interactive Islamic Prayer (iIP)

A thesis presented for the degree of Doctor of Philosophy

Mohammed Farsi

School of Engineering and Computing Sciences

Durham University

England, UK

2015

Abstract:

The implementation of Virtual Environments has often been used within the educational domain. This study adopts a Virtual Environment (VE) setting to enhance and develop the physical aspects of teaching the Islamic prayer to primary school children, in comparison to traditional forms of teaching through a prayer book and prayer video.

An interactive teaching Software, the interactive Islamic Prayer (iIP), was designed and developed for this purpose and uses technology by Microsoft's Microsoft Kinect 360 for Windows to demonstrate the various movements of the prayer in sequence. Through the administration of a number of questionnaires, a quantitative analysis of the participants' learning experience were identified, as well as details over which approach the participants preferred. The questionnaires also provided a detailed insight into six areas of study from the learners' perspective when using the various learning approaches: comprehension, learning experience, interaction, satisfaction, usability and achievement.

The results revealed a higher degree of interaction within the lesson on prayer when using the iIP compared to the traditional teaching methods, and although some were unfamiliar with using the Microsoft Kinect 360, on the whole, they found it to be fun and educational. The findings also showed that the software was able to focus on lower level thinking skills, such as recalling information and memory, as a test of the students' knowledge on the prayer before and after using the software showed a significant improvement in comparison to the other approaches. Recommendations have been given on how to effectively implement this software within these relevant classrooms.

I would like to dedicate this PhD to my loving parents.

I do not know how I should start this letter. You have given me everything. Even throughout the hardships and difficulties that you have gone through, you have always continued to keep a warm and loving house. Your smile makes life easy and simple. When I achieved my Bachelors and Masters Qualifications, I saw the happiness on your faces and this is why I pursued my PhD so I could see the light that shines from your faces like the sky is new and is warm and real and bright. My world has somehow shifted when I got married and became a father to a lovely daughter and son. I learnt from you silence and responsibility. Your encouragement and continuous support raises me high on your shoulders. I learnt from you how to stand tall. I am really proud of you both. The words "thank you" is not enough for you I love you that what I learnt from you.

Your Son

Acknowledgement:

First and foremost, I would like to thank Almighty God, the Merciful for giving me the opportunity and ability to pursue this thesis. To Him, I will always be in need of and continue to seek His help and counsel. After thanking God, I would like to acknowledge the Prophet Muhammad (peace be upon him), as his guidance in teaching me the Islamic prayer was the foundation that this whole thesis was based on.

I would like to thank my parents for their unconditional and continuous love and support in my journey throughout my academic studies. If it was not for them I would not be where I am today and for that, I am ever grateful to them. In addition, I am highly thankful to my wife, Bshair, and my children, AbdulWahab and Lara, who sacrificed so much for me during my studies and were a great source of support, encouragement and extremely patient with me.

I am extremely grateful to my supervisor, Professor Malcolm Munro for his exceptional advice, support and guidance throughout this PhD. I would also like to extend similar thanks to Professor Liz Burd for her help and support at the beginning of this research. It is with her that this idea was born and grew.

Lastly, I would like to thank my brother and sister, my close friends, and all of my colleagues in the School of Engineering and Computing Science at Durham University for their advice, support and encouragement.

Mohammed Publication List

Conferences

1- Farsi, M. & Munro, M. (2014) A Comparative Study of Teaching the Islamic Prayer. *7th Saudi student Conference - Edinburgh – UK , 2014*

2- Farsi, M. & Munro, M. (2014) HCI aspects to teaching Primary School Children the Islamic Prayer. *HCI International 2014, Crete, Greece*

3- Farsi, M. & Munro, M. (2015) A Comparative Study of Teaching the Islamic. *ICCSIT 2014, Barcelona , Spain .*

4- Farsi, M. & Munro, M. (2015) Human Computer Interaction System to learn Islamic Prayer . *8th Saudi student Conference , London , UK , 2015*

5- Farsi, M. , Munro, M. & Althobaiti, A (2015) The Effects of Teaching Primary School Children the Islamic Prayer in a Virtual Environment. T*he Science and Information Conference 2015 (SAI 2015) in London, UK*

6- Farsi, M. & Munro, M. (2015) Teaching the Islamic Prayer using Interactive Software. *International Conference on Human-Computer Interaction (HCI International 2015) Los Angeles, USA*

Journals

1- Farsi, M. & Munro, M. (2015) A Comparative Study of Teaching the Islamic. *International Journal of Information and Education Technology* (IJIET) ISSN: 2010-3689 Vol 6, No. 5, May 2016.

Declaration

No part of the material provided has previously been submitted by the author for a higher degree in Durham University or in any other university. All the work presented here is the sole work of the author and no one else.

Table of Contents

List of Tables:

List of Figures:

Chapter 1 Introduction

The use of technology within the classroom has become prevalent within education, specifically as a means of improving and enhancing the learning experience. For instance, the use of smart boards is now commonly used in schools and this has created a shift in how education is viewed and presented. This thesis investigates the implementation and use of technology in the Saudi Arabian context, in order to enhance the learning experience when teaching the Islamic prayer for primary school learners. This chapter therefore provides a background to the educational system in Saudi Arabia, which has motivated a number of reasons to explore this area of research. Thus, the contribution of this research will be presented in this chapter, along with an introduction to the software that has been designed for the purpose of teaching the prayer. The chapter will also include the criteria for success, which is a means of determining how effective this study is, and finally, the structure and organisation of the chapters within this thesis is outlined.

1.1 Education within Saudi Arabia

Within the education system of The Kingdom of Saudi Arabia, there is a strict adherence to the laws governed by the religious practices and sources of Islam. These are often integrated within the educational decisions that are established by the Ministry of Education, which is the department that governs all aspects of education and learning in the Kingdom (Al-Abdel and Ramadan, 1994). The adherence to following practices based on Islamic teachings and sources is found within their constitution, which states "the Kingdom of Saudi Arabia is a sovereign Arab Islamic State with Islam as its religion; God's Book and the Sunnah (ways and practices of His Prophet, Peace Be Upon Him) are its constitution, and Arabic is its language" (International Constitutional Law, 2005). Thus, what is often the case within primary and secondary state schools, an emphasis is also placed on learning Islamic and Arabic studies, which can equate to approximately 30% of the curriculum in primary schools (Jamjoom, 2009). This shows that religious studies are held in high regard. One such area of study is learning the Islamic prayer, which is a fundamental pillar of the Islamic faith and an obligation upon all Muslims to pray five times a day if they meet a certain criteria. One of the criteria is that the individual should reach the age of puberty before they are obliged to pray, which is often the reason why schools within

Saudi Arabia begin to teach their students how to pray at such an early age, ensuring they are prepared and have a clear understanding of what is required when they reach this age. This is also in line with the teachings of the Prophet Muhammad, who narrated a saying that advised parents to teach their children to pray between the ages of 7-10.

However, one of the fundamental problems that has been identified, and often criticized, is the approach and method of teaching that is often applied within the schooling system in Saudi Arabia. That is, the current educational system is criticized for adopting traditional teaching theories and methods that are specifically teacher-centered and thus, provide little interaction and feedback from the learners (Al-Qurashi & Al-Thubaiti, 2001). The method of rote learning, which emphasizes the use of memorising through repetition, is commonplace within Saudi Arabia and this had led to what is often described as a behaviourist style of teaching in the majority of schools (Jamjoom, 2009). In such cases, students are generally quite passive in their response and will only react when given a certain stimuli. This often hinders their learning experience as many find it unappealing. In light of this, the teaching of the Islamic prayer is no different; as the Ministry of Education has informed schools that they must adhere to a textbook to teach the prayer and not deviate from this. However, one may begin to draw certain comparisons and contradictions between this approach and those that are used in other countries such as the United Kingdom and USA. For instance, many of these countries have transitioned to a more constructivist approach to learning, which is more student-centered and facilitates the student to build their knowledge through interaction and involvement. This has led to many Saudi researchers to advocate reform for the educational system in Saudi Arabia, where many academics such as Al-Asiri (2005), Al- Shirbini & Yaser, (2003) and Al-Ali, (2007) wish to see how technology could bring a greater achievement in learning within the classroom.

1.2 Using Technology in the Classroom – Research Contribution

The continual technological development of virtual environments (VE) has revolutionised how computers and consoles are utilised in daily life. Within the education domain, VE have been used for decades as an adopted method of learning and pedagogy, of which early interactive designs have included various functions and uses, such as aeronautical training (i.e. flight simulations) or for medical procedures (Miles et al, 2012). With certain advancements and improvements, not only has there been an expansion in the contexts of legitimate learning

environments, but more importantly, in how interaction occurs. This is evident with the advent of appliances such as the Wii and Microsoft Windows Kinect 360, where individuals are now able to engross themselves in a full body experience, whether for entertainment or educational purposes, or for skill acquisition through motor movement. One can see this manifested through the use of "exergaming", a term that combines gaming and exercise in an interactive manner by tracking body movement and reaction (Papastergiou, 2009). Such technology has been popularised in professional and educational environments as a means of developing muscle memory and ultimately, learning and understanding. Interestingly, Rieber (1996) suggests that even through individuals may use such environments for play and entertainment; it is inherent that learning is present. McCrindle (2013) refers to this as ludic engagement, which is where the differences between work and play are blurred, and subsequently leads to an increase in motivation. Thus, the concept of integrating interactive learning for a number of purposes is potentially possible. One potential use of this is for religious practices that require certain movement, more specifically in the Islamic faith and the Muslim prayer.

Thus, in light of the above discussion, it is evident that a clear contribution from this thesis study is to provide an effective alternative to teaching the Islamic prayer for primary school children, specifically by incorporating technology into the classroom. This study therefore explores whether the use of Virtual Environment software can ultimately improve the learning for primary school learners, particularly in comparison to the traditional approaches that have been detailed above. Additionally, the incorporation of technology into Saudi classrooms may provide a greater impact on a governmental level, as the originality and novelty factor of using IT within this research could be seen as a viable option to establish in schools across the country.

1.3 Introducing the Islamic Interactive Prayer (iIP) Software

iIP Software is the learning tool that has been designed specifically for this study in order to resolve the issues that have been highlighted within the Saudi educational system. The software has been designed and developed for the Microsoft Windows Kinect 360, so that learners can immerse themselves into the prayer through physical interaction without the need of a controller. This means the learners can model their learning through the software and actually perform the prayer movements in sequence through movement that the software recognises and assesses the learner's progress accordingly. Through

this, the iIP Software caters for all different learning styles, specifically the four modalities that are outlined in Fleming's (2001) Visual, Aural, Read/write, and Kinesthetic (VARK) model. This model states that learners have a dominant learning style or preference, which can provide a greater depth of learning for them. These styles are broken down into following styles:

- Visual preference: in the form of graphical or pictorial representations
- Aural preference: in the form of listening to lectures or discussions
- Read/write preference: in the form of reading and writing texts and words
- Kinesthetical preference: in the form of doing and use of action

As stated, the iIP Software seeks to cater to all these styles through an incorporation of each element. Hence, analyzing this from the perspective of the traditional method to teaching, one may postulate that the development of a system like this is more appealing to learners and the lesson itself, as it is not teacher-centered, nor does it only cater for one style of teaching. Rather, the appeal is greater as it is envisaged this approach will provide a greater learning experience and sense of achievement for the learners.

1.4 Criteria for Success

In order to evaluate whether this thesis has been successful in achieving its objectives, a criteria for success has been outlined as follows:

1.4.1 Develop software-based method for teaching the Islamic Prayer

As previously stated, in order to provide an effective alternative to the traditional methods of teaching that utilises technology, a software-based method should be devised and developed to successfully teach the Islamic prayer. The objective of the software is to specifically teach the correct posture and sequence of each of the movements that are found within the prayer, so that students are able to recall the names for each movement. This will subsequently provide a solid foundation for them to learn the sequences for each of the five daily prayers. This criterion of success for this thesis will be measured by the overall development of the software that seeks to teach the Islamic prayer, but more specifically, it will also be used to assess the various key HCI elements that have been incorporated to ensure the learner achieves the best experience they can without causing any difficulties, confusion or disinterest.

1.4.2 Analysis of how primary school learners can effectively learn the Islamic Prayer

One of the key objectives of this study is to determine what method of teaching will effectively improve and facilitate the learning experience for primary school learners. The methods of learning that were outlined in this study are the traditional approaches – i.e. learning through the use of an Islamic Prayer Book and an Islamic Prayer video, as well as the use of the iIP Software. The students will therefore undergo an experiment to see which approach they felt provided a better learning experience for them, which in turn enabled them to learn more effectively and greater achievement. This criterion of success will therefore be measured through a set of questionnaires that were administered throughout each experiment, where the learners will assess various domains of learning.

1.4.3 Implement new software (iIP) to teach the Islamic Prayer

Upon developing the new iIP Software to teach the Islamic Prayer, it is imperative to implement this within the classrooms. This criterion for success is therefore determined by how effectively it can be implemented within the classroom, which is measured through the pilot test and the various experiments that will be incorporated within this study. An analysis will also be made by exploring the views of the teaching staff as to the feasibility and viability of incorporating this type of technology in the classroom on a regular basis.

1.4.4 Evaluate the new software (iIP) for teaching the Islamic prayer

Similar to the implementation criteria, this criterion is used to determine the overall effectiveness of the iIP Software. This is a fundamental aspect of this study as the incorporation of technology in Saudi classrooms could be further supported and advocated by this thesis. Moreover, it will further support much of the research that has been written in support of using the "learning by doing" approach within the classroom environment. Thus, to measure this criterion for success, various analyses will be made, including the quantitative analysis from the learners' perspective, as well as qualitative analysis from observations of the teachers.

1.5 Thesis Organisation

This thesis has been organised in the following manner:

Chapter 2 (Literature Review) presents a detailed review of the existing literature pertaining to learning theories and learning styles that have been commonly used within teaching and education. This provides a solid foundation to the types of teaching approaches, which further

illustrates how learners can effectively learn. Following this, a deep insight is given to the Saudi Arabian context; that is, the educational system that is currently in effect within this country, which gives scope to the background and more importantly, the research problem. This leads the chapter to provide an overview for the implementation of technology or gaming within the classroom, with a section addressing the human-computer interactions that are necessary if such implementation is made.

Chapter 3 (Research Method) presents the research methodology for this thesis. It begins with outlining the research question that has been formulated for the basis of this study, followed by an overview of the various study designs that can be implemented, including a justification over the selected study design during the experiments within this research. After this, a detailed description is given to the processes for the experiment, with an insight into the different variables that will be measured, the sample audience, the methods of data collection and analysis, as well as any ethical considerations that need to be addressed.

Chapter 4 (Implementation) presents the implementation stages of the iIP Software, which focuses on addressing the software platform that were considered for this system and justifying the reason for selecting Microsoft Windows Kinect 360. Further configurations were also explained such as the design and animation of the program, the type of software that was used to design the iIP Software and how it was coded accordingly.

Chapter 5 (iIP Software) focuses primarily on the Islamic Interactive Prayer system. It begins by outlining the software specifications that are needed to develop a system for the purpose that is required. It also justifies the use of a virtual environment program to be used within education by reviewing existing literature of how this is currently being used effectively in different areas of learning. This chapter also provides an overview of the Islamic prayer, particularly the process of how the prayer is to be performed; this is then used to illustrate the storyboard for the iIP software, which shows how the program will be designed and the structure it follows during game play. Lastly, limitations regarding the iIP Software – both hardware and software – were presented.

Chapter 6 (Analysis and Result) presents the findings of the study and an analysis of what these results relate to. Firstly, the results that were obtained from the Students' Questionnaires

are presented, which looks at their demographics and their preferences to the different approaches to teaching - this is then analysed in light of six areas of teaching that the students score within their questionnaires. Following this, the researchers' observations are given over the various interactions and feedback that was noted by the students when they were sitting in each of the sessions. What follows after this is the Post Questionnaire results, which provides the overall data and preference of the students over the different teaching methods. Finally, the teachers' observations are noted and their feedback is presented. It should be noted that because this study adopts a quantitative analysis of the data, subsequent data statistical analysis were conducted throughout the chapter to ensure validity and reliability of the results.

Chapter 7 (Evaluation and Discussion) presents the discussion an evaluation of the overall research. Based on the findings that were presented in Chapter 6, this chapter begins to elaborate upon these results using the existing literature to support the various findings. The chapter begins by addressing each of the factors that was discussed within the questionnaire and through the observations, which enables the researcher to provide a detailed insight into the answers that were given. Following this, a summary of the findings is presented and then the focus is given to the iIP Software itself with a constructive analysis of the software based on answering the research question.

Chapter 8 (**Conclusion**) concludes the research by evaluating the whole thesis. It begins by reviewing the problem that was identified within the Saudi educational system, followed by the thesis contribution and how the implementation of the iIP Software could potentially rectify such an issue. Following this, the criteria for success are addressed to determine how effective this solution was in resolving this problem. Lastly, a discussion of any further work and recommendations is given.

Chapter 2 Literature Review

2.1 Introduction

This literature review seeks to examine the existing literature on appropriate teaching methods in relation to technology and virtual environments, particularly those that have been used to enhance the learning experience. It begins by presenting an overview of the common learning theories that have been grounded within various disciplines of teaching. This is then followed by the key concepts of learning approaches and how individuals actually learn. After laying this vital foundation, the next stage is to contextualize these theoretical concepts in light of this research, by addressing the Saudi context of teaching, and also how virtual environments are suited to certain teaching concept and approaches. Lastly, a detailed insight into the interaction between humans and computers (HCI) is presented for the purpose of identifying how the iIP Software should be developed to maximize learning and the overall user experience.

2.2 Learning Theories

Researchers have explored and identified various methods of teaching and what is effective in enhancing learning and skill acquisition. Moreover, academics and psychologists alike have delved into deep discussion over how individuals learn (Biggs, 2003), which is a vast area of discussion and disciplines. While many of these approaches are seen as traditional forms of education (such as the Behaviourist approach), others have revolutionised the classroom environment, particularly as a result of innovative technologies similar to VE. Additionally, although Biggs (2003) feels this has not necessarily led a better quality of teaching, it has provided a foundation and framework for teachers to implement, which can then be regarded as the means for better teaching.

Learning theories within education psychology are generally classified into three areas: behaviourism, cognitivism and constructivism. These have commonly been derived from research in psychology and philosophy and Ford (2007) states that each of these express an alternative manner into how individuals learn. More often than not, this is dependent upon the environment around the learner or whether it is as a result of specific actions from an external source, such as meaningful input, repetition or reinforcement. In terms of this study, by outlining

these theories, it may provide a greater insight into their suitability for the context of Saudi Arabia and in using VE in a classroom setting.

2.2.1 Behaviourism

Behaviourism refers to the "control, behaviour modification, and learning through reinforcement." (Gilley et al, 2001:24). Behaviourists assert that learning occurs through conditioning of certain stimuli, which in turn shapes an individual's behaviour or response (Giley et al, 2001). Moreover, they pay a great deal of attention to how this change in behaviour can be measured as a consequence of external environmental influences (Ford, 2007). While there are various manifestations and classifications of this learning theory, one such division is to categorise behaviourism into relational and functional theories. Relational theories focus on the associated connection between natural stimuli and certain responses. A classic example of this is the experiments of Pavlov, who observed the response of saliva secretion in dogs when food was served as a stimulus. In contrast, functional theories relate to the functional relationship between stimuli and behaviour, for example, learning through trial and error (Salkind, 2004).

Behaviourists believe that, while the brain controls all behaviour of habits that are acquired in various stages of an individual's life, these habits can be controlled, conditioned or modified in direct dependency to the stimulus that is given. Thus, knowledge is not innate or instinctive, but rather it is dependent upon the environmental stimuli and reinforcement. Moreover, in terms of education, Gilley et al (2001) assert that effective learning takes place through the environment and controlling behaviour through positive reinforcement, whereas it is hindered through negative reinforcement. That said, one may argue that not all knowledge or effective learning occurs as a result of behavioural changes. For instance, Ford (2007) demonstrates this using the example of reading a book, whereby this can provide the individual with new knowledge on a particular subject, but this may not affect their actual behaviour, especially if it was simply read for enjoyment or holds little relevant to the individual's values or beliefs.

2.2.2 Cognitivism

Taking the previous example into account, the conceptualisation of the cognitivism theory was formed when researchers began to focus their efforts on the learning processes that take place in the brain in order to produce learning; as opposed to the focus on behavioural outputs found in behaviourism (Leonard, 2002). Cognitivists assert that learning and knowledge is gained

through a sequential development based on the development of an individual's ideas, observations and experiences (Benson, 2011). This affirms what Ausubel (1967:10) previously states, that learning is a "clearly articulated and precisely differentiated conscious experience that emerges when potentially meaningful signs, symbols, concepts, or propositions are related to and incorporated within a given individual's cognitive structure on a non-arbitrary and substantive basis." Consequently, in the context of learning, this theory assumes there is more than just output and action based on a stimulus, but rather a reliance on mental cognitive abilities and internal processing, such as interpretation, recalling, analysing, reflecting, comprehending, and evaluating (Leonard, 2002). A clear distinction can be made between this and the behaviourist theory.

Learners therefore use these processes to understand a particular topic or the world around them, suggesting that the individual is rational and is in control of the decisions that they make (Baer et al, 2008). Subsequently, learning is an active process, obtained by understanding through thinking and facilitated by past experiences. Vygotsky (1962) demonstrates this through the early learning and development in children, which asserts that children build upon knowledge sequentially by characterising various stages of their learning from a simple abstract entity to a tangible concept. In other words, learning consists of acquiring or reorganizing the cognitive structures by which an individual stores and processes information (Good and Brophy, 1990). By doing so, an individual can use these structures to recall and apply information more effectively.

2.2.3 Constructivism

Hadjerrouit (1998:105) describes constructivism as "the most significant alternative to the traditional view of education, which considers learning as the passive transmission of knowledge". As with behaviourist and cognitivist theories, it is assumed that learning takes place as a result of knowledge input, namely the transference of knowledge from teacher to student. Therefore the overall development and success of the student is dependent on how effective the teacher is able to transfer that particular knowledge (Vegas et al., 2005). However, within constructivism, a shift of balance occurs whereby the responsibility on learning is upon the students. According to Glaserfeld (1989), various fields of study such as psychology, philosophy and cybernetics adopt the constructivism paradigm, where learning occurs through direct and active involvement from the individual, as knowledge is gradually formed (Lefoe,

1998). This is different to previous methods, which were commonly seen as more teacher-centered and involved learners listening passively to the teacher who would deliver the teaching materials and lesson. (Hadjerrouit, 1998: 105).

Constructivism asserts that every individual has their own unique method of acquiring and constructing knowledge (Kincheloe and Horn, 2008), and so they should be allowed to reflect on developing this knowledge through new experiences (Wang, 2012). Similar to the cognitivist approach, constructivists do not focus on the change in behaviour, but rather draw attention to the cognitive processes of thought and self-awareness, which is all used to construct new ideas and experiences on how to learn (Adjibolosoo, 1995). It is further associated with collaborative learning, as learning is seen as a social activity where each individuals - peers, teachers etc - can all contribute to the specified subject matter (Piaget, 2002).

One may draw further similarities between cognitivism and constructivism because they both affirm knowledge is constructed and built upon; however, constructivism goes beyond this by explaining how knowledge is constructed (Mergel, 1998). That is, individuals develop their knowledge through their learning experiences using accommodation and assimilation (Piaget, 2002). Accommodation refers to the need for the individual to restructure their worldview or framework in order to accommodate the new information they have experienced, whereas assimilation is the simple addition of new knowledge to their existing knowledge.

One could sum up the constructivist theory as implying knowledge is not transferred passively but rather requires an active participation from the learner. Thus, learning becomes a gradual and conceptual growth or change of the learner as opposed to just an acquisition of information (Biggs, 2003). The concept of active learning therefore is deeply rooted within this theory and is a style that seems to suit the interactive nature of the iIP Software.

2.2.4 Active Learning

Simons (1997:19) refers to active learning as “the extent to which the learner is challenged to use his or her mental abilities while learning”. In other words, any method or strategy within an environment that ensures maximum involvement from the student in the learning process. Meyers and Jones (1997:162) aptly state, “Active learning means that they [students] can no longer look on with glazed eyes while their minds wonder to other thoughts”, and thus it

continues to highlight how different it is from traditional teaching methodologies such a behaviourism, because there is no longer a passive role from students when receiving knowledge or information (Simons, 1997).

Thus, only through experiencing new situations and relating these to previous experiences will the individual construct and build upon their knowledge. It is therefore imperative that the learner plays an active role in their overall learning experience. This implies that the "learner-centred" approach and goal driven method of teaching a more viable and effective method and is appropriate when using interactive applications that require frequent user input.

It should also be noted that active learning does not necessarily mean this approach is completely kinesthetical or, "learning by doing". Learning by doing may simply refer to doing a task repetitively until it becomes an automatic response. However, this does not mean the individual has learnt anything, rather it shows that they have reacted to a particular stimulus, which would conform to the behaviourist theory. On the contrary, although this may be an integral part of this learning process, its focus is utilising the constructivist theory, whereby the learner can reflect and evaluate over their learning experiences. To reconcile this, Prince (2004:1) explains that the learning by doing approach should comprise of "meaningful learning activities and think about what they are doing"

2.2.4.1 Implementing active learning within the classroom environment

As mentioned, the focus of active learning is to ensure the individual plays an integral and active role in the learning process through engagement and interaction. This is fundamentally established by developing critical thinking skills within the learner, by fusing new experiences with that of previous and older experiences and knowledge (Watkins et al, 2007), The teachers' role in this regard is to provide this, who can develop the learners by encouraging them to share their understanding and explanation of certain aspects that they have learnt.

As it is often regarded as a deeper approach to learning from the learners' perspective, Biggs (1993) asserts that this means more involvement is required from the learner. Teachers should therefore give the learners tasks to use their analytical problem solving skills as opposed to delivering and walking them through the steps. This process is often considered as a reflective cycle wherein individuals evaluate over the task they have completed (see figure 2-1).

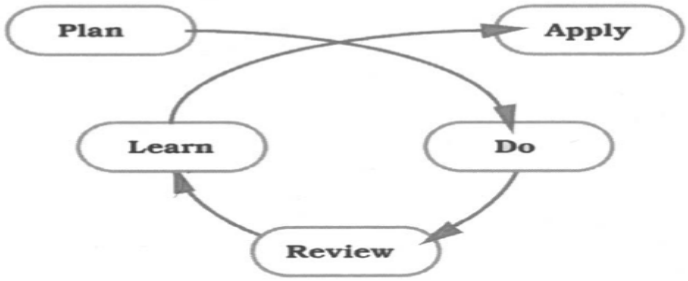


Figure 2-1: Reflective cycle of Active Learning

2.2.4.2 Active listening & experimentation

Watkins et al. (2007: 74-76) suggest a number of variations for active learning should be considered. Those that are relevant to this research include active listening and active experimentation.

In cases where a traditional teaching methodology is observed, listening is often seen as passive. For instance, within the educational context of a lecture or classroom, the teacher-centered approach comprises of a teacher who will spend a great deal of the lesson talking to the class. On the contrary, Watkins et al (2007:75) explain that "a learner can be listening in a way which involves actively raising questions, having new (internal) conversations, noting down new ideas and questions... [the learner] can be an active and effective learner for that context, especially if they review the experience once they have left".

With regards to active experimentation, this is similar to what has previously been stated. That is, the use of experiments has a clear element of action or "doing" from the learner, such as using interactive technology. Moreover, Watkins, et al. (2007:75) affirms that this approach of "active seeking of knowledge through trying something out is a very powerful process" and is "a key way of gaining knowledge". It is evident therefore, that the implementation of constructivism and incorporation of active learning is suitable for the nature of this research; however, to incorporate this into the Active Learning processes, it is important that this includes mental processes where the learner can reflect over the experiment.

2.2.5 Learner Approaches to Learning

In order to effectively engage with the learners, it has been established that the role of the teacher or instructor is instrumental. However, what has been observed in various methodologies and teaching theories is what actual role the teacher plays. For instance, this role can be one of solely delivering the content without any form of interaction with the learners, or, as found in the constructivist method, actively facilitate discussion and interaction.

Duffy and Cunningham (1996) state that instruction should be used as a means of developing knowledge rather than transmitting knowledge. Moreover, the constructivist theory implies that the learner also plays a significant and important role within the learning process through an active involvement and participation. As the constructivist theory states that learning is a result of individuals constructing their own worldview based upon their own experiences, the manner in which they do this must be as a result of their own involvement and reflection. Lambert and McCombs (1998:10) surmise "Learning is a constructive process that occurs best when the learner is actively engaged in creating her or his own knowledge and understanding by connecting what is being learned with prior knowledge and experience."

There a numerous factors that influence the manner in which individuals approach learning, such as subject interest, reason for learning or previous experiences to learning by the individual. Such factors all contribute towards the learners' motivation towards the topic, which ultimately controls how far the learner is willing to go in order to learn. If the learner is responsible for their own learning, they are more motivated to achieve, which means they are more likely to maintain their pursuit to seek knowledge and learn (Glasersfeld, 1989).

One of the key objectives of this research is to determine whether interactive prayer through VE can develop and improve motivation. Motivation, as defined by MacIntyre et al (2001:463) as, "an attribute of the individual describing the psychological qualities underlying behavior with respect to a particular task". In relation to physical activity, this can be a desire to participate or engage in such a task, with a different root cause of that motivation. Those who are intrinsically motivated often experience "flow", which refers to a state of being fully engrossed or immersed in an activity with full contentment and pleasure (Csikszentmihalyi, 1975). In the context of VE or gaming, Chen (2007) proposes that Csikszentmihalyi's description of the Flow theory is similar to the feelings that a gamer experiences when they are immersed in video games.

Furthermore, after identifying the various contexts and potential barriers to learning the prayer, one may extract specific areas that require research, namely accessibility, practical implementation and practice, accuracy and motivation. Consequently, as different perspectives are put forth, my research seeks to identify whether the VE can foster a suitable learning environment, particularly for those who have certain barriers within the socio and religious contexts.

2.2.5.1 Surface and Deep Learning

There are two common approaches that have been identified to ensure effective learning occurs. These are classed as surface and deep learning, and was first introduced by Marton and Saljo (1976) to distinguish between individuals who learn with the intention of remembering and memorizing key factual information and those who do so with the intention of understanding the principles and overall concepts behind what is being studied (Biggs, 1979; Marton and Saljo, 1976). Similarly, Glasterfeld (1989) makes a similar distinction from the perspective of the teacher by defining the difference between teaching and training. In this regard, training is associated with surface learning, which involves repetition, whereas teaching is deeper understanding of specific views and concepts.

The Surface Learning approach comprises of repeating the teacher without the need to fully understand why (Jackson, 1995). In such cases, this can refer to those who are solely interested in memorising specific details that will help them pass an exam or test. Their interest does not lie in wanting to understand the intricate details behind a specific concept or task or even how it fits together with other parts of a subject. Subsequently, one whose approach is surface learning often correlates with their motivation as being focused on grades and ensuring they achieve a pass mark by doing the minimum requirement and effort (Biggs, 2003). Biggs (2003) describes this by using terms such as “cutting corners” or “sweeping under the carpet” because the learner simply wants to get the task out of the way and completed.

Having said that, surface learning does have its advantages in the overall scope for learning. For instance, this approach is suited for instances where learning or memorizing certain actions, words or steps is necessary, such as an actor learning their lines for a production or learning a particular formula. This may be more relevant for the iIP Software as an importance is given to memorizing the actions and ensuring the actions are done accordingly, particularly for the target

audience of young children.

In contrast to the Surface approach, Deep learning focuses on gaining an understanding of behind what is being taught. While the surface learner will memorise the teaching concepts in order to reproduce them at a later date, the deep learner will seek to find meaning with the concept so that they can have built upon this from a cognitive or constructivist perspective (Biggs, 2003). Jackson (1995) explains that they may do so by linking the concept to their own experiences, whether they are real or imagined. Furthermore, whilst memorisation may be associated more closely with surface learning, it is not exclusive to it, as this still may occur among deep learners. Kember (1996) for example, states that deep learners may use certain strategic methods in order to memorise certain concepts whilst also linking and relating them to arguments and conclusions (Ramsden, 1988). To use a previous example, both the surface and deep learner may memorise a mathematical formula for an exam; however the deep learner will not only memorise the formula but also have a greater understanding of why and how this formula is to be applied correctly.

It is evident that deep learning is more effective than surface learning. Deep learning brings about a greater understanding and overall intellectual growth to the individual and is therefore encouraged and recommended if one is to construct and build upon knowledge (as per the constructivist theory). However, as highlighted, one may also argue that there are instances where surface learning is more suitable and appropriate.

2.2.5.2 Learning Styles: Visual, Auditive and Kinesthetical

In accordance to the constructivist theory, there are various methods that foster the learners' ability to construct new ideas and concepts. What is evident with regards to this is, regardless of class size, it is likely that there are individuals who learn differently and have a certain preferences for their learning style. Three common learning styles have been presented in existing literature, which are methods for how learners can perceive information and knowledge in order to facilitate their learning: Visual, Auditory or Kinesthetic (figure 2.2) (Felder and Silverman, 1988, Miller, 2002)

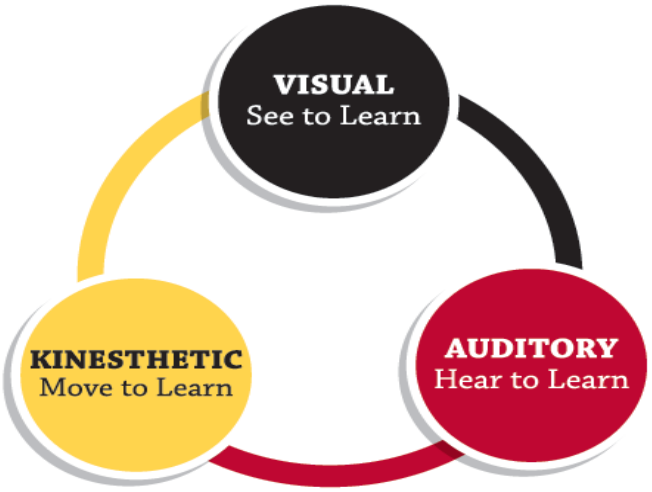


Figure 2-2: Summary of learning preferences

Kinesthetical learners have been identified as a key group of learners that are often ignored or not provided for. However, in many studies, they have been regarded as a large portion of the preferred learning styles. A study conducted on primary and secondary school children by the Specific Diagnostic Studies found that 29% of learners preferred visual, 34% preferred auditory means and 37% classed themselves as kinesthetical learners. A similar survey was conducted by Zeid et al (2014) among Kuwaiti university students and found 56% were kinesthetical learners. Accordingly, Hsu (2011) states that in many cases kinesthetical learners make up 15% of the student population. These individuals learn better through "action" or being actively/physically involved in the subject that is being studied.

The "learn-by-doing" or kinesthetical approach therefore allows individuals to experience something with minimal guidance from a teacher or supervisor. Instead of being told "the answers," they are presented with a question, problem, situation, or activity which they must make sense of for themselves.

Learning by doing is also called "experiential learning" because it is based on learning from experiences. Moreover, this form of learning is more of an approach to learning than a specific method as a variety of teaching methods can be used in the different steps of the process. Kinesthetic learning has been observed to be the most effective method of learning, particularly for children as they are able to learn more effectively through play and action (Zeid et al, 2014), which is evidently how the iIP Software will be implemented within the classroom environment.

It is however important to note, that although learning styles have a great influence over pedagogy and how teachers interact with their students in a classroom setting, it is not without its criticisms. Pashler et al (2009:116) provide an analytical review of the existing data and literature concerned with learning styles and conclude that, even though learners will express their preferences for how information should to be presented to them, the studies that assess this "*fails to provide adequate support for applying learning-style assessments in school settings*" and that these studies have not sought to test the validity for the use of learning styles in education. On the contrary, they assert that several of those that did, such as Massa & Mayer (2006) and Constantinidou & Baker (2002), contradicted the theories relating to learning styles (i.e. the meshing hypothesis, which states instruction is best presented if it corresponds to the preferences of the learner, such as using visuals for visual learners). Furthermore, they postulate that basing the effectiveness and most optimal instruction solely on a learner's preference will have little or no bearing on whether this approach should be adopted by the teacher. For instance, a study by Cook et al (2009) hypothesised that learners that possess a "sensing learning style" would have more success when given instructions on problems that provided the problem first, and then the content to resolve the problem, and vice versa for intuitive learner; however, after reviewing 123 internal medical residents, there was no evidence that supported this claim. While such issues have been highlighted, this does not mean certain learners will not benefit from having information presented in a certain style (Pashler et al, 2009).

2.3 The Saudi Context – teaching and learning

As this study seeks to address the application of the technology in Saudi Arabia, it is important to discuss the current context, specifically at primary school level. The education system in the Kingdom of Saudi Arabia is primarily governed by The Ministry of Education, with The Ministry of Higher Education and The General Organisation for Technical Education & Vocational Training also supervising other aspects of learning (Al-Abdel and Ramadan, 1994). It is a requirement by law for children between the ages of 6-15 to attend schooling at both primary and secondary schools. For the majority, state schools are available whilst many children obtain an education at private or international schools.

As part of their education, an adherence to Islamic practices is integrated in all of the educational decisions that are made by the Ministry, as cited in the International Constitutional Law (2005),

"the Kingdom of Saudi Arabia is a sovereign Arab Islamic State with Islam as its religion; God's Book and the Sunnah (ways and practices of His Prophet, Peace Be Upon Him) are its constitution, and Arabic is its language". As a consequence, within primary and secondary state schools, Islamic studies and Arabic are compulsory components of the national curriculum, ensuring students learn basic Islamic theology, memorization and explanation of the Holy Qur'an and the narrations of Prophetic sayings and actions. Jamjoom (2009) states that such topics cover approximately 30% of the curriculum in primary schools.

In terms of the method of teaching, there is a clear contrast between the Saudi schooling system and those found in Western countries like England. The current educational system uses traditional teaching theories and methods and in many cases, sees it as a difficulty in transitioning to more effective theories of learning (Al-Qurashi & Al-Thubaiti, 2001). That is, whilst many Western countries have begun to deeply integrate constructivist and cognitivist theories within their educational pedagogy and processes, the Saudi system is still very much teacher-centered, with little interaction from the learners. Rote learning is commonplace in Saudi Arabia, which one could assume is as a result of the amount of effort is placed in memorization, particularly in memorizing religious texts such as the Holy Quran (International Constitutional Law, 2005). Jamnoom (2009) describes this as a typical behaviourist style classroom, whereby students react directly to stimuli but otherwise remain quite passive in their response and attitude towards the teacher and lesson. During the interviews with a number of teachers, Jamnoom (2009) found that their strategy for discussion revolved around certain parameters. For instance, many of the teachers considered discussion to be a one-way transfer of "giving" from the teacher to the student. Additionally, discussions were normally as a result of question and answer, which are often closed questions and did not necessarily encourage deep learning.

Prokop (2003) further states that teachers within Saudi and other Middle Eastern countries are often seen as a leading authority and therefore it is bad etiquette to question their knowledge on a subject. This further results in a quiet, passive learning environment. It has also been documented that if teachers are asked unexpected questions, it can negatively affect the flow of the lesson (Jammoon, 2009). In short, the Saudi educational system can be surmised as being quite regimental and disciplined, where the focus is on ensuring grades are met as opposed to ensuring the learners are able to have a better grasp and understanding of the subject matter (Al-

Abdel and Ramadan, 1994). It is for this reason that many researchers and experts have said Arab countries are below the international standard in university education (Sabri, 1986; Al-Muaayrah, 1999).

Female Education

The history of education for females in Saudi Arabia has an interesting journey. Prior to 1960, the government of Saudi Arabia had no formal educational system set up for women and it was often the case that only females who came from affluent backgrounds would be homeschooled or learn religious studies under strict conditions (i.e. only from a female teacher) (Hamdan, 2005). However, the emergence of public schooling for females began as a result of immigrant workers from Malawi and Indonesia, who came to Saudi Arabia as pilgrims in the early 1940s, but stayed in the country to work (Al-Rawaf and Simmons, 1991). During this time, they established private schools and as a result, many of the local population also saw this as necessary for its own citizens. A revolutionary moment then followed, whereby the King of Saudi Arabia first addressed this issue in 1959 as he explained that schools would now be established for the teaching girls (Alamri, 2011).

The government wrote up the Girls' Educational Constitution, which outlined the overall guidelines for how and why women should be educated (Alharbi, 2014). For instance, the Directorate General stated within this constitution, that the objective of education females within Saudi Arabia was Directorate General, was "to bring her up in a proper Islamic way so as to perform her duty in life, be an ideal and successful housewife and a good mother, ready to do things which suit her nature as teaching, nursing, and medical treatment" (Alireza, 1987). Furthermore, and a strict rule that has been in place even up until today, is that there must be segregation amongst the genders in all levels of education (Alharbi, 2014; Alireza, 1987). This also included teachers, where only male teachers would teach males and female teachers would teach females. These guidelines were based on cultural and certain religious practices that are adhered to throughout the country, which seeks to maintain a separation amongst genders, with the exception of those that are married or close family members.

2.4 Using Technology in Education

The use of technology in the classroom has become a means of gradually improving the education system in Arab countries. For instance, Al-Asiri's (2005) research on the effect of computers towards achievements in Islamic jurisprudence found a higher achievement in using computers and modern technology. Similar studies have also been concluded with the same results (Al- Shirbini & Yaser, 2003; Al-Ali, 2007).

2.4.1 Technological teaching and learning tools in Classrooms

With the continuous improvement made towards IT and computers, D'Angelo et al., (2007: 462) state that, "technology has evolved and become more central to teaching and learning". Moreover, as a result of implementing technology within classrooms, the various barriers towards effective learning may be overcome (Hannafin et al., 1997). A great deal of effort and research has been conducted in terms of assessing how well technology can provide new opportunities for learning across all levels and areas of education (Boling, 2003; Poland, La Velle and Nichol, 2003; Repenning, Rausch, Phillips and Ioannidou, 1998; Resnick, 1995, 1998; Wilensky and Stroup, 1999) (Brill and Galloway, 2007)

On the contrary however, other studies have indicated that if technology is not used correctly, it can become more of a hindrance in the classroom and towards effective learning. Salomon (1998) explains the various pitfalls can occur as a result of combining traditional teaching methods with technology. For instance, if a teacher attempts to apply the constructivist theory whilst using IT, the amount of tools at the learners' disposal can create an "information avalanche" for the learner and hinder the construction of knowledge. The Internet is a prime example of this, as from an outsider's perspective; it seems to have everything that is necessary in the constructivist theory. However, the fact that there is too much information at hand can cause confusion for the learner in terms of where they should start and therefore have a negative impact as previously explained. Subsequently, Salomon (1998:9) explains that, "education has to chase technology down the classroom aisles and Internet channels to tailor old pedagogical rationales to the new possibilities or make up new ones". Thus, is it imperative that technology such as virtual environments is adapted and moulded around the pedagogical educational theories and processes and not vice-versa?

