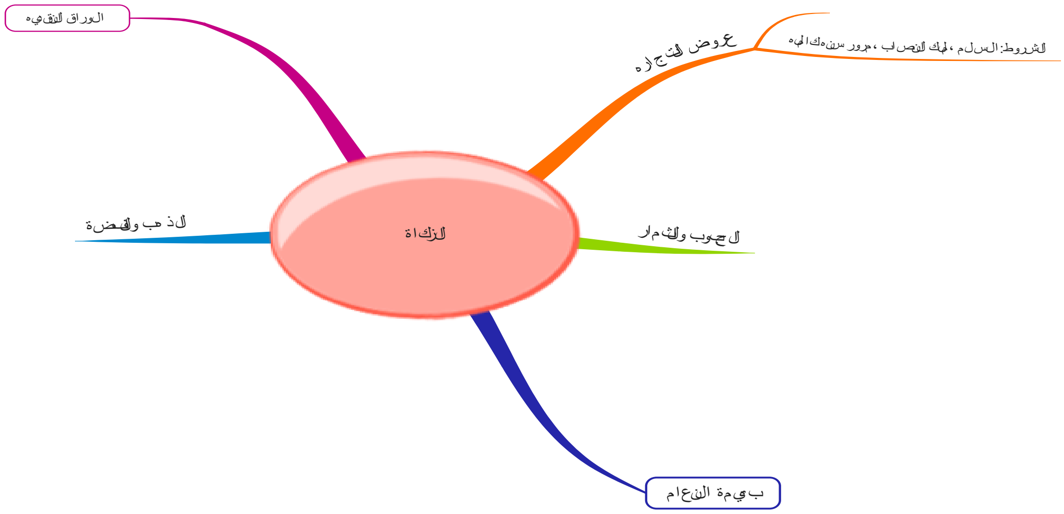
٤٣٧
١/٣٠

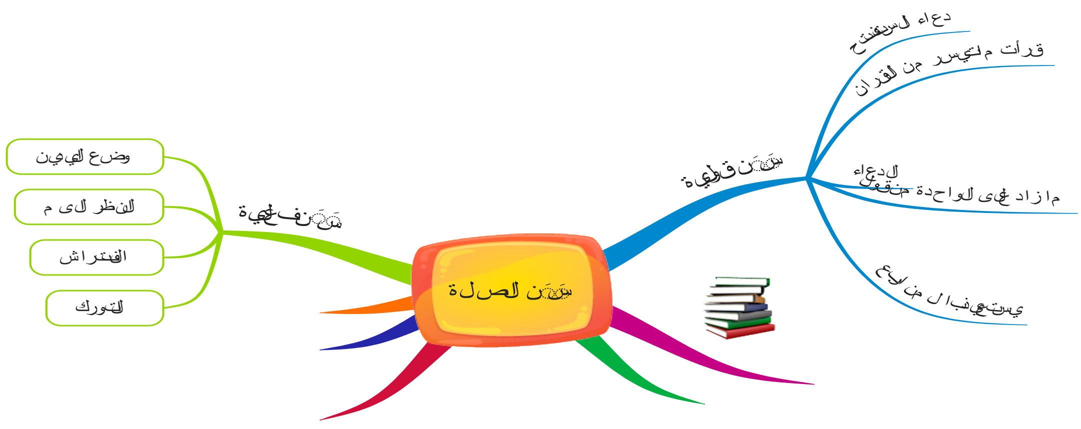
عبد الرحمن بن عبد العزيز الفوزان

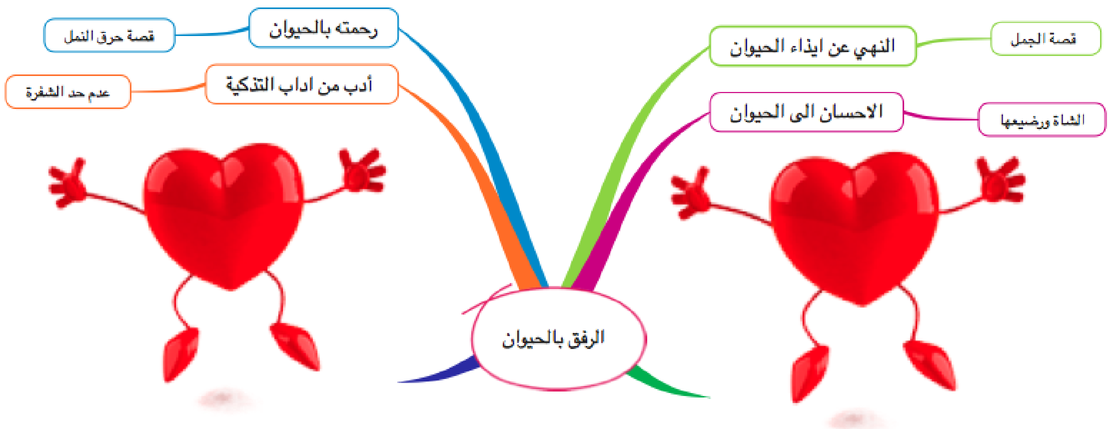
ص / لإدارة التخطيط والتطوير (البحوث)
١٦٦

هاتف : ٠١٦٣٢٦٣١٨٧ فاكس : تحويلة (١١٦) planning1436@gmail.com
qassimedu.gov.sa

Appendix (9): Examples of students Digital Mind Maps

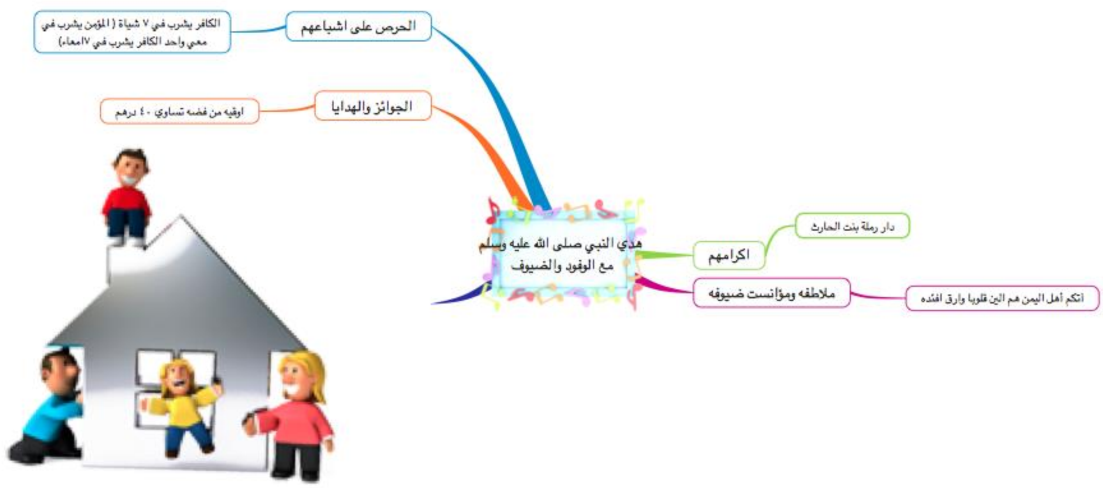






الرفق بالحيوان
رحمته بالحيوان
قصة حرق النمل
أدب من اداب التذكية
عدم حد الشفرة
النهي عن ايذاء الحيوان
قصة الجمل
الاحسان الى الحيوان
الشاة ورضيعها

زكاة الفطر
حكمها
واجبه
مسلم-حر-عبد-ذكر-انثى
مقدارها
٣ كيلو للشخص الواحد
وقت اخراجها
تجب قبل صلاة العيد
تجوز اقدامها بيوم او يومين
يحرم تأخيرها بعد صلاة العيد



هدي النبي صلى الله عليه وسلم مع الوفود والضيوف
الحرص على اشباعهم
الكافر يشرب في ٧ شياة (المؤمن يشرب في معي واحد الكافر يشرب في ٧امعاء)
الجوائز والهدايا
اوقيه من فضه تساوي ٤٠ درهم
اكرامهم
دار رملة بنت الحارث
ملاطفه ومؤانست ضيوفه
اتكم أهل اليمن هم الين قلوبا وارق افئده

Appendix (10): An example for Islamic Education curriculum

Curriculum: The Quran and Tajwid
Unit 1
Subject: The Morals of Some Verses of the Quran
Level: Year 6