While one may acknowledge how extensively ICT or Virtual Environments are used in a number of different sectors and fields of study, there are instances that highlight how this type of technology has also been previously implemented within religious contexts. More specifically, the research into this particular area has found that this refers to the integration of ICT equipment within religious classrooms, which are primarily used as a teaching tool to enhance learning (Becta, 2010; Bor, 2013) as opposed to being used in teaching certain aspects of a religion such as the prayer. For instance, Becta (2010:3) argues that the underlying reason for using technology in the classroom is because it is "*only natural*" due to it being a part of everyday life, and that "*learners are already engaging extensively with technology and expect it to be used in school*". As a result, the reasons that are cited in using ICT in the classroom are to improve the teaching by catering for various learning styles, develop planning skills for the teacher and enhance assessments through sophisticated electronic tracking of the students' progress. This perspective addresses the use of ICT from a broader angle, whereby the students in Religious Studies classes may explore all faiths in the schooling curriculum. However, another aspect is to look at this from the perspective of faith-based schools, which is where schools of a particular faith (i.e. Christian, Muslim or Jewish schools) may use ICT to enhance specific aspects of faith. However, as stated, there is little evidence that occurs in such settings. For instance, in her article entitled "Training Educators to Use Technology in the Jewish Classroom", Bor (2013) still focuses on the use of technology and ICT to be a means of preparing interactive presentations or to complete assignments, as opposed to such technology becoming the actual teaching tool. The use of PowerPoint or having laptops available are specific examples of how the development of ICT is understood within these environments. However, there are criticisms pertaining to the use of ICT in this way as it begins to shift away from how religious studies is traditionally taught. Bor (2013:1) argues that this is the "*crossroads*" that many Jewish teachers find themselves in, where "*the ever growing assortment of technological tools available to synagogues, schools, and agencies serving the Jewish community…is to ensure that technology will enhance Jewish communal life, not replace it*." This is similar to the Islamic tradition, where the teachings of "*innovation*" (Arabic: bid'ah1) has been condemned by Muslim clerics because innovating in religious practices or aspects of Islam is regarded as a major sin and something forbidden by the

[1] Bid'ah: Understanding the Evil of Innovation Abu Muntasir ibn Mohar Ali 2006 International Islamic Publishing House (IIPH), North Carolina

Islamic teachings (Ali, 2006). One may therefore argue that using ICT to teach Islamic knowledge could - from one perspective - be considered an innovated practice in the religion of Islam, leading certain religious scholars to brand such action as innovation. However, upon further clarification of this concept, one may note that innovation refers specifically to the core religion and religious teachings itself and not the means that is used to reach this. For instance, it would be classed as an innovation if one would teach the Islamic prayer differently to the sources of Islam, but to teach it using different means (i.e. a book, video, via Skype or telephone) is not.

2.4.2 Virtual Environments – a tool for teaching in classroom based learning

A Virtual Environment is defined by Miles et al, (2012:715) as "a collection of technologies that allow people to interact efficiently with 3D computer generated models in real-time using their natural senses and skills." A common goal for utilising these environments is to improve motor control skills, making it appropriate to use in practical situations that mimic real-world scenarios (Miles et al, 2012) (figure2.3). Moreover, VE allows designers to develop specific scenarios that can enrich a learner's performance. As a result, by immersing oneself into a virtual environment, it allows the user to be effectively situated in any learning environment that technology can provide and therefore provides a rich, realistic and comprehensive learning experience (Dede, 2009).

Figure 2-3: An example of a virtual environment setting using real world scenarios

While one would not normally associate computer gaming with developing and acquiring motor

skills, the evolution of Gaming Virtual Environments, particularly with the introduction of the Nintendo Wii and Microsoft Windows Kinect 360, have revolutionised how individuals interact and access games. Studies have shown how they can contribute to improve fitness and health, and as a result, gaming companies have launched products that target this particular market. The Wii Balance Board and Wii Fit packages, for example, are amongst Nintendo's highest grossing products and as Miles et al (2012:715) state, even "the popular Wii Sports package provides simplified versions of tennis, baseball, bowling, golf, and boxing, and evidence is emerging that the Wii platform is contributing to the acquisition of skills in some real sports (e.g., 10-pinbowling)." In contrast to sedentary video games, the distinct feature of this environment is that it does not require a physical controller; the individual becomes the controller and an intricate part of the game. This further enhances the immersion experience and environment, and as Lee et al (2011) states regarding the Wii, "The Nintendo Wii gaming console provides more interactions for fun in learning…users can improve their skills with practice. It shows positive effect in learning after using such kind of educational simulation games"

A more recent and progressive form of VE is Microsoft Windows Kinect 360, which employs markers to recognise, capture, track and decipher a user's movement through infrared technology (DePriest & Barilovits, 2011). This has been described as a "revolution in the making" as the method of interaction between human and computer is no longer bound by tangible objects such as a controller, mouse or keyboard (Hsu, 2011). Moreover, the Kinect is a flexible teaching tool as it allows interaction with multiple users in movement, gestures and voice. Hsu (2011) also draws certain similarities between the use of the Kinect with interactive White Boards, whereby they both not only encourage interaction, but can empower the teacher to manipulate multi-media and combine visual, auditory and kinesthetical components within the classroom.

While such consoles are primarily aimed at entertainment, researchers are keen to also see how such technology can further be utilised for educational purposes, and in effect to "learn by doing". Thus, in order to discuss this, it is first important to explore the underpinning knowledge of how learners learn through theoretical educational approaches.

2.4.3 Learning theories and their application in Virtual Environments

After outlining these core learning theories, it is vital to identify where the use of virtual environments within this research would apply. While one could presume there are elements of

behaviourism in the learning process, such as the mimicking of certain movements for the prayer, there is also a level for developing and constructing one's own understanding and knowledge of the prayer.

An apt example of this is the use of dance in computers and gaming for educational purposes, or with the intent to learn certain dance sequences. Calvert et al (1993) state, that digital dance research has been developed to be used by choreographers since the early 1990s, coupling technology and performance. Eaves et al (1996) looked at the short-term effects of virtual reality feedback within ballet. In relation to gaming, one of the more influential and popular releases of this genre was Dance Dance Revolution (DDR) on the Nintendo Wii; an interactive game using a four-arrow floor mat that audiences press in correspondence to the arrows on screen. Thus, although the system does not accurately monitor or score the full body movement, feedback on footwork is given, and in turn, through prolonged practice, this will continue to develop motor acquisition in this particular area.

An experiment by Charbonneau, Miller and LaViola Jr (2011), tested participants (n=30) in learning a dance sequence using a virtual environment dance instructional video. As a post-experiment review, the participants danced without visuals, music or the virtual environment and the results showed that the majority of participants were found to remember specific moves accurately and on time. This indicates that practice using a VE that is close to real life will enhance and influence skill/motor acquisition. A similar study was conducted by Gao et al (2012), which focused on analysing the relationship between the motivations of children when playing DDR. The results revealed that the children exhibited a positive correlation of moderately high levels motivation and enjoyment. As motivation is the driving force for learning, it is important that the integration of technology also ensures the learner is motivated to use it. That is, they find learning enjoyable. Lai, Wang and Yang (2012) explain that "enjoyment is a crucial element in exergames as it can motivate players to play persistently". This is evident in various studies that look at how education for children and early years encourages learning through play and enjoyment, without any sort of pressure (Lee et al, 2011). However, Lee et al (2011) argue that as children grow older, they require more experience to actual situations that can occur such as school exams and tests. As a result, situational learning, or authentic learning experiences are necessary, which can be implemented through the use of advanced computer

technology. Thus, game based learning or the use of VE provides scope for this to occur by simulating real life experiences and interactions and will also maintain intrinsic motivation levels with the learner. In recent years, this has proven to be the case, whereby the Kinect technology has been used to create situational learning of science labs, which can often be expensive or hazardous. Thus, Squire (2007) affirms that Virtual Environments adopt a constructivist pedagogy whereby rich, engaging, interactive sessions that are student centered are adopted to facilitate and encourage learning. Kissco (2011) concurs, believing this type of technology will flourish in classrooms due its collaborative and interactive capabilities. This is also supported by the Horizon Report (2010, 2011).

Interactivity within the classroom has been characterised as influential in successful learning and without adequate interaction, learning activities can stifle and bore students and continues to keep them passive (DePriest & Barilovits, 2011). This proves to be a highly innovative tool for education in schools and training centers, as it not only provides a positive impact on the physical fitness of the body, but also psychosocial and cognitive effects too (Lai, Wang and Yang, 2012). One may also assert that the use of VE in this context can develop a better spatial awareness and attention to detail (Lai, Wang and Yang, 2012). Lancia (2009) further believes that the use of VE, and in particular using the Kinect for educational purposes, can benefit all types of learners, including visual-orientated learners. This is also supported by Hsu (2011), who uses the Theory of Multiple Intelligences proposed by Gardner (1995) to support his argument. This theory states that there are multiple capacities for human intelligence, which are independent forms of information processing. One of these includes the bodily-kinesthetic intelligence, which is where the ability to control and manage body movements. Hsu (2011) argues that the use of Kinect would facilitate this aspect of intelligence and that if learners have a preference to the kinesthetical approach, it will help them develop and learn as a result of using the Kinect. Alaya et al (2013) has demonstrated this by using the Kinect software to aid learners with mathematical difficulties.

It should however, be noted that Interactive learning does not necessarily remove the lecture based traditional approach from the classroom or other learning preferences. Rather, it actual combines this with active demonstrations, active listening and interaction (Sessoms, 2008). Interactive learning therefore is also in contrast to traditional approaches where the learner would

listen and attempt to "absorb" the knowledge from the lecturer and through the notes they make and that which is presented to them. Interactive learning now establishes the learner as an active participant. Hsu (2011) also states that, there is much optimism for its integration in education, including the ability to cater for the needs of the aforementioned learning approaches (i.e. visual, auditive and kinesthetical) as well as a means of increasing interaction as a class and among individuals. In a study observing five year olds that learn the phonetic rules of spelling, Bara et al (2004) examined how this process took place. The researcher provided visual and auditory cues, and then asked the children to trace the word with their finger whilst pronouncing it. The findings showed that by tracing the word, a multi-sensory approach of visual, auditive and kinesthetical influences were effective in developing the children's learning as it created a "real experience". Hsu (2011) further cites a recent study by Rachael Folds of Nottingham Trent University, where she examined whether an activity in a virtual environment from the use of the Wii or Kinect technology could help students with learning difficulties when performing the same activity in real life. The disabilities ranged from Down's Syndrome to autism disorders and the participants were asked to play Wii tennis and Kinect bowling over a 5-week period. The results revealed a significant improvement in the pre and post-test scores after using the Wii/Kinect games.

Furthermore, as a teaching tool, Hsu (2011) identifies four key features that makes Kinect a valid and feasible option. Firstly, the Kinect is flexible in terms of proximity within the classroom or what content is used (i.e. voice commands, video, audio, gestures, etc.). Secondly, the Kinect has the ability to play with multiple users simultaneously. With this feature incorporated into its flexibility, this allows the classroom to conduct whole class instruction, group work or one-to-one type of interactions. Thirdly, it can support and offer virtually any situation (provided it is within the computing hardware and design restrictions) that is required. For instance, the Kinect can be used to train dance, cooking, martial arts or medical procedures and experiments. Lastly, the Kinect makes the learner get involved directly.

2.5 Human Computer Interaction

As the Kinect and Wii consoles have traditionally been designed for gaming purposes, designers spend a great deal of time ensuring the game is designed with the user in mind (Dyck et al., 2003). User satisfaction, novelty and user performance are important for a game if it is to

become commercially successful and therefore the HCI (Human Computer Interaction) features are carefully considered. Dyck et al (2003:1) further state, "games have both become early adopters of new HCI technologies as well as innovators in the area of HCI interaction design."

Studies in HCI have generated a huge success within the technology industry and ultimately transformed how computers are used. For example, the Graphical User Interface (GUI) devised by Microsoft on their Windows Operating System or even how certain applications and programs such as web browsers or those used in word processing (i.e. Internet Explorer or Microsoft Word respectively).

An interesting aspect of the research in HCI is that it focuses on both the human and computer perspectives. From the technological side, the focus is on how the computer hardware can improve the quality of HCI. Computer graphics for example, aims to ensure the graphics of the game is of a good standard so users will enjoy their game play, whilst operating systems are also considered in order to ensure good multiprocessing and to tune system response times to human interaction times. From the human side, HCI is primarily focused on the cognitive relationship with computers by ensuring the design is suitable for humans to operate successfully. Among the major human factors is the sensory-motor relationship, but also addressing the physiological aspects including stress (Baecker et al, 2014).

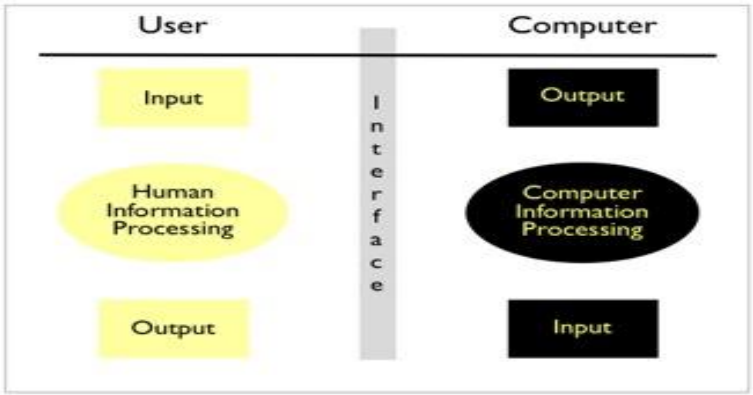


Figure 2-4: The HCI model

Whilst HCI research on games in particular has been considered since the 1980s, the evolution of the gaming industry and progress of game design continues to grow exponentially, which means reviewing design and innovations from an HCI perspective is necessary (Dyck et al., 2003). Consequently, research in HCI can actually help to introduce new interaction models or interface

designs. In a study by Dyck et al (2003), they reviewed the HCI design innovation for a number of games. Their findings led to four innovations that could be used to evaluate HCI and user interfaces: 1) effortless community, referring to how easy multi-player games were to join and participate in; 2) learning by watching – this referred to whether the HCI was good enough for individuals to learn how to play a game simply by observing or watching others play it; 3) deep customizability, which looked at whether HCI would allow games to be customized according to the user's preference; 4) fluid system-human interaction – this referred to how smoothly the game could be played, without causing the user to be distracted.

As an integral part of HCI research, the GUI replaced the traditional text-based interaction method with computers, such as the command line prompt or DOS, particularly for everyday users of PCs (Eberts, 1994). Typically, a GUI consists of visual indicators such as graphical icons that are easy to find and understand, as opposed to a traditional outlook of text and labels. Additionally, if detailed planning and design has gone into the GUI, it can provide significant opportunity to enable effective use from individuals, where applications are easy to understand and serve a practical purpose (Jansen, 1998). Moreover, it should be designed in such a way that it can respond to and improve the user's learning curve (Myers, 1998), as the way it looks should serve as cues to help the user experience. That is, the look and feel is the GUI instinctively makes it easy for any user to grasp, whether a novice or expert, without them having to refer to a manual or read through help files. Jansen (1998) explains that the aim of a GUI is to enable the user to complete a task using a computer or application, allowing them to focus on the primary cognitive task. As a result, the user should not have to be concerned with the interface, nor should it distract them from the primary focus. This unfortunately can occur if the interface is not designed adequately and as a consequence, users spend more time frustrated in finding the correct function or icon they need to fulfill the primary task. The GUI should therefore be predictable and consistent.

Usability is regarded as a fundamental component of HCI (Hornbaek, 2006). It has been defined by Shackel (1991:24) as "the capability to be used by humans easily and effectively'' as well as referring to it as a comprehensive term that addresses the overall efficiency, effectiveness and satisfaction when interacting with IT to achieve specific goals (ISO, 1998). Nielsen (2012)

elaborates further be defining usability with five key components. The first of these components is learnability, which addresses how easy users find it to complete basic tasks using the software design. This is followed by efficiency, which looks at how quickly users are able to perform these tasks. Memorability is the next component, which measures how successfully users are able to remember how to perform certain tasks, especially if they have not used the software for a period of time. The next component is errors; this looks at how accurate the user is when using the software design, as well as focusing on whether any errors – severe or minor - were made by the user during their interaction with the software design. Lastly, the final component is satisfaction, which measures the user's perception of how pleasant it was to use the software design.

Thus, in the context of designing and developing interactive and gesture-based applications such as the Kinect and Wii, it is important to address how usability can be maximised or how it can be measured in order to improve it. Studies pertaining to the quality of IT systems have been discussed at length and under various headings, such ergonomics (Shackel, 1959) and ease of use (Bennett, 1972). However, there has been more focus on what approach is best suited to measure usability as opposed to simply acknowledging its presence within HCI. For instance, Dillon (2001) argues that usability measures such as time has been overlooked by designers and developers, while new measures are constantly being proposed like fun (Carroll and Thomas, 1988), aesthetics (Tractinsky, 1997) and flow (Hoffman and Novak, 1996).

Hornbaek's (2006) study took on a monumental task of reviewing the discussions, guidelines and methods that have been adopted in measuring usability from 180 studies published in core HCI journals. Table 2-1 provides a summary of the types of usability measurements that have been adopted in those studies.

Measures	Definition and explanation	Examples of Measuring tools/criteria
Binary task completion	Number or percentage of tasks that the user was able to successfully complete	Number of correct tasks completed within an allotted time (Westerman et al., 2001), whether the user gave up on particular tasks (Dumais et al., 2001), number of incomplete tasks.
Accuracy	How accurate users were able to complete tasks, how errors could be quantified and defined during a specified task.	Counting the number of errors/correctly done actions during a specified task (Marshall et al, 2001), number of hints needed to complete a task (Nyberg et al, 2001)
Recall	Users' ability to recall information from the IT interface.	Able to remember where certain features and layout of the interface. Recalling what each button or action does (Bayles, 2002)
Completeness	The extent or completeness of users' solutions to tasks.	Number or percentage of tasks done (McFarlane, 1999); number of relevant documents identified (Cribbin and Chen, 2001)
Quality of outcome – Understanding	Whether or not the user has understood or able to understand the task from their interaction with the interface.	Pre and post-test to assess understanding, multiple-choice questions (Corbett and Anderson, 2001)
Users' assessment	The users' subjective assessment of how they felt the interaction was. Whether or not they found it enjoyable, useful and effective.	Grading and likert scale (Hornbæk and Frøkjær, (2001)

Table 2-1: Summary of Hornbaek's (2006) review of methods to measure usability in HCI

There were other criteria that were used to measure the effectiveness of HCI such as the users' ability to predict how the functions of the GUI would be used, whereas other studies depended on the context and in which HCI usability was measured as well as the users' preferences. For instance, Whittaker et al., (2002:279) study, they noted that "users differed greatly in their thoroughness: some spent large amounts of time trying to optimize solutions, whereas others were satisfied with quick, but approximate, solutions."

As efficiency also falls under the banner of usability in HCI, Hornbaek's (2006) research found *time* to be among the most significant criteria to measure this factor. This addressed the time it

took for users to complete a task using an interface from different aspects and implied that the longer it took was due to users being unfamiliar with the interface. Examples of this measurement include the time it took performing actions (Golightly et al., 1999) and the time taken on specific parts of the display (Burns, 2000). In addition, attention was given to the users' attitudes and opinions of the interface, which specifically addressed their overall satisfaction in HCI interactions. This area of study is highly relevant to the current study. Table 2-2 provides a summary of the measurements for satisfaction implemented in those studies.

Measures	Definition and explanation	Examples of Measuring tools/criteria
Preference	Measures the ranking and preference of users in terms of the user interface of a given application.	1-10 scale of preference
Satisfaction in terms of Ease-of-Use	Whether the users find it easy or not to use the interface and their experiences towards it.	Likert scale addressing questions such as: "This software is satisfying to use" "This interface was easy to use"
Satisfaction in terms of layout.	Users' satisfaction pertaining to specific features of the interface.	Likert scale
Before and after use	Users' perceptions of the interface before and after using it.	Reflex responses, Observing any frustrations or negative comments during use.
Overall attitude and perception	Attitudes towards the content of the interface when content can be distinguished from the interface.	Answering questions such as: 'How do you judge the quality of the task outcome?''; users' sense of success; assessment of own performance ''With which interface did you think you were faster?''; users' perception of task difficulty

Table 2-2: Summary of Hornbaek's (2006) review of methods to measure satisfaction in HCI

To measure satisfaction of HCI, many studies used post-questionnaires that the users could convey their views accordingly. In such instances, a preference scale was used to capture this data by finding out which interface users prefer using through a series of questions and ranking using a likert scale (i.e. Gutwin, 2002; Rui et al., 2001). Moreover, others focused their data on specific factors, such as Isbister and Nass (2000), who used *fun* to be their main factor of

analysis and revolved their questionnaire around adjectives related to this concept (i.e. how enjoyable/exciting their interaction was). Ease-of-use was also seen to be a noteworthy feature in measuring satisfaction, particularly looking at the "before and after" interactions that the users carried out on a specific IT application. For example, Cockburn and McKenzie (2001) looked at how users rated the ease-of-use in organizing and finding web pages before and after spending time with the browser. Lastly, in order to understand the psychology behind how users rate satisfaction, Hornbaek (2006:88) states that this refers to how they rate "their perception of the process of interaction." This means the users will contemplate on task complexity and of task completion times.

2.6 Summary

This literature review highlights the challenges that the researcher may face in Saudi Arabia when attempting to improve the learning of the Islamic prayer through the iIP Software. As explained, the Saudi classrooms adhere to a very traditional method of teaching, generally in accordance to the behaviourist theory where the teaching is very teacher-centred and teacher-led. However, the iIP Software has been designed and developed using a constructivist approach, whereby learning is constructed through active learning and "learning by doing". This kinesthetical style to teaching therefore is more appropriate, particularly when using virtual environments or gesture-based consoles such as the Wii and Kinect, as it is proven to be an effective method to develop motor skills. Moreover, the interactivity that the iIP Software provides will improve such skill acquisition for all types of learners, as it not only caters for the kinestherical learners, but also facilitates learning for visual and auditory type of learners.

Technology is fast becoming an integral part of the classroom and as a result, it is vital that IT is used appropriately in order to maximise learning. Thus, the rationale behind using an interactive learning tool such as the iIP Software, is because such methods will be suited to every type of learner and will incorporate existing technology (VE) that has been established to enhance the learning process.

Chapter 3 Research Method

3.1 Introduction

This chapter outlines the research methods that have been adopted to effectively answer and address the research question, which forms the basis of this study. Thereafter, the implementation of the experimental study design, method of data statistical analysis and collection instruments will be presented. In addition, as this research focuses on the learner experience during specific interactions in the classroom, a detailed description of the study sample is given. Finally, validity and reliability issues of the study will be addressed.

Table 3-1 shows a brief overview of the elements of the research method and indicates that a mixed-method approach is taken.

Main research question	**Does the Interactive Islamic Prayer (iIP) Software enhance the development and understanding of the physical aspects of the Islamic prayer in comparison to learning from reading a Prayer Book, or by watching a Prayer Video?**
Main Method and Approach	A mixed-method approach of a comparative study between iIP Software and a Prayer Book or Prayer Video.
Experimental Design	Within-subject experiment design
Experiment Instruments	iIP Software (designed on Kinect)
Location	Primary School in Jeddah, Saudi Arabia.
Participants	

	30 primary school students: (3 Groups every group has 10 students)
Data Collection	Pre and Post-Questionnaires demographic and Pre and Post-Test on Prayer positions. Observations of the students during each session.
Focus of the data analysis	Comprehension Learning experience Interaction Satisfaction Usability Achievement Teachers' preferences

Table 3-1: An overview of the Research Method

3.2 Research Question

The primary objective for this research is to investigate whether the use of an interactive virtual environment is a suitable platform for learning and as a means to enhance the performance of the Islamic prayer. Therefore, the main research question is defined as: ***Does the Interactive Islamic Prayer (iIP) Software enhance the development and understanding of the physical aspects of the Islamic prayer in comparison to learning from reading a Prayer Book, or by watching a Prayer Video?***

This question leads to a number of null hypotheses that have been extracted and defined in Table 3-2. By testing them, the main research question will be answered accordingly.

3.2.1 Null Hypotheses

NH1	The iIP Software does not encourage a greater comprehension of the physical Islamic prayer than a Islamic Prayer Book.
NH2	The iIP Software does not encourage a greater comprehension of the physical Islamic prayer than from watching an Islamic Prayer Video.
NH3	The learning experience for the Islamic prayer is neither more or less attractive or enjoyable using the iIP Software than from a using Islamic Prayer Book
NH4	The learning experience for the Islamic prayer is neither more or less attractive or enjoyable using the iIP Software than from a watching an Islamic Prayer Video.
NH5	The iIP Software does not encourage participants to interact physically more than reading about the prayer in an Islamic Prayer Book.
NH6	The iIP Software does not encourage participants to interact physically more than watching an Islamic Prayer Video about the prayer.
NH7	Participants were neither more nor less satisfied with learning with the iIP Software than learning the prayer through a Prayer Book.
NH8	Participants were neither more nor less satisfied with learning with the iIP Software than learning the prayer through a Prayer Video.
NH9	Understanding the prayer was neither easier nor harder in using the iIP Software than using a Prayer Book.
NH10	Understanding the prayer was neither easier nor harder in using the iIP Software than using a Prayer Video.
NH11	The iIP Software does not increase nor decrease the participants' achievement of the prayer.
NH12	Teachers do not prefer using iIP Software more than teaching by Prayer Books.
NH13	Teachers do not prefer using iIP Software more than teaching by Prayer Video.

Table 3-2 : Research Hypotheses

3.3 Study Design

Whilst adopting a mixed methods approach, this research is primarily quantitative in nature, as it seeks to assess the Human-Computer Interaction (HCI) between the participants and the iIP Software, whilst also evaluating the level of interaction that is undertaken during visual and audio styles of learning (i.e. a prayer book and video). The use of the iIP as the main experiment is vital because it allows the aforementioned hypotheses to be tested and may be a means of identifying causation (Ross and Morrison, 2007). In relation to this study, it will also ensure the participants are able to provide detailed answers for the research question through specific questionnaires when they have completed the prayer. Moreover, the outlined experiments will serve as the relevant means to test whether the HCI of the iIP Software enhances and develops learning in comparison to the other methods.

When collecting data from an experiment that involves participants, it is crucial that the study design compliments the data collection methods. This means the researcher must carefully consider the type of analysis method that they will use (Lazar et al, 2010). Subsequently, within the existing literature relating to study design, there are two common techniques that have been adopted when planning experiments: Between-Group and Within-Subject designs (Field and Hole, 2003). A brief overview of the two will be discussed in the following section (Figure 3.1), followed by a justification for the one that was chosen in this research.

3.3.1 Between Group Design

The between-group design, also referred to as independent measures, is where different groups of participants are simultaneously tested against different independent variables (Lazar et al, 2010). The set-up for this approach is to assign individuals to a control group and experimental groups, which are then examined and observed to identify any differences between them. In doing so, it ensures the participants do not have to go through a rigorous amount of testing as they only experience one variable (Seltman, 2012).

The implications of this type of design might lead to certain complications, as it requires a larger number of participants. More significantly, the variations that may be present within each of the participants, such as their mood or IQ, can cause confounding or external variables that may alter the validity the results (Field and Hole, 2003). Thus, in order to minimize such issues, participants should be randomly selected to the various groups, which means there is a greater chance that the variables will be evenly distributed.

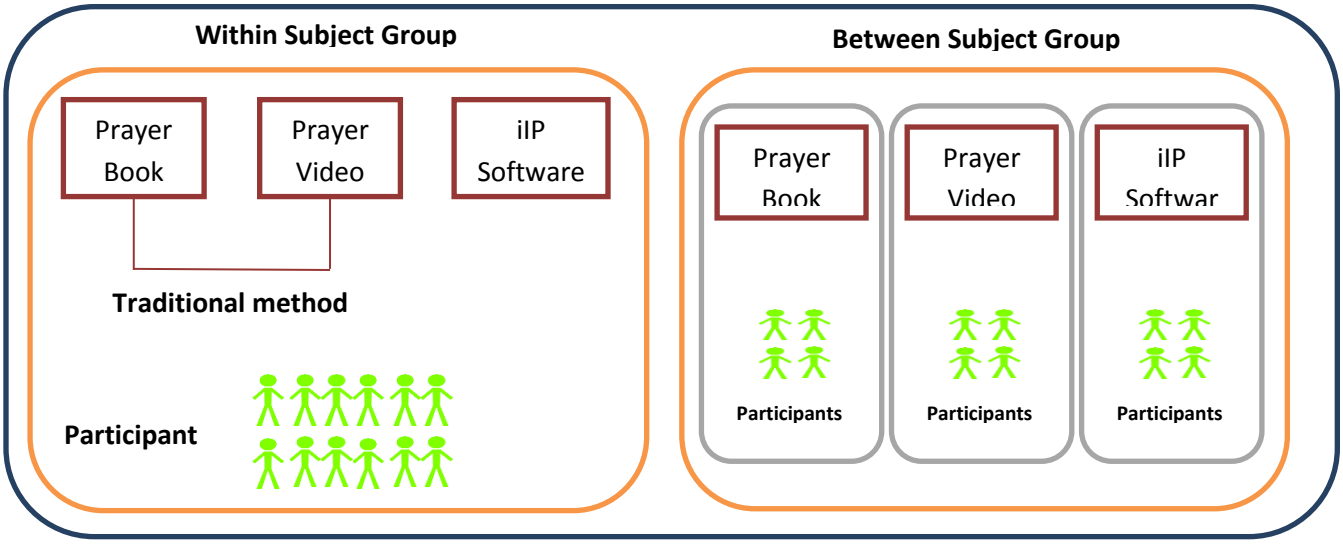


Figure 3-1An illustrated overview of Between-Group and Within-Subject designs

3.3.2 Within-subject Design

In contrast to the between-group approach, the within-subject design (also referred to as repeated measures) is implemented for experiments where all the subjects participate in, and are exposed to, every "level" or "treatment" of the variables (Seltman, 2012). In reference to this design method, treatment refers to all the levels of the independent variable. The reason for this, according to Seltman (ibid), is two-fold: to observe the changes of an outcome over a period of time and, by observing the multiple outcomes of a subject, it allows each subject to be their own "control" group, which can drastically reduce any subject-to-subject variation when repeating different treatments on the same subjects. Thus, by implementing a within-subject design, certain advantages are evident. Firstly, the number of participants is significantly increased in comparison to the between-group design because the participants are not restricted to only one specific treatment. Rather, they are treated for all the levels of the independent variable, which means, provided each group is to have equal numbers; every condition in a within-subject design will have a larger pool of participants than the between-group design. For instance, if 20 subjects join an experiment that measures two conditions and the experiment is conducted fairly and equally, 10 subjects will undergo each treatment using the between-group design. However, in a within-subject design, because all the subjects must experience all the conditions, it means 20 participants will undergo each treatment accordingly. In such a situation, the study sample has doubled, which means an increase in the number of participants directly increases the statistical

power and leads to a greater efficiency. Secondly, this design reduces any error variances that can occur as a result of individual or subject-to-subject differences. Within a between-group design experiment, the results from the treated groups may vary significantly due to the participants in one group possessing personal differences from the other. However, these differences are somewhat irrelevant in a within-subject design experiment because the focus is on the fact that the conditions for each treatment will be the same and all the participants are exposed to the same treatments. Consequently, the results will not be subject to any distorted from individual differences.

Whilst such factors strongly support the use of within-group design, it does have its shortcomings that need to be taken into consideration. One main disadvantage of this approach is the carry-over effect, which refers to any influences that the participants experience when they move from one experiment to the next. In such instances, this could negatively affect the results of subsequent treatments, particularly if multiple experiments are conducted within the same day because the participants may get tired or bored as the day progresses. In addition, it could affect the results by providing the participants with prior knowledge of the format or structure of subsequent treatments so they have enough practice to become better as the experiments continue. In certain cases, Seltman (2012) asserts this approach is not necessarily valid as it may be impractical or unfeasible to conduct multiple repeated experiments on a single subject group. He clarifies this with an example of using within-group design on surgery vs. drug treatment for a disease, wherein participants would generally be only able to receive one type of treatment in order to observe the effects of the drug.

3.3.3 Discussion

When deciding which method to implement, the within-subject design method was chosen because of the nature and setup of this experiment design. Field and Hole (2003) advise that the within-subject design method should be adopted because the independent variable is manipulated in each experiment. This is in line with this research because, in order to determine the preference over the learning experience for the prayer, it stands to reason that the participants should experience all the specified forms of learning so they can make an informed decision. Moreover, Lazar et al (2010) believes that the within-subject design improves the accuracy of HCI-related research as it mirrors real life scenarios, as participants will commonly engage with

more than one condition. This also enriches the observations that are conducted during the experiment and analysis.

3.3.4 Process

The overall steps that are taken when conducting this experiment are presented in this section. This describes the overview and scenarios that may be encountered, as well as the instructions that were given to the teacher and students. A detailed breakdown for the Experiment Research Protocol is also provided in the Appendix B. In addition, it was vital to ensure any external sources of variation were kept to a minimum during the experiments so that only the specific condition outlined by the researcher was prominent.

Preparation

Prior to the experiment, permission was sought from the Ministry of Education in Saudi Arabia, which is necessary for any form of research in Primary schools across the country. Upon approval, the head teacher of a primary school was approached and permission was also sought. Once authorization was given from the primary school, the time and dates were arranged with the participating teachers, who were briefed on how each approach should be delivered. In order to resolve the issues pertaining to the carry-over effect or boredom, the lessons for each learning style was to be delivered over three consecutive days (Table 3-3).

	Week 1	Week 2	Week 3
Class 1 (n=10)	Prayer Book	Prayer Video	iIP Software
Class 2 (n=10)	Prayer Video	iIP Software	Prayer Book
Class 3 (n=10)	iIP Software	Prayer Book	Prayer Video

Table 3-3: Experiment outline with the participants

On each week, three different sessions with three different classes were observed and studied during various times and various data collection tools will be used and administered (Figure 3-2). For the sake of brevity in this section and to avoid repetition of the process, a description of the procedure for Class 1 is given; it is presumed that the other classes will abide by the same procedures for each specific teaching method.

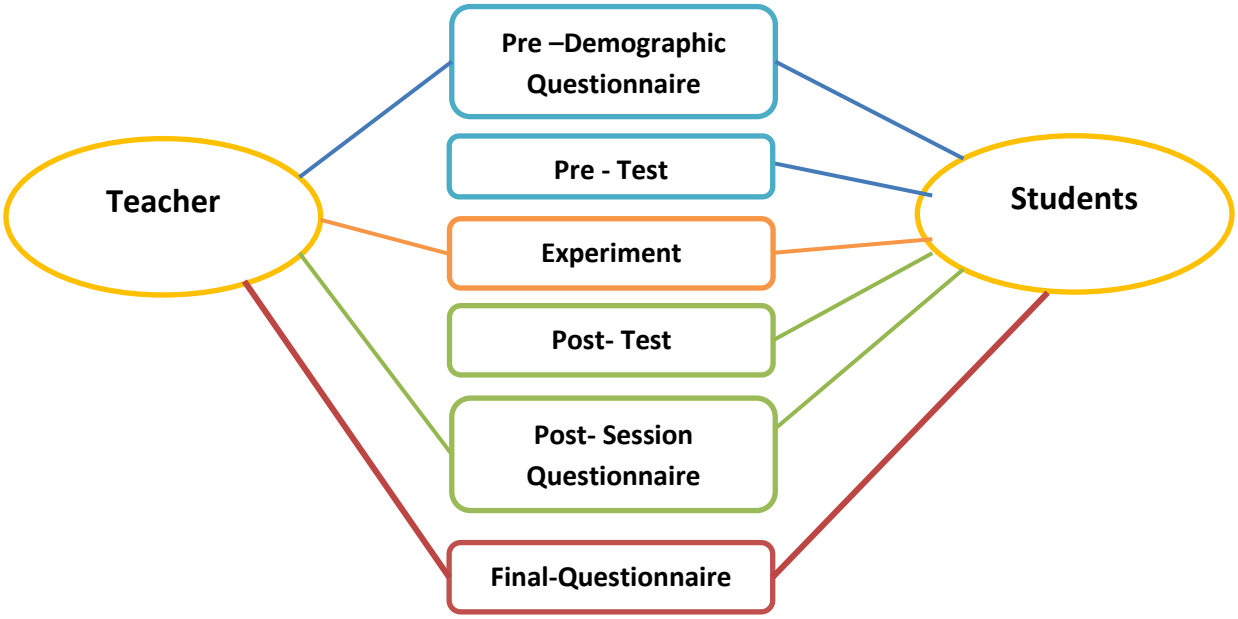


Figure 3-2: A breakdown of all the data collection tools

In order to provide a clear example of how this will work practically, the following section gives an example of how the experiment will work for Group "A". It should be noted that this format is also used for the other groups accordingly, which can be found in Appendix B.

Group "A" Experiment

Step 1:

- The students and teachers will be requested to complete the **Students' Demographic Questionnaire and Teachers' Pre Experiment Questionnaire** (Document **1** and **2**).

Step 2:

- Students are given the **Pre-Test** to ascertain what aspects of the prayer they know and are familiar with (Document **3**).
- The teacher then gives a lesson from the specific chapters in the **Prayer Book** whilst the researcher observes the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- When they have completed the lesson, Students are then given a **Post-Test** (Document **5**).
- The students and teacher are requested to complete the **Post Questionnaire** (Document **6** and **7).**

Step 3:

- The teacher gives a lesson from the **Prayer Video** whilst the researcher observes the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- The students and teacher are requested to complete the **Post Questionnaire** (Document **6** and **7).**

Step 4:

- The teacher informs and instructs the class that they will learn the prayer using the **iIP Software**; however, in order to assess ease of use, the teacher did give the students any indication of how it works.
- Each student is called up to interact and complete the prayer directly with the **iIP Software** within 5-8 minutes, while the other students observed and waited for their turn.
- It should also be noted that the teacher did not give any instructions to the students, except for reading out what is on the screen if they required.
- During the experiment the researcher observes the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- The students and teacher are requested to complete the **Post Questionnaire** (Document **6** and **7).**

Step 5:

- The students and teachers are finally given the **Final Questionnaire** to rank preferences in specific areas for all three approaches (Document **8** and **9)**.

Documents **1** – **9** are in Appendix C

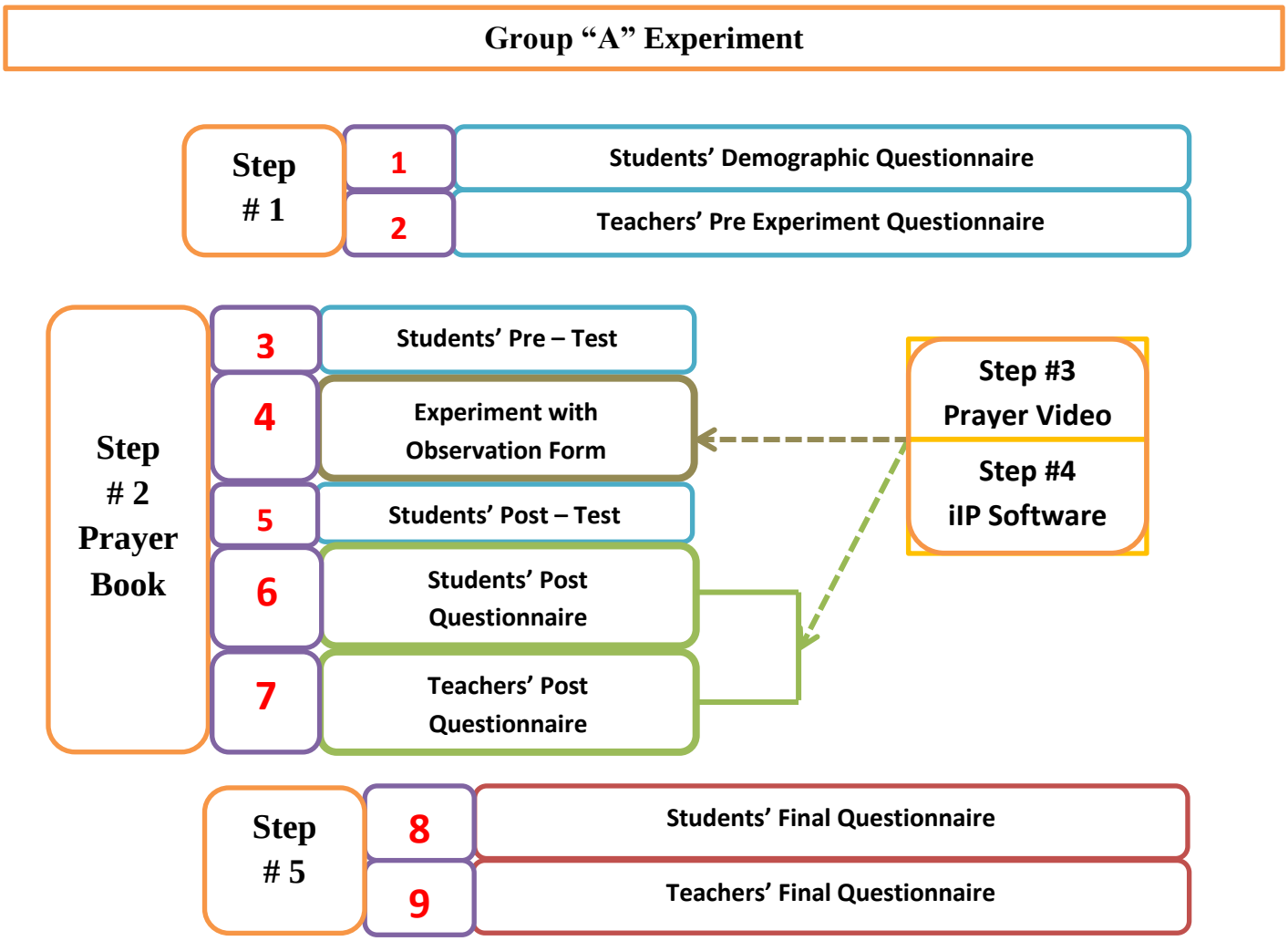


Figure 3-3: Chronological order and process for the data collection

3.4 Variables

As highlighted by Field and Hole (2003), it is essential to determine the dependent and independent variables of a study when conducting a scientific experiment. By doing so, Bryman (2008) states that the internal validity and, more specifically, the issue of causality can be established between the cause and effect. Consequently, the independent variables are referred to as the proposed causes of the outcome, where this variable has a causal effect over another variable. The dependent variable is the variable that is affected by the independent variable and relates to the proposed outcome itself. With regard to this study, both the dependent and independent variables observed within this research are based on common variables that are documented within HCI studies (Lazar et al, 2010). Thus, the various approaches to learn the prayer; namely: by the Prayer Book, Prayer Video and the iIP Software will be the independent variables. The objective is therefore to see how these influence the dependent variables, which are categorised into three main groups: engagement, interaction and the learning experience. The following overview provides a greater insight into these variables:

3.4.1 Independent variable

3.4.1.1 Prayer Book

The current teaching method for the Islamic prayer adopted in Saudi Primary schools is reflected in this teaching style. This is considered a traditional form of teaching the prayer, whereby the teacher will go through a specified Book on Islamic jurisprudence, of which there is a chapter that covers the different components of the prayer. This approach is predominantly teacher-led as the students are required to follow the teacher's instructions in their own copy of the Prayer Book.

3.4.1.2 Prayer Video

This approach incorporates multimedia, visual and audio stimuli to teach the prayer. The use of video technology in education is not new and is becoming increasingly popular[2]. For example, Neisser (1997) postulates that one of the reasons for a rise in worldwide intelligence is due to the visual stimuli children are exposed to through television and computers. Jurich (1999) further notes that video stimuli does this by bridging the gap between the abstract principles and

[2] A recent prominent example of this is presented in 2011 at TED Talks, California by Salman Khan, founder of Khan Academy, which is a series of educational videos in mathematics for various levels of academia. (Full video: http://on.ted.com/SalKhan)

concepts that are learnt by students in the classroom, with their actual application in a real world situation. For this experiment, the Prayer Video that will be used is taken from a popular prayer demonstration that is found on YouTube.

3.4.1.3 iIP Software

The iIP Software is the software that has been specifically designed for this research. The software incorporates audio, visual and kinesthetical components of learning, which are achieved by having learners, interact directly with the learning tool.

3.4.2 Dependent variables

Taking the proposed hypotheses (Table 3-2) into consideration, the potential impact that the iIP software may have on the learners' means it is important to assess the dependent variables from an HCI perspective.

3.4.2.1 Engagement

This variable will determine how well the participants engage with the subject of the prayer within the three learning approaches. Data from the student and teacher questionnaires, as well as through direct observations, will help to analyse this variable and illustrate whether or not participants were bored of the subject matter during a specific approach.

Within the domain of HCI, engagement is regarded as a vital concept to review, particularly during the design of software interfaces, as it allows the designer to determine how a user will behave when implementing or interacting with their system. In the existing literature pertaining to this area of study, engagement is viewed in varying ways, such as an experience, process or concept; however two underlying features are prevalent: sustained attention and emotional involvement. By having a combination of both, the user maintains their interest and attention on the system. Thus, Morency et al (2005) express engagement to be a three-stage process: Interaction start, interaction maintained and interaction end. The goal is therefore to maximize the first two stages and minimise the last stage.

3.4.2.2 Interaction

Synonymous with engagement, interaction refers specifically to how much the participants interact with the three approaches, as well as with the teacher who is delivering the session. The key factor will be to see whether participants are willing to answer or ask questions during the session, as well as how much they participated when performing the prayer. As the name

suggests, within Human-Computer Interaction, this variable is a fundamental component that must be taken into account. The objective is to enhance the interactive behaviour between the user and the computer by making computer systems according to the users' needs and therefore, more usable.

3.4.2.3 Learning Experience

This variable determines the overall experience that the participants had with the three approaches and enables them to express their overall like/dislike and preference. Kolb (1984:38) refers to the learning experience as the "process whereby knowledge is created through the transformation of experience". This is therefore vital to any study involving education and learning, as it will determine whether or not the iIP Software can help develop the participants in learning the prayer. It should be noted that this is extremely comprehensive as it encompasses various sub-categories, including level of comprehension, level of satisfaction and ease of use.

3.5 Data Sources

This section outlines the data sources that were used in order to describe how the data for this research was collected, analysed and evaluated.

3.5.1 Participants

This study focuses on individuals from primary school in Saudi Arabia within the age range of 7-10 year olds. The reason for conducting this research in Saudi Arabia is because the study focuses on whether this approach is a more preferred as a teaching and learning tool for teachers and students respectively. Moreover, although Saudi students are constantly exposed to the prayer, it will focus the attention on whether this method will attract and provide a positive experience for the learner. Furthermore, the justification for assigning a specific age group for the participants is based upon the schooling and religious education constitution of Saudi Arabia, which is fundamentally related to the Holy Quran and the prophetic teachings of the Holy Prophet Muhammad (may God's peace be upon him[3]). In relation to the prayer, the Prophet Muhammad advised parents to teach their children how to pray between the ages of 7-10, which is a fundamental reason for selecting the sample under this criterion.

[3] It is customary within the Islamic faith to send salutations of peace upon the Prophet Muhammad.

A total of 30 young persons were involved in the experiment, which were divided equally into three groups. Each of the groups interacted with each method during their Religious Studies class, which allowed them to compare usability and preferences. The class lasted for 1 hour where the students were taught according to that particular method. In addition, the teachers for each group (n=3) was also among the participants of this research, as their perceptions on the iIP Software in terms of the pedagogical implications were crucial. It should be noted that, as the experiment took place within Saudi Arabia, the participants were all male due to specific religious and cultural restrictions

Participants	N
Primary school students	30 (3 groups of 10)
Teachers	3

Table 3-4: Number of participants

3.5.2 Sampling Criteria

As this study aims to determine whether the iIP Software can be used effectively as a learning tool to develop and understand the Islamic prayer, the sample strategy should reflect this in order to establish certain hypotheses and conclusions. An ideal sample would be primary school children who have not yet been exposed to various detailed aspects and movements of the prayer, whose progression and preferences could then be recorded accordingly. However, with the context of this study taking place in Saudi Arabia, the majority of the population adhere to the Islamic faith and most cities revolve around the Islamic practices of the five daily prayers. This is done so by ensuring all public trading organizations stop working during the prayer time. Coupled with an abundance of mosques and prayer rooms in every major city, it would be extremely challenging to find individuals who are not accustomed to the prayer, regardless of their age. As an alternative, a convenience sample has been used after gaining approval and access to one of the main primary school in Jeddah and requesting use of their facilities (and students). Although Bryman (2008:183) acknowledges a convenience sample may not be the most effective form of sampling, he does agree that it does have its place in social science research, stating “in the field of organization studies it has been noted that convenience samples are very common and indeed are more prominent than samples based on probability sampling”.

3.5.3 Data collection methods

For this study, the data is heavily reliant upon the use of questionnaires, which will be used to analyse and compare the learning tools. Each participant will be given certain questionnaires to complete during different stages of the experiment.

3.5.4 Observation

Observations of the students were conducted in order to examine the extent by which the dependable variables, more specifically, engagement and interaction, are demonstrated by the learners within each learning method. The observations took place throughout each session by the researcher, using the same classroom layout and criteria (Figure 3-4).

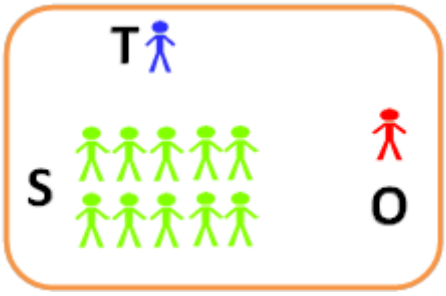


Figure 3-4: Classroom layout during observation

The role of an observation in experimental research design can, in many cases, provide a greater degree of triangulation for the data. Robson (2002) notes that although interviews and questionnaires generate a plethora of data, there are instances where they have shown to cause certain discrepancies between what the participants actually say and do. For instance, during a study by Auge (1999), there were certain discrepancies in the data of actual drug use by professional bodybuilders in comparison to their actual surveys. Therefore, observations have the potential to significantly contribute towards the reliability and validity of a study and ensure real world data is provided (Robson, 2002). However, a common concern to the observations is what is often referred to as reactivity, wherein the participants react unnaturally during the experiment due to the presence of the observer (ibid). This will be taken into consideration during the study and ensure the observer is positioned appropriately within the classroom and does not directly affect the interaction between teachers and students.

3.5.5 Questionnaires

A number of Questionnaires were administered to all the participants during various stages of the experiment. The Questionnaires for all three learning methods (Prayer Book, Prayer Video and iIP Software) are similar in their layout, format and content, with the questions pertaining specifically to the method that is being analysed. Moreover, each Questionnaire relates directly to a hypothesis and expands on the participants' perceptions of the dependent variables.

As the Questionnaires were given to both teachers and students, a likert scale was applied for ease of use and so that the data provided explicit answers to the questions. The scale consists of four values: Strongly Agree, Agree, Disagree, and Strongly Disagree (or for the purpose of children, the use of emoticons: ☺☺ ☺ ☹ ☹☹), which are given the value 4-1 respectively when inputting the data into statistical analysis software for analysis. An overview of the different Questionnaires shall follow.

1. Students' Demographic Questionnaire

The Students' Demographic Questionnaire administered to each group when they are introduced to their first method of teaching. This data will be used to evaluate the learners' existing knowledge of the Islamic prayer by providing certain demographic information such as their age, whether they already know how to pray and how they have learnt the prayer. Upon completion of this Questionnaire, the participants will be given a Pre-Test.

2. Teacher Pre-Experiment Questionnaire

The Teachers' Pre-Experiment Questionnaire predominantly consisted of open questions in order to gain a deeper insight into their normal practices on how they teach the prayer, the difficulties they face and whether they incorporate (or have attempted to incorporate) IT in their classroom. This will provide the data with an appropriate foundation, which will be used to see whether the teaching methods we propose (more specifically the iIP approach), is more suitable and favoured.

3. Students' Pre-Test

The Pre-Test determined the students' existing knowledge of the prayer. It consisted of certain images of specific positions and statements of the prayer with multiple-choice questions. The students were then instructed to choose the correct name for the position and statements.

4. *Experiments with Observation Form*

The observations were used to analyse the level of interaction from the students within each class. This was achieved by observing how many of the students show a willingness to participate within the session, by recording how many times the teacher asked a question against how many and how often the learners raised their hand to answer it (Figure 3-4). In addition, this included how often the students asked a question, which may illustrate a desire to learn. The observation also evaluated the level of engagement and interaction that the students showed through a number of areas pertaining to their behavior and attentiveness.

5. *Students' Post-Test*

The Post-Test were given at the end of each groups' first session. This will be compared with the Pre-Test, allowing the researcher to evaluate whether any learning has taken place. It may also imply that the learning method was effective in teaching the specific movements for the prayer. The rationale behind administering the test at the end of the first learning style as opposed to at the end of all three sessions is to minimize any influences. For instance, the knowledge of the prayer may be built over the three separate sessions or they may learn more from one session and not another. Thus, if the Post-Test were given at the end of the three sessions, it would be difficult to determine which of the methods has caused this progression. This also explains why each of the three groups began with a different learning style on Week 1.

At this point in the study, the data that is collected from the main participants generates a "before/after" record of the specified teaching method. Therefore, in order to track each participant for the purpose of conducting a comparative analysis, whilst also ensuring they remain anonymous, each of the participants will be numbered 1-10 and their corresponding number will be indicated on the Pre and Post-Questionnaires/Tests.

6. *Students' Post- Questionnaire*

After each group completed their first learning style, they were be given a Post-Test and Post-Questionnaire. The Post-Questionnaire relates to the specific learning style that the participants complete. More importantly, it directly corresponds to the hypotheses that have been defined. It should also be noted that, because the participants are at primary school level, the Questionnaire uses simplified language and images, and when the students are required to complete them, the researcher will sit with each individual to ensure they understand each question and help them fill it in accordingly.

7. Teachers' Post- Questionnaire

Similar to the students' Post-Questionnaire, this also provided specific data in relation to the hypothesis, but from the perspective of a teacher. The open questions again enable the teachers to expand on their views regarding the various methods and whether it can be effectively used within the classroom.

8. Students' and Teachers' Final Questionnaires

After all three classroom sessions had been completed; the students and teachers were asked to complete a Final Questionnaire. The Questionnaire was used specifically to rank the three methods in terms of their preference and whether or not they are effective tools for teaching and learning.

3.6 Pilot study

A pilot study was conducted solely on the iIP Software, in order to evaluate the experiment process and to identify any potential bugs. Five students (2 female, 3 males) ranging from 7-11 years old and one teacher from the local Saudi School for Children in Newcastle upon Tyne participated in the study. Before the participants began the experiment, the Pre-Questionnaire and Pre-Test were given and completed. After this, the teacher introduced the class and informed the students that they will be learning the Islamic prayer using the iIP Software. Students were given 5 minutes each on the software and once all the students had taken their turn, the teacher brought the session to a close and the iIP Post-Test and Post-Questionnaire were then administered. The pilot study proved to be extremely valuable as it identified various issues that required specific attention.

Interaction with the iIP Software:

During the class, the researcher observed signs of engagement and interaction from the learners when engaging directly with the iIP Software. Many of the participants had never used the Microsoft Windows Kinect 360 games console before, so they were unfamiliar with how it works, and more specifically where they should stand and their proximity to the screen. This was quite common throughout the study as they kept moving closer to the screen because they were curious to see themselves. To overcome this issue, a marker was positioned on the floor and the learners were instructed to stay on the marker at all times.

Another concern that emerged was that the younger children (7-9) were unable to read the instructions in each movement of the software. Instead, their main focus was to watch the coach

avatar and they would follow this repeatedly. As a result, it was observed the younger children exhibiting more frustration towards the software. It seems therefore, that this software is better suited to those above the age of 10, as they were able to interact more effectively. This further relates to the autonomous nature of the software, as those below the age of 10 needed constant assistance. Taking this forward, the age group needs to be taken into consideration when implementing this experiment and whether or not the teacher must read out the instructions during each movement. In addition, it was observed that this method of "learning by doing" from the iIP Software enabled those who were watching the learner using the Kinect to learn from any mistakes they made.

Students' overall feedback:

Although there were elements of frustration from some of the learners, the overall feedback was unanimous, as the iIP Software was extremely well-received and the learners saw the learning experience as a "great game…and great fun". This demonstrates that the software is perceived to be a game for young people whilst also being educational.

Teachers' overall feedback:

From the teachers' perspective, she expressed extremely positive feedback, stating the software was an excellent method to practice the prayer, which was innovative and new. She felt the students were engaged and were able to learn from it. In addition, she also highlighted certain limitations that were specific to having clearer instructions and feedback when the learners make a movement incorrectly.

Software feedback:

The teachers' feedback provides extremely useful recommendations that may need to be considered. The concept of positive feedback has been advocated within the field of education as it stimulates and encourages learners to work harder. Moreover, having audio feedback when a user does something wrong is preferable.

Questionnaire:

Lastly, conducting the Questionnaire feedback with each participant raised certain issues. Each participant took approximately 30 minutes to complete the Questionnaire and this was due to a number of factors including small font size, words and phrases they did not know/understand ("involved", "achievement" "more room to express myself", "satisfied") and the ranking was unclear. These have been taken into account and rectified accordingly.

3.7 Data Analysis

This section describes the methods that have been implemented in order to analyse the data, as well as highlight the specific approaches that will be adopted for both the quantitative and qualitative responses.

3.7.1 Quantitative Analysis

The quantitative data derived from the Questionnaires was the primary source of data for this research and was analysed using statistical analysis tools (i.e. SPSS). It should be noted that the questions from the three Post-Questionnaires (Prayer Book, Prayer Video and iIP) are identical, with the exception of having each question specifically relating to that particular learning method. The purpose for this is to provide a comparison of the learning methods from varying perspectives, features and preferences. More importantly, this enabled the researcher to conduct various analyses and tests on the defined hypotheses, which in turn will be used to effectively answer the research question. Table 3.5 outlines the correlation between a specific hypothesis and the questions.

Q	Statement	NH	Null Hypothesis
PRAYER COMPREHENSION			
Q1	This method makes me better at understanding the prayer properly.	***NH1,NH2***	***NH1*****:** The iIP Software does not encourage a greater comprehension of the physical Islamic prayer than a Islamic Prayer Book. There is no difference in the comprehension of the psychical Islamic prayer in all three approaches. ***NH2*****:** The iIP Software does not encourage a greater comprehension of the physical Islamic prayer than from watching an Islamic Prayer Video.
Q2	I know the prayer positions when using this method		
Q3	I learnt a lot about the prayer using this method		
LEARNING EXPERIENCE (Attraction and Enjoyable)			
Q4	Using this method for learning is very exciting and interesting for me	***NH3,NH4***	***NH3*****:** The learning experience for the Islamic prayer is neither more or less attractive or enjoyable using the iIP Software than from a using Islamic Prayer Book ***NH4*****:** The learning experience for the Islamic prayer is neither more or less attractive or enjoyable using the iIP Software than from a watching an Islamic Prayer Video.
Q5	This method makes the classroom very relaxed and enjoyable		
Q6	This method makes us want to learn to pray and use it more.		

PHYSICAL INTERACTION			
Q7	I found it easy to get involved in the lesson	***NH5,NH6***	***NH5*****:** The iIP Software does not encourage participants to interact physically more than reading about the prayer in an Islamic Prayer Book. ***NH6*****:** The iIP Software does not encourage participants to interact physically more than watching an Islamic Prayer Video about the prayer.
Q8	It was easy to interact with this method		
Q9	This method made me learn by practice		
OVERALL SATISFACTION			
Q10	I enjoyed the lesson	***NH7,NH8***	***NH7*****:** Participants were neither more nor less satisfied with learning with the iIP Software than learning the prayer through a Prayer Book. ***NH8*****:** Participants were neither more nor less satisfied with learning with the iIP Software than learning the prayer through a Prayer Video.
Q11	Overall, I like this method		
Q12	This Method makes me feel more confident when I pray		
Usability			
Q13	It was easy to learn how to pray using this method	***NH9,NH10***	***NH9*****:** Understanding the prayer was neither easier nor harder in using the iIP Software than using a Prayer Book. ***NH10*****:** Understanding the prayer was neither easier nor harder in using the iIP Software than using a Prayer Video.
Q14	It was easy to follow the prayer movements using this method		
Q15	This method explains the prayer clearly from beginning to end.		
ACHEIVEMENT			
Q16	I can remember the prayer positions after using this method	***NH11***	***NH11*****:** The iIP Software does not increase nor decrease the participants' achievement of the prayer.
Q17	My prayer performance is better after using this method.		

Table 3-5: Correlations between a specific hypothesis and the questions from the Questionnaires.

The students have their own perception of how much the iIP Software improves their interaction, engagement, participation and understanding of the prayer; however, this does not necessarily mean they have succeeded in those particular areas. Therefore, the teachers' Observation and professional opinion is valued for this research, which is why their Post-Questionnaire will be taken into account when analyzing the questions relating to the hypotheses. Upon completion of the Post/Final Questionnaires, this data will be input into SPSS in order to analyse the following seven areas:

1. **Analysis of prayer comprehension:** This is done to identify how well the students feel they have understood how to pray according to the various methods.
2. **Analysis of learning experience (attraction and enjoyable):** The learning experience is a key analysis for this study as it determines which method the students preferred in how to learn the prayer.
3. **Analysis of physical interaction:** As the prayer is a physical action, it is vital to analyse whether the students/teacher felt a particular learning method increased and encouraged their physical interaction.
4. **Analysis of overall satisfaction:** This is done to determine the students' and teachers' preference of learning method.
5. **Analysis of ease of use:** This analysis also relates to the learning experience, particularly how easy the students and teachers found the particular methods.
6. **Analysis of achievement:** Similar to prayer comprehension, this analysis determines whether students were actually able to perform the prayer correctly.
7. **Analysis of the teachers' preference:** This analysis determines which method was suited as an effective teaching tool, which will ultimately enhance the learning experience.

3.7.1.1 Shapiro-Wilk Test

In order to determine which statistical test shall be applied within the analysis of the quantitative data, a number of various tests are available. For instance, to establish which test can measure the above factors for the three teaching methods, the Shapio-Wilk test can be applied. This test is typically used to test the normality of the data for small samples sizes less than 50 Ghasemi et al (2010). This is achieved by comparing the sample scores with a normally distributed set of

scores with standard deviation and the same mean. Thus, the test results can be non-significant if the P-value is > 0.05, which means there is no significant difference in the distribution of the sample in compassion to a normal distribution. If this is the case, then a parametric test, such as ANOVA can be implemented. In contrast, it could be significant if the P-Values is < 0.05 which means there is a difference from the normal distribution, in which case, non-parametric tests such as Kruskal-Wallis H must be implemented.

3.7.1.2 Kruskal-Wallis Test

The Kruskal-Wallis test is a non-parametric test used to measure the equality of means from a number of independent groups (i.e. those domain areas that have been outlined above) and used to see if there are any significant differences between them. However, it should be noted that this does not show where the differences lie.

3.7.1.3 One Way ANOVA

A one-way ANOVA test is a parametric test that is used to compare a number of means when these means are from more than two groups or methods. This means the ANOVA test will be used to determine a statistical analysis of the various independent variables for the three teaching methods. For this test, if the P-Value is < 0.05, there is a significant difference among the three methods, whereas, if the P-Value is > 0.05, there is no significant difference between these methods.

3.7.1.4 Cronbach Alpha Test

The Cronbach Alpha test is a common analysis that is used to measure the internal reliability for the research instrument and coefficients. The measurement for this test ranges from 0 to 1, and the higher the alpha value, the more reliable the scale is. De Vaus (2002) states that, in general, the alpha value should be a minimum of 0.7. Cronbach's Alpha was used to test the reliability, Table 3-6 show the Alpha value is close to 1 among learning methods that means the data is more reliable.

Reliability Statistics

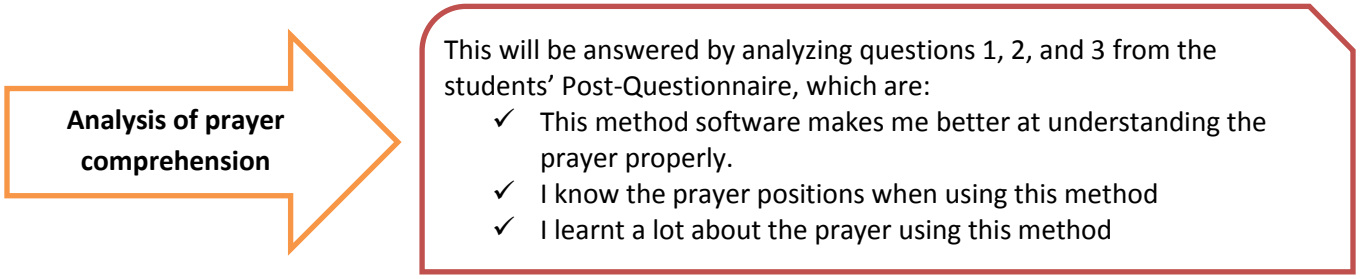
Method	Prayer Book	Prayer Video	iIP
Cronbach's Alpha	0.887	0.883	0.892
N of Items	17	17	17

Table 3-6: If the Alpha value is close to 1 that means the data is more reliable

3.7.2 Qualitative Analysis

In addition to the Quantitative Analysis, an analysis will be derived from certain observations of the classroom sessions and through open-ended questions for the teacher for their overall feedback. The open ended questions will provide a detailed insight into their overall views and opinions over the different methods of teaching and more specifically, will help me as a researcher to see which approach they felt was more effective and provided a better learning experience. Thus, it is envisaged that the adopted approach for this experiment is a formal structured observation, where the observer focuses on pre-specified aspects of the classroom to provide Quantitative results. As stated by Robson (ibid: 329), structured observations are used to measure dependent variables, and the observer "tend(s) to take a detached, 'pure observer', stance." To fulfill these criteria and ensure the necessary data is captured, the foundations for the observation correlates directly to the research questions and seeks to primarily analyse the dependent variables. Hence, the formation of certain coding systems and checklists with pre-determined categories has been designed (Appendix C). In doing so, this study considers the guidance from Robson (2002), such that the observation is focused on particular areas, has little or no interference from the observer, provides explicit definitions of what is to be recorded and observed, is exhaustive and covers all the possible areas for the dependent variables, as well as easy to record.

3.8 Areas of analysis



Analysis of learning experience attraction and enjoyable

This will be answered by analyzing questions 4, 5, and 6 from the students' Post-Questionnaire, which are:

- ✓ Using this method for learning is very exciting and interesting for me
- ✓ This method makes the classroom very relaxed and enjoyable
- ✓ This method makes us want to learn to pray and use it more.

Analysis of physical interaction

This will be answered by analyzing questions 7, 8 and 9 from the students' Post-Questionnaire, which are:

- ✓ I found it easy to get involved in the lesson
- ✓ It was easy to interact with this method
- ✓ This method made me learn by practice

Analysis of overall satisfaction

This will be answered by analyzing questions 10, 11 and 12 from the students' Post-Questionnaire, which are:

- ✓ I enjoyed the lesson
- ✓ Overall, I like this method
- ✓ This Method makes me feel more confident when I pray

Analysis of ease of use

This will be answered by analyzing questions 13, 14 and 15 from the students' Post-Questionnaire, which are:

- ✓ It was easy to learn how to pray using this method
- ✓ It was easy to follow the prayer movements using this method
- ✓ This method explains the prayer clearly from beginning to end.

Analysis of achievement

This will be answered by analyzing questions 16 and 17 from the students' Post-Questionnaire, which are:

- ✓ I can remember the prayer positions after using this method
- ✓ My prayer performance is better after using this method.

3.9 Ethical Consideration

An experiment of this nature requires certain ethical considerations in order to safeguard the integrity of all those concerned in the research process, such as the Ministry of Education in Saudi Arabia, the intended primary schools and the actual participants of the experiment. Oates (2006) highlights the importance of ethical issues within research, whereby all participants should be treated honestly and fairly throughout. Moreover, Boddy and Oliver (2010) states that in experiments comprising of large number of participants, the worth and dignity of those involved should also be maintained. Consequently, during key stages of this study, written consent will be obtained and signed by all the relevant parties and the researcher, as well as reassuring the participants that any data and information they provide will remain anonymous and protected. Furthermore, all the participants will be informed of their rights and that they can withdraw from the experiment at any given time.

3.10 Threats to Validity

Upon analysis of the research, the main threats that could potentially affect the validity of this study are related to the cultural environment for where the experiments are being conducted. As stated in 2.3, the educational system in Saudi Arabia maintains gender segregation, whereby males and females are separated and have their own schools for each gender. Therefore, as a male researcher, there are certain restrictions placed upon me from going to female schools and observing female teachers and students. This restricts the data to male students only, which could potentially impact the data because the female opinion is equally valid to the male opinion and may add a different perspective than their male counterpart.

3.11 Summary

This chapter begins by describing the steps that have been in order to accurately answer and establish the proposed research question and hypotheses. After much deliberation on the type of study design that was to be adopted, the within-subject design method was implemented and a strategy was put forth as to how the experiments will be conducted, whilst maintaining validity and reliability of the experiments by minimizing any carry-over effect. In addition, what has proceeded in this chapter is a clear understanding of what the variables, in order to effectively determine how they will be measured. A detailed description of the data collection tools and overall analysis has therefore been presented, followed by ethical considerations.

Chapter 4 iIP Software Implementation

4.1 Introduction

This chapter looks at how the requirements that are present in the relevant available platforms are suited for the design objectives and implementation. A detailed comparison at the current virtual environment gaming platforms – namely Microsoft Windows Kinect 360 and Wii – will be given, as well as the reasons for opting for Kinect Microsoft Windows platform. Consequently, a detailed insight will be provided in relation to how the relevant design tools were implemented, such as the Software Development Kit for Kinect.

4.2 Requirements for the software platform

Upon revisiting the design objectives, it is vital that the gaming platform specifications are able to meet these objectives. That is, the hardware must have the capability to:

- **Capture motion and movements accurately**: This is a primary requirement of the desired platform because the joints need to be in specific places when the Islamic prayer is performed. To achieve this, Natural User Interfaces implement 3D cameras and skeletal tracking that mimic the movements and gestures of the user. This process creates a depth image data to determine the positions of specific joints of the user.
- **Illustrate animation**: The animation is important, specifically for primary school children, as it provides a guide that the user can mimic to perform the prayer actions. Moreover, the platform should have the ability to compare whether the user and animated guide is similar.

4.2.1 Comparison of Virtual Environment Gaming Platforms

To fulfil the requirements that are necessary for the design of the iIP Software, both the Wii and Microsoft Windows Kinect 360 were identified as ideal platforms (Figure 4-1).

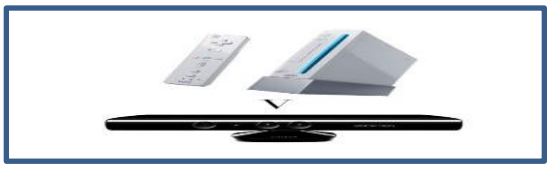


Figure 4-1: Nintendo Wii vs Kinect 360

There are however, certain distinctions that need to be made between these two consoles, which highlight how they will be used and implemented within this specific context. Both the Wii and Kinect are considered as motion capturing hardware, wherein they are able to detect the user and track their movements. A comparative description is outlined in Table 4-1.

	Kinect360	Nintendo Wii
Sensor interfaces	Depth camera: 640*480 pixels @ 30 Hz, distance range 0.7m - 6.0m. RGB camera: 640*480 pixels @ 30 Hz. Multi-array microphone.	Remote Plus: IR camera (128*96 pixels), 3D gyro sensor, 3D acceleration sensor @ 100Hz. Sensor Bar: highlighting IR LEDs.
Sensor capabilities	3D information of position and orientation of objects in the camera view field.	3D information of acceleration and rotational angular of the Controller. 3D position information of the controller
Key features	No need for controllers. 3D gesture recognition. 3D scene recognition.	Hand motion detection with relatively high temporal resolution.
Limitations	Low temporal resolution. Difficulty in occluded motion recognition. Difficulty in recognition of motion that does not change depth information (e.g., arm axial rotation).	Limited detection to hand motion. Difficulty in detection of 3D hand position.
Availability of software Development Kit	Open to the public (e.g., OpenNI).	Open to the public (e.g.,Wiimote Lib).
Specification		700MHz Processor, 64MB RAM, 24MB Graphics memory, 512MB non-removable flash memory

Table 4-1: A specification comparison between Kinect 360 and Nintendo Wii

Nintendo Wii

The underlying technology that enables the Wii to capture movements is through its sensor and Wii controller (Figure 4-2). The Wii controller (or Wii Remote) uses wireless Bluetooth technology, where movement is detected by an accelerometer, which is then transmitted to the Wii console to determine position and speed of the movement (Kazumoto, et al, 2012). According to Lee (2008), the controller receives input of approximately 100 times a second, which enhances the response time to and from the Wii controller and console.

Figure 4-2: Nintendo Wii

Microsoft Windows Kinect 360

In contrast to the Wii, the Kinect utilizes depth-detection technology that captures 3D whole body motion and therefore does not require any external controllers. Rather, the technology is dependent upon the Kinect sensor device, consisting of an RBG camera, a depth camera and an infrared laser speckle pattern projector (Figure 4-3). As it is infrared, the speckle pattern is invisible to the naked eye but is used as the initial source to capture the users' skeletal image. Upon this, the depth camera maps the image from the speckle pattern to identify one that correlates to the human skeleton and also ascertains the distance and position of the user (García, et al., 2008). The Kinect proves to demonstrate a greater advantage over the Wii due to the technological advances in whole body motion capturing.

Figure 4-3: Xbox Kinect 360

Having reviewed both consoles, the rationale behind using the XBox Kinect 360 for the basis of this study was primarily because the Kinect detected users without them having to have controllers. The reason why this is important in this study is because the positioning of the hands is necessary during the prayer movements and therefore, it was important for the learner to know exactly how they should place their hands accurately during these movements. In addition, the Kinect provided a camera on screen, which enabled the user to see how well they were able to follow the instructional avatar in the main screen. Both these factors were limited within the Nintendo Wii as the Wii is limited to detect hand motion and also it has a difficulty in detecting the positioning of a 3D hand (which is necessary in this study). Furthermore, the Kinect hardware has the ability to detect voice command in order to perform certain actions. For instance, the learner can say certain words and if they correspond to the audio library that is present in the Kinect, the software will act accordingly. This facility is also not present in the Nintendo Wii (see Table 4-2 for a comparative).

Required Attributes	**Microsoft Windows Kinect 360**	Nintendo Wii
Video streaming camera	√	√
Detects 3D movement	√	√
Open to public for software development	√	
Voice command detection	√	√
Detects movement and motion	√	
No need for control device	√	√
Full body experience	√	
3D gesture recognition	√	√
	8	5

Table 4-2: A suitability comparison between Microsoft Windows Kinect 360 and Nintendo Wii

4.3 Actual configuration and implementation

Upon opting for the Kinect as the desired console, it was identified that specific phases would be incorporated in order to construct the iIP Software. Figure 5-4 illustrates the various stages of implementation. Moreover, it should be noted that during each stage, a number of development tools were included, such as graphic editing software to design the Start Screens and GUI, 3D modeling software to create the instructional coach avatar, programming editing software to develop the code that was necessary for the Microsoft Kinect. What follows is a detailed insight into each phase and the tools that were used.

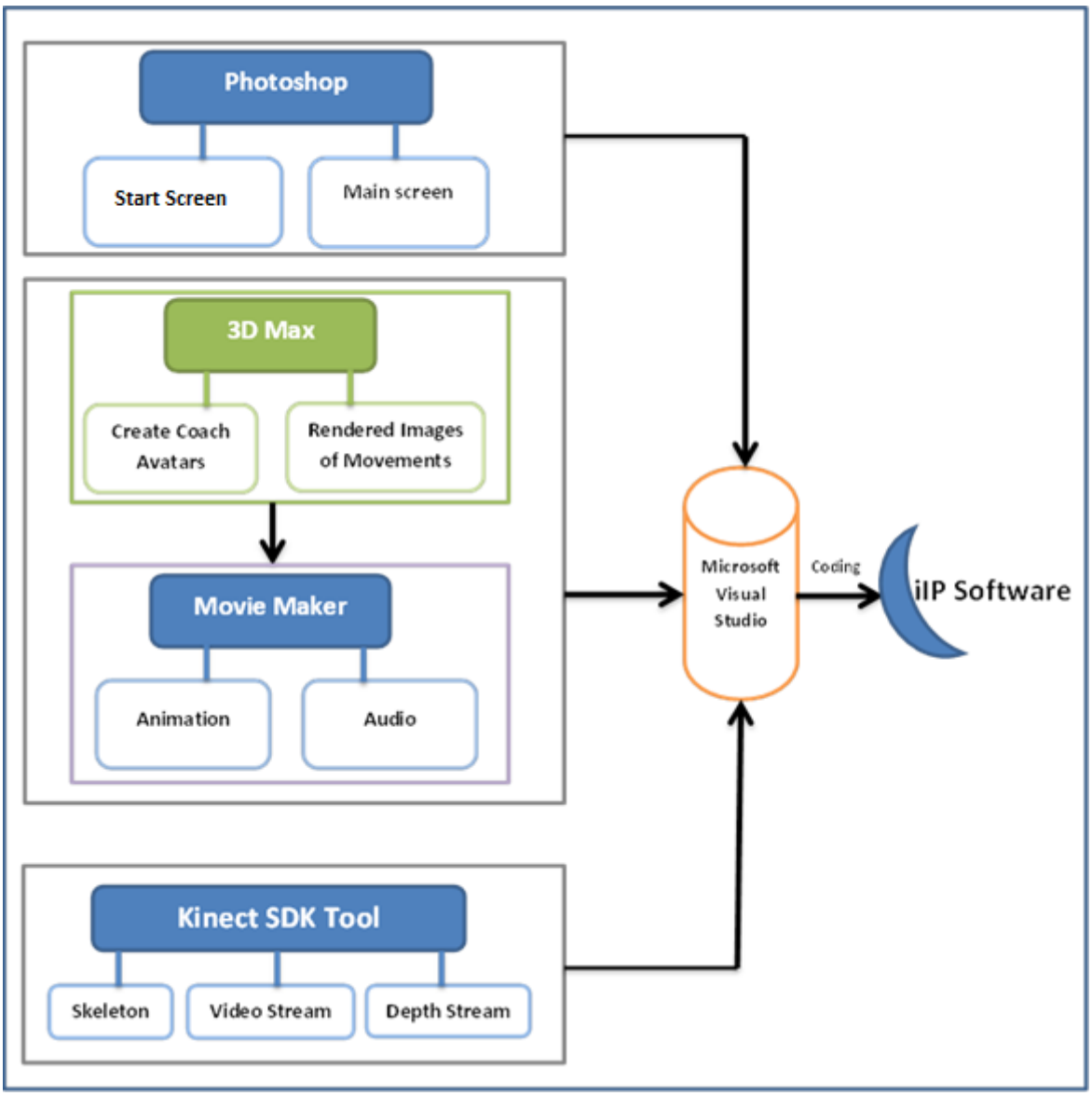


Figure 4-4: Stages of implementation for the iIP Software

4.3.1 Design and Animation

The initial stage was designing the various interface screens, graphics and logos that would be used in the iIP Software. Adobe Photoshop CS 8.0 was primarily used in this regard, which is a common image-editing program used by graphic designers to edit and enhance digital pictures and graphics (Figure 4-5). When designing the background screens, a particular colour scheme (i.e. light colours) was used throughout so it would not strain the users' vision and make it easy to follow what else was on the screen.

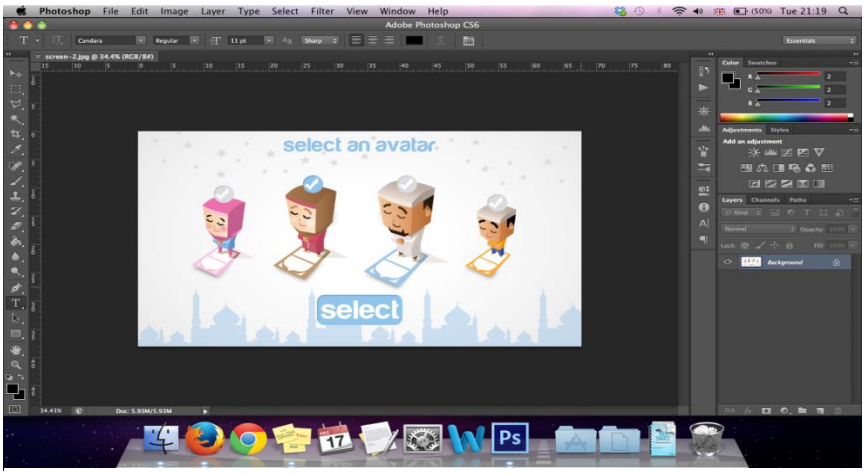


Figure 4-5: Adobe Photoshop CS 8.0

Following this, Autodesk 3DS Max Design 2013 was used to generate 3D models of the instructional coach avatars (Figure 4-6). As 3D computer graphic software, 3DS Max is frequently used in games as well as special effects in TV and movies. As highlighted earlier, within the design stage of the iIP Software, four models were designed for different genders and ages. Each motion of the prayer is developed by creating an array of still images of the movement from beginning to end.

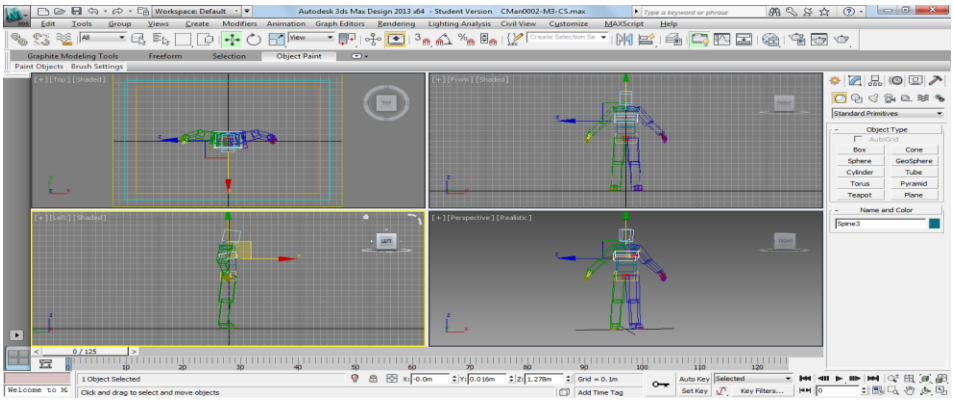


Figure 4-6: Autodesk 3DS Max Design 2013

In order to animate the 3D avatars, a basic video-editing program that can be used to insert the still images of the 3D generated models in the correct order was required. As a result, Microsoft Movie Maker was used, and once the still images of all the movements were added, it was split into each specific prayer movement (Figure 4-7). In addition, audio instructions that would help the user were included.

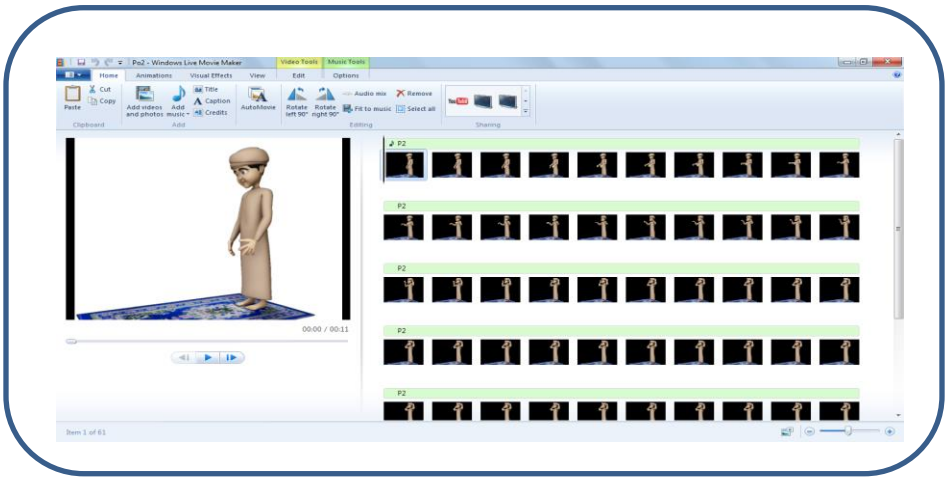


Figure 4-7: Microsoft Movie Maker design

4.3.2 Over structure code

The next phase was to initiate the core component of the iIP Software, which was the actual coding for it to run effectively on the Kinect. For this stage, two main development tools were utilized: Microsoft Visual Studio 2010 (using Microsoft XNA tools) and the Microsoft Kinect for Windows Software Development Kit (SDK) version 1.7. The SDK is provided by Microsoft for developers to design Kinect applications for non-commercial use. The toolkit comprises of a vast reference library that is used to incorporate into Visual Studio for Kinect application development (Figure 4-8).