١
الوحدة الأولى
فضائل بعض سور القرآن الكريم
تلاوة - حفظ

أهداف الوحدة
يتوقع منك ـ أخي الطالب ـ في نهاية الوحدة أن:
١ تسمي السور التي خصها الله تعالى بمزيد فضل.
٢ تميز بين فضائل السور.
٣ تورد الأدلة على فضائل السور.
٤ تتلو سورة سبأ من الآية رقم (١) حتى الآية رقم (١٤) تلاوة مجودة.
٥ تحفظ سورة الملك من الآية رقم (١) حتى الآية رقم (٢) حفظًا متقنًا.

دروس الوحدة

عدد الحصص	الدرس	موضوع الدرس	رقم الصفحة	الزمن
أربع حصص في الأسبوع	الأول	فضائل بعض سور القرآن الكريم	١٠	٤٥ دقيقة
	الثاني	تلاوة	١٣	٤٥ دقيقة
	الثالث	تلاوة	١٤	٣٠ دقيقة
		حفظ (السماع)	١٥	١٥ دقيقة
	الرابع	حفظ (العرض)	١٦	٤٥ دقيقة

الوحدة الأولى
الدرس الأول
فضائل بعض سور القرآن الكريم

تمهيد
القرآن الكريم هو أفضل الكتب التي أنزلها الله تعالى على رسله عليهم الصلاة والسلام، وقد خص الله تعالى بعض سور القرآن الكريم بمزيد فضلٍ تنويها بمكانتها وشرفها، ومنها سورُ: الفاتحة، والملك، والكافرون، والإخلاص، والمعوذتين، ومما ورد في فضل هذه السور ما يأتي:

فضل سورة الفاتحة
ن فضائل سورة الفاتحة: أنها أعظمُ سورة في القرآن الكريم.
الدليل على ذلك: حديث أبي سعيد بن المُعلّى رضي الله عنه أن رسول الله ﷺ قال: (« ألا أعلمك أعظم سورة في القرآن قبل
ن تخرج من المسجد»، فأخذ بيدي، فلما أردنا أن نخرج قلت: يا رسول الله إنك قلت: «لأعلمنَّك أعظمَ سورة من القرآن»،
ل: ﴿ ٱلْحَمْدُ لِلَّهِ رَبِّ ٱلْعَٰلَمِينَ ﴾ هي السبع المثاني والقرآنُ العظيمُ الذي أوتيتُه)(١).

نشاط ١
يقوم الطلاب بذكر الآية التي أشار إليها النبي ﷺ في آخر الحديث السابق مع ذكر السورة التي وردت فيها.

فضل سورة الملك
ن فضائل سورة الملك: أنها تشفع لمن داوم على قراءتها.
الدليل على ذلك حديث أبي هريرة رضي الله عنه عن النبي ﷺ قال: « إن سورةً من القرآن ثلاثون آية شفعت لرجل حتى غفر
، وهي سورة تبارك الذي بيده الملك»(٢).

) أخرجه البخاري، كتاب التفسير، باب قوله تعالى: ﴿وَلَقَدْ ءَاتَيْنَٰكَ سَبْعًا مِّنَ ٱلْمَثَانِى وَٱلْقُرْءَانَ ٱلْعَظِيمَ﴾، رقم الحديث٤٧٠٢.
) أخرجه الترمذي، أبواب فضائل القرآن، باب ما جاء في فضل سورة الملك، رقم الحديث ٢٨٩١، وقال: حديث حسن.

١٠

Appendix (11): Certificate of Mind Mapping from Buzan Center


This certifies that

Mona Saleh Alwazzan

has successfully completed
the prescribed course of study in

Mind Mapping®

And has learned how to use the Mind Map to:
* Think up brilliant ideas.
* Remember things.
* Gain control of your life.
* Plan Personal Goals.
* Plan a presentation and a report.

Tony Buzan
Creator of Mind Mapping

Dr. Yousuf
Instructor Yousuf AL-Khadher

20-21 Mar 2016
Date

buzan
Buzan Centres Ltd
54 Parkstone Road, Poole
Dorset, BH15 2PG, UK
Tel : 44(0) 1202 674 676
buzan@buzancentres.com
www.buzancentres.com