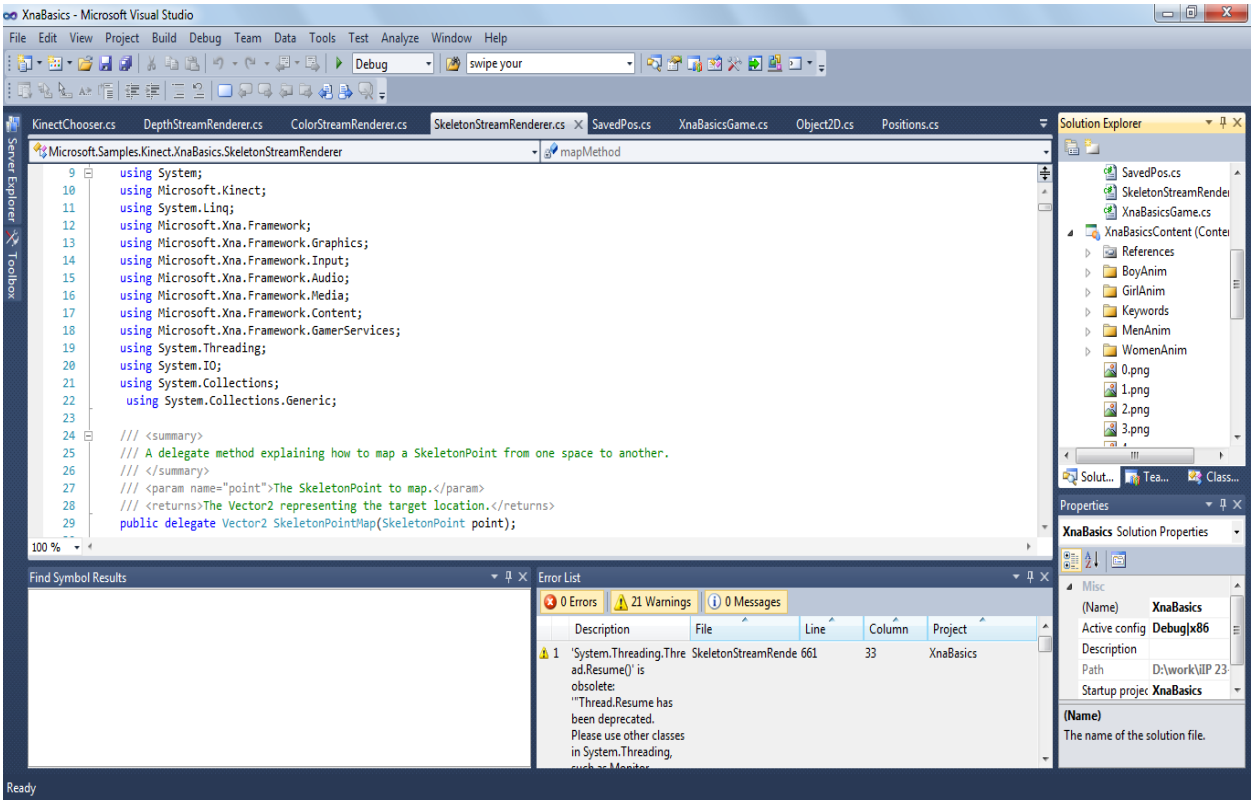


Figure 4-8: Microsoft Visual Studio (Coding Phase)

For the iIP Software, three of the SDK samples were used, which were related to the skeleton tracking and hand pointer, depth and video stream camera. Furthermore, the previous stages (design and animation) were all incorporated into Visual Studio 2010 as this was the main program used for final coding and implementation (Figure 4-8). The programming language used in XNA was C#. During this stage, a structure and process for how the coding would be implemented was drawn up in a flow chart diagram (Figure 4-11). This enabled the researcher to effectively write up the code so that the software runs through the 10 positions accordingly in Figure 5-1.

As part of the coding, the iIP Software uses a comparing algorithm when determining whether the user has performed each prayer movement correctly, by analysing the human motion across the X and Y axis of the depth camera (Figure 4-10). To achieve this, each prayer movement was captured using Visual Studio, whereby the actual human motion was recorded and titled accordingly (i.e. Level 1, Level 2 etc). Following this, an algorithm in C# that compares the X and Y coordinates of real-time and saved movements were tested, leaving a degree of flexibility within the coordinates to take into account slight variations from each user.

```
1125  private int CheckSelectedPosition(SavedPos sv)
1126  {
1127      int k = 0;
1128      int g = 0;
1129      for (JointType i = 0; i <= JointType.FootRight; i++)
1130      {
1131          if ((mapMethod(skel.Joints[i].Position).X >= sv.pos[k].x - radius
1132          && mapMethod(skel.Joints[i].Position).X <= sv.pos[k].x + radius)
1133          && (mapMethod(skel.Joints[i].Position).Y >= sv.pos[k].y - radius
1134          && mapMethod(skel.Joints[i].Position).Y <= sv.pos[k].y + radius))
1135          {
1136              g++;
1137          }
1138          k++;
1139      }
1140      return g;
1141  }
```

Figure 4-9: C# code for the skeleton position algorithm in comparison to saved position

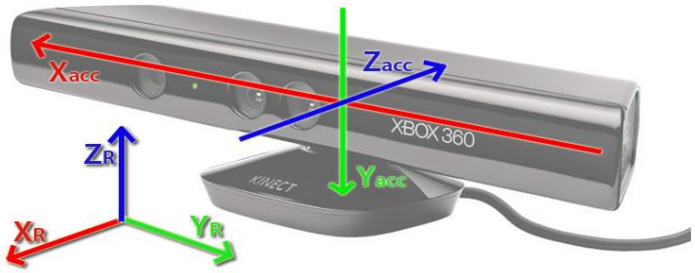


Figure 4-10: X and Y axis used to track live movements

In addition, the coding also incorporated various checks and balances to establish whether the user was in the correct position before proceeding to the actual game play (Figure 4-10). This is important within the context of the Islamic prayer because the prayer begins with the standing position. Moreover, it is also an HCI aspect of game play so that there is a clear level of interaction between the console and the user.

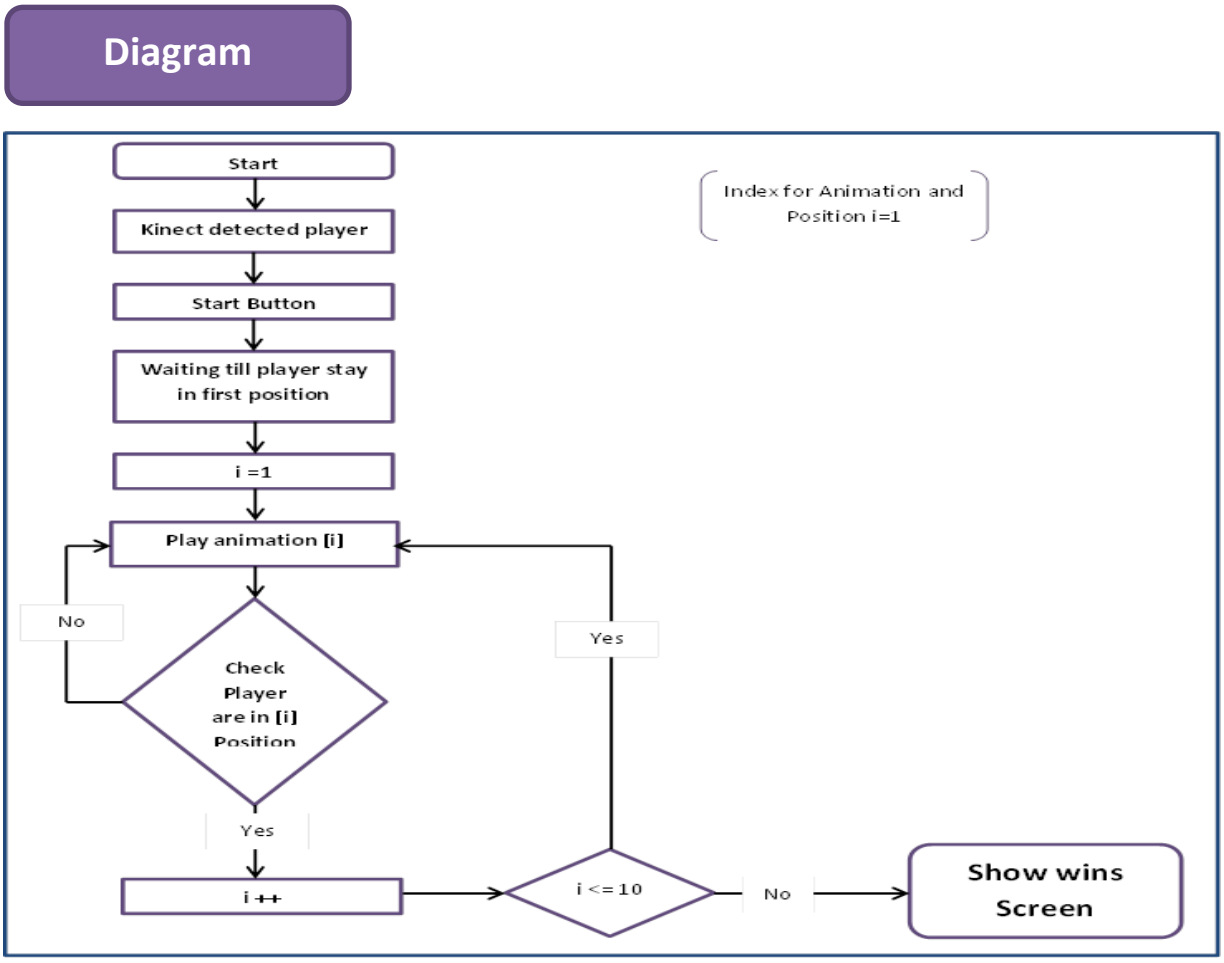


Figure 4-11: A process flow-chart for iIP software

4.4 Summary

This chapter outlines the actual implementation of the iIP Software. It describes the development tools that were used; more specifically how they have been incorporated together for the final implementation. The various phases have been presented; namely: the design phase, which consisted of using Adobe Photoshop to design the background and main screens as well as using 3D Max to design the 3D instructional avatar, the animation phase, wherein the 3D avatar was animated using Microsoft Movie Maker, and finally the coding phase, where Microsoft Visual Studio and the Microsoft SDK were utilized to combine all the previous phases. Moreover, this was used to code the iIP Software in order to capture and analyse real-time motion of the user, and compare them with pre-recorded movements for each prayer component.

Chapter 5 iIP Software Design

5.1 Introduction

This chapter gives an overview of the iIP Software, specifying the overall design, development and requirements to effectively implement it in the pre-contextualised settings. Additionally, by outlining the overall objectives that this software intends to achieve, a focus on how the design correlates directly with these objectives is provided with support from existing literature pertaining to the use of Virtual Environment platforms in education. Moreover, a description of the Graphical User Interface is illustrated, which explains how the users will directly interact with the software.

5.2 Software Requirements

The interactive Islamic Prayer (iIP) Software is a learning tool that incorporates a Virtual Environment (VE) platform, enabling the users to immerse themselves into the prayer through physical interaction and active learning. This provides an alternative approach to traditional learning methods, such as using textual or visual materials. More significantly, unlike traditional methods, the iIP Software seeks to combine all three learning modalities outlined by Fleming (2001) in his Visual, Aural, Read/write, and Kinesthetic (VARK) model. According to this model, learners have a preferred or dominant learning style that facilitates a greater depth of learning and acquisition of knowledge. These styles can be broken down into three sensory models as visual, aural and kinesthetical. The visual learner is one who learns more effectively through pictorial or graphical aids. For instance, they prefer to view information in graphical form such as diagrams, graphs, mind maps and the like. In contrast to the visual learner, the aural learners' preferences are found by listening to information in the form of lectures or group discussions. This type of learner, according to Fleming (ibid), has high auditory skills and generally proficient at public speaking and presentations. The third type of learner is the one that prefers text-based input and output, such as reading books, instructional manuals or even learning through PowerPoint presentations. Lastly, the kinesthetical learner has an inclination to learn through the use of action or "doing". Coker (1996:66) explains, "the kinesthetical learner wants to know what the movement feels like. The correct feeling becomes the frame of reference in which to compare". Thus, the use of physical interaction and repeated practice of simulations, acting and "hands-on" experiments all assist in building this frame of reference for the learner.

Taking this into consideration, the design the software around this specific aim, the following HCI objectives have been considered:

- Accurately tracking the synchronous movements of the participant
- Is flexible and adaptable with respect to time and place.
- Has an appealing interface that makes it easy to use and understand, yet challenging for the users.

Additionally, in order to effectively implement the proposed methodology outlined in the previous chapter, the design of the software is in direct agreement with the sentiments expressed by Manninen (2002): "Games and game-like activities offer enormous potential for practitioners and researchers. While the game setting itself can be of great value, there is also the additional benefit of acquiring research material from these playing sessions. Because the game system has been designed with the research task in mind, it adequately supports various forms of data collecting (e.g., video capture, observer views, control mechanisms and log files)".

5.3 Virtual Environment

Before expounding upon how this software enhances the learning experience, it is crucial to define what is meant by the virtual environment. A Virtual Environment is defined by Miles et al, (2012:715) as "a collection of technologies that allow people to interact efficiently with 3D computer generated models in real-time using their natural senses and skills." A common goal for utilising these environments is to improve motor control skills, making it appropriate to use in practical situations that mimic real-world scenarios (Miles et al, ibid). Moreover, VE allows designers to develop specific scenarios that can enrich a learner's performance.

While one would not normally associate computer gaming with developing and acquiring motor skills, the evolution of Gaming Virtual Environments, particularly with the introduction of the Nintendo Wii, has revolutionised how individuals interact and access games. Studies have shown how they can contribute to improve fitness and health, and as a result gaming companies have launched products that target this particular market. The Wii Balance Board and Wii Fit packages, for example, are amongst Nintendo's highest grossing products and as (Miles et al, ibid) even "the popular Wii Sports package provides simplified versions of tennis, baseball,

bowling, golf, and boxing, and evidence is emerging that the Wii platform is contributing to the acquisition of skills in some real sports (e.g.,10-pinbowling)."

A more recent and progressive form of VE is Microsoft's Kinect 360 for Windows , which employs markers to recognise, capture, track and decipher a user's movement through infrared technology (DePriest & Barilovits, 2011). This has been described as a "revolution in the making" as the method of interaction between human and computer is no longer bound by tangible objects like a controller, mouse or keyboard (Hsu, 2011). For instance, the Kinect has been used as a tool for rehabilitation and recovery for hospital patients with brain injuries (Simmons and McCrindle, 2013). Moreover, the Kinect is a flexible teaching tool as it allows interaction with multiple users in movement, gestures and voice. While such consoles are primarily aimed at entertainment, researchers are keen to also see how such technology can further be utilised for educational purposes, and in effect to “learn by doing”. Thus, the specifications used for the iIP Software adopts this specific technology.

5.4 Specification: The importance of VE for education

The continual technological development of virtual environments (VE) has revolutionised how computers and consoles are utilised in daily life. Within the education domain, VE have been used for decades as an adopted method of learning and pedagogy, of which early interactive designs have included various functions and uses, such as aeronautical training (i.e. flight simulations) or for medical procedures (Miles et al, 2012). With certain advancements and improvements, not only has there been an expansion in the contexts of legitimate learning environments, but more importantly, in how interaction occurs. This is evident with the advent of appliances such as the Wii and Kinect, where individuals are now able to engross themselves in a full body experience, whether for entertainment or educational purposes, or for skill acquisition through motor movement. One can see this manifested through the use of “exergaming”, a term that combines gaming and exercise in an interactive manner by tracking body movement and reaction (Papastergiou, 2009). Such technology has been popularised in professional and educational environments as a means of developing muscle memory and ultimately, learning and understanding. Interestingly, Rieber (1996) suggests that even through individuals may use such environments for play and entertainment; it is inherent that learning is present. Consequently, one may also infer that interactive learning – similar to exergames –

could be useful to effectively teach and supplement classes on how to pray. In order to do so, there is a need to develop motor movement and skill acquisition, which requires practical implementation and investment in specific and relevant practice (Miles et al, 2012).

Having researched and reviewed the concepts behind interactive learning, there is an underlying emphasis to investigate how the VE within this research can facilitate understanding and acquisition of specified and sequential motor movements (i.e. the physical aspects of the prayer). As alluded to in the previous chapter, the overall objective for this research is to encourage the participants to learn by doing, which DuFour et al (2006:1) states, "develops a deeper and more profound knowledge and greater commitment than learning by reading, listening, planning or thinking".

5.5 Software Design

Although related to ball sports, Miles et al (2012) outline three vital processes in order to achieve skill acquisition and how to learn a particular sequence of movements. They are: 1) conveying information through observation, 2) providing structured contextualised practice, and 3) feedback on accuracy and timing; therefore, this will be used as the basis for the overall design of the iIP Software. Several features have been incorporated within the design of the iIP Software in order to enhance the learning experience and ensure learning takes place.

The literature review demonstrates each of the five daily Islamic prayers consists of a different number of units, which all use two units as a marker within the prayer. As the focus for the iIP Software is to ensure users are performing the prayer movements correctly and in the correct order, it takes into consideration the two units marker and ensures users are able to perform these accordingly. The goal of the software is for users to complete one unit of prayer using the interactive software, which tracks specific movements and ensures they are completing the components correctly.

5.5.1 Islamic Prayer Process

Within the design of the iIP Software, there are certain aspects of the actual prayer process that need to be addressed. These include how the prayer is performed, the names for each prayer movement, what statements are made during each movement, the prayer times for each of the five main prayers and how many units each prayer consists of.

Although each of the five daily Islamic prayers consists of a sequence of movements that are performed by the user, they are also made up of a different number of units. Figure 5-1 shows each specific movement that is performed in one unit of prayer. Thus, as the focus for the iIP Software is to ensure users are performing the prayer movements correctly and in the correct order, the design takes into consideration how users should complete one unit of prayer using the interactive software.

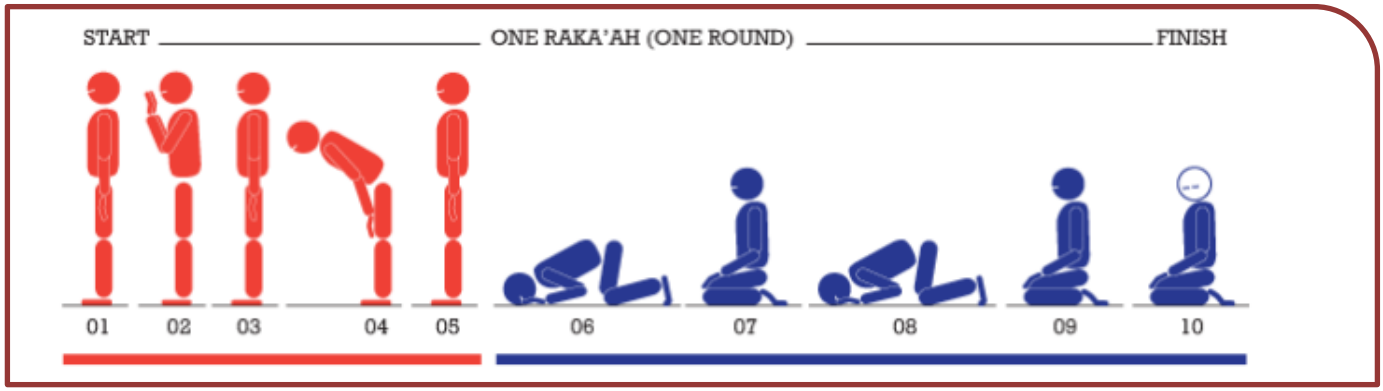


Figure 5-1: The Islamic prayer postions and levels

In addition, the statements that are made during each prayer movement are certain Arabic phrases that have been predefined within the Islamic teachings. Table 5-1 provides a list of all the various statements that are made at different stages/movements of the prayer. For the purpose of the iIP design, each statement has been assigned a statement code, which is used to identify when the statement should be made.

Statement Code	Statement
S1	"Allahu Akbar."
S2	"Surat ul Fatihah" + "any Surat "
S3	"Subhana Rabbiyal Adhim."
S4	"Sami'Allahu liman hamidah" + "Rabbana wlaka alhamd."
S5	"Subhana Rabbiyal A'la."
S6	"Rabbighfir li."
S7	"Assalamu alaikum wa rahmatullah"

T1	"At-Tahiyyatu lillahi was- Salawatu wat-Tayyibatu. As-Salamu ' alaika ayyuhannabiyyu wa rahmatullahi wa barakatuhu. Assalamu 'alaina wa'ala ibadil-Lahis -Salihin ash hadu al-La ilaha il-Lal lahu wa ash hadu anna Muhammadan abduhu wa rasuluhu."
T2	"Allahumma salli 'ala Muhammadin Wa 'ala ali Muhammadin Kama sallaita 'ala Ibrahima wa 'ala ali Ibrahima wa barik 'ala Muhammadin wa 'ala ali Muhammadin Kama barakta ' ala Ibrahima Wa ' ala ali Ibrahima Fil a'lamina Innaka hamidun Majid."

Table 5-1: A transliteration of the Arabic statements used during the movements of the prayer

After having the list of statements that will be uttered within the prayer, Table 5-2 demonstrates the actual correlation between the movement and the statements by illustrating the prayer position name, a visual representation of this position and which statement is uttered at that particular time (using the statement code from Table 5-1).

	Prayer Position name	Visual image of the prayer position	Statement Code
01	**Qiyaam** (stand upright facing the dircation of **ALKa'bah**)		
02	Takbeer Al-ihraam (Entering the prayer)		**S1**

03	Place your right hand on top of your left hand		**S2 , S1**
04	Rukoo (bowing)		**S3**
05	Stand up from the bowing position		**S4 , S1**
06	Sujood (prostration)		**S5 , S1**
07	Al-Jaloos (sitting)		**S6 , S1**
08	Sujood position		**S5 , S1**

09	Al-Jaloos (sitting) , Tashahhud		**T1 ,T2**
10	Tasleem (closing the prayer)		**S7**

Table 5-2: Statement codes assigned to their prayer movement

In relation to the number of units (Arabic: Rak'ah) within each prayer, there are three types of Rak'ah that correspond to the prayer movements that are outlined in Figure 5-1. These types of Rrak'ah are represented using a key in Table 5-3. For instance, Rak'ah #1 indicates the user will perform the sequential movements from 1-8 and upon completion of this, it means this unit of prayer complete.

	Units (Arabic: Rak'ah) Types	**Code**
1	Rak'ah #1 (Level 1-8)	
2	Rak'ah #2 (Level 1-9)	
3	Rak'ah #3 (Level 1-10)	

Table 5-3: The Rak'ah in relation to the prayer movements

In each of the five daily prayers, the timings and number of rak'ah for each prayer differs. Table 4-4 describes the prayer names in Arabic and the time period when each prayer is to be performed. Furthermore, the key that has been defined in Table 5-3 is also used to describe the number of rak'ah in each of these prayers.

Prayer Name	Prayer times	Number of units (Rak'ah)
Fajr	**One hour before Sunrise – Sunrise**	
Duhr	**Noon - Evening**	
Aser	**Evening - Sunset**	
Magreb	**Sunset - Night**	
Isha	**Night - Fajr**	

Table 5-4: Prayer names with their times and units

After defining and establishing how and when each prayer movement, statement and units are performed, Figures 5-2 – 5-6 provide a specific breakdown of how each of the five daily prayers are to be performed. A working example of this will be given, however for the sake of brevity; only the Dhuhr prayer will be shown.

The Dhuhr prayer begins with Rakah #1 (Table 5-3), which corresponds to the movements of 1-8 (Figure 5-1). In each movement, certain statements are made that correspond to the statement

codes in Table 5-1. Upon completing movement 8, the user then goes to Rak'ah #2 (Table 5-3) and performs movements 1-9 (Figure 5-1) with the assigned statements. Upon completion of movement 9, the user makes the statement T1 (Table 5-1), and then goes to Rakah #1 (Table 5-3) and performs it as before. Lastly, the user completes Rakah #3 (Table 5-3), where they complete all the movements from 1-10 (Figure 5-1). The final movement (and statement code **S7**) is used to end the prayer. It should be noted that each Rak'ah refers to the prayer in an ordinal sequence, which means the Dhuhr prayer is made up of 4 units.

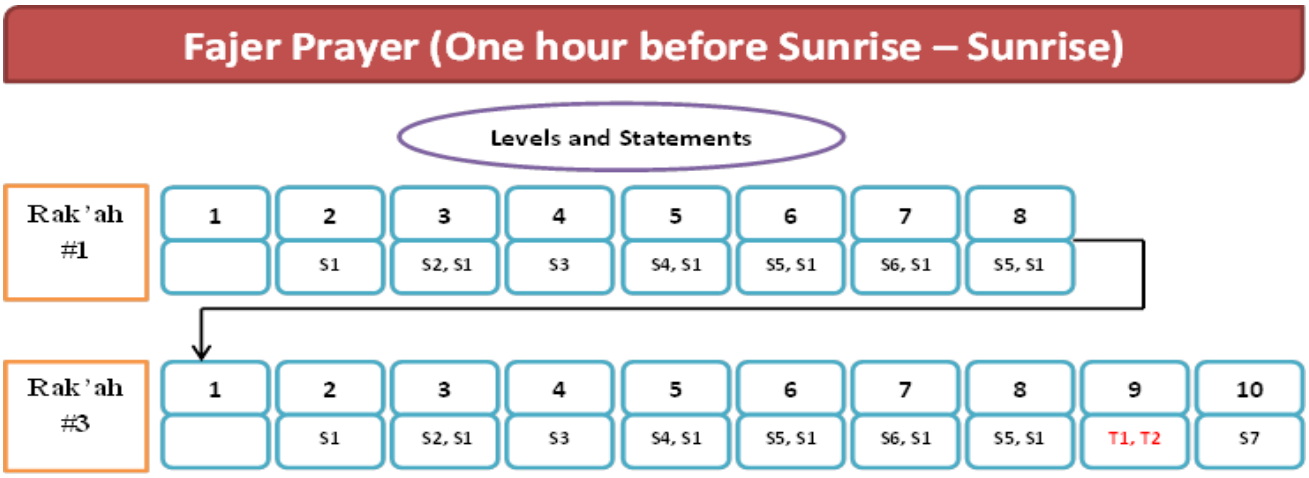


Figure 5-2: Sequence of movements and units for the Fajr Prayer

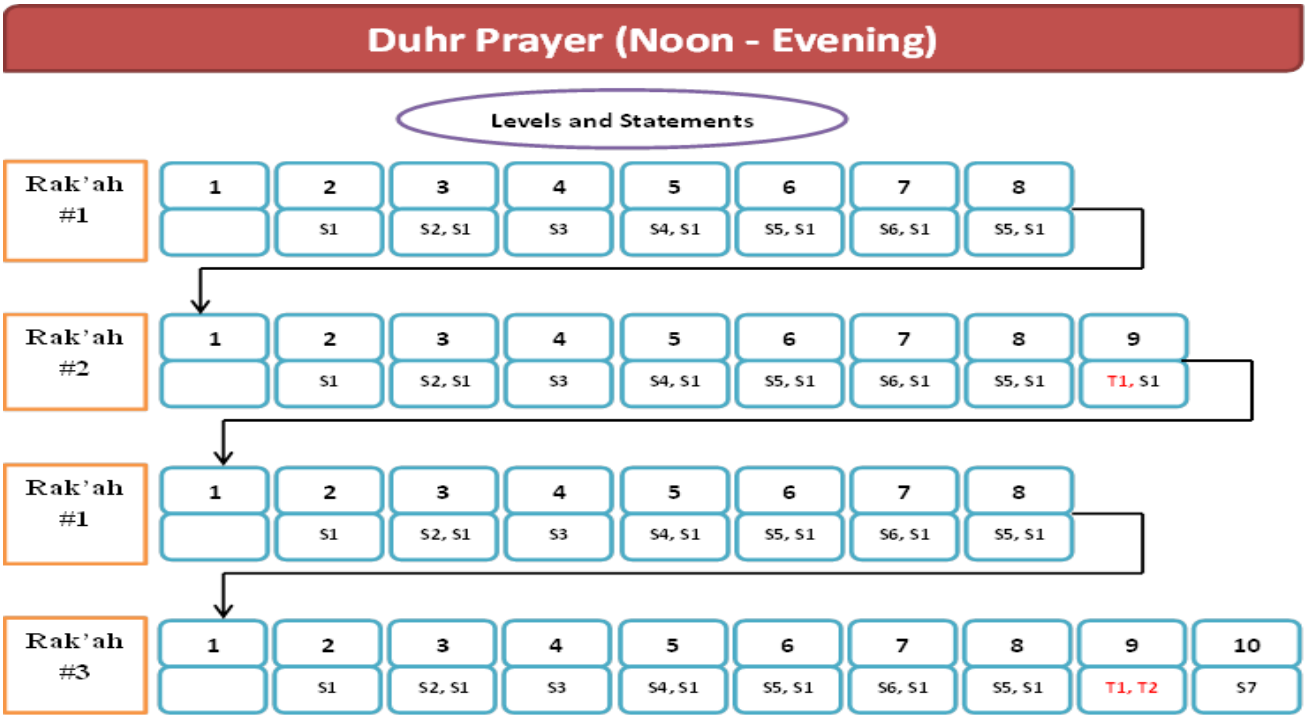


Figure 5-3: Sequence of movements and units for the Dhuhr Prayer

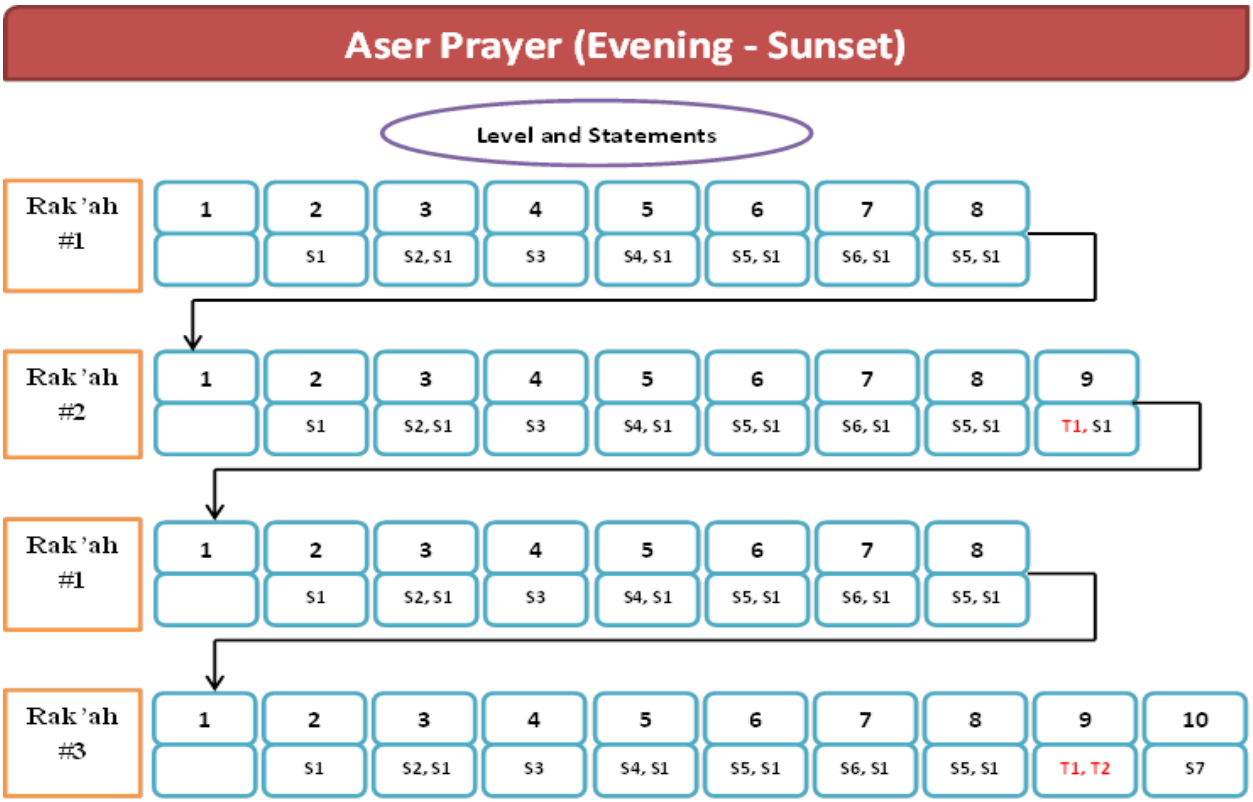


Figure 5-4: Sequence of movements and units for the Asr Prayer

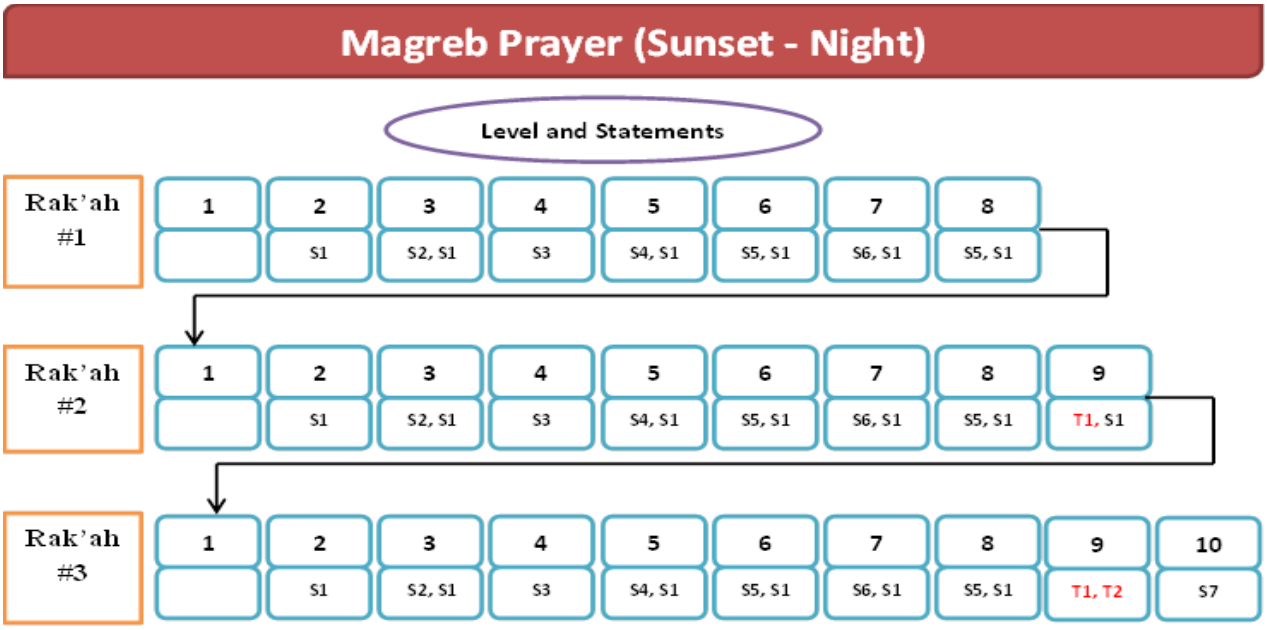


Figure 5-5: Sequence of movements and units for the Maghrib Prayer

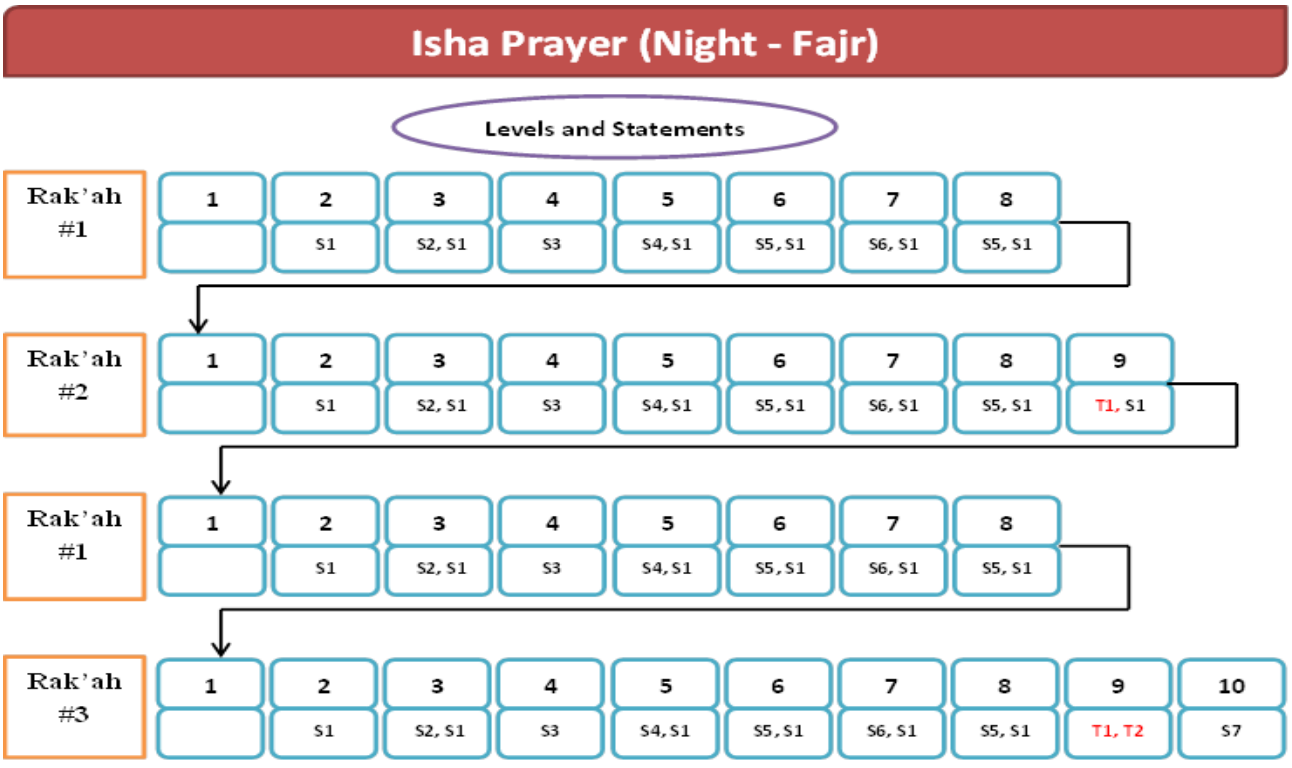


Figure 5-6: Sequence of movements and units for the Isha Prayer

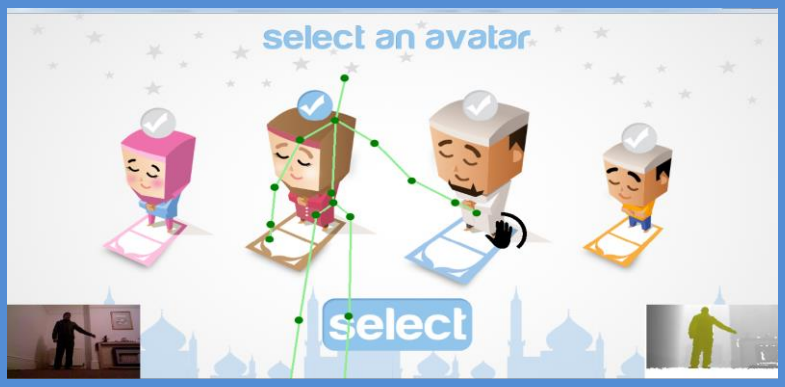
5.5.2 iIP Storyboard

Utilising the design elements of the prayer process, a storyboard was developed. The storyboard has 3 Screens, Start, Main and Congratulations. Within the Main Screen there are 10 levels which show the development prayer positions as specified in section 4.5

Start Screen

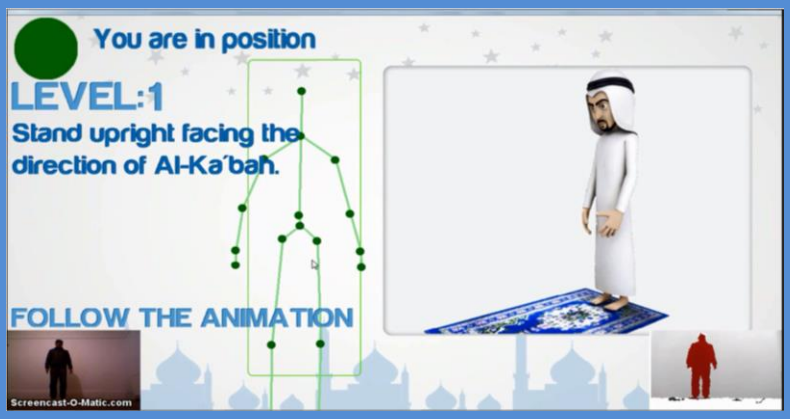
Users begin with the start screen to enter the training software. The user must place and keep their right hand over the "Start" button for approximately 3-5 seconds until the loading bar is complete.

The Main Screen



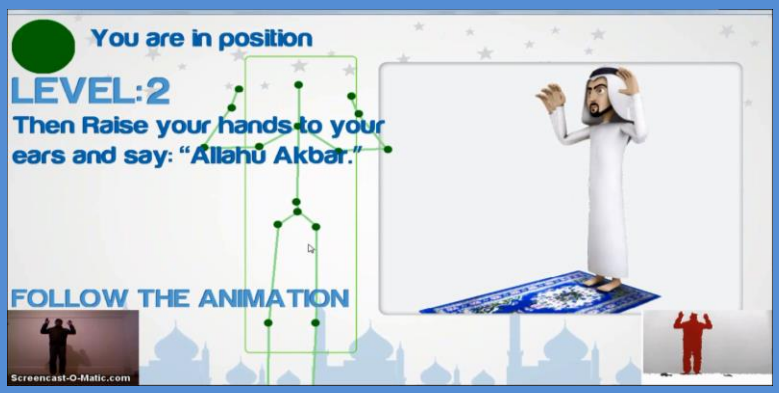
The main screen introduces the user to the iIP where learners can first choose their instructional avatar. They do so by placing and keeping their right hand over the character until the loading bar has completed.

Level 1



Level 1 is the first position of the Islamic prayer, where the user must stand upright. The user is given instructions on what to do, as well as watching their instructional avatar.

Level 2



Level 2 is the second movement of the prayer – the user must raise their hands to their ears to enter the prayer.

Level 3

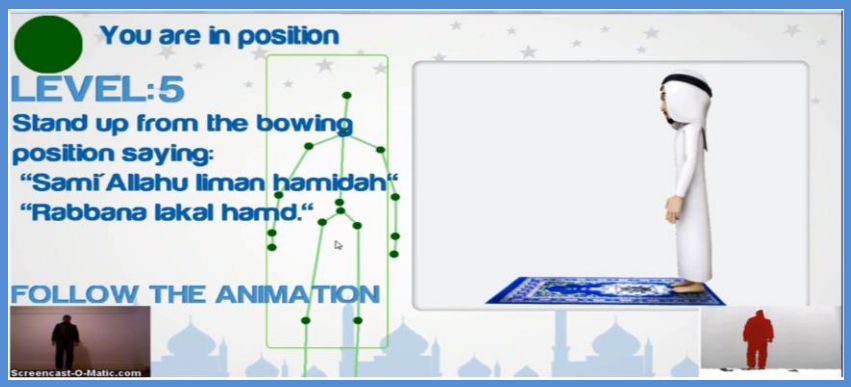
Level 3 is the third movement of the prayer – placing the hands on the chest.

It should be noted that the instructions inform the learner where they must look or what they must read, however the software will not pick up on these particular aspects.

Level 4

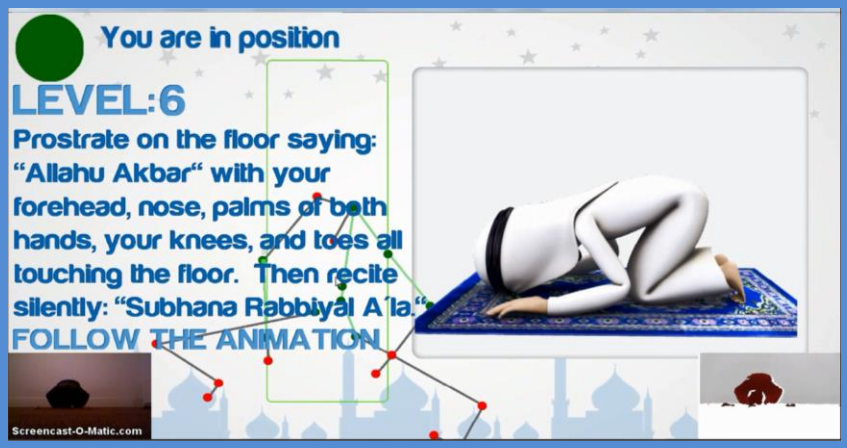
Level 4 is the bowing position of the prayer.

Level 5



Level 5 is rising up from the bowing position.

Level 6



Level 6 is the prostration of the prayer. It should be noted that the software does not identify whether the forehead, nose or toes are touching the ground (these are essential body parts that need to touch the ground).

Level 7

Level 7 is the movement upon rising from the prostration.

Level 8

Level 8 is identical to Level 6, which is another prostration. Upon completing this movement, the software informs the learner that they have completed one unit of the prayer.

Level 9

Level 9 is the penultimate movement of the prayer. It informs the learner what they must say during the sitting position.

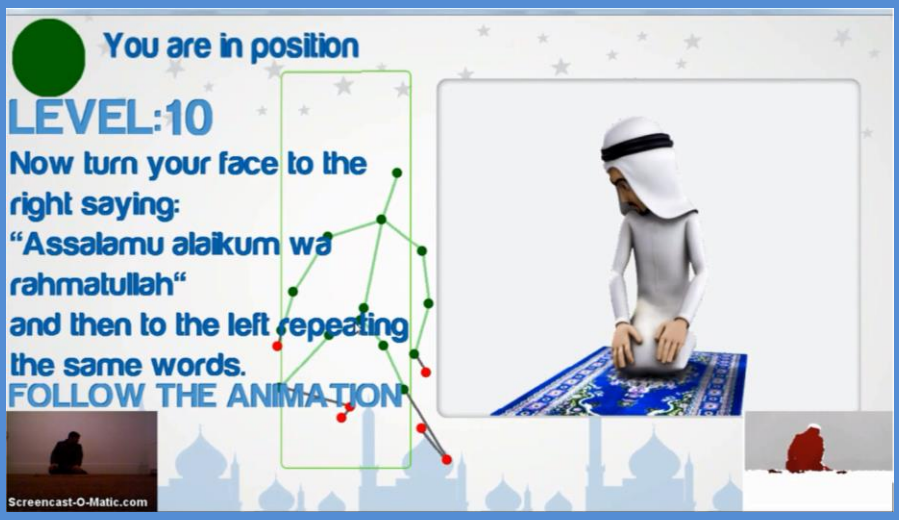
Level 10
 Level 10 is the final movement that concludes the prayer.
Congratulation Screen
 The final screen indicates to the learner that they have successfully completed the prayer.

Table 5-5: The iIP Story Board

5.6 User Interface Components

As highlighted in the storyboard, the Level stages are the main part of the software. From a GUI perspective, they maintain the same format and layout. Figure 4-7 demonstrates key components of the GUI for the Level screens:

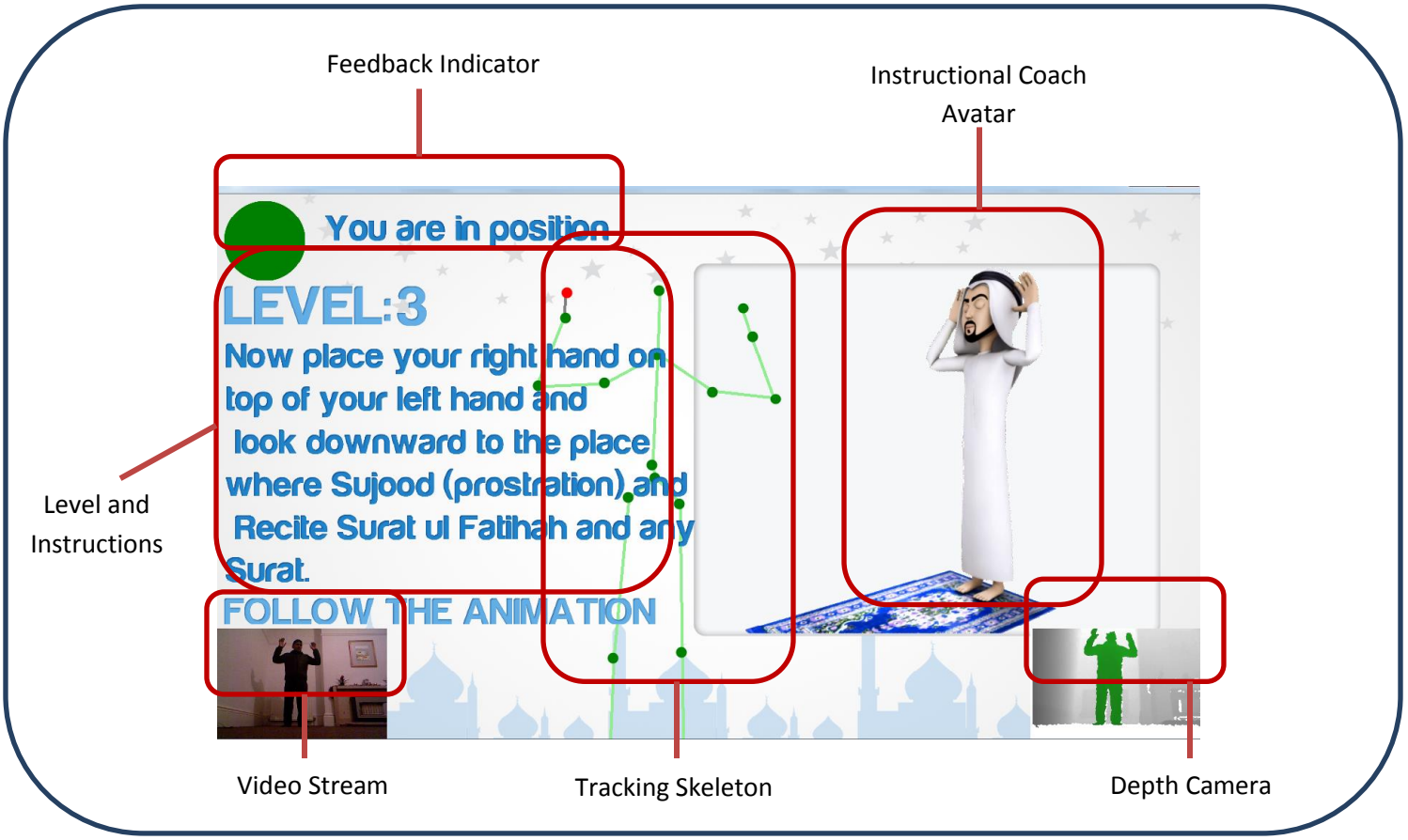


Figure 5-7: Main components of the GUI for the Level screens

5.6.1 Instructional Coach Avatar

To aid the users in how to perform the various prayer components correctly, an instructional avatar is positioned on the screen throughout the Level screen from the beginning to the end of the prayer (Figure 5-7). In the Main Screen, a selection of avatars has been designed, so user has the option to select their preference. The choices have been designed to suit all audiences including younger or older males/females. Similar to the design used in Charbonneau, Miller and LaViola Jr (2011), the procedure for each specific movement of the prayer will be achieved by splitting the display screen into two halves; one showing a detailed instructional tutorial video of

the desired movement. The other half will be the user's avatar that will track and display the movements of the user. The goal will be for the participant to follow and complete the movement as shown on the instructional tutorial. Utilising the constructivism approach, the participant will continue to build upon previous knowledge and movements until the whole prayer is complete. This makes the user feel that they are a part of the software, which in turn elevates their learning experience. Moreover, this is in line with Nielsen's (2012) explanation pertaining to usability as the coach avatar will help in terms of learnability and memorability by making the task easy to perform and help the learner to remember what they need to do, even if they forget. The remaining screens show the movements that the users will be instructed to complete in order to complete one unit of prayer.

5.6.2 Level and Instructions

Upon selection, the instructional avatar will then begin to perform the prayer movements. The user can also read the instructions, which reinforces the visual aid from the avatar. The instructions are both clear and concise for easy comprehension amongst the users. Moreover, the Arabic phrases that are used throughout the prayer have been transliterated for English speaking audiences in case they are unfamiliar with Arabic.

5.6.3 Video Stream

In order to aid the user in assessing whether they are performing the movements appropriately and accurately, the iIP Software uses two specific means for tracking. The first means is the video stream is a real-time camera built-in on the hardware that projects the users' actions, while the second is from the tracking skeleton (see figure 5-7). From an HCI perspective, the former enables the users to apply the camera like a mirror, which shows them exactly what they are doing and whether they are mimicking the interactional avatar correctly.

5.6.4 Tracking Skeleton

The tracking skeleton provides a deeper insight for the user, as it pinpoints all the relevant joints of the user (Figure 5-8). As shown in the diagram, each of the labelled joints are recognised and found by the hardware. This means that whatever movement the user makes, the tracking skeleton will follow. This is important during each movement, in order for the user to ascertain exactly which joints are in the correct position or not.

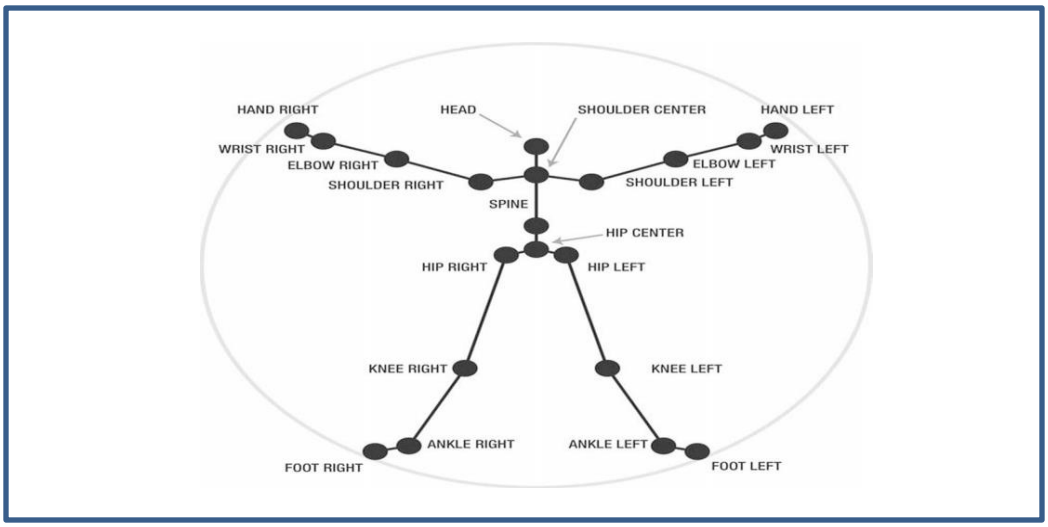


Figure 5-8: Tracking skeleton and joints

5.6.5 Feedback Indicator

Due to the nature of VE, Miles et al, (2012) illustrate not only the importance of providing feedback, but the effectiveness it offers in collating and analysing data on user performance. Furthermore, Eaves et al's (2011) investigation on using VE for motor skills in dance, found feedback drew the participants' attention to specific actions that were required to be learnt. In terms of formative assessment, this will occur in real-time when the participant attempts to perform each prayer component. The participant will receive immediate feedback, whereby the software will inform them if they have succeeded in the movement, focusing attention on accuracy and timings. This is done through the use of visual and auditory aids, in the form of a green or red light in the corner of the screen and a sound to indicate the movement has been performed correctly (Figure 5-9). Furthermore, if the participant has not fulfilled the appropriate requirements, the program will ask them to repeat the movement; hence, it will not continue until the user has completed each task accordingly. Miles et al (2012) refer to this as guidance and informative feedback, which guides users to the correct body movement and provides statistical information on performance respectively. Kelly et al (2010) also used informative feedback in VE in a difference context, namely for training and improving golf swings. The design was similar to that mentioned above, whereby a "coach" avatar displayed guided movements that the user could mimic and compare.

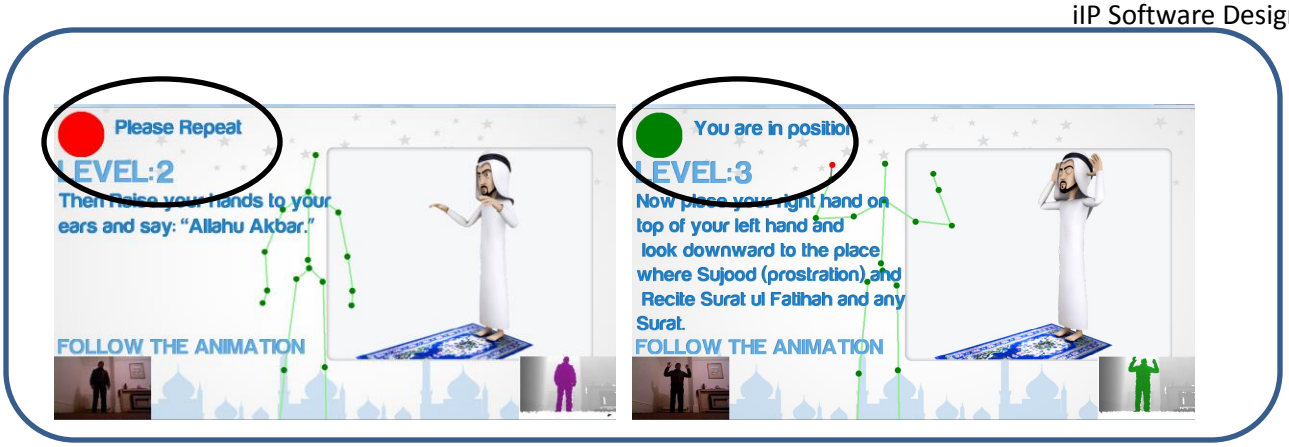


Figure 5-9: Red and Green indicator (and caption)

Moreover, if a joint is not recognized or is in an incorrect position, it will turn red to notify the user. This can however be a limitation of the software, because it occurs when joints overlap one another or are interconnected, which are necessary during the prayer (i.e. placing the hands on the knees or placing one hand over the other).

5.7 Limitations with the iIP Software

Throughout the design and develop stages of the iIP Software, there have been various limitations and issues that have emerged. It is important therefore to highlight what these limitations are and how they have been overcome. They are as follows:

Arabic Language: An integral part of the Islamic prayer is to perform the prayer in Arabic. This comprises of reading certain passages from the Holy Qur'an and uttering key phrases before changing to a different position of the prayer (i.e. saying "Allahu Akbar" when moving from the standing to bowing position). It is therefore important to measure and assess whether these phrases are said correctly and accordingly. However, as stated on the Microsoft website, the Kinect Software does not recognize or support the Arabic language. This has a considerable impact on the implementation of the prayer as voice recognition is not implemented and thus, voice interaction cannot be monitored. Although this is a serious limitation of the hardware and an important aspect of the prayer, a work-around that has been suggested whereby the Software will state when to say the Arabic phrases, and the teacher will monitor whether this is said correctly or not.

Finger/hand placement recognition: The Islamic prayer requires certain actions where the placement of finger and hands are necessary (i.e. during the standing of the prayer, the right hand

should be placed over the left hand and during the sitting position, the index finger should be pointing straight). Again, this will require teacher observation, but also the animation and written instructions will be given on the screen.

5.8 Summary

This chapter summarises the overall design of the iIP Software. Moreover, when analyzing the specific objectives that the software must achieve, a focus on the various aspects of the iIP Software was presented in detail. These specific features also highlight how the software ensures the Human-Computer Interaction is kept at the forefront of the design.

Chapter 6 Analysis and Results

6.1 Introduction

This chapter provides an analysis of the results that were made from the participants' interaction and involvement in a case study. The case study was small scale based on 30 students all from the same school in Saudi Arabia. It is acknowledge that the result may be limited because of this small scale study. The data from both the students and teachers is extracted, which consists of the Pre-Test information from the Demographic Questionnaire and The Pre-Test, as well as a specific focus on the Post-Test data. The Post-Test data provides a detailed analysis of how each of the participant groups found the different approaches in relation to the six areas of interest that were outlined in Chapter 5. Finally, the results from the Final Questionnaire are presented, where the participants rank the three approaches and inform the study which of these approaches is best for learning and teaching.

6.2 Students

There were 30 students divided into 3 groups of 10 students each (Table 6-1). Chapter 3 explains that each of the three experiments was conducted in three separate groups (A, B, C) and that each group experienced a different teaching approach as their first experiment. This meant they all had a different first experience with a particular teaching approach, as this was in line with the within subject design methodology.

	Week 1	Week 2	Week 3
Group A (n=10)	Prayer Book	Prayer Video	iIP Software
Group B (n=10)	Prayer Video	iIP Software	Prayer Book
Group C (n=10)	iIP Software	Prayer Book	Prayer Video

Table 6-1: Experiment outline with the participants

6.2.1 Students' Demographic Questionnaire Results

The Demographic Questionnaire was given to the 30 students before the experiments were conducted, determining certain information about the participants' background and knowledge concerning the Islamic Prayer (Appendix C).

The first question asked the participants whether they knew how to pray (Figure 6-1) from the results, it showed that the majority felt they had a good grasp of how to pray, with 87% of them answering this in the affirmative.

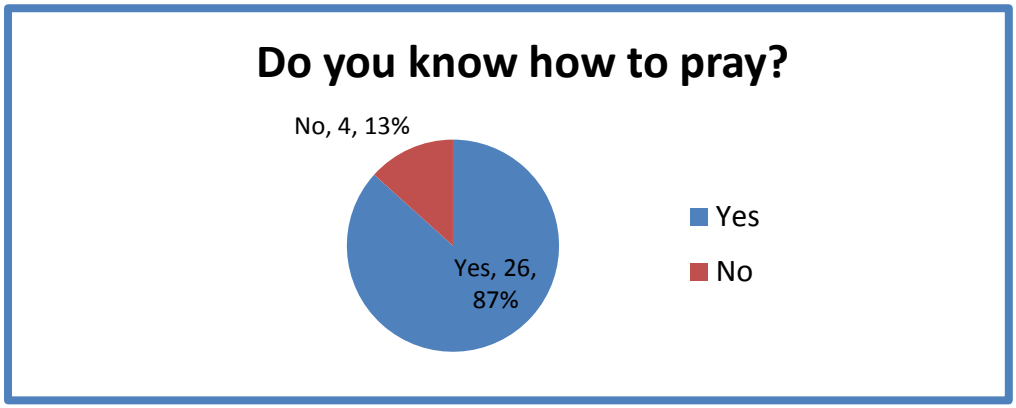


Figure 6-1: Do you know how to pray.

The next question provided a follow-on question to the first one, by asking the participants where they learnt how to pray. The students could choose as many of the options as necessary. The largest number of them stated they learnt the prayer from their parents (26%), followed by those who learnt the prayer within the schooling and educational environment (i.e. school and teacher, both at 12% respectively). The next highest group learnt the prayer from their local Mosque, whereas a small number of them learnt the prayer from videos, Internet, books and friends. This highlights that the participants chose to take their knowledge of the prayer from figures of authority, such as parents, teachers and imams.

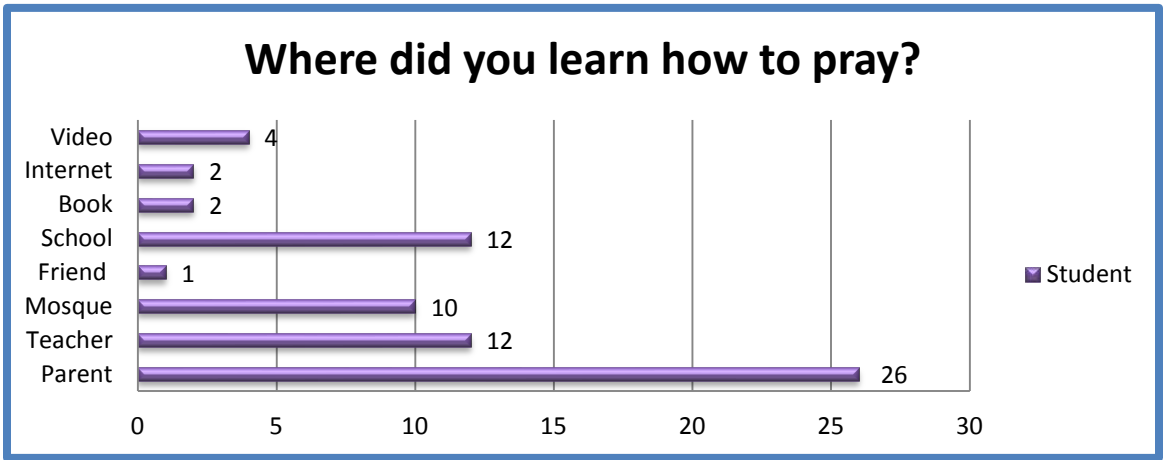


Figure 6-2: Where did you learn how to pray.

In relation to the previous question, the next question that was posed explored which method the participants felt would be the best way to learn the prayer (Figure 6-3). Similar to the previous question, the majority of the participants stated this was by listening to their parents or teacher, whilst the next highest stated they preferred to learn the prayer by immersing themselves into it and actually doing it. This also shows that the participants prefer to be taught how to pray, rather than self-studying, by directly interacting with someone of authority and following their lead. The learning by doing method is regarded as an important method amongst the learners as it enables them to grasp a better understanding of how to pray.

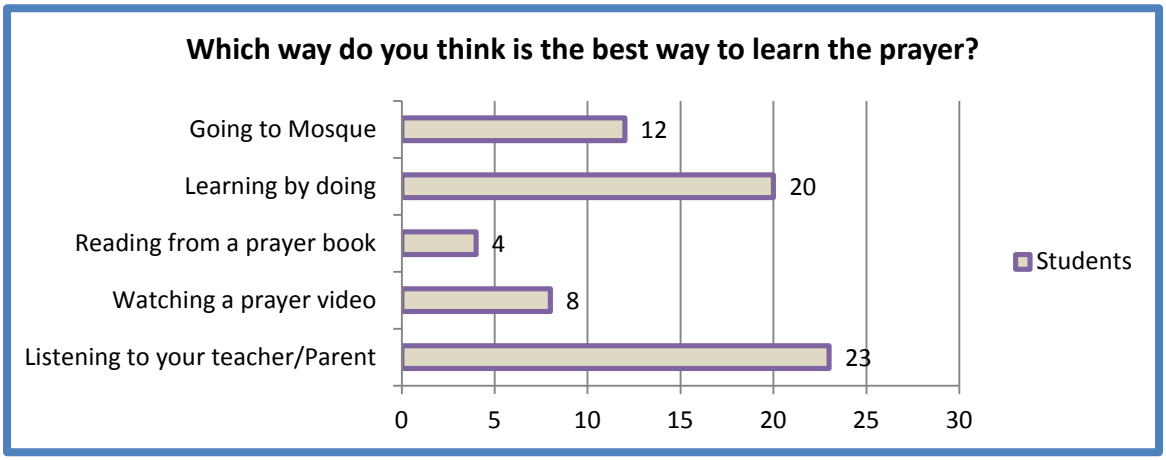


Figure 6-3: Which way do you think is the way to learn the prayer.

The subsequent questions moved on more towards the students' attitude towards the prayer, focusing on whether they actually liked to pray or not. The majority of the participants stated that not only did they pray, but they also prayed 5 times a day (figures 6-4).

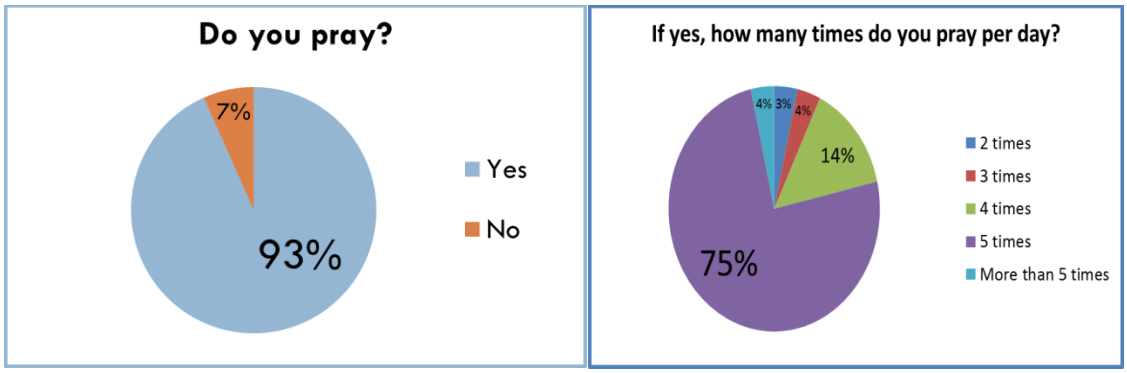


Figure 6-4: Do you pray?

When they were asked whether they enjoyed praying, again the majority 93% (Figure 6-5) stated that they did, highlighting that they are inclined towards performing the prayer and will do so when they it is time to pray throughout the day.

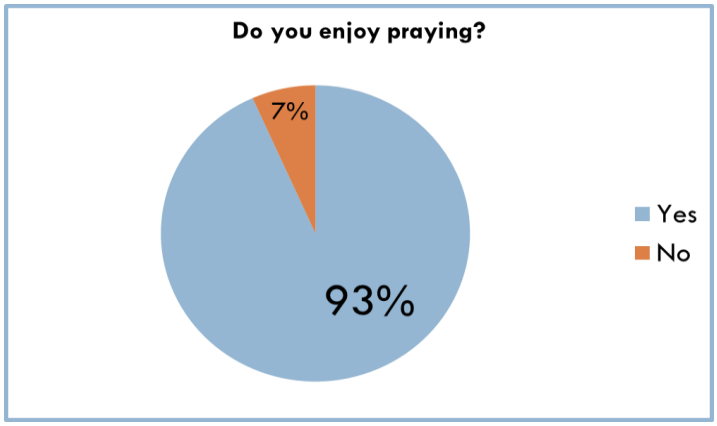


Figure 6-5: Do you enjoy praying.

A final question posed to the participants was whether they knew the positions of the prayer. This question allowed the researcher to evaluate the participants' own perception of how well they understood the prayer and whether they felt they were confident in knowing what the positions were. As a result, 77% (Figure 6-6) of the participants stated that they did know the positions.

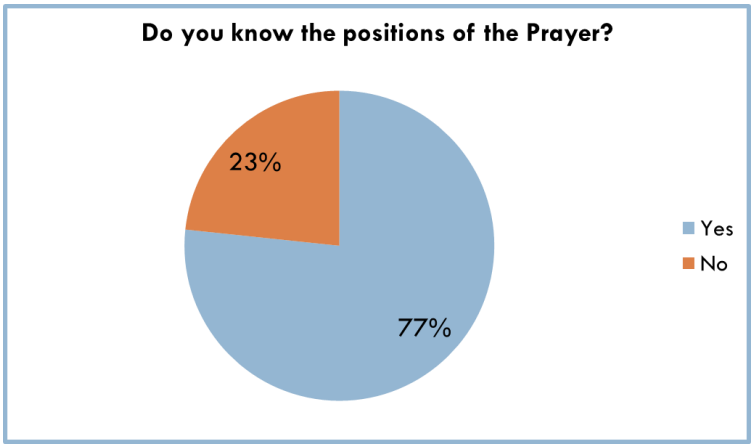


Figure 6-6: Do you know the positions of the Prayer.

6.2.2 Students' Pre-Test

The Pre-Test (Appendix C) was set of 10 questions was given to the students in order to assess their knowledge of the Islamic Prayer. Similar to the demographic questionnaire, the Pre-Test was given to each group prior to the experiment. Figure 6-7 indicates that the majority of the students did not know the names of the prayer positions (28%, 32%, 30%) did for Groups A, B

and C respectively. This means that, although they felt they had an understanding of the prayer from the demographic questionnaire, in reality, the Pre-Test shows this was not necessarily the case, specifically in terms of knowing the actual names of each of the prayer positions. One can further postulate that the methods they have used to learn the prayer have not necessarily been effective in helping them to identify the names of the prayer movements and positions.

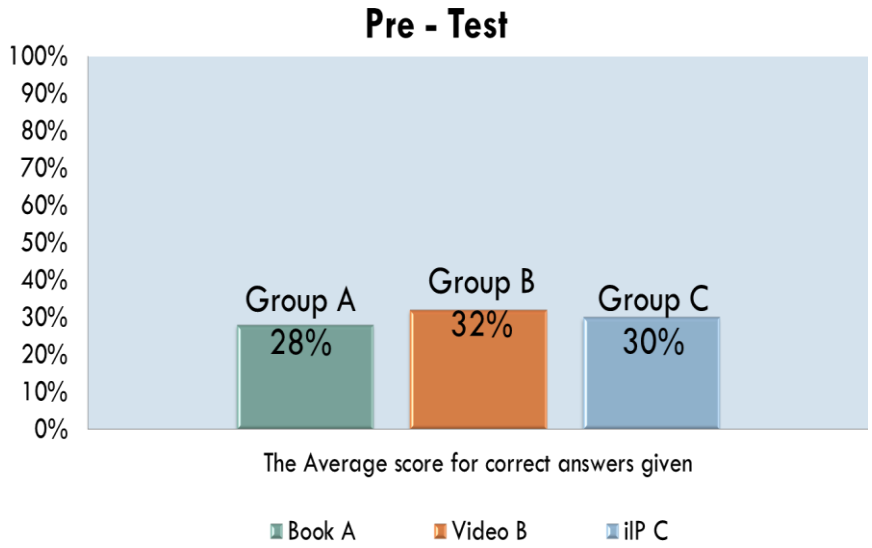


Figure 6-7: Pre-Test

6.2.3 Students' Observations during the Experiments

Throughout the experiments, certain observations made by the researcher to provide a different perspective on their overall interaction and perceptions towards the various teaching approaches.

Prayer Book:

During the traditional approach with the Prayer Book, all the students were given a copy of the Islamic Book for prayer. The teacher then asked them to follow his instructions, which was by going through the Book. In addition, the teacher pointed out certain pictures of the prayer movements, as well as the conditions and pillars that are necessary for the prayer to be valid. Whilst observing the class, it was noticed that the session was predominantly a behaviourist style of teaching, wherein the information transfer was one way from the teacher to the student. In addition, the teacher would simply go through the Book and not engage directly with the students except for the end of the session where they asked one of the students to stand up at the front of the class and make them go through the actions. As a result, there was very little interaction

between the students and the teacher and this was visibly shown by the students who seemed very bored and would occasionally yawn during the session.

Prayer Video

During the session that used the Prayer Video, the teacher first started the session by giving the students a piece of paper and a pen. They then informed them that they were going to watch a Video on the prayer and if they wanted to make notes they could do so. The teacher asked if there were any questions from the class and then proceeded to play the video.

The Video was approximately ten minutes long and during this time, many of the students were observed as not paying attention to the Video as they would start to draw/doodle on their paper. Once the Video was finished, the teacher began to quiz the students on what they had seen, particularly asking them about certain positions of the pray and what they should say during each position. The questions that were used were predominantly closed questions and only a few of the students per group would get involved in answering them. It was also observed that there was no practical example in the classroom for the students to perform. This may have been because there was a Video for the students to see.

Once the teacher had completed their questions, they then played the video again for them to watch and informed them that if they had any further questions, they could raise their hands after the Video - no-one raised their hands and many of them were seen not paying attention to the Video.

iIP Software

During the iIP session, the teacher first started by introducing the Kinect software. The teacher then informed the class that they would be learning the prayer using this software and asked them to form a queue. Once in a queue, the students were asked to stand on the place marker one at a time and then each student went through the software. The observations that were made during this session were that all the students looked extremely excited to use the iIP Software. It came across as having quite a novelty factor for them as they were intrigued by its use and more so because they had never seen a games console being used in the classroom setting. During the session, they were extremely pleased when using the software and there was a sense of achievement once they finished the prayer. Moreover, even for those that were standing in the

queue and watching the students interacting with the software, they would also be learning from one another and learning from the mistakes of others. This was evident because whenever a person made a particular mistake, those in the queue would physically act out and orally explain what the participant needed to do to make this movement correct. Additionally, many of the later students were observed as making little or no mistakes, which could be due to them learning from previous students.

6.2.4 Students' Post-Test

The Post-Test was a repeat of the Pre-Test but conducted **after** the first use Prayer Book, Prayer Video or iIP in week. The data showed:

- There was an increase in all Post-Tests Scores (Figure 6-8).
- For Book Group A, the average score for the 10 students in the Pre-Test was 2.8, whereas it was 6.0 in the Post-Test.
- For Video Group B, the average score for the 10 students in the Pre-Test was 3.2 whereas it was 6.2 in the Post-Test.
- For iIP, the average score for correct answers given by the 10 students in the Pre-Test was 3.0, which resulted in 92% of all participants answering the questions correctly after using this approach. This increased to an average of 9.2 correct answers for this group.

This shows that the students were able to answer more questions correctly after using iIP Software.

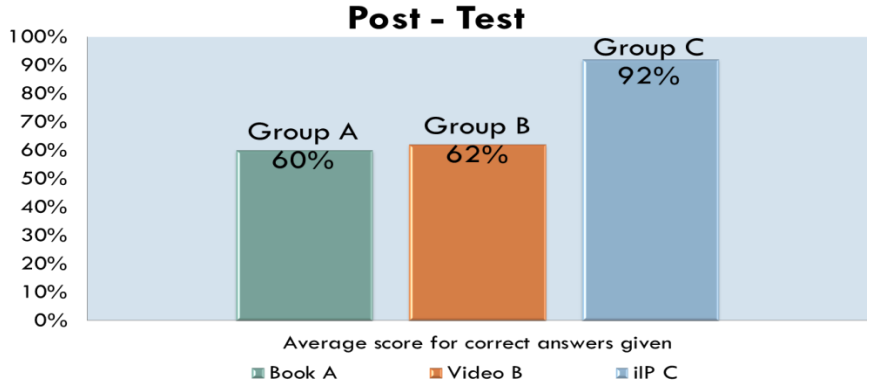


Figure 6-8: Post - Test

6.2.5 Students' Post Questionnaire

The Post-Questionnaire (Appendix C) was administered each time the participants had the opportunity to experience each approach. The format design for this Questionnaire was in accordance to the Likert scale, based on a range of 1 to 4 (Figure 6-9). In addition, as the students were of primary school age, the use of emoticons and support from the researcher helped them understand the questions.

Figure 6-9: The Likert scale

The results for the three teaching methods were compared and analysed in relation to the following dependent variables:

1. Comprehension
2. Learning experience
3. Interaction
4. Satisfaction
5. Usability
6. Achievement

These six areas were the entire focus of the Methods and evaluated how each Method did in accordance to them.

The following sections will therefore show different perspectives of the data, highlighting the participants overall perception of each specific method of teaching (i.e. how the participants in each group found the iIP Software, regardless of when they experienced it), as well as a comparison of each group in terms of their first experiences with each teaching method and an overall comparative experience once they had completed each Method.

6.2.5.1 Testing Data Normality

Before conducting any statistical analysis on the data, it is vital to conduct a normality test to ensure the data is valid. Figure 6-10 shows the tests that are conducted on the data.

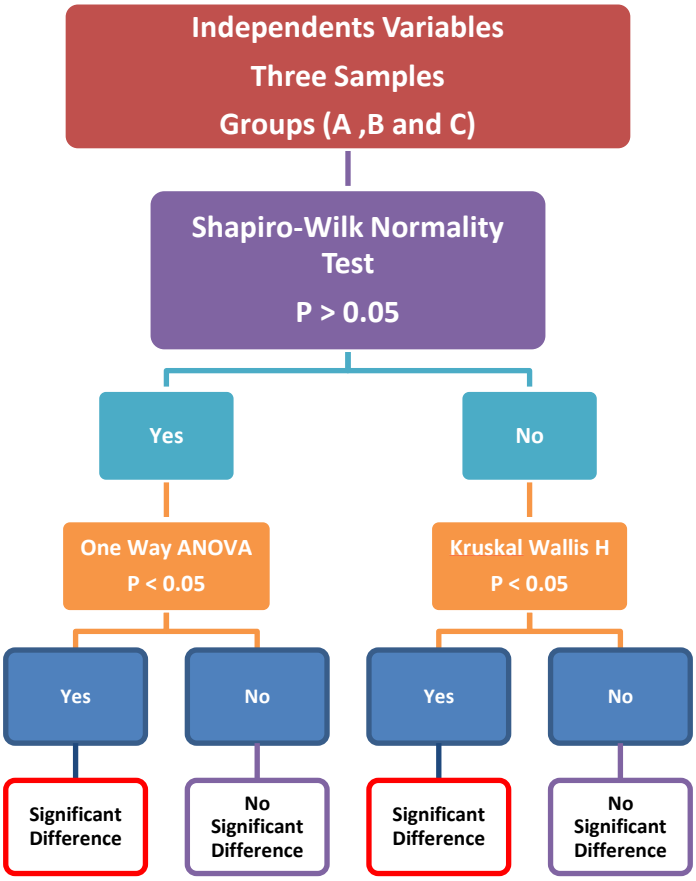


Figure 6-10: Testing Data Normality diagram

6.2.5.1.1 Normality Test for all factors in the iIP teaching method

To determine which test could be used to measure each factor for all three groups in relation to the iIP teaching Method, the *Shapiro-Wilk test* will be used. This test is typically used to test the normality of the data for small samples sizes less than 50 (Ghasemi A, Syedmoradi L, Zahediasl S, Azizi F. 2010). From this test, if the P-Value is > 0.05, it indicates a normal distribution of the data, in which case a one-way ANOVA test will be conducted.

If however, the P-Value is < 0.05, the data has deviated from a normal distribution, and therefore, a non-parametric test, the Kruskal-Wallis H test, is used. Table 6-2 shows the Tests of Normality for all the six factors per group. As evident from the results, two of the factors were not distributed normally (Interaction and Achievement), whilst the remaining factors were and subsequently, the related tests were conducted accordingly.

Tests of Normality iIP

Factors	Group	**Shapiro-Wilk**	
		df	P-Value
Comprehension	A	10	0.064
	B	10	0.098
	C	10	0.463
Learning Experience	A	10	0.521
	B	10	0.530
	C	10	0.463
Interaction	A	10	0.732
	B	10	0.024
	C	10	0.537
Satisfaction	A	10	0.234
	B	10	0.141
	C	10	0.142
Usability	A	10	0.398
	B	10	0.709
	C	10	0.287
Achievement	A	10	0.055
	B	10	0.005
	C	10	0.046

Table 6-2: The Normality Test for iIP

Kruskal-Wallis H test - iIP

As per the data above, the Kruskal-Wallis H test was used for Interaction and Achievement (Table 6-3). When using the Kruskal-Wallis H test, if the P-Value is < 0.05, there is a significant difference of the factor for the three groups. Conversely, if the P-Value is >0.05, it means there is no significant difference. As the results show, both factors were greater than 0.5, indicating there is no significant difference for interaction and achievement using iIP across all three groups.

Kruskal-Wallis H test for iIP				
Group		N	Mean Rank	P-Value
Interaction	A	10	16.25	0.940
	B	10	15.30	
	C	10	14.95	
Achievement	A	10	16.50	0.871
	B	10	15.50	
	C	10	14.50	

Table 6-3: Kruskal-Wallis H test - iIP

ANOVA Test - iIP

Similar to the Kruskal-Wallis H test, the results from the one-way ANOVA showed there was also no significant difference for the factors when using the iIP Software across the three groups (Table 6-4).

ANOVA						
Factors		Sum of Squares	df	Mean Square	F	P-Value
Comprehension	Between Groups	0.119	2	0.059	.136	0.873
	Within Groups	11.733	27	0.435		
	Total	11.852	29			
Learning Experience	Between Groups	0.007	2	0.004	.009	0.991
	Within Groups	10.678	27	0.395		
	Total	10.685	29			
Satisfaction	Between Groups	0.119	2	0.059	.258	0.775
	Within Groups	6.211	27	0.230		
	Total	6.330	29			
Usability	Between Groups	0.052	2	0.026	.111	0.896
	Within Groups	6.333	27	0.235		
	Total	6.385	29			

Table 6-4: ANOVA Test - iIP

6.2.5.1.2 Normality Test for all factors in the Book teaching method

To determine which test could be used to measure each factor for all three of the groups, in relation to the Book teaching Method, the *Shapiro-Wilk test* was used. Table 6-5 shows the Tests of Normality for all the six factors per group, which shows that two of the factors indicated normal distribution; however the remaining factors (i.e. Experience, Interaction, Satisfaction and Usability) were not normally distributed. This meant the one-way ANOVA and Kruskal-Wallis H test was conducted respectively.

Tests of Normality Book

Factors	Group	Shapiro-Wilk	
		df	P-Value
Comprehension	A	10	0.638
	B	10	0.321
	C	10	0.107
Learning Experience	A	10	0.178
	B	10	0.002
	C	10	0.108
Interaction	A	10	0.209
	B	10	0.391
	C	10	0.001
Satisfaction	A	10	0.701
	B	10	0.012
	C	10	0.055
Usability	A	10	0.226
	B	10	0.004
	C	10	0.886
Achievement	A	10	0.646
	B	10	0.172
	C	10	0.000

Table 6-5: The Normality Test for Book

Kruskal-Wallis H test – Book

As per the data above, the Kruskal-Wallis H test was used for four factors Table 6-6. The results show that the P-Value for all the factors were greater than 0.05, indicating there is no significant differences for them when using the Book teaching Method across all three groups.

Kruskal-Wallis H test for Book				
Factors	Group	N	Mean Rank	P-Value
Learning Experience	A	10	16.50	0.881
	B	10	15.40	
	C	10	14.60	
Interaction	A	10	18.75	0.285
	B	10	14.95	
	C	10	12.80	
Satisfaction	A	10	17.40	0.675
	B	10	14.15	
	C	10	14.95	
Usability	A	10	20.35	0.091
	B	10	12.65	
	C	10	13.50	

Table 6-6: Kruskal-Wallis H test – Book

ANOVA Test – Book

Similar to the Kruskal-Wallis H test, the results from the one-way ANOVA showed there was also no significant difference for the factors when using the Book across the three groups (Table 6-4).

ANOVA						
		Sum of Squares	df	Mean Square	F	P-Value.
Comprehension	Between Groups	1.474	2	.737	1.928	0.165
	Within Groups	10.322	27	.382		
	Total	11.796	29			
Achievement	Between Groups	0.817	2	.408	1.111	0.344
	Within Groups	9.925	27	.368		
	Total	10.742	29			

Table 6-7: ANOVA Test – Book

6.2.5.1.3 Normality Test for all factors in the Video teaching method

To determine which test could be used to measure each factor for all three of the groups, in relation to the Video teaching Method, the *Shapiro-Wilk test* was used. Table 6-8 shows the Tests of Normality for all the six factors per group, which shows that two of the factors (Comprehension and Achievement) were not distributed normally, while the remaining factors were. This meant the one-way Kruskal-Wallis H test and one-way ANOVA was conducted respectively.

Tests of Normality Video

Factors	Group	Shapiro-Wilk	
		df	P-Value
Comprehension	A	10	0.246
	B	10	0.011
	C	10	0.016
Learning Experience	A	10	0.398
	B	10	0.499
	C	10	0.673
Interaction	A	10	0.137
	B	10	0.282
	C	10	0.294
Satisfaction	A	10	0.240
	B	10	0.061
	C	10	0.230
Usability	A	10	0.179
	B	10	0.484
	C	10	0.082
Achievement	A	10	0.318
	B	10	0.008
	C	10	0.198

Table 6-8: The Normality Test for Video

Kruskal-Wallis H test - Video

As per the data above, the Kruskal-Wallis H test was used for Comprehension and Achievement Table 6-9. As the results show, both factors were greater than 0.05, indicating there is no significant difference for them when using Video across all three groups.

Kruskal-Wallis H test for Video				
Group		N	Mean Rank	P-Value
Comprehension	A	10	15.90	0.639
	B	10	17.10	
	C	10	13.50	
	Total	30		
Achievement	A	10	15.90	0.780
	B	10	16.60	
	C	10	14.00	
	Total	30		

Table 6-9: Kruskal-Wallis H test - Video

ANOVA Test – Video

Similar to the Kruskal-Wallis H test, the statistical data from the ANOVA test also showed there was no significant difference for the factors across the groups Table 6-10.

ANOVA for Video						
		Sum of Squares	df	Mean Square	F	P-Value
Learning Experience	Between Groups	0.585	2	0.293	0.772	0.472
	Within Groups	10.233	27	0.379		
	Total	10.819	29			
Interaction	Between Groups	0.319	2	0.159	0.256	0.776
	Within Groups	16.778	27	0.621		
	Total	17.096	29			
Satisfaction	Between Groups	0.363	2	0.181	0.303	0.741
	Within Groups	16.189	27	0.600		
	Total	16.552	29			
Usability	Between Groups	0.274	2	0.137	0.195	0.824
	Within Groups	19.000	27	0.704		
	Total	19.274	29			

Table 6-10 : ANOVA Test – Video

Once the normality tests were completed, analysis was conducted to compare the groups and teaching approaches in light of the domain factors.

6.2.5.2 Comparison of the six factors for all the teaching Methods.

This section looks at the data for each group (Group A, B, C) and compares the teaching method that they experienced accordingly, in light of the students' feedback for the six factors. The data will be presented by the group in consecutive order, and the scores that were given for each Method as they relate to the statements for a particular factor. It should be noted that by conducting this comparative experiment, it shows which of the approaches were more effective for the learner in each area.

Statement breakdown for the Comprehension per teaching method (Group A)

Table 6-11 provides a breakdown for each of the statements in the Post-Questionnaire for comprehension, as experienced by the participants in Group A. The participants in this group experienced the three learning Methods in the following order: Week 1: Prayer Book, Week 2: Prayer Video and Week 3: iIP Software.

Comprehension (Group A)

Book							
S	**Statement**	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S1	The Book makes me better understand the prayer.	F=10	2	2	5	1	2.50
S2	I know the prayer positions when using the Book.	F=10	5	3	1	1	3.20
S3	I learnt a lot about the prayer using the Book.	F=10	2	1	6	1	2.40
Video							
S	**Statement**	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S1	The Video makes me better understand the prayer.	F=10	2	2	5	1	2.50
S2	I know the prayer positions when using the Video.	F=10	5	3	1	1	2.60
S3	I learnt a lot about the prayer using the Video.	F=10	3	5	1	1	2.50
iIP							
S	**Statement**	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S1	The iIP makes me better understand the prayer.	F=10	3	5	1	1	3.00
S2	I know the prayer positions when using the iIP.	F=10	5	3	1	1	3.20
S3	I learnt a lot about the prayer using the iIP.	F=10	3	5	1	1	3.00

Table 6-11: The Comprehension statements in The Post Questionnaire in Group A

For S1, the highest mean for comprehension in Group A was a mean of 3.00 from the iIP Software, with both the Prayer Book and Prayer Video scoring a mean of 2.50. For S2, both the iIP Software and Prayer Book scored equally as the highest score with 3.20 respectively, Lastly, the highest mean for S3 was the iIP Software, which scored 3.00. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book. However, as the mean for S2 was the same for iIP Software and Prayer Book, it shows that in light of this statement, both of these Methods facilitated in giving this group a better knowledge of the prayer positions (Figure 6-11).

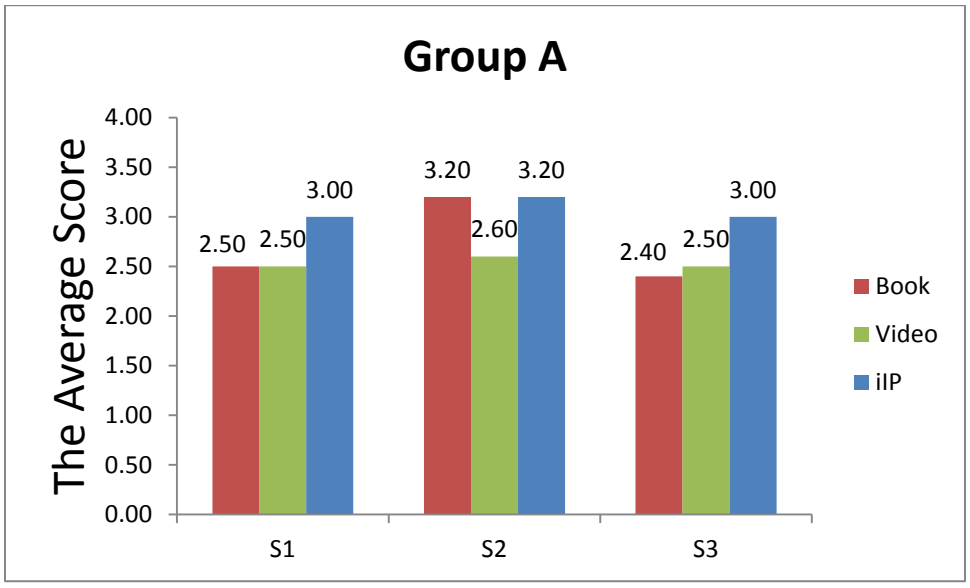


Figure 6-11: The Average Score of Comprehension in Group A

Statement breakdown for the Comprehension per teaching method (Group B)

Table 6-12 shows the results for the comprehension factor that was experienced by the participants in Group B. The participants experienced the three learning Methods in the following order: Week 1: Prayer Video, Week 2: iIP and Week 3: Prayer book

Comprehension (Group B)

Video							
S	**Statement**	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S1	The Video makes me better understand the prayer.	F=10	2	2	5	1	2.60
S2	I know the prayer positions when using the Video.	F=10	5	3	1	1	2.50
S3	I learnt a lot about the prayer using the Video.	F=10	2	1	6	1	2.60
iIP							
S	**Statement**	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S1	The iIP makes me better understand the prayer.	F=10	4	4	1	1	3.10
S2	I know the prayer positions when using the iIP.	F=10	4	4	1	1	3.10
S3	I learnt a lot about the prayer using the iIP.	F=10	3	5	1	1	3.00
Book							
S	**Statement**	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S1	The Book makes me better understand the prayer	F=10	1	1	7	1	2.20
S2	I know the prayer positions when using the Book.	F=10	1	3	5	1	2.40
S3	I learnt a lot about the prayer using the Book.	F=10	1	1	7	1	2.20

Table 6-12: The Comprehension statements in The Post Questionnaire in Group B

For S1, the highest mean for comprehension in Group B was a mean of 3.10 from the iIP Software, with the Prayer Book and prayer video scoring a mean of 2.20 and 2.60 respectively. For S2, the iIP again scored the highest with a mean of 3.10. Lastly, the highest mean for S3 was the iIP, which scored 3.00. From this analysis, it is clear that the overall mean of the iIP is higher than those for the Prayer Video and Prayer Book (Figure 6-12).

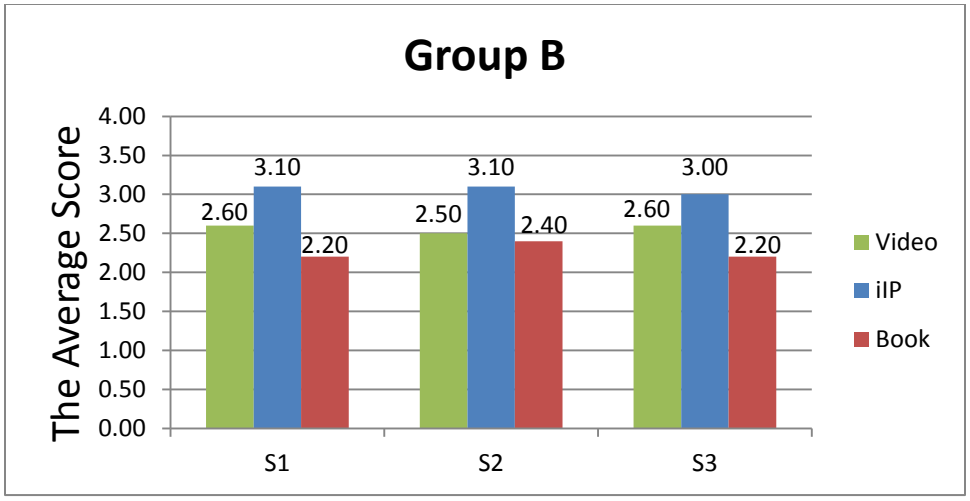


Figure 6-12 : The Average Score of Comprehension in Group B

Statement breakdown for the Comprehension per teaching method (Group C)

Table 6-13 shows the results for the Comprehension factor that was experienced by the participants in Group C. The participants experienced the three learning Methods in the following order: Week 1: iIP Software, Week 2: Prayer Book and Week 3: Prayer Video

Comprehension (Group C)

iIP							
S	**Statement**	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S1	The iIP makes me better understand the prayer.	F=10	6	2	1	1	3.30
S2	I know the prayer positions when using the iIP.	F=10	5	3	1	1	3.20
S3	I learnt a lot about the prayer using the iIP.	F=10	4	4	1	1	3.10
Book							
S	**Statement**	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S1	The Book makes me better understand the prayer.	F=10	1	1	7	1	2.20
S2	I know the prayer positions when using the Book.	F=10	1	1	7	1	2.20
S3	I learnt a lot about the prayer using the Book.	F=10	1	1	7	1	2.20
Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S1	The Video makes me better understand the prayer.	F=10	1	3	5	1	2.40
S2	I know the prayer positions when using the Video.	F=10	1	2	6	1	2.30
S3	I learnt a lot about the prayer using the Video	F=10	2	1	6	1	2.40

Table 6-13: The Comprehension statements in The Post Questionnaire in Group C

For S1, the highest mean for comprehension in Group C was a mean of 3.30 for the iIP Software, with the Prayer Book and Prayer Video scoring a mean of 2.20 and 2.40 respectively. For S2, the iIP again scored the highest with a mean of 3.20; the highest mean for S3 was the iIP, which scored 3.10, From this analysis, it is clear that the overall mean of the iIP is higher than those for the Prayer Video and Prayer Book (Figure 6-13).

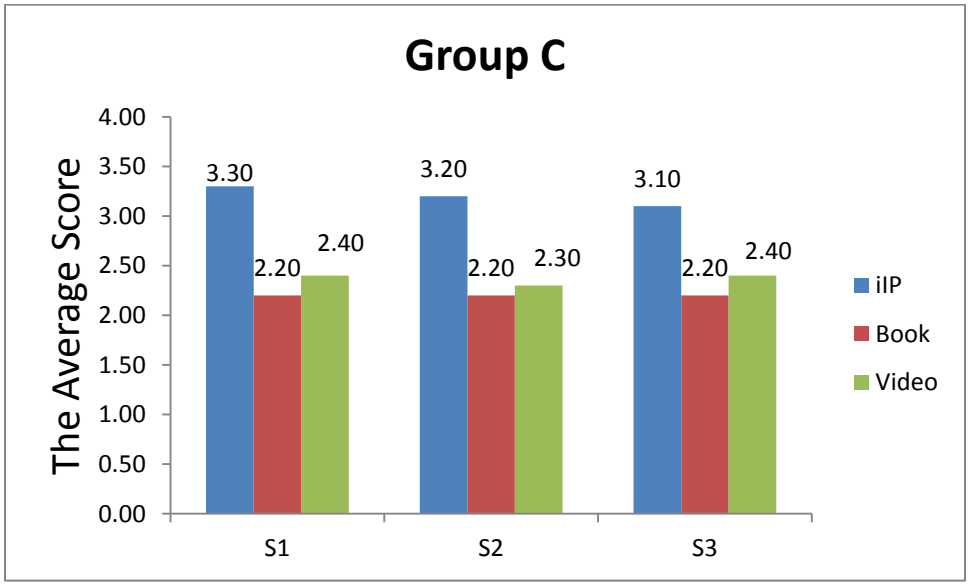


Figure 6-13: The Average Score of Comprehension in Group C

Statement breakdown for the Learning Experience factor per teaching method

Appendix A provides a breakdown for each of the statements in the Post-Questionnaire for Learning Experience factor, as given by the participants in Group A, B and C. The format follows the same layout as outlined in the Comprehension section above. The statements pertaining to Learning Experience were:

- *S4: Using the iIP Software for learning is very exciting and interesting for me*
- *S5: This method makes the classroom very relaxed and enjoyable*
- *S6: This method makes us want to learn to pray and use it more*

For S4, the highest mean for Learning Experience in Group A was a mean of 3.10 from the iIP Software, with both the Prayer Book and Prayer Video scoring a mean of 2.20 and 2.40 respectively. For S5, the Prayer Book scored higher than the other two Methods with 2.90. Finally, the highest mean for S6 was the iIP Software, which scored 3.20. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and

Prayer Book. However, as it important to note the mean of S5, which was in favour of the Prayer Book, highlighting the students felt this Method made the class more relaxed than the other methods (Figure 6-14).

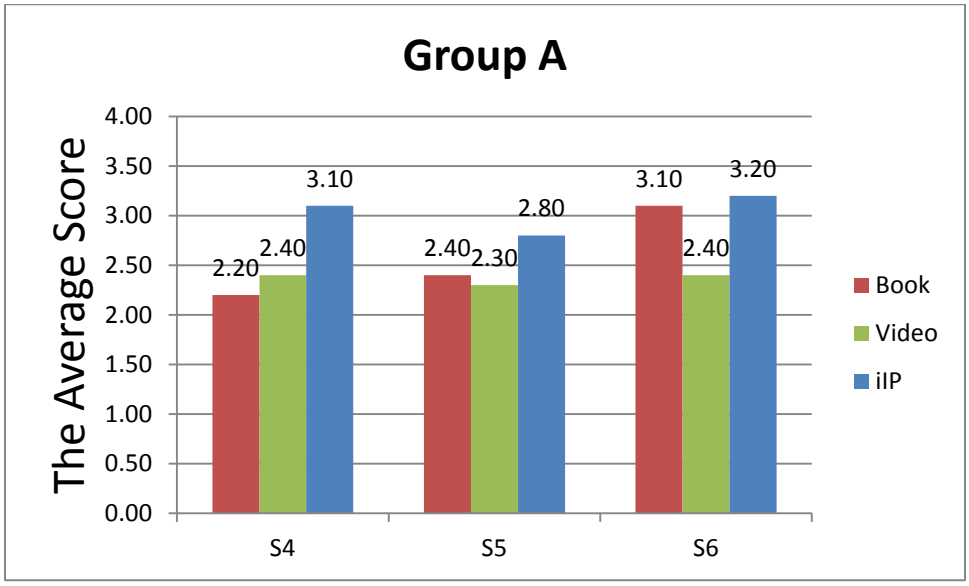


Figure 6-14 : The Average Score of Learning Experience in Group A

As for Group B, the results show the highest mean for Learning Experience for S4 was a mean of 3.00 from the iIP Software. For S5, the iIP Software again scored the highest with a mean of 3.00. The highest mean for S6 was the iIP Software, which scored 3.20. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book (Figure 6-15).

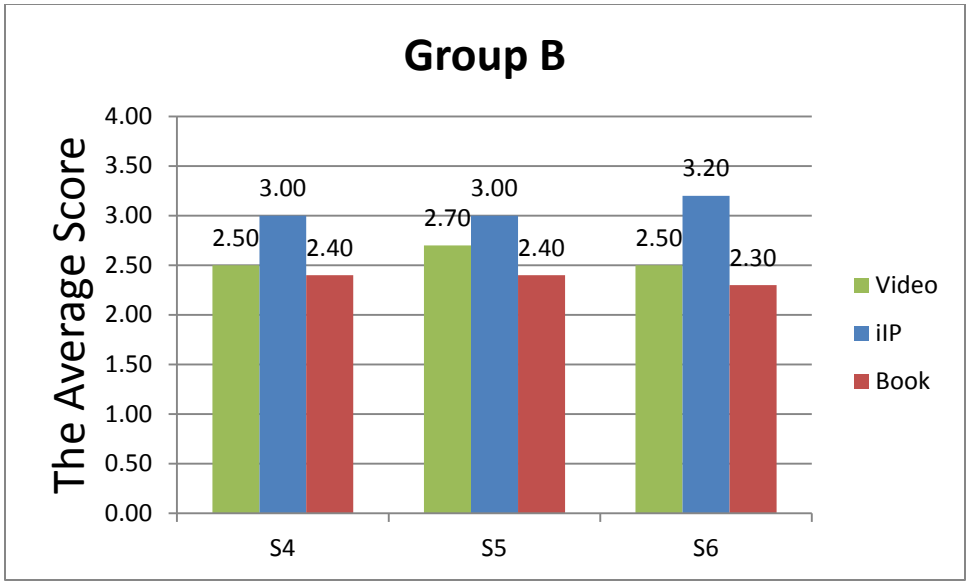


Figure 6-15: The Average Score of Learning Experience in Group B

For Group C, the results show the higher mean for Learning Experience for S4 was a mean of 3.00 from the iIP Software. For S5, the iIP Software again scored the highest with a mean of 2.90. The highest mean for S6 was the iIP Software, which scored 3.30. From this analysis, it is clear that the overall mean of the iIP is higher than those for the Prayer Video and Prayer Book (Figure 6-16).

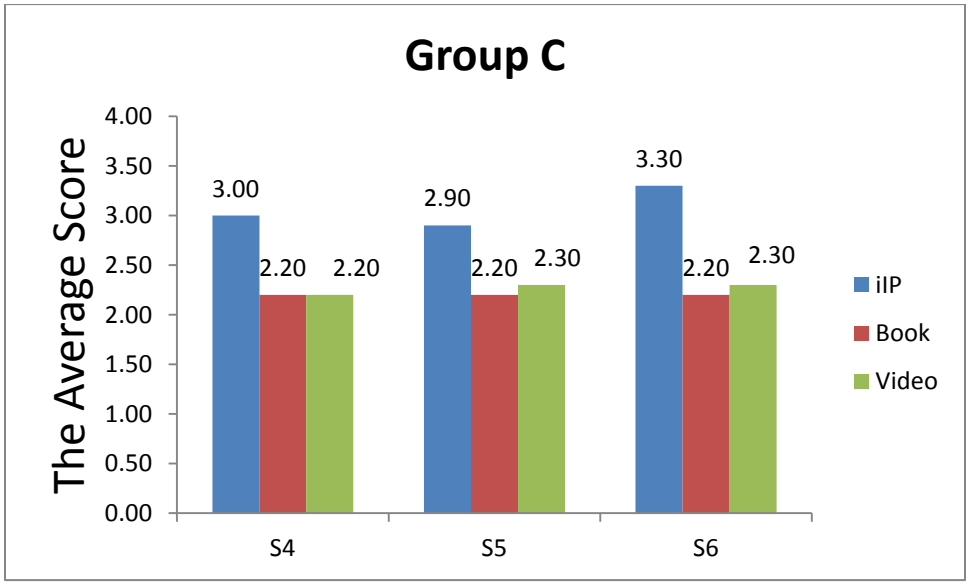


Figure 6-16: The Average Score of Learning Experience in Group C

Statement breakdown for the Interaction factor per teaching method

Appendix A provides a breakdown for each of the statements in The Post-Questionnaire for the interaction factor, as given by the participants in Group A, B and C. The statements pertaining to Interaction were:

- *S7:I found it easy to get involved in the lesson*
- *S8:It was easy to interact with this method*
- *S9:This method made me learn by practice*

The results show that, for S7, the highest mean for Interaction in Group A was a mean of 3.30 from the iIP Software. For S8, both the iIP Software and Prayer Book scored equally as the highest score with 3.20 respectively. The highest mean for S9 was the iIP Software, which scored 3.10. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book. However, as the mean for S8 was the same in iIP Software and Prayer Book, it shows that in light of this statement, both of these Methods facilitated in enabling the participants to interact easily during the session (Figure 6-17).

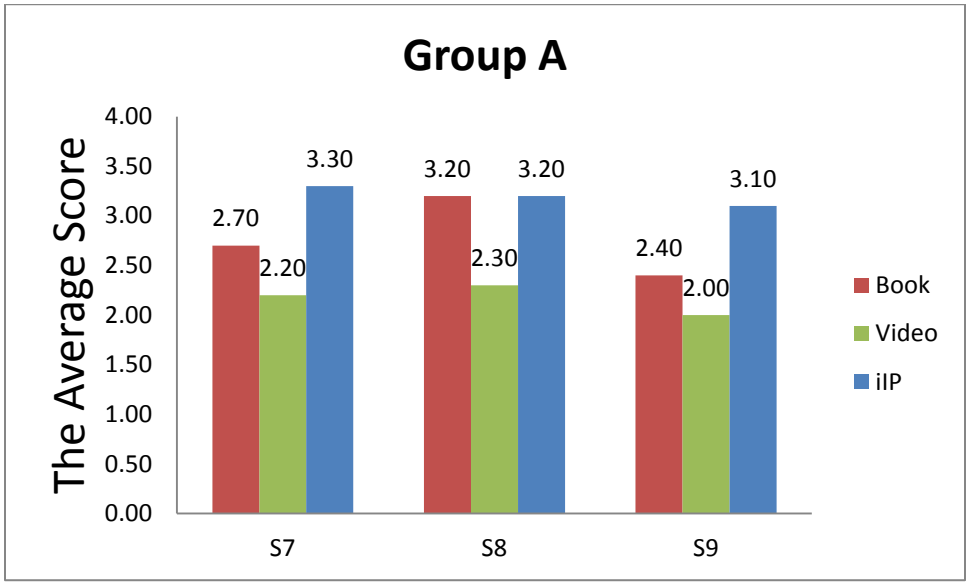


Figure 6-17: The Average Score of Interaction in Group A

The results show, for S7, the highest mean for Interaction in Group B was a mean of 3.20 from the iIP Software. For S8, the iIP Software again scored the highest with a mean of 2.90. The highest mean for S9 was the iIP Software, which scored 3.00. From this analysis, it is clear that

the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book (Figure 6-18).

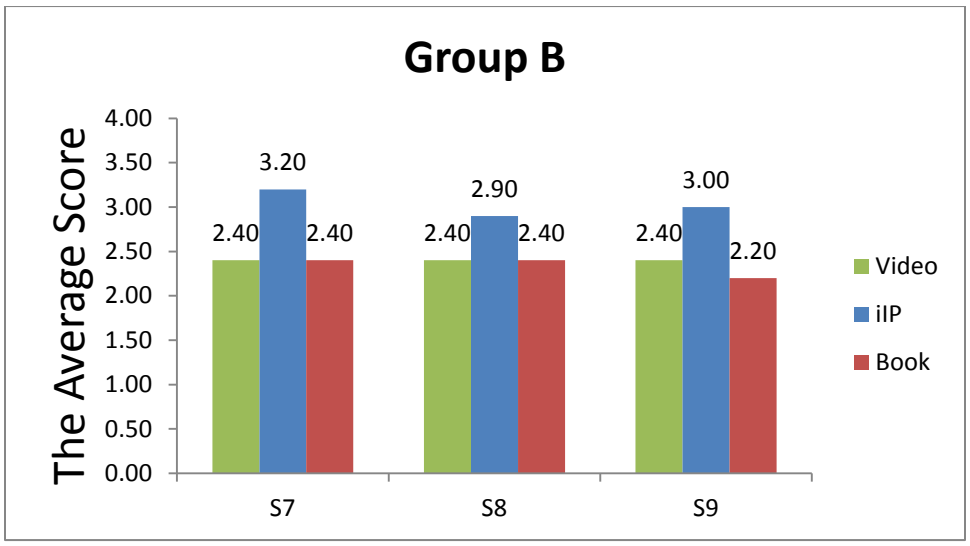


Figure 6-18: The Average Score of Interaction in Group B

The results show, for S7, the highest mean for Interaction in Group C was a mean of 3.20 from the iIP Software. For S8, the iIP Software again scored the highest with a mean of 3.00. The highest mean for S9 was the iIP Software, which scored 3.10. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book (Figure 6-19).

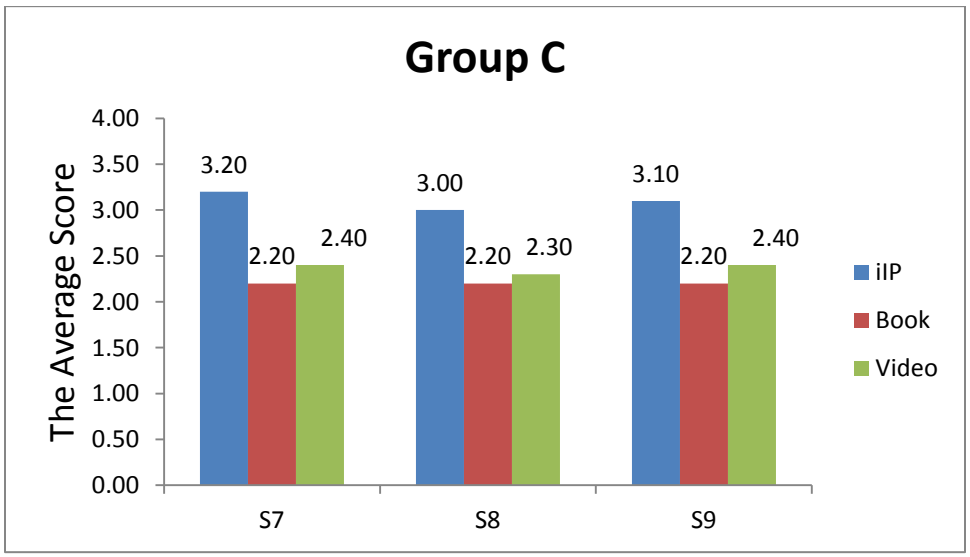


Figure 6-19: The Average Score of Interaction in Group C

Statement breakdown for the Satisfaction factor per teaching method

Appendix A provides a breakdown for each of the statements in The Post-Questionnaire for the Satisfaction factor, as given by the participants in Group A, B and C. The statements pertaining to Satisfaction were:

- *S10:I enjoyed the lesson*
- *S11:Overall, I like this method*
- *S12:This Method makes me feel more confident when I pray*

The results show that, for S10, the highest mean for Satisfaction in Group A was a mean of 3.10 from the iIP Software. For S11, both the iIP Software and Prayer Book scored equally as the highest score with 2.90. The highest mean for S12 was the iIP Software, which scored 3.10, whereas both the Prayer Video and Prayer Book scored a mean of 2.20. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book. However, as the mean for S11 was the same in iIP Software and Prayer Book, it shows that in light of this statement, the participants were satisfied with these Method overall (Figure 6-20).

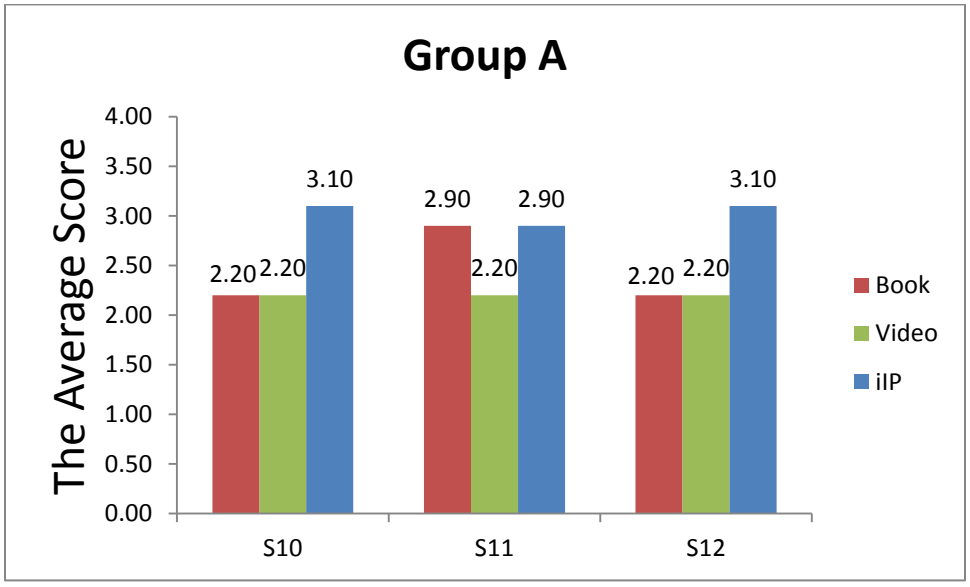


Figure 6-20: The Average Score of Satisfaction in Group A

For S10, the highest mean for Satisfaction in Group B was a mean of 3.00 from the iIP Software. For S11, the iIP Software again scored the highest with a mean of 3.00. Both Prayer Video and

iIP Software scored an equally high score of 2.70. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book. However, as the Prayer Video Method scored the same as iIP Software for S12, it shows that both these Methods can be used to make the participants more confident during their prayer (Figure 6-21).

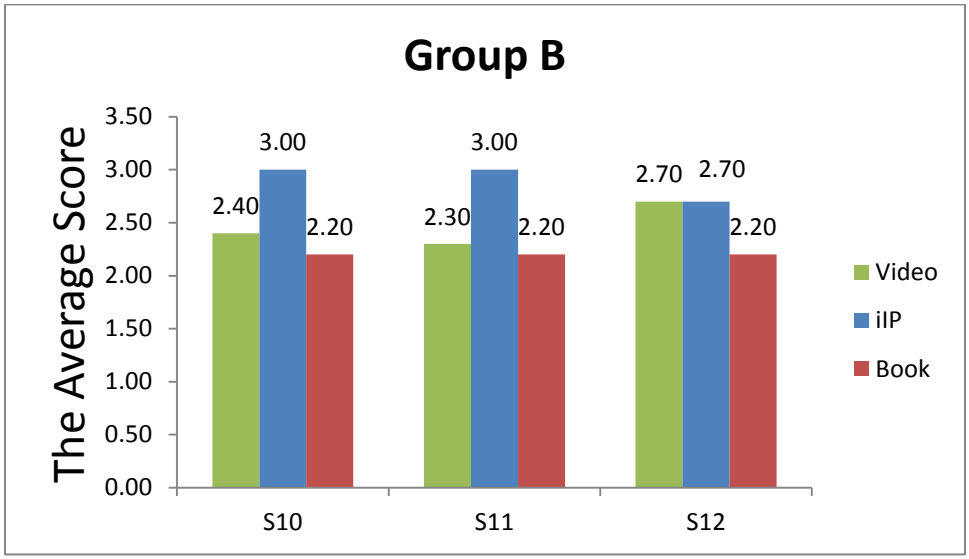


Figure 6-21: The Average Score of Satisfaction in Group B

The results show, for S10, the highest mean for Satisfaction in Group C was a mean of 3.10 for the iIP Software. For S11, the iIP Software again scored the highest with a mean of 2.90. The highest mean for S12 was the iIP Software, which scored 3.10. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book (Figure 6-22).

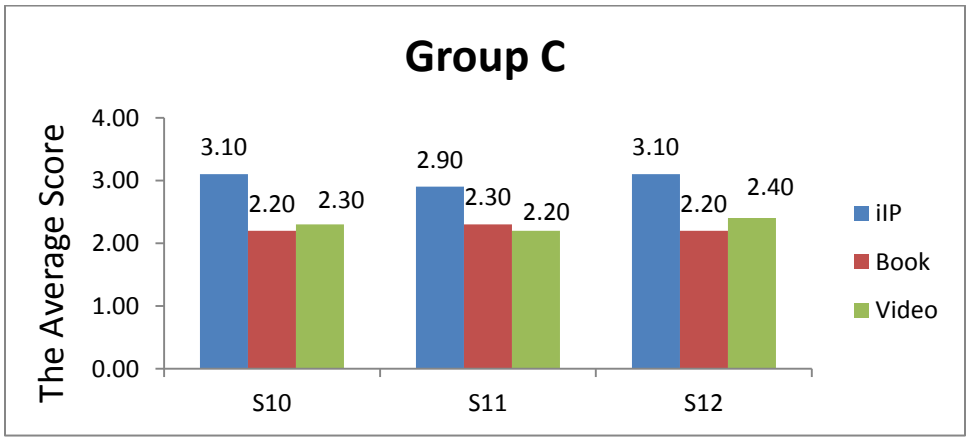


Figure 6-22: The Average Score of Satisfaction in Group C

Statement breakdown for the Usability factor per teaching method

Appendix A provides a breakdown for each of the statements in the post-questionnaire for the usability factor, as given by the participants in Group A, B and C. The statements pertaining to Usability were:

- *S13:It was easy to learn how to pray using this method*
- *S14:It was easy to follow the prayer movements using this method*
- *S15:This method explains the prayer clearly from beginning to end*

For S13, the highest mean for Usability in Group A was a mean of 3.20 for the iIP Software. For S14, the Prayer Book Method scored the highest with 3.30, followed closely by iIP Software with 3.20. The highest mean for S15 was the iIP Software, which scored 3.10. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book. However, as the Prayer Book Method scored the highest mean for S14, it does highlight that this Method was seen as the easiest way in following the prayer movements (Figure 6-23).

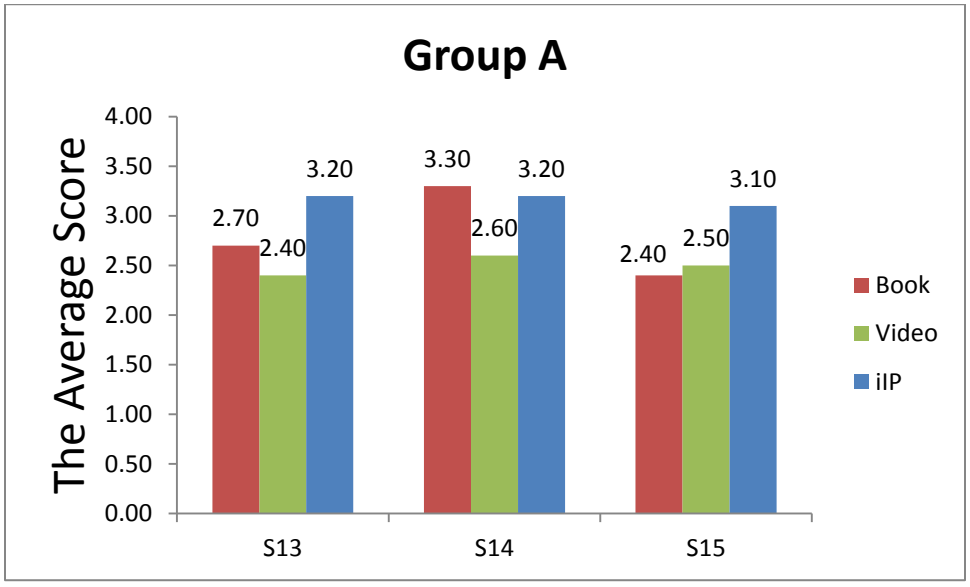


Figure 6-23: The Average Score of Usability in Group A

For S13, the highest mean for Usability in Group B was a mean of 3.20 for the iIP Software. For S14, the iIP Software again scored the highest with a mean of 3.20. The iIP Software scored a

highest score of 3.20. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book (Figure 6-24).

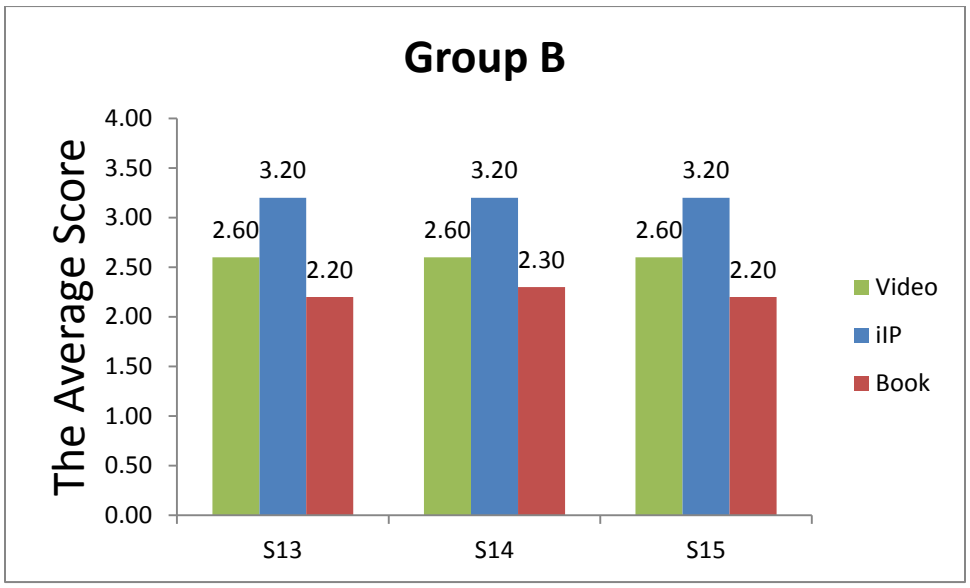


Figure 6-24: The Average Score of Usability in Group B

The results show, for S13, the highest mean for Usability in Group C was a mean of 3.10 for the iIP Software. For S14, the iIP Software again scored the highest with a mean of 3.10. The highest mean for S15 was the iIP, which scored 3.10. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book (Figure 6-25).

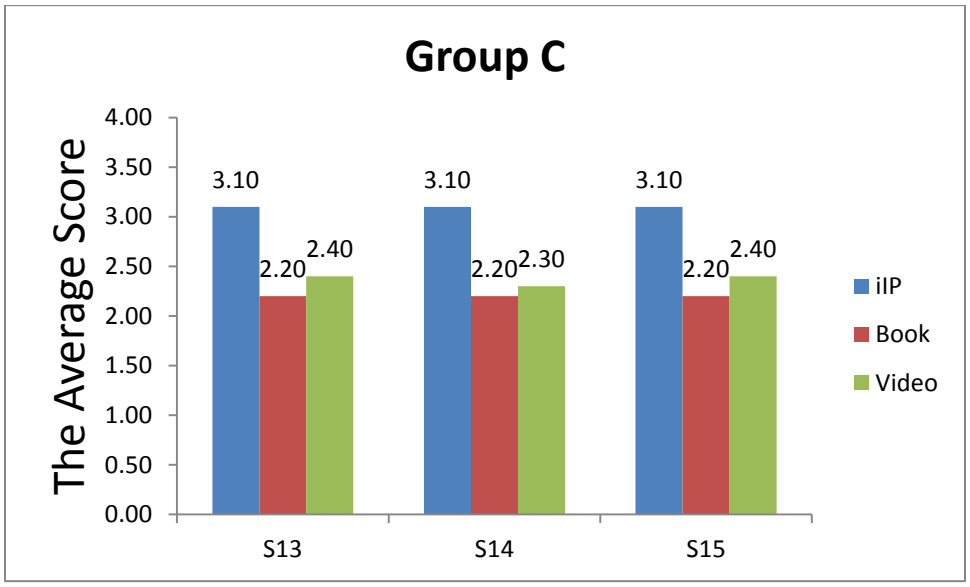


Figure 6-25: The Average Score of Usability in Group C

Statement breakdown for the Achievement factor per teaching method

Appendix A provides a breakdown for each of the statements in The Post-Questionnaire for the Achievement factor, as given by the participants in Group A, B and C. The statements pertaining to Achievement were:

- *S16:I can remember the prayer positions after using this method*
- *S17:My prayer performance is better after using this method*

For S16, the highest mean for Achievement in Group A was a mean of 3.20 for the iIP Software. For S17, the iIP Software again scored the highest mean with 3.10. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book (Figure 6-26).

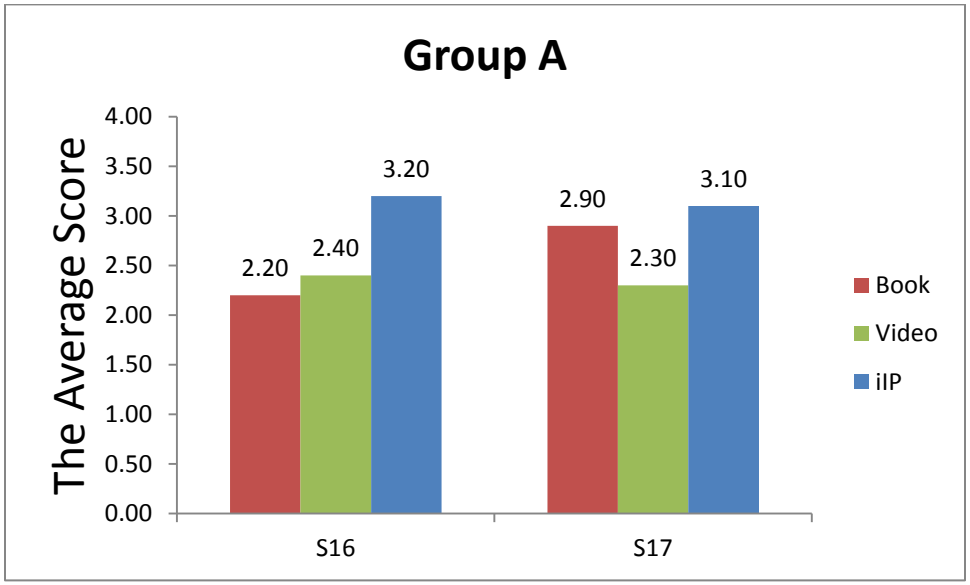


Figure 6-26: The Average Score of Achievement in Group A

For S16, the highest mean for Achievement in Group B was a mean of 3.00 for the iIP Software. For S17, the iIP Software again scored the highest with a mean of 3.10. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book (Figure 6-27).

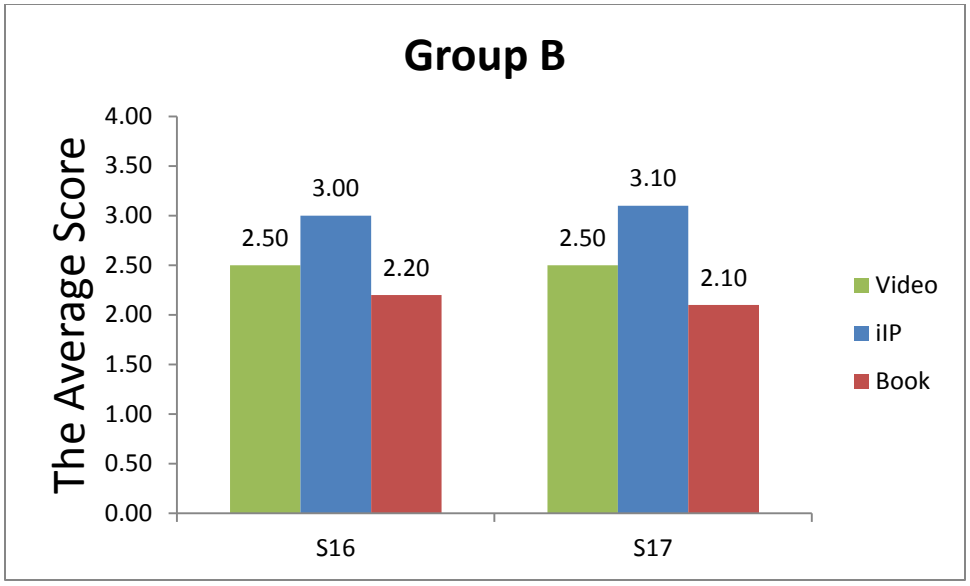


Figure 6-27: The Average Score of Achievement in Group B

For S16, the higher mean for Achievement in Group C was a mean of 3.10 for the iIP Software. For S17, the iIP Software again scored the highest with a mean of 3.10. From this analysis, it is clear that the overall mean of the iIP Software is higher than those for the Prayer Video and Prayer Book (Figure 6-28), with Prayer Book being the worst.

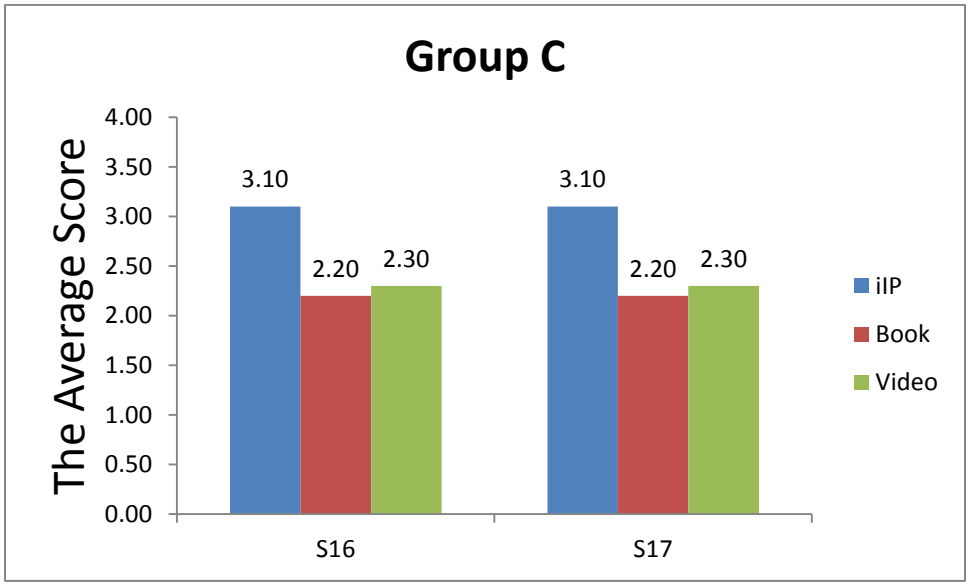


Figure 6-28: The Average Score of Achievement in Group C

6.2.5.3 Analysing the factors for each teaching Method separately, in comparison to the three groups

After describing the results for all the teaching methods per group and in light of the six factors, the subsequent analysis was to isolate each teaching method and evaluate the factors across the three groups for that particular method. This would determine whether there was a consistency across the groups when they experienced a particular teaching method, regardless of when this occurred or whether chronological order had an influence over the results.

6.2.5.3.1 Analysing the factors for the iIP Method in comparison to the three groups

A comparative analysis was conducted on the three groups that used the iIP Software. As highlighted, the three groups experienced the different Methods on different weeks (Table 6-1). Group A used the iIP Software in the third week, Group B used it on the second week and Group C interacted with the software during the first week. Table 6-14 shows The Post Questionnaire results for the three groups and the scores given by the students for the six domains of interest. It should be noted that by conducting this comparative experiment, it enables to see whether or not using the previous Methods influenced the users. Table 6-14 shows the scores for the factors of all three groups in relation to the iIP Software.

Descriptive Statistics iIP

Group		Comprehension	Learning Experience	Interaction	Satisfaction	Usability	Achievement
A	Mean	3.07	3.03	3.20	3.03	3.17	3.15
B		3.07	3.07	3.03	2.90	3.20	3.05
C		3.20	3.07	3.10	3.03	3.10	3.10

Table 6-14: The Scores for the Factors of all three Groups-iIP

The results show that, for comprehension, all three groups were in agreement that the iIP Software helped facilitate their comprehension and understanding of the Islamic prayer, with the groups scoring a mean of 3.07, 3.07 and 3.20 respectively. This gave an average mean score across these three groups of 3.11. It should also be noted that Group C scored the highest among the groups, which could relate to the fact that they experienced the iIP Software without experiencing any other Method before it. For Experience, the results also show the participants had a positive experience when using the iIP Software, with the groups scoring a mean of 3.03, 3.07 and 3.07 respectively, thus indicating they agreed with this factor. With regards to interaction, the mean scores were all in agreement, with 3.20 for Group A, 3.03 for Group B and 3.10 for Group C. The participants also stated they were satisfied with the iIP Software, as each

group was in agreement with the statements relating to this factor, with mean scores of 3.03, 2.90 and 3.03. The three groups also scored the usability factor with 3.17, 3.20 and 3.10 respectively, indicating they were in agreement and lastly, all the groups felt they achieved the Islamic prayer as they scored the achievement factor with mean scores of 3.15, 3.05 and 3.10(Figure 6-29).

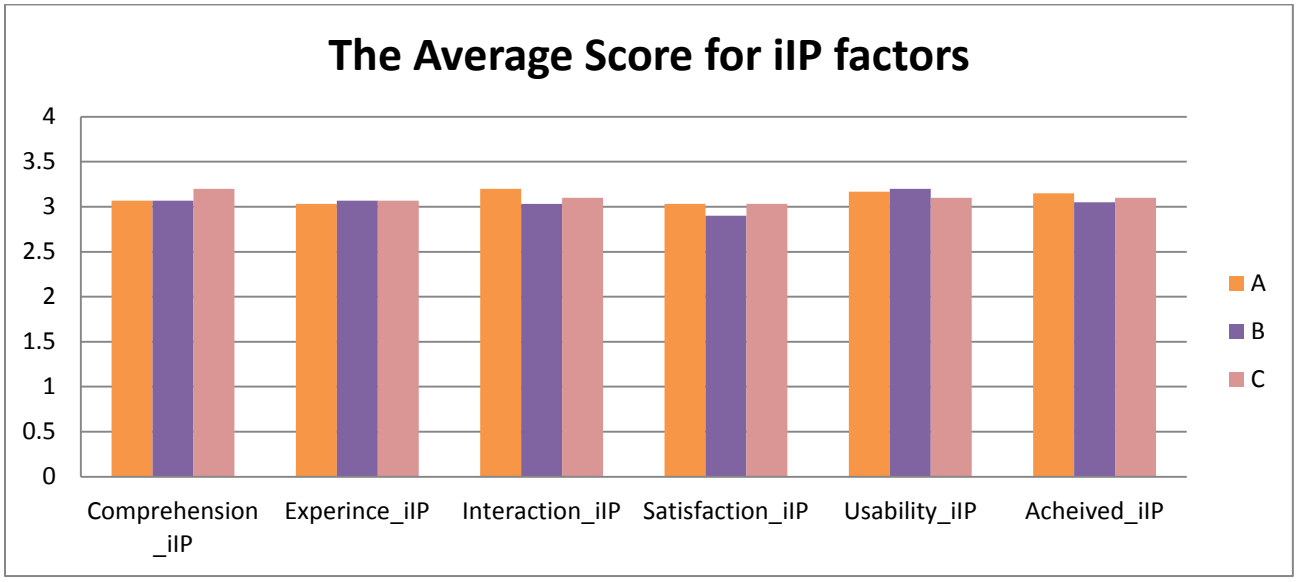


Figure 6-29: The Average Score for iIP factors

6.2.5.3.2 Analysing the factors for the Book Method in comparison to the three groups

A comparative analysis was conducted on the three groups that used the Book software. Group A used the Book Method in the first week, Group B used it on the third week and Group C interacted with the Book method during the second week. Table 6-15 shows the post questionnaire results for the three groups and the scores given by the students for the six domains of interest.

Descriptive Statistics Book

Group		Comprehension	Learning Experience	Interaction	Satisfaction	Usability	Achievement
A	Mean	2.70	2.50	2.77	2.43	2.80	2.55
B		2.27	2.37	2.33	2.20	2.23	2.15
C		2.20	2.20	2.20	2.23	2.20	2.20

Table 6-15: The Scores for the Factors of all three Groups-Book

The results show that, for Comprehension, all three groups were between the ranges of agree and disagree (2.70, 2.20 and 2.20 respectively) in that the Book Method helped facilitate their Comprehension and understanding of the Islamic prayer. Interestingly, it showed that Group A,

who used the Book Method first and therefore were not influenced by other Methods, scored this the highest, whereas the other two groups scored it lower, indicating they may have been influenced by other two Methods or made certain comparisons in relation to them.

For Learning Experience, the results also show similar scores to the previous factor, with Group B and C scoring a mean of 2.37 and 2.20 each, whilst Group A also scored relatively 2.50. With regards to Interaction, Group A again scored higher than the other two with 2.77. The Satisfaction factor scored similar to the Experience factor, 2.43 for Group A. However, the Usability factor scored highly with Group A , indicating they all inclined towards disagreeing with this, and lastly, all the groups were between agreeing and disagreeing as to whether the Book Method helped them achievement how to perform the Islamic prayer factor with mean scores of 2.5 (Figure 6-30).

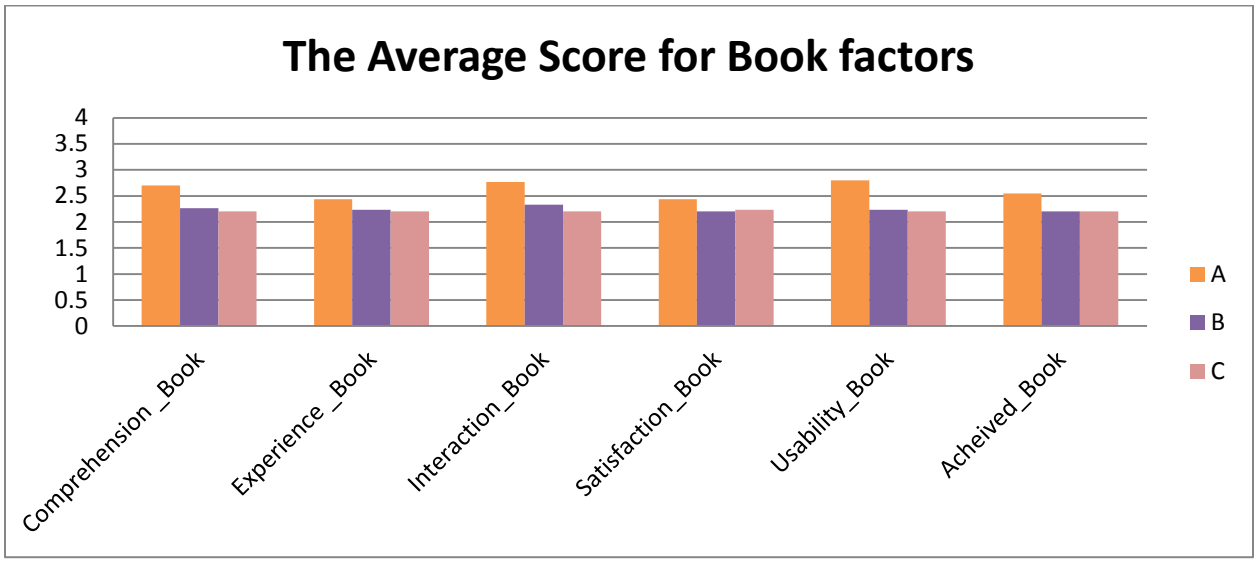


Figure 6-30: The Average Score for Book factors

6.2.5.3.3 Analysing the factors for the Video Method in comparison to the three groups

A comparative analysis was conducted on the three groups that used the Video Method. Group A used the video Method in the second week, Group B used it on the first week and Group C interacted with the video method during the third week. Table 6-16 shows The Post Questionnaire results for the three groups and the scores given by the students for the six domains of interest.

Descriptive Statistics Video

Group		Comprehension	Learning Experience	Interaction	Satisfaction	Usability	Achievement
A	Mean	2.53	2.36	2.16	2.20	2.50	2.35
B		2.56	2.60	2.40	2.46	2.60	2.50
C		2.36	2.26	2.36	2.30	2.36	2.30

Table 6-16 : The Scores for the Factors of all three Groups-Video

The results show that, for Comprehension, all three groups were between the ranges of agree and disagree (2.53, 2.56 and 2.33 respectively) in that the Video Method helped facilitate their Comprehension and understanding of the Islamic prayer. As Video was the first Method Group B interacted with, it did show for this factor that there was no influence or comparison made.

For Learning Experience, the results also show similar scores to the previous factor, with Group A and C scoring a mean of 2.36 and 2.26 each, but with Group B scoring relatively higher (2.60). Similarly with regards to Interaction, Group B scored higher than the other two with 2.40, whereas Group B scored 2.16 and Group C scored 2.36. The Satisfaction factor scored in a similar fashion, with Group B scoring higher with a mean of 2.46 and scores of 2.20 and 2.30 for Groups A and C respectively. For Usability, Group A and B scored quite high with 2.50 and 2.60, and Group C scoring the lowest here with 2.36. Lastly, Group B again scored the highest, with 2.50, whilst both A and C had a mean score of 2.30 (Figure 6-31).

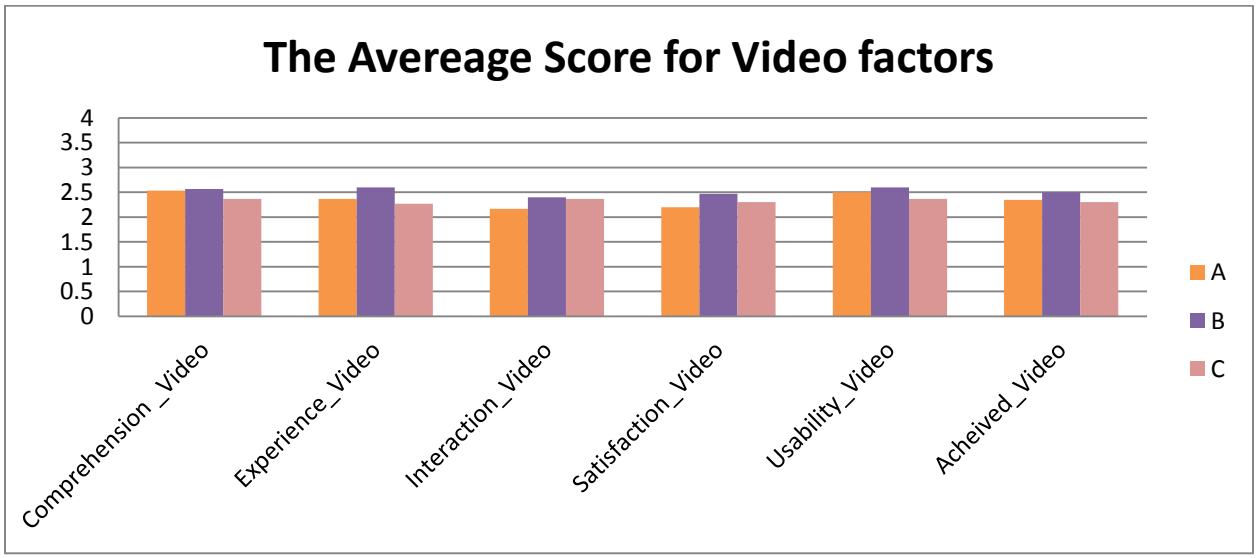


Figure 6-31: The Average Score for Video factors

6.2.5.4 Overall comparison of the learning Methods for each factor:

After amalgamating the scores for each of the groups, an overall mean score was calculated. Table 6-17 and (Figure 6-31) provides these score.

Descriptive Statistics

Group		Comprehension	Experience	Interaction	Satisfaction	Usability	Achievement
iIP	Mean	3.11	3.05	3.11	2.98	3.15	3.10
Book	Mean	2.38	2.28	2.43	2.28	2.41	2.31
Video	Mean	2.48	2.41	2.31	2.32	2.48	2.38

Table 6-17: The Scores for the Factors of all three Groups-Video

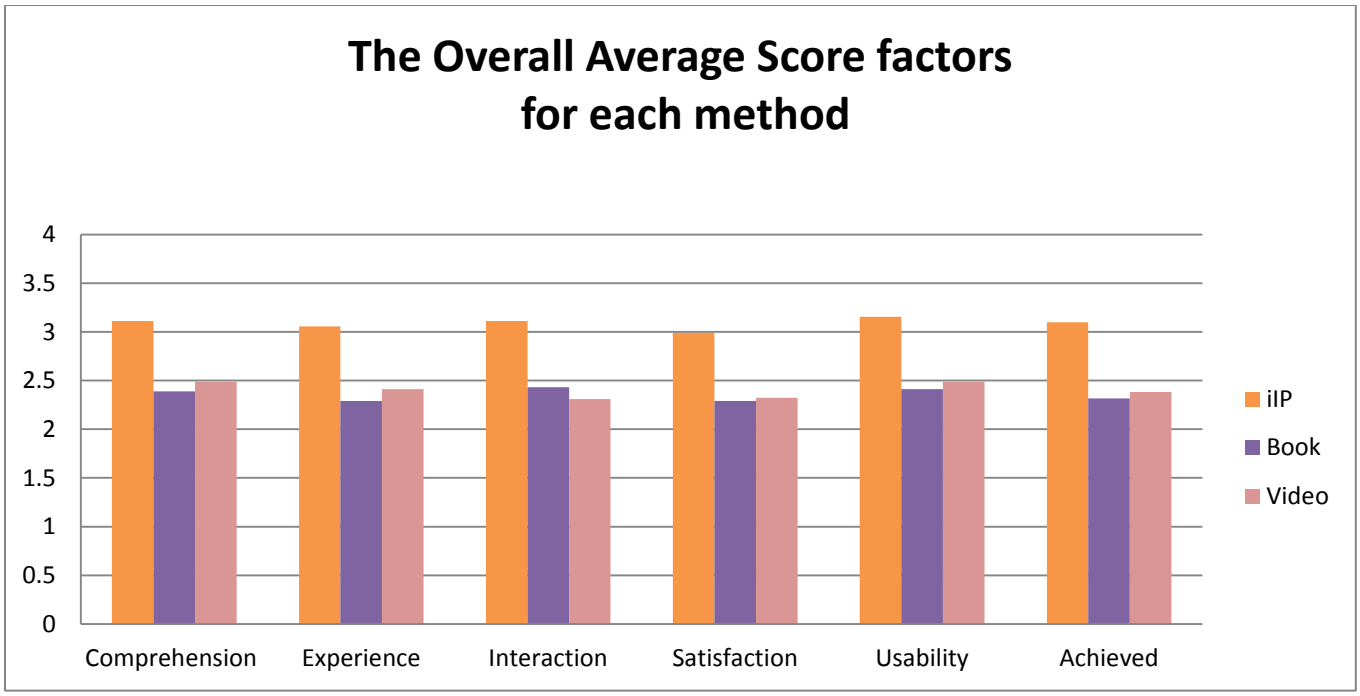


Figure 6-32: The Overall Average Score factors for each method

In addition, a Freidman test was conducted on the three methods overall (Figure 6-32) (i.e. across all three groups), which tested the differences in the dependent variables between the Methods (i.e. the six factors that were influenced by the teaching Methods). As the results show, there is a clear difference between the iIP and traditional Methods. This is further expressed in the statistical data; where the P-Value in the Freidman test was lower than 0.05 for all the six factors, making it statistically significant. Subsequently, in analysing this data in comparison to the null hypothesis.

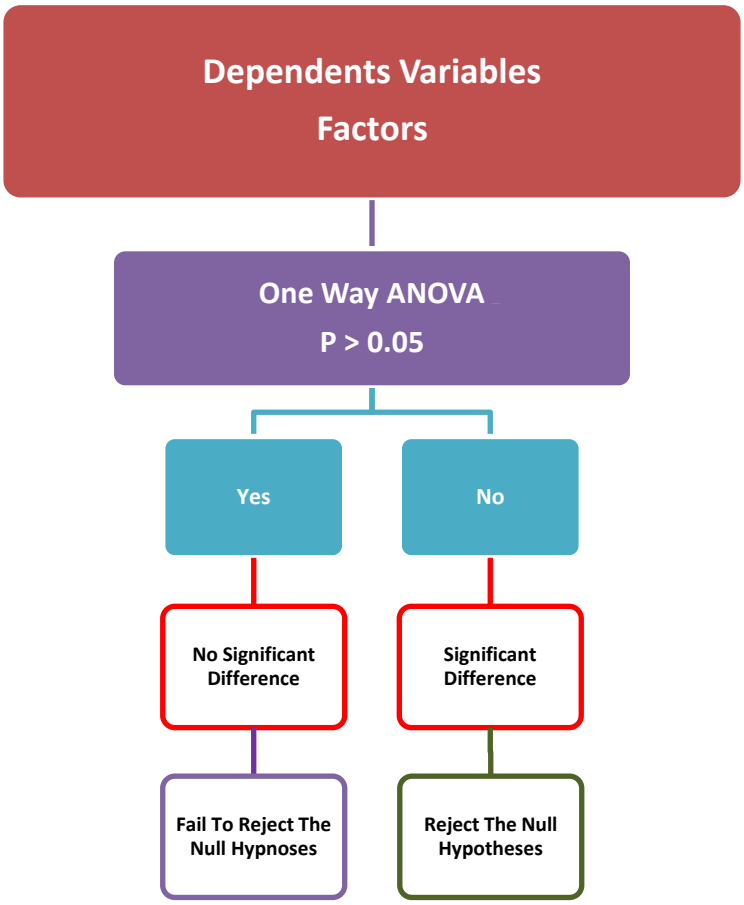


Figure 6-33: One Way ANOVA Diagram

Comprehension

To analyse and evaluate comprehension across the three Methods, two null hypothesis statements were made in accordance to the statements relating to comprehension in The Post-Questionnaire. The results show that the P-Value was less than 0.001, which indicates that the iIP Software was a ***Significant Difference*** compared to Book and Video Table 6-18, meaning the null hypothesis statements were ***Rejected*** Table 6-19.

ANOVA

Comprehension

	Sum of Squares	df	Mean Square	F	**P-value**
Between Groups	9.188	2	4.594	9.766	<0.001
Within Groups	40.922	87	.470		
Total	50.110	89			

Multiple Comparisons

Dependent Variable: **Comprehension**

Tukey HSD

(I) Method	(J) Method	Mean Difference (I-J)	Std. Error	**P-Value**	95% Confidence Interval	
					Lower Bound	Upper Bound
iIP	Book	.72222*	.17708	<0.001	.3000	1.1445
	Video	.62222*	.17708	0.002	.2000	1.0445
Book	iIP	-.72222*	.17708	<0.001	-1.1445	-.3000
	Video	-.10000	.17708	.839	-.5222	.3222
Video	iIP	-.62222*	.17708	0.002	-1.0445	-.2000
	Book	.10000	.17708	.839	-.3222	.5222

*. The mean difference is significant at the 0.05 level.

Table 6-18: One Way ANOVA and Tukey Test to evaluate the Comprehension factor

Tukey Pairwise Comparisons

Grouping Information Using the Tukey Method and 95% Confidence

Method	N	Mean	Grouping
iIP	30	3.111	A
Book	30	2.389	B
Video	30	2.489	B

The mean values that do not share a letter are significantly different.

COMPREHENSION	
Null Hypothesis	**Result**
NH1: The iIP Software does not encourage a greater comprehension of the physical Islamic prayer than an Islamic Prayer Book.	***REJECTED***
NH2: The iIP Software does encourage a greater comprehension of the physical Islamic prayer than from watching an Islamic Prayer Video.	***REJECTED***

Table 6-19: Null Hypothesis results for the Comprehension factor

Learning Experience

To analyse and evaluate experience across the three Methods, two null hypothesis statements were made in accordance to the statements relating to experience in The Post-Questionnaire. The results show that the P-Value was less than 0.001, which indicates that the iIP Software was a ***Significant Difference*** compared to Book and Video Table 6-20, meaning the null hypothesis statements were ***Rejected*** Table 6-21.

ANOVA

Learning Experience

	Sum of Squares	df	Mean Square	F	**P-Value**
Between Groups	10.180	2	5.090	14.927	<0.001
Within Groups	29.667	87	.341		
Total	39.847	89			

Multiple Comparisons

Dependent Variable: **Learning Experience**

Tukey HSD

(I) Method	(J) Method	Mean Difference (I-J)	Std. Error	**P-Value**	95% Confidence Interval	
					Lower Bound	Upper Bound
iIP	Book	.76667*	.15077	<0.001	.4071	1.1262
	Video	.64444*	.15077	<0.001	.2849	1.0040
Book	iIP	-.76667*	.15077	<0.001	-1.1262	-.4071
	Video	-.12222	.15077	.697	-.4817	.2373
Video	iIP	-.64444*	.15077	<0.001	-1.0040	-.2849
	Book	.12222	.15077	.697	-.2373	.4817

*. The mean difference is significant at the 0.05 level.

Table 6-20: One Way ANOVA and Tukey Test to evaluate the Learning Experience factor

Tukey Pairwise Comparisons

Grouping Information Using the Tukey Method and 95% Confidence

Method N Mean Grouping
iIP 30 3.055 A
Book 30 2.289 B
Video 30 2.411 B

The mean values that do not share a letter are significantly different.

LEARNING EXPERINCE	
Null Hypothesis	**Result**
NH3: The learning experience for the Islamic prayer is neither more or less attractive or enjoyable using the iIP Software than from a using Islamic Prayer Book	***REJECTED***
NH4: The learning experience for the Islamic prayer is neither more or less attractive or enjoyable using the iIP Software than from a watching an Islamic Prayer Video.	***REJECTED***

Table 6-21: Null Hypothesis results for the Learning Experience factor

Interaction

To analyse and evaluate Interaction across the three Methods, two null hypothesis statements were made in accordance to the statements relating to interaction in The Post-Questionnaire. The results show that the P-Value was less than 0.001, which indicates that the iIP Software was a ***Significant Difference*** compared to Book and Video Table 6-22, meaning the null hypothesis statements were ***Rejected*** Table 6-23.

ANOVA

Interaction

	Sum of Squares	df	Mean Square	F	**P-Value**
Between Groups	11.143	2	5.572	12.875	<0.001
Within Groups	37.648	87	.433		
Total	48.791	89			

Multiple Comparisons

Dependent Variable: **Interaction**

Tukey HSD

(I) Method	(J) Method	Mean Difference (I-J)	Std. Error	**P-Value**	95% Confidence Interval	
					Lower Bound	Upper Bound
iIP	Book	.67778*	.16985	<0.001	.2728	1.0828
	Video	.80000*	.16985	<0.001	.3950	1.2050
Book	iIP	-.67778*	.16985	<0.001	-1.0828	-.2728
	Video	.12222	.16985	.753	-.2828	.5272
Video	iIP	-.80000*	.16985	<0.001	-1.2050	-.3950
	Book	-.12222	.16985	.753	-.5272	.2828

*. The mean difference is significant at the 0.05 level.

Table 6-22: One Way ANOVA and Tukey Test to evaluate the Interaction factor

Tukey Pairwise Comparisons

Grouping Information Using the Tukey Method and 95% Confidence

Method	N	Mean	Grouping
iIP	30	3.111	A
Book	30	2.433	B
Video	30	2.311	B

The mean values that do not share a letter are significantly different.

PHYSICAL INTERACTION	
Null Hypothesis	**Result**
NH5: The iIP Software does not encourage participants to interact physically more than reading about the prayer in an Islamic Prayer Book.	***REJECTED***
NH6: The iIP Software does not encourage participants to interact physically more than watching an Islamic Prayer Video about the prayer.	***REJECTED***

Table 6-23: Null Hypothesis results for the Interaction factor

Satisfaction

To analyse and evaluate Satisfaction across the three Methods, two null hypothesis statements were made in accordance to the statements relating to satisfaction in The Post-Questionnaire. The results show that the P-Value was less than 0.001, which indicates that the iIP Software was a ***Significant Difference*** compared to Book and Video Table 6-24, meaning the null hypothesis statements were ***Rejected*** Table 6-25.

ANOVA

Satisfaction

	Sum of Squares	df	Mean Square	F	**P-Value**
Between Groups	9.356	2	4.678	11.915	<0.001
Within Groups	34.156	87	.393		
Total	43.511	89			

Multiple Comparisons

Dependent Variable: **Satisfaction**

Tukey HSD

(I) Method	(J) Method	Mean Difference (I-J)	Std. Error	**P- Value**	95% Confidence Interval	
					Lower Bound	Upper Bound
iIP	Book	.70000*	.16178	<0.001	.3142	1.0858
	Video	.66667*	.16178	<0.001	.2809	1.0524
Book	iIP	-.70000*	.16178	<0.001	-1.0858	-.3142
	Video	-.03333	.16178	.977	-.4191	.3524
Video	iIP	-.66667*	.16178	<0.001	-1.0524	-.2809
	Book	.03333	.16178	.977	-.3524	.4191

*. The mean difference is significant at the 0.05 level.

Table 6-24: One Way ANOVA and Tukey Test to evaluate the Satisfaction factor

Tukey Pairwise Comparisons

Grouping Information Using the Tukey Method and 95% Confidence

Method	N	Mean	Grouping
iIP	30	2.989	A
Book	30	2.288	B
Video	30	2.322	B

The mean values that do not share a letter are significantly different.

SATISFACTION	
Null Hypothesis	**Result**
NH7: Participants were neither more nor less satisfied with learning with the iIP Software than learning the prayer through a Prayer Book.	***REJECTED***
NH8: Participants were neither more nor less satisfied with learning with the iIP Software than learning the prayer through a Prayer Video.	***REJECTED***

Table 6-25 Null Hypothesis results for the Satisfaction factor

Usability

To analyse and evaluate Usability across the three Methods, two null hypothesis statements were made in accordance to the statements relating to usability in The Post-Questionnaire. The results show that the P-Value was less than 0.001, which indicates that the iIP Software was a ***Significant Difference*** compared to Book and Video Table 6-26, meaning the null hypothesis statements were ***Rejected*** Table 6-27.

ANOVA

Usability

	Sum of Squares	df	Mean Square	F	**P-Value**
Between Groups	10.047	2	5.023	11.102	<0.001
Within Groups	39.367	87	.452		
Total	49.414	89			

Multiple Comparisons

Dependent Variable: **Usability**

Tukey HSD

(I) Method	(J) Method	Mean Difference (I-J)	Std. Error	**P-Value**	95% Confidence Interval	
					Lower Bound	Upper Bound
iIP	Book	.74444*	.17368	<0.001	.3303	1.1586
	Video	.66667*	.17368	0.001	.2525	1.0808
Book	iIP	-.74444*	.17368	<0.001	-1.1586	-.3303
	Video	-.07778	.17368	0.895	-.4919	.3364
Video	iIP	-.66667*	.17368	0.001	-1.0808	-.2525
	Book	.07778	.17368	.895	-.3364	.4919

*. The mean difference is significant at the 0.05 level.

Table 6-26: One Way ANOVA and Tukey Test to evaluate the Usability factor

Tukey Pairwise Comparisons

Grouping Information Using the Tukey Method and 95% Confidence

Method	N	Mean	Grouping
iIP	30	3.156	A
Book	30	2.411	B
Video	30	2.489	B

The mean values that do not share a letter are significantly different.

Usability	
Null Hypothesis	**Result**
NH9: Understanding the prayer was neither easier nor harder in using the iIP Software than using a Prayer Book.	***REJECTED***
NH10: Understanding the prayer was neither easier nor harder in using the iIP Software than using a Prayer Video.	***REJECTED***

Table 6-27: Null Hypothesis results for the Usability factor

Achievement

To analyse and evaluate Achievement across the three Methods, one null hypothesis statement was made in accordance to the statements relating to achievement in The Post-Questionnaire. The results show that the P-Value was less than 0.001, which indicates that the iIP Software was a ***Significant Difference*** compared to Book and Video Table 6-28, meaning the null hypothesis statements were ***Rejected*** Table 6-29.

ANOVA

Achievement

	Sum of Squares	df	Mean Square	F	**P-Value**
Between Groups	11.317	2	5.658	12.531	<0.001
Within Groups	39.283	87	.452		
Total	50.600	89			

Multiple Comparisons

Dependent Variable: **Achievement**

Tukey HSD

(I) Method	(J) Method	Mean Difference (I-J)	Std. Error	**P-Value**	95% Confidence Interval	
					Lower Bound	Upper Bound
iIP	Book	.78333*	.17350	<0.001	.3696	1.1970
	Video	.71667*	.17350	<0.001	.3030	1.1304
Book	iIP	-.78333*	.17350	<0.001	-1.1970	-.3696
	Video	-.06667	.17350	.922	-.4804	.3470
Video	iIP	-.71667*	.17350	<0.001	-1.1304	-.3030
	Book	.06667	.17350	.922	-.3470	.4804

*. The mean difference is significant at the 0.05 level.

Table 6-28: One Way ANOVA and Tukey Test to evaluate the Achievement factor

Tukey Pairwise Comparisons

Grouping Information Using the Tukey Method and 95% Confidence

Method N Mean Grouping
iIP 30 3.100 A
Book 30 2.317 B
Video 30 2.383 B

The mean values that do not share a letter are significantly different.

ACHEIVEMENT	
Null Hypothesis	**Result**
NH11: The iIP Software does not increase nor decrease the participants' achievement of the prayer.	***REJECTED***

Table 6-29: Null Hypothesis results for the Achievement factor

In conclusion, the overall results from The Post-Questionnaire show that all the groups found the iIP Software to be more effective and gained more positive feedback in the six areas, in comparison to the Book and Video Methods. The null hypotheses were all rejected, indicating that the iIP Software facilitated an improvement in learning and teaching of the Islamic prayer.

6.2.6 Students' Final Questionnaire

The Final Questionnaire Appendix C was used to ask how what the students felt about the three Methods after they all had the opportunity to interact with them all. The first question on The Final Questionnaire asked them to choose which of the three Methods they felt was attractive and eye-catching. The results showed that the majority of participants chose the iIP Software as the most attractive Table 6-30 and Figure 6-34.

1- It was very attracting and eye-catching

	Prayer Book	Prayer Video	iIP	Total
Students	3	2	25	30

Table 6-30: It was very attracting and eye-catching

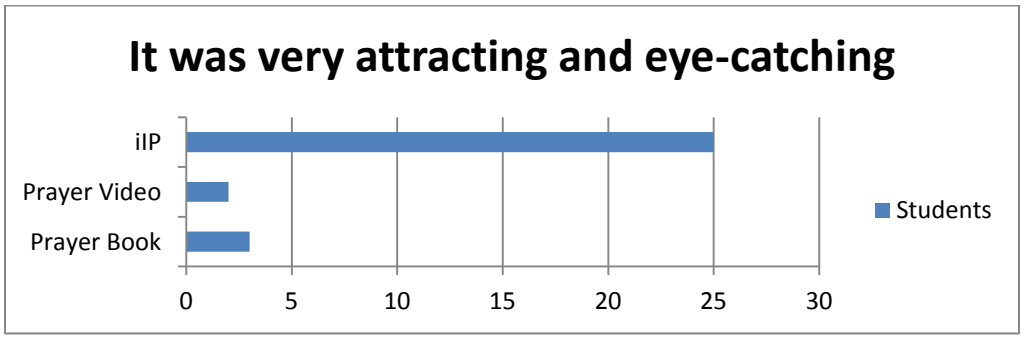


Figure 6-34: It was very attracting and eye-catching

The second question asked which of the Methods helped the students understand the prayer better. Again, the majority chose the iIP but there were approximately a quarter of the participants that chose the Prayer Book Table 6-31 and Figure 6-35.

2- It helped me understand the prayer better

	Prayer Book	Prayer Video	iIP	Total
Students	7	5	18	30

Table 6-31: It helped me understand the prayer better

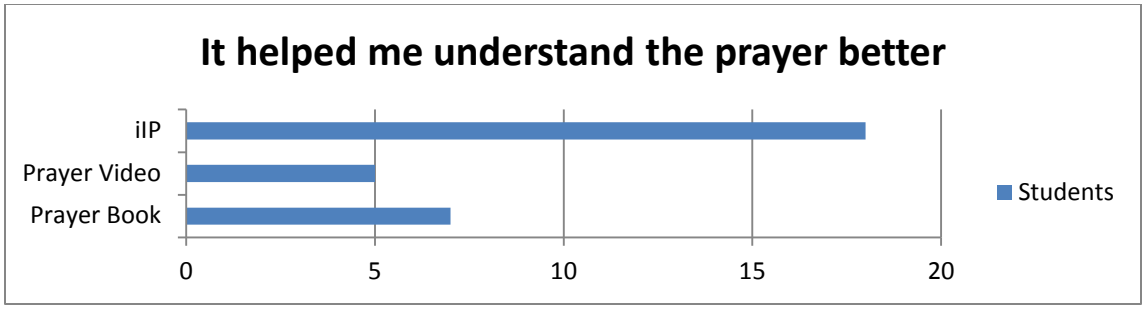


Figure 6-35: It helped me understand the prayer better

When asked which of the three Methods made the learners get more involved in the class Table 6-32, (27 students) said the iIP provided the facilities for them to do this Figure 6-36; this was also supported by the observations made during the session as the iIP created more opportunities for interaction and moved the attention away from the teacher. Furthermore, similar responses were given to the fourth question, which asked which of the Methods got the learners to interact psychically Table 6-33, which was evident during the observations that the iIP would score as the majority Figure 6-35.

3- It made me get involved in the class

	Prayer Book	Prayer Video	iIP	Total
Students	2	1	27	30

Table 6-32: It made me get involved in the class

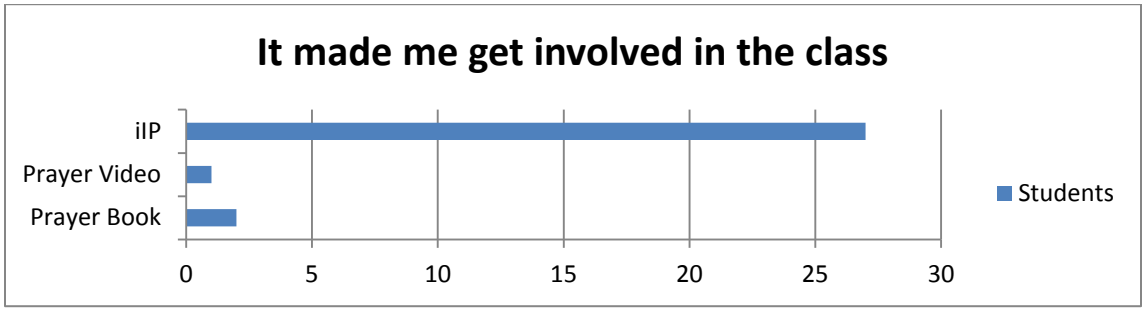


Figure 6-36: It made me get involved in the class

4- It made me interact physically

	Prayer Book	Prayer Video	iIP	Total
Students	1	1	28	30

Table 6-33: It made me interact physically

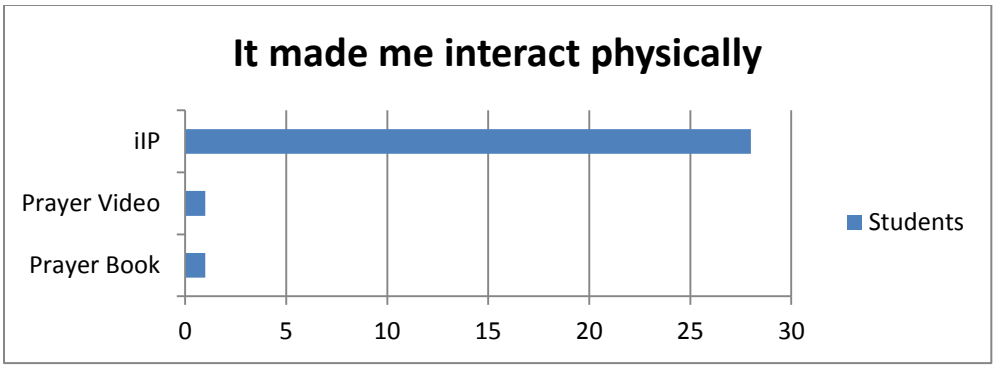


Figure 6-37: It made me interact physically

In terms of user satisfaction, (24 students) felt the iIP made them happier than the other Methods Table 6-34 and Figure 6-38. Lastly, the final question of this survey was extremely important as if explicitly asked the learners which of these Methods did they prefer the most Table 6-35. 28 of the learners stated that the iIP was a better method of learning the prayer Figure 6-39, which highlights further the preference that the students had for not only a "learning by doing" approach, but to also incorporate a gaming application that means the teacher does not become the only source of knowledge and information.

5- It made me very happy

	Prayer Book	Prayer Video	iIP	Total
Students	4	2	24	30

Table 6-34: It made me very happy

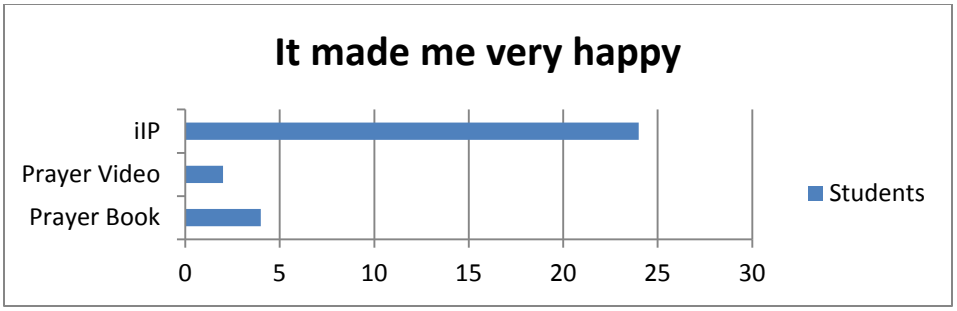


Figure 6-38: It made me very happy

6- Which method do you prefer the most

	Prayer Book	Prayer Video	iIP	Total
Students	1	1	28	30

Table 6-35: Which method do you prefer the most

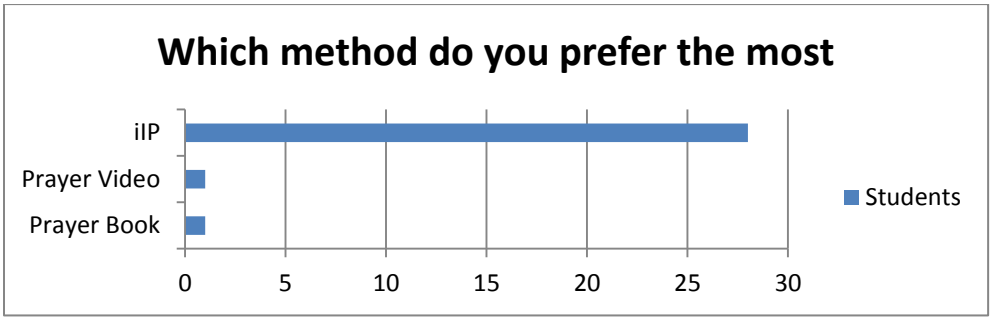


Figure 6-39: Which method do you prefer the most

6.3 Teachers

6.3.1 Teachers' Pre-Experiment Questionnaire

The teachers were given a Pre-Experiment Questionnaire to explore certain aspects of their teaching and their views over the "learning by doing" approach, particularly when using multimedia in a classroom environment.

Questions 1-4 related to the teachers' background in teaching and how long they had been teaching Islamic studies, as well as their overall Method in doing so. All the teachers stated they had been teaching this curriculum for over five years, indicating they had the same level of experience. When asked how they would normally teach the Islamic prayer to their students, they provided similar answers. Whilst they all stated they predominantly adhered to the official Saudi curriculum to teach the prayer, which meant they were obliged by the school to teach the

theoretical aspects from the Islamic curriculum book, two of them stated they incorporated discussion into the lesson, whilst they all stated they would try to include some level of practical examples; However, it was noted that this was seen very much as a supplementary part of the lesson due to the strict rules that stated they should follow the Book.

The next question, which was for teachers to explain what difficulties they found in teaching the Islamic prayer to the children. As expected, they all stated they felt restricted when teaching the lesson as they had to adhere to the Book. As a result of this, two of the teachers stated that it left very little practice or practical time for the prayer, whilst they also complained that the current Method was highly theoretical and did not provide a system for the students to practice more at home. Lastly, one of the teachers said the difficulty he found was in getting the students to remember (or rather, "memorise") the names of the prayer position and the statements that are uttered during the prayer.

The questions then moved on to whether or not the teachers incorporated software or multimedia in the classroom and explored their views on whether this could improve the learning environment. When asked if the teachers used computers or games consoles in their teaching, they all replied that they do, particularly in using Microsoft PowerPoint slides when the need or opportunity was made available. They further explained that they used this software as it helped change the atmosphere of the class. One of them stated "Using PowerPoint makes the lesson more attractive", whilst another stated "this new generation is used to using technology in their everyday life, so it makes it more accessible and familiar to them if we also use it."

In order to assess how they felt towards the kinesthetical approach to learning (i.e. learning by doing), the teachers were asked what advantages they felt this could bring to their classroom. They all agreed that this would be a positive thing as it would improve the interaction with the students and help them, "not only memorise more information but it will make them more accurate when they do a particular task". They expanded upon this question when they were asked if they would find it useful to have a system that would teach the prayer by doing, and also included all the important features they require for teaching (i.e. incorporating visual and auditory aspects, facility for feedback etc). Again, all the teachers were unanimous in their answers, whereby they all agreed this would be an ideal answer to teaching the prayer. One teacher stated he would strongly recommend its usage as it will attract the young students and

give them the opportunity to practice. In doing so, he stated that "using this at an early age would make the information etched into their minds". In other words, by using this type of system, the knowledge of the prayer would remain with them even when they get older. Similarly, one teacher stated that because technology is a part of our everyday life, he would recommend it as students are already aware of how to use it. Additionally he explained, "By using this Method, it makes the teaching more comprehensive and helps them memorise the prayer." Lastly, the final teacher expanded upon his answer and said this would enable a quicker transfer of information between the learner and the teacher.

6.3.2 Teachers' Post Questionnaire

Upon completion of the each learning Method, the teachers were given a Post Questionnaire to complete to explore their views in relation to these Methods (Appendix C).

Book

In relation to the first question, "What did you like/dislike about this Method?" the teachers all stated they disliked the fact that there was very little participation and engagement from the students, as they had to just sit and listen to them go through the various pages. One teacher further explained that when he asked questions to recall information, not all the students raised their hands, which he interpreted as the students not understanding the question or knowing the answer. Another teacher said the class was very quiet and only a few of the students were eager to ask questions. In terms of what they liked about this Method, one of the teachers interestingly explained that, although the Book Method meant they had to adhere only to the Book and potentially restrict their teaching, he also stated that this was a positive thing because the Book provided a clear structure to the lesson, and also, because it was written by esteemed scholars from Saudi Arabia, it ensured a high degree of authenticity so not to confuse the students. Another teacher said the Book Method was easy to use and accessible as all the information was already prepared for the lesson to take place.

In terms of the best thing about this Method, the teachers stated it allowed them to control the class and they were able to keep an eye on all the students so they would not become boisterous or misbehave. One of the teachers also stated this the benefit of this Method was that all the students and teachers own the Book and therefore they can choose to cover this topic at any

given time, as well as enabling the students to do it at home or with their religious teachers in their local mosque.

For the worst thing of this Method, as the teachers previously stated, this Method did not engage the students very well as it the transfer of information or discussion was only in one direction. Two of the teachers stated that they could see some of the students visibly getting bored and sleepy throughout the lesson, which they felt was not good for the students' learning nor does it help their confidence as a teacher.

When asked what the teachers would improve about this Method, they said there should be more opportunities for practical examples, which should be incorporated into the lesson plan within the Book. They felt this would increase the students' engagement and interaction in the session. They also stated that they wished they were given more permission and were allowed to input into how the curriculum should be delivered. One teacher stated, "Currently, we have no input or say for how the curriculum is rolled out in our school. We are just told to teach what is in front of us." This helped answer the final question, which was whether or not the teachers would incorporate this method in their classroom, whereby they all stated they would, but provided the improvements highlighted above could be addressed.

Video

In relation to the first question, "What did you like/dislike about this Method?" the teachers all stated that they liked the facility within the Prayer Video that it could explain the prayer movements in action and was able to show the students how they should perform the prayer and what they should say. One teacher added "Because the video had animated characters, it appealed to the children". However, the teachers all agreed that having this method on its own was not necessarily suitable as they got bored of the video quite quickly and were slightly uninterested in it as the video went on. The teachers further stated that the good thing about this method was that it was easily accessible because it was a YouTube clip. This meant they could watch it in the comfort of their own homes and that they could pause and repeat any of the movements when necessary. Nevertheless, the teachers felt that incorporating this within a classroom environment meant there was little interaction between students. One teacher stated "The class was too quiet and there was no engagement from the students". From the teachers'

perspective, they all felt this method made them also detached from the class as they had little or no input:

- "I felt that there was no need for me in the classroom because all I had to do was press play and let the children watch the Video"
- "I had no responsibilities in this session. It was just letting the Video do all the engagement"
- "I did not have control of the class. I did not even need to be there because the Video did all the work."

In terms of the best feature of this Method, the teachers did state it was extremely easy to setup and prepare because all the materials were readily available. However, this was also seen as a negative and among the worst feature because what came from this was little or no interaction between the teacher and students. Therefore, when asking how they could improve this Method, the teachers all agreed that they would incorporate a practical component to the lesson, whereby the teacher could review and interact with the students in performing the actual prayer movements. In turn, they felt the method was useful for the classroom environment but more as a supplementary material, possibly incorporating it with the Book Method.

iIP Software

In terms of the iIP Software, the teachers all stated that this Method was extremely effective in helping the students' practice, interact and remember the prayer movements. They all liked that this Method was able to cater for different learning styles, as it incorporated visual, auditory and kinesthetical aspects of learning. Moreover, the teachers could see how much the students were engaged with the iIP Software and that this method allowed the students to learn from their mistakes and the mistakes of others. One teacher stated "This is probably one of the best ways I have seen on how children can learn the prayer. They are really engaged and you can see how the avatar appeals to them. You can really see the students feel they have achieved something when they finish the game" Another supported these views, asserting, "because the software allows them to learn by actually doing the actions. Also because there is feedback information, if they get it right or wrong, the children will remember the prayer movements more." This feedback seemed to resonate throughout all the three teachers and this aspect of a more fruitful learning experience seemed to be what they felt was the iIP's best feature.

Although the majority of discussion concerning the likes and dislikes of the iIP Software were positive, the teachers did highlight some negative aspects of it. More specifically, the hardware limitations of the Kinect was identified, whereby, if two or more students stood in front of the camera, the hardware would have difficulty in detecting who is the individual that is performing the movements. Additionally, the majority of the teachers felt this Method was not necessarily easily accessible as it meant only those who had a Kinect (or could afford one) could use it outside of the school environment. Discussion concerning this then went to whether this Method could be used on different platforms such as a Windows. One of the teachers suggested, "If this software could be used on a laptop or computer, it means any of the students who have a laptop and webcam could use it". Lastly, in terms of certain negatives concerning the iIP Software, the topic of religious sensitivities arose with the teachers, where they felt, from an Islamic perspective, there may be certain scholarly opinions that would view the software as an entertainment factor as opposed to an educational tool.

With regards to what the teachers felt was the worst aspect of the iIP Software; they explained that what stood out more for them was that it took a long time to complete for each learner. That is, they stated it took between 8-10 minutes per student to complete, which means it may be difficult to use with larger groups.

The teachers also stated that, while they would "definitely incorporate the iIP Software in the classroom", and that they preferred this over the other methods, they would like it to include the different prayers for each of the different prayer times, as well as some testing function at the end so that the students could reinforce their learning.

6.3.3 Teachers' Final Questionnaire

Similar to the students' Final Questionnaire, the teachers were also asked the same questions, but asked to rank their answers in accordance to 1st, 2nd and 3rd place. For all the questions, which pertained to which method was more appealing, helped the students with their prayer comprehension, got involvement and physical interaction from the students and their own personal satisfaction, the iIP was ranked 1st in all of the questions. Additionally, the Prayer Book came 2nd for all of the questions and finally, the Prayer Video was ranked last Table 6-36.

Statement	Prayer Book	Prayer Video	iIP Software
It was very appealing.	2nd	3rd	1st
It helped the students to comprehend the prayer	2nd	3rd	1st
It made the students get more involved in the class	2nd	3rd	1st
It made the students physically interact more in the lesson.	2nd	3rd	1st
This method makes me satisfied.	2nd	3rd	1st

Table 6-36 Teachers' ranking for final questionnaire

Upon revisiting the Null Hypothesis concerning the teachers (Chapter 3), the following stated:

- NH12: Teachers do not prefer using iIP Software more than teaching by Prayer Books.
- NH13: Teachers do not prefer using iIP Software more than teaching by Prayer Video.

The results reveal that the teachers actually did prefer the iIP Software over the other Methods based upon a number of factors as stated in the Final Questionnaire. One may analyse here, that the teacher found the iIP to be more appealing as a teaching tool within the classroom and from their perception, it was a better Method to help the students not only understand the prayer, but to also facilitate their involvement and interaction. This means that the hypotheses are rejected.

6.4 Summary

This chapter provides the results that were extracted from the experiments that were conducted with the participants. It outlines both the students' and teachers' opinions concerning how they felt towards the Method, including observations that were made by the researcher. The results reveal that, in general, the iIP Software was regarded as a better method of learning the Islamic prayer and that the participants had a better learning experience when interacting with the software. A greater analysis of this will be given in the next chapter, which seeks to expound upon the results in greater detail.

Chapter 7 Evaluation and Discussion

7.1 Introduction

This chapter elaborates upon the results from chapter 6 and seeks to provide a detailed evaluation of the three teaching approaches. The overall objective of this chapter is to therefore answer the research question and determine whether or not the use of an interactive approach is more appropriate in enhancing and developing the understanding of the Islamic Prayer. Upon revisiting the research question for this thesis, it is important to see if the results reflect this: Does the Interactive Islamic Prayer (iIP) Software enhance the development and understanding of the physical aspects of the Islamic prayer in comparison to learning from reading a Prayer Book, or by watching a Prayer Video?

A discussion over the identified factors is given, wherein an analysis of how these factors compare to the teaching approaches is made, as well as identifying which of the approaches gained more positive feedback in these areas. Lastly, a look at the overall results, particularly a detailed comparison of the approaches, is presented and seeks to establish which teaching approach is better for the purpose of teaching the Islamic prayer.

7.2 Questionnaire Factors

Comprehension

The results when testing the null hypothesis relating to comprehension shows that there is a statistically significant difference that the iIP Software encouraged a greater comprehension of the prayer than using an Islamic Prayer book or by watching the Prayer Video. This was consistent throughout the various groups, who all indicated that they felt the iIP was better for their learning and understanding of the prayer movements.

This means the iIP Software provided a better means to comprehend the physical aspects of the Islamic prayer. This is in line with the statement made by Pivec, Dziabenko and Schinnerl (2003), who state that the use of computers has been "used as a cognitive tool for learning" as early as the 80s. Moreover, it seems that these results are in agreement with the findings by Charbonneau, Miller and LaViola Jr (2011), whose use of the virtual environment helped their participants to learn and understand dance moves better. In addition, from the theoretical perspective, Hsu's (2011) argument using Gardner's (1995) Theory of Multiple Intelligences

further supports these findings, as the use of the iIP Software facilitated the students in improving their bodily-kinesthetic intelligence. This was also the case in Gameiro et al's (2014) study, which saw an effectiveness in helping non-deaf people to comprehend and learn sign language to communicate with deaf people.

In analyzing the positive effects that the implementation of the iIP Software has in comprehending the Islamic prayer, one may suggest that this could be a means of improving how the prayer is taught in Saudi Arabian primary schools and leading to a greater comprehension. However, it should also be noted that, while there was a greater comprehension, in light of the Blooms Taxonomy, the comprehension is still at a lower spectrum, as it still only seeks to recall and remember information as opposed to higher levels such as analysis or synthesis.

Therefore, this shows that although the iIP Software aided the students in their comprehension of the prayer and that it was better than the other approaches, it does require further improvements. That said, at this stage of learning, one could argue that children at this stage do not have the mental capability to progress into higher levels of learning and that, the focus should be on improving this so they can cognitively improve during later stages of their development. As a starting point, this is acceptable and the evidence suggests this need to be done accordingly.

This further supports Squire's (2007) stance that VE adopt a contructivist approach in the classroom, where learning is progressive and build upon. This means there must be a starting point for this and the iIP proves to be appropriate for this.

It should however be noted that, just because the iIP Software encourages physical activity, this does not necessarily lead to learning. As stated by Clark and Mayer (2008:5), "physical activity does not equate to mental activity, and it is mental, not behavioral, activity that leads to learning. Specifically, engaging in online games, immersive simulations, or various forms of collaborative learning is not a guarantee of learning." Thus, while the iIP Software enabled participants to move around, this does not mean learning and comprehension took place; rather, one could argue that the initial objectives of the iIP Software, which was to cognitively develop learners' understanding of the prayer movements, was achieved.

Learning Experience

The results from the second hypothesis show that there is a statistically significant difference between the iIP Software and the other traditional approaches in relation to the participants learning experience. This supports the findings by Gao et al (2013) and Lai, Wang and Yang (2012), where the use of VE was the factor that motivated their participants to continue interaction with their respective VE software. This is even more so the case for Gao et al (2013) as their study mirrors this one in terms of the age of the participants. Both studies used children and saw a positive correlation between the learning experience and using VE in the classroom. Lee et al (2011) confirms this with children as this is necessary for children to view learning as play, without any sort of pressure. This is further supported by McCrindle (2013:197), who states:

> *"One key intention of the work is that it is 'fun' and achieved via an interactive process rather than a more conventional type of assignment, with the key aim being that the learning process of the student becomes embedded in the 'play' aspects of the game"*

This sums up how the iIP software was viewed and perceived by the learners and teachers, as the 'fun' element of the iIP software provided an enjoyable experience, which is important if teachers wish to keep their students engaged and motivated in the subject. With respect to this, it seems as though the iIP engaged the students on the correct level in relation to their skills. This is because, as stated by Csikszentmihalyi (1990), "If a game does not provide enough challenge, the player eventually gets bored. If a game provides too much challenge, the player might experience anxiety or quit after endless defeats. If the challenges of a game are equal to the player's skills, the player enters the flow channel". This was quite evident for the iIP Software as the observations showed students were all engrossed by the software and wished to experience it. In light of this, the iIP Software is evidently viewed as a stimulating tool, which is what Hsu (2011) states the Kinect can be analysed as.

When the students elaborated upon why they felt their learning experience with the iIP was good, some of the reasons they gave related to how bright, colourful and animated the software was. This leads the discussion to determine whether or not the animated display from the iIP has an adverse effect over the learner experience. In a study conducted by Mayer, Hegarty, Mayer, and Campbell (2005), they compared learning that occurred from visual still images and an animated

display. Their results showed that the visual still images created better learning than the animated version. This opposes the results in this session and from a theoretical perspective, it would seem to be somewhat paradoxical, as the visuals are more passive, whereas the animation is a more active medium (Clark and Mayer, 2008). Nevertheless, Mayer, Hegarty, Mayer, and Campbell (2005:264) gave the following conclusion: "Animation may be entertaining, but these experiments offer no reason to conclude that animation inherently provides more educational value than static diagrams. Instead, a well-designed series of still frames can be as good or better than animation". Clark and Mayer (2008) explain that this could be because animation may generate an overload of information for the learner to absorb, whereas the still images give the learners time to take it all in accordingly. However, they go on to state, "do not conclude that animations are never effective. Their effectiveness may depend on the type of content being displayed or how the animation is designed, including elements such as "pause and replay functionality" (Clark and Mayer, 2008:9). One could therefore argue that this study provided animation that was suited for the situation and circumstances, because the learners were using the animation for modeling purposes, similar to Kelly et al's (2010) use of a coach avatar to teach golf swings.

Interaction

The results from the third hypothesis show that there is a statistically significant difference between the iIP Software and the other traditional approaches in relation to the participants' interaction. This is in line with HCI research which states the use of technology has the ability to increase learner interaction, as well as research surrounding consoles such as Nintento Wii and Microsoft Kinect, where "people have shown huge interest and motivation to develop new and interactive methods or teaching" (Lee et al, 2012:5)

According to Hsu (2011), this type of medium is designed with interaction at its very core and focus, simply because it requires body movement and gestures directly from the individual. This, according to Boutsika (2014:125) "supports the idea that the pedagogical strategies should encourage student participation in interaction". Osunkoya and Chern (2013) go further and affirm that human movements and gestures is now becoming the natural interact for HCI and, while there are still many advancements that need to be made in this area, this method of interaction is creating a more robust bridge between humans and graphical interfaces, moreso than the use of a keyboard or mouse.

Furthermore, there are a number of different comparisons that could be made from the diverse interactions that took place throughout this study. For instance, one comparison could be the interaction between the iIP and the other two approaches, where observations saw users less engaged and unmotivated during the session. Another interesting aspect of interaction that was observed, was within the iIP session, where the interaction made by those learners who were waiting for their turn, yet rather than spend it doing other activities, they spent this time watching and observing those who were using the iIP Software instead. One may ascribe this to the novely factor of the iIP Software, however it could also Dyck et al (2003:240) attribute this to "learning by watching", where they state, "In communities, individuals regularly learn by observing others." This is certainly the case for the iIP Software.

Satisfaction

With regards to the hypothesis that tested whether or not the iIP Software would lead the learners to be more satisfied with this approach in comparison to other approaches, the results were in favour of the iIP Software. One could argue that this is due to the novelty factor that comes with using an interactive gaming-style approach in the classroom.

Usability

With regards to the hypothesis that tested whether or not the iIP Software would be easier to use than the other approaches, the results were in favour of the iIP Software. Usability is linked quite closely with interaction, particularly from the perspective of how easy it is to understand the content due to the method of teaching. For instance, through the use of the Kinect hardware and the instructional approach (i.e. learning by doing), the iIP was regarded as more suitable method in learning the prayer for the target learners. Thus, this hypothesis is supported by the ISO (1998:2) definition of usability, which refers to it as 'the effectiveness, efficiency, and satisfaction with which specified users can achieve goals in particular environments''. In this case, the target group were able to achieve their goals of understanding the prayer much more easily with the iIP than the other methods. This again shows how these comonents are inherently interlinked with one another, whereby the usability and interaction of the iIP, as well as the other components that were addressed, can all be analysed to illustrate achievement. In other words,

because the iIP was designed to maximise interaction, with the interaction being easy to follow, it subsequently led to a greater achievement.

Thus, focusing on aspects of the iIP design is what generated usability. One may refer to the learning experience domain, in which design aspects such as having an instructional avatar made it easy to use.

Achievement

In the final hypothesis, the results showed that there was a statistically significant difference between the iIP Software and the other traditional approaches in relation to the participants' achievement. That is, using this approach helped the learners to recall more of the prayer movements in its correct sequence.

What was evident with the iIP Software was that the feedback facility was in real time and the learners were able to correct their own mistakes accordingly. This is regarded as an excellent framework for achievement and the learning process in general, as it creates a student-centred approach and is more self-directed, as opposed to reliance upon a teacher to give the answers (DePriest and Barilovits, 2011). Thus, game play can be the cause of achievements being earned.

7.3 Summary of findings

This research aimed to explore whether the use of a virtual environment program could enhance and improve the development of the Islamic prayer in comparison to other traditional approaches. After detailed experiments to analyse this, the main findings of this research are as follows:

1. The iIP Software provided a greater comprehension of the Islamic prayer in comparison to the other approaches.
2. From the participants' perspective, using the iIP Software provided a greater learning experience when learning the Islamic prayer in comparison to the other approaches.
3. From the participants' perspective, using the iIP Software provided a greater interaction of the Islamic prayer in comparison to the other approaches
4. From the participants' perspective, using the iIP Software provided a greater satisfaction of the Islamic prayer in comparison to the other approaches

5. From the participants' perspective, using the iIP Software provided a greater usability of the Islamic prayer in comparison to the other approaches
6. From the participants' perspective, using the iIP Software provided a greater achievement of the Islamic prayer in comparison to the other approaches.
7. The participants preferred the iIP Software over the other approaches.

7.4 iIP Software

When initially deciding on the design and development of the iIP Software, the focus was primarily on how this tool could be used to improve education. In light of this, this study has shown that education is an extremely comprehensive term that does not just refer to reading a book or learning by doing; rather, it encompasses all aspects to ensure an individual progresses in their understanding and achievement. It was therefore, this objective that the iIP Software set out to achieve, particularly in its attempt to cover all aspects of education, such as catering for all learning styles (i.e. visual, auditive and kinesthetical) as well as providing feedback and fostering an interactive classroom environment that encourages discovery and learning to occur. This would subsequently be used to encourage even those learners that would normally be classed as introverts.

Referring back to Chapter 4, the design of the iIP Software fulfilled the objectives, such as ensuring the software was able to accurately track the movements of the participant, provide flexibility in where this software can be used, as well as ensuring it appealed to the nature of the target group (i.e. children aged at primary school level). Moreover, with the focus within the design of the iIP Software addressing how to educate the participants by improving their skill acquisition of the prayer movements, the processes outlined by Miles et al (2012) were truly met with the iIP Software. In revisiting these processes, Miles et al (2012) state skill acquisition is achieved as follows:

1) **Conveying information through observation** – the iIP Software conveyed how each prayer movement was to be performed through the use of the instructional avatar. In addition, the stream camera was able to show the learner how accurate they were in following the avatar. Moreover, the avatar repeated each prayer movement on a loop so the learners could review them accordingly and not feel they would miss it.

2) **Providing structured contextualised practice** – the iIP Software fulfilled a structured approach by enabling the learners to complete the movements of the Islamic prayer in a sequential order as they would be performed in real life.
3) **Feedback on accuracy and timing:** As stated in Chapter 4, the software incorporated audio and visual elements that would be used to give the learners feedback on whether or not they had performed the prayer movement correctly.

These areas highlight how the iIP Software has been able to provide a significant contribution to how the prayer is learnt, but also affirms how important a learning by doing approach is within schools, particularly in providing a greater impact on achievement and improving the learning experience. This is also in line with Goodbourn et al (2009), who shows how this approach of "learning by doing" has progressively improved in popularity amongst students over the last few decades, from 35% in 1998 to 58% in 2008.Moreover, taking into account the feedback from the teachers, the iIP Software showed teachers that this is not only a viable alternative to the current methods of teaching, but also a highly effective one in terms of understanding, achievement and experience.

However, the iIP Software is not without its limitations or improvements. Upon detailed analysis of the software, it is evident that much of these can be categorized into three areas: hardware limitations, software limitations and pedagogical considerations.

As previously highlighted in Chapter 4, the hardware limitations of the iIP Software hindered certain aspects of the prayer movement. For instance, those that were previously discussed were the lack of support or recognition for the Arabic language and finger/hand placement recognition. Nevertheless, upon further analysis after the experiment, other limitations were uncovered. First, it is important to reevaluate the initial limitations. Thus, in terms of supporting the Arabic language, the workaround that was given was for the teacher to monitor how well the student said the Arabic phrases. While this worked in the classroom environment, this creates a serious issue on the overall implementation of the Islamic prayer in other environments, such as the home. This is because users will have no sure method to know whether they have said the Arabic phrases correctly or not. With regards to the finger/hand recognition, this too creates significant problems with how the iIP is implemented outside of a classroom environment or

without supervised input. That is, the hardware does not recognize certain placement of the hands or fingers that are necessary during some of the prayer movements.

Both these two areas cause a gap in this research that needs to be addressed in future work or in future development of the Kinect hardware. In addition, a similar hardware issue is that the Kinect 360 does not detect the prostration movement as it cannot see the positioning of the feet correctly. All these issues had a knock-on effect on the overall accuracy of the software.

In terms of the some of the software limitations that were found, one that was clearly observed was the issue of having two individuals standing in front of the camera at the same time, which caused the iIP Software to not detect which of the two should be used to enter the software. For instance, if two individuals stood in front of the camera, two skeleton images would appear on the screen and due to the hardware capabilities of the Kinect, the iIP Software would either give false measurements by taking the two individuals as one, or would not continue until only one person was in view of the camera. One could argue that this could be viewed as a hardware issue, however the Kinect does have the capability of having two users on screen simultaneously; the issue was more related to the iIP Software coding not accounting for this. This is an issue, particularly in a classroom environment when there are many individuals who will wish to observe the player and potentially be on screen at any given time. Moreover, other software improvements came from the teachers' suggestions, which were areas that were also identified by the researcher. For instance, the presence of the depth camera was quite redundant and not needed because it did not add any improvement to the student or the teacher. Furthermore, future efforts in designing the iIP Software should take into account the layout of what is on screen, such as making enough room for the skeleton, but to also include an avatar skin around it so it looks more familiar to the user.

With regards to pedagogical considerations, one of the main areas that the iIP Software needs to reconsider is to what extent the software improves cognitive development of the prayer. It is evident that the software focuses on the lower level of learning (i.e. surface learning) as the main areas of learning include memorizing and recalling information. It could be argued that this is indeed a strong fundamental basis for the software, particularly when acknowledging who the target audience is (primary school learners). At this level, one may postulate that this level of learning is necessary and a higher progression of this could be detrimental. However, it is

something to consider for future work. From the teachers' perspective, the time keeping was an issue when using the iIP Software as it was difficult to ensure all the learners had a turn, particularly in larger classroom groups. This further highlights an issue that should be considered, which could be addressed by using a timer system or to be lesson planned accordingly. Other suggestions that were made by the teachers were to incorporate their current syllabus into the software, as well as covering the five daily prayers. These are all valid areas for improvement as the iIP should be able to cover all the prayers, as well as include other aspects of the prayer such as how to perform the ablution before praying, how to perform the call to prayer, as well as what to say/do after the prayer is complete. In doing so, this will provide an all-encompassing tool for the whole of the prayer.

One final argument over this software that is important to discuss is that, due to the current learning approaches that are used in Saudi Arabia, the reason why this was seen as successful is because of this current context and that it was successful because the traditional approaches are already seen as ineffective or, as shown in this study, "boring". In other words, any alternative would be better than the current approach, not just the iIP Software. This is a valid point; however, I would argue that, while it is true that this approach is new and innovative in the Saudi context, there is documented evidence external to Saudi Arabia that shows the learning by doing approach is an effective means to improving understanding and learning. This, I believe, is no different in respect to the iIP Software. In fact, this further illustrates how necessary this type of software and approach is needed in Saudi Arabia, which also shows the effective contribution that this study will bring to achieve these objectives.

7.5 Summary

This chapter provides a detailed discussion of the results from the previous chapter, which seeks to answer the research question over which teaching method is more appropriate in developing the understanding of the Islamic prayer. The discussion is made over the various factors to learning that were used to evaluate each of the approaches and to also expand upon why the iIP approach was regarded as better than others. Evidence was also given to support these findings as well as providing a solution to many of the limitations for the iIP in order to fully implement this within the classroom environment.

Chapter 8 Conclusion

The final chapter provides an overall conclusion for this research, which addresses the overall effect and implementation of Virtual Environment software in Saudi Arabian primary schools to teach the Islamic prayer. The chapter begins by reassessing the problem area within the educational system in Saudi Arabia and then focusing on how the iIP Software is a potential solution and contribution for this issue. Following this, the chapter will reassess the criteria for success that was outlined in Chapter 1, in order to determine how successful and effective the software was in achieving its objective. Lastly, the chapter shall provide further recommendations and suggestions for future work, which can be used to improve this study and further improve the use of Virtual Environment software within this particular context, or even in others.

8.1 Contributions of Thesis

The education system in the Kingdom of Saudi Arabia is one that has been criticized by academics for adhering to traditional behaviourist teaching methods, which are often teacher-centered with little interaction from the learners (Al-Qurashi & Al-Thubaiti, 2001) and a focus on rote learning (Jamnoon, 2009). This style of teaching can lead to a lack of understanding within the classroom and causes a passive attitude from many students, who gain little or no stimulus from the lessons as they find them to be boring and uninteresting. This, in short, is the problem that has been identified within the education system in Saudi Arabia and, although there are many researchers that are calling for reform to take place, these problems do still arise (Al-Asiri, 2005; Al- Shirbini & Yaser, 2003; Al-Ali, 2007). A suggestion to reform and revolutionize the Saudi classroom is to incorporate the use of IT or Virtual Environments, which is where this thesis provides a significant contribution. Upon revisiting and reevaluating the research question for this thesis, one is able to identify how the results from this study can contribute to the educational system in Saudi Arabia.

The research question is: *Does the Interactive Islamic Prayer (iIP) Software enhance the development and understanding of the physical aspects of the Islamic prayer in comparison to learning from reading Prayer Book, or by watching a Prayer Video?*

Thus, the results showed that the use of the iIP provided a greater development and understanding of the prayer than the other approaches, which shows that the implementation of a VE program such as the iIP Software can greatly benefit classrooms in primary schools across Saudi Arabia. More specifically, Chapter 6 and Chapter 7 highlight that the iIP Software scored higher in all the areas of learning in comparison to the other approaches. This makes the iIP Software an effective alternative to teaching primary school children in facilitating their learning.

An additional contribution is that Islamic Prayer Process has been defined (Section 5.5.1) in terms of diagrams and text to be spoken.

8.2 Criteria for Success

In Chapter 1, the criteria for success were outlined to evaluate whether this thesis was successful in achieving its objectives. What follows is a review and insight into these areas:

8.2.1 Develop software-based method for teaching the Islamic Prayer

The iIP Software was devised and developed as a means of teaching the Islamic prayer. Chapter 5 provides a breakdown of how the iIP was devised. Within this chapter, the software specifications were initially identified in terms of what the iIP software must be able to provide the users. The primary specification was to provide users with a VE setting that would enable them to immerse themselves into the prayer. This led to analyse specific objectives for HCI, such as being able to track movements in an appealing and easy-to-use software. The software was therefore designed by helping users achieve skill acquisition in learning a sequence of movements of the Islamic prayer, but also helped consider the fundamental HCI aspects that needed to be addressed. Once the design stage was comprehended and finalized, the implementation stage was considered in Chapter 4. This chapter explored the necessary platform and specification requirements from the comparison of two such platforms (Wii and Kinect 360 for Windows) and also gave the actual configuration and what software was used to devise the iIP. From the results obtained in Chapter 6, the iIP was successfully developed in achieving this objective, as it provided primary school learners the necessary steps and components to learn the prayer in sequential order. In addition to this, it enabled the learner to understand what needed to be said during each movement. Although this was the case, there were a number of issues and challenges that were met along the development process of the software, and while many issues were resolved, there were some that were not able to be resolved due to hardware limitations.

Chapter 7 provides a detailed breakdown of these issues. Upon reflection over this as a criterion for success, I feel that it is inevitable that software programs will likely have certain limitations that require extensive solutions; however, I do not think they were so significant to cause a problem in achieving the overall objective in teaching the Islamic prayer. This was evident in the feedback from students and teachers, as well as the Post-Questionnaire, which indicated that the students improved in their learning.

8.2.2 Analysis of how primary school learners can effectively learn the Islamic Prayer

As stated in Chapter 1, one of the primary objectives for this research was to assess which of the teaching approaches (and styles) provided a greater learning experience for the learners, which in turn could generate a more effective improvement in their overall comprehension and understanding. The research question outlined in Chapter 3 therefore sought to determine which approach was able to enhance the development and understanding of the physical aspects for the Islamic Prayer, and the experiments that were conducted in Chapter 6 showed the approach using the iIP Software was received better by the learners in comparison to the other approaches. In addition, as stated in Chapter 7, further reflection of this concluded that this was due to the novelty factor, whereby if one is to draw comparisons to the style of teaching that the learners are familiar with (i.e. behaviorist method) and contrast it to the iIP Software, then one can assume they will be inclined to choose the latter as this is more interactive and generates more stimuli for the learner (i.e. makes learning fun). Thus, this criterion was effective in analysing how the learners learn as it gave an insight into their preferences and reasons for this.

8.2.3 Implement new software (iIP) to teach the Islamic Prayer

Upon developing and testing the software through a pilot test, the software was successfully implemented within local Saudi School for Children in Newcastle upon Tyne, which was used in the experiments and results that formed the basis of this research. Details of this are presented in Chapter 3.

8.2.4 Evaluate the new Software (iIP) for teaching the Islamic prayer

As Chapter 6 demonstrated, the iIP Software was evaluated by the primary school learners through a series of questionnaires, which enabled the researcher to analyse their thoughts via quantitative analysis as well as observations made by the researcher and the teachers. In terms of evaluating the software to teach the Islamic prayer, the Observations and Pre/Post-Test both gave

rise to show how much of an impact the iIP Software was in improving the students' understanding of the prayer. That is, when the students used the iIP Software, their test scored after using the software showed a greater improvement than when they learnt the prayer using other methods.

8.3 Recommendations

The results that have been presented in this thesis can help educators and academics to have a greater understanding of how VE can be used within the classroom environment, particularly when contextualizing this for learning practical movements such as the Islamic prayer. In light of this, there are certain recommendations that may arise from this research, which could be used to further enhance the use of this type of software and method within the classroom environment.

***Recommendation 1**: Incorporating the iIP Software to be used in primary schools across Saudi Arabia (Governmental backing)*

Although this research did not initially set out to see this type of software being implemented across the country, it was highlighted as a viable option. However, due to the impact that has been highlighted in the results of this thesis, one can see that this is now a much greater recommendation and one that could become a reality. The reason for this is, if the educational system within Saudi Arabia continues to adhere to a behaviourist/teacher-centered approach, learning may remain inactive and stagnant. However, if the Ministry of Education wishes to incorporate new teaching methods, then the iIP is a viable option to help facilitate the teaching of the Islamic prayer in primary schools.

***Recommendation 2**: Developing the iIP Software to be used on mobile/SMART devices.*

From the results, many of the teachers felt the software could be designed and imported so that it can be used on mobile/smart devices such as tablets or SMART phones. There is a possibility for this to occur; however it would require a front-facing camera that has the same functionality as the Kinect technology.

***Recommendation 3**: Incorporate the Islamic Book into the iIP Software*

As the Islamic Prayer Book has been specifically designed by the government to teach the Islamic prayer, one could suggest that this should be incorporated into the iIP Software so that it

includes more than just the movements of the prayer – that is, it incorporates aspects such as how to prepare for the prayer (i.e. the mandatory ablution) or what to do/say after the prayer finishes.

8.4 Future Work

What follows are certain suggestions that could be conducted for future work:

- To improve the validity and reliability of the study, one may conduct this experiment using more students and from a number of primary schools across Saudi Arabia. Additionally, comparative studies could be conducted by using primary schools across the Middle East in general. However, one should consider the experimental procedures as it takes time for one individual to go through the whole iIP process.
- Conduct this experiment using different participants, such as female primary school children and new Muslims. The reason for highlighting these three categories is as follows: 1. For female primary school children – due to the cultural restrictions within Saudi Arabia, segregation amongst the sexes is strict, which limits the study to be with males only. Thus, it will require a female researcher from Saudi Arabia to conduct this experiment for this category. 2. For new Muslims, the prayer is something entirely new for them, so it would be interesting to observe how this could be used to help their development of the Islamic prayer movements and statements. Moreover, new Muslims may not be in a Muslim country or have access to a local teacher to teach them the prayer.
- Incorporate a quiz/question bank within the software so that the software can detect any improvements made by the learner.
- With new technology always being developed, it may be possible that it could resolve the limitations that were highlighted in chapter 7, such as detecting the placement of the hands or during the prostration position. Future work could therefore develop the software based on this new hardware such as new technology like Kinect One.

Appendix

A Detailed Questionnaire Results

Group A:
Learning Experience

Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S4	Using the Prayer Book for learning is very exciting and interesting for me	F=10	1	1	7	1	2.20
S5	This method makes the classroom very relaxed and enjoyable	F=10	4	2	3	1	2.90
S6	This method makes us want to learn to pray and use it more	F=10	1	1	7	1	2.20
Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S4	Using the Prayer Video for learning is very exciting and interesting for me	F=10	1	3	5	1	2.40
S5	This method makes the classroom very relaxed and enjoyable	F=10	1	4	2	3	2.30
S6	This method makes us want to learn to pray and use it more	F=10	1	3	5	1	2.40
iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S4	Using the iIP Software for learning is very exciting and interesting for me	F=10	4	4	1	1	3.10
S5	This method makes the classroom very relaxed and enjoyable	F=10	3	4	1	2	2.80
S6	This method makes us want to learn to pray and use it more	F=10	5	3	1	1	3.20

Interaction

Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S7	I found it easy to get involved in the lesson	F=10	3	2	4	1	2.70
S8	It was easy to interact with this method	F=10	5	3	1	1	3.20
S9	This method made me learn by practice	F=10	2	1	6	1	2.40
Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S7	I found it easy to get involved in the lesson	F=10	2	1	4	3	2.20
S8	It was easy to interact with this method	F=10	1	2	6	1	2.30
S9	This method made me learn by practice	F=10	1	1	5	3	2.00
iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S7	I found it easy to get involved in the lesson	F=10	6	2	1	1	3.30
S8	It was easy to interact with this method	F=10	5	3	1	1	3.20
S9	This method made me learn by practice	F=10	4	4	1	1	3.10

Satisfaction

Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S10	I enjoyed the lesson	F=10	1	1	7	1	2.20
S11	Overall, I like this method	F=10	4	2	3	1	2.90
S12	This Method makes me feel more confident when I pray	F=10	1	1	7	1	2.20
Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S10	I enjoyed the lesson	F=10	1	2	5	2	2.20
S11	Overall, I like this method	F=10	2	1	4	3	2.20
S12	This Method makes me feel more confident when I pray	F=10	1	2	5	2	2.20
iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S10	I enjoyed the lesson	F=10	4	4	1	1	3.10
S11	Overall, I like this method	F=10	3	4	2	1	2.90
S12	This Method makes me feel more confident when I pray	F=10	4	4	1	1	3.10

Usability

Book								
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean	Std. Deviation
S13	It was easy to learn how to pray using this method	F=10	3	2	4	1	2.70	1.059
S14	It was easy to follow the prayer movements using this method	F=10	6	2	1	1	3.30	1.059
S15	This method explains the prayer clearly from beginning to end	F=10	2	1	6	1	2.40	0.966
Video								
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean	Std. Deviation
S13	It was easy to learn how to pray using this method	F=10	2	1	6	1	2.40	0.966
S14	It was easy to follow the prayer movements using this method	F=10	2	3	4	1	2.60	0.966
S15	This method explains the prayer clearly from beginning to end	F=10	1	4	4	1	2.50	0.850

iIP								
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean	Std. Deviation
S13	It was easy to learn how to pray using this method	F=10	5	3	1	1	3.20	1.033
S14	It was easy to follow the prayer movements using this method	F=10	5	3	1	1	3.20	1.033
S15	This method explains the prayer clearly from beginning to end	F=10	4	4	1	1	3.10	0.994
		%=100	40.0	40.0	10.0	10.0		

Achievement

Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S16	I can remember the prayer positions after using this method	F=10	1	1	7	1	2.20
S17	My prayer performance is better after using this method	F=10	4	2	3	1	2.90

Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S16	I can remember the prayer positions after using this method	F=10	1	3	5	1	2.40
S17	My prayer performance is better after using this method	F=10	1	4	2	3	2.30

iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S16	I can remember the prayer positions after using this method	F=10	5	3	1	1	3.20
S17	My prayer performance is better after using this method	F=10	4	4	1	1	3.10

Group B:

Learning Experience

Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S4	Using the Prayer Video for learning is very exciting and interesting for me	F=10	2	2	5	1	2.50
S5	This method makes the classroom very relaxed and enjoyable	F=10	1	6	2	1	2.70
S6	This method makes us want to learn to pray and use it more	F=10	1	4	4	1	2.50
iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S4	Using the iIP Software for learning is very exciting and interesting for me	F=10	3	5	1	1	3.00
S5	This method makes the classroom very relaxed and enjoyable	F=10	4	3	2	1	3.00
S6	This method makes us want to learn to pray and use it more	F=10	5	3	1	1	3.20
Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S4	Using the Prayer Book for learning is very exciting and interesting for me	F=10	2	1	6	1	2.40
S5	This method makes the classroom very relaxed and enjoyable	F=10	1	3	5	1	2.40
S6	This method makes us want to learn to pray and use it more	F=10	1	2	6	1	2.30

Interaction

Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S7	I found it easy to get involved in the lesson	F=10	1	3	5	1	2.40
S8	It was easy to interact with this method	F=10	1	3	5	1	2.40
S9	This method made me learn by practice	F=10	1	3	5	1	2.40
iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S7	I found it easy to get involved in the lesson	F=10	5	3	1	1	3.20

S8	It was easy to interact with this method	F=10	4	3	1	2	2.90
S9	This method made me learn by practice	F=10	3	5	1	1	3.00
Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S7	I found it easy to get involved in the lesson	F=10	2	1	6	1	2.40
S8	It was easy to interact with this method	F=10	1	3	5	1	2.40
S9	This method made me learn by practice	F=10	1	1	7	1	2.20

Satisfaction

Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S10	I enjoyed the lesson	F=10	1	3	5	1	2.40
S11	Overall, I like this method	F=10	2	4	3	1	2.30
S12	This Method makes me feel more confident when I pray	F=10	2	3	0	5	2.70
iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S10	I enjoyed the lesson	F=10	3	5	1	1	3.00
S11	Overall, I like this method	F=10	4	3	2	1	3.00
S12	This Method makes me feel more confident when I pray	F=10	2	4	3	1	2.70
Book							
S	Statement	Frequency & Percentage	SA 4	`A 3	D 2	SD 1	Mean
S10	I enjoyed the lesson	F=10	1	1	7	1	2.20
S11	Overall, I like this method	F=10	1	1	7	1	2.20
S12	This Method makes me feel more confident when I pray	F=10	1	1	7	1	2.20

Usability

Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S13	It was easy to learn how to pray using this method	F=10	2	3	4	1	2.60
S14	It was easy to follow the prayer movements using this method	F=10	2	3	4	1	2.60
S15	This method explains the prayer clearly from beginning to end	F=10	2	3	4	1	2.60

iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S13	It was easy to learn how to pray using this method	F=10	5	3	1	1	3.20
S14	It was easy to follow the prayer movements using this method	F=10	5	3	1	1	3.20
S15	This method explains the prayer clearly from beginning to end	F=10	5	3	1	1	3.20
Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S13	It was easy to learn how to pray using this method	F=10	1	1	7	1	2.20
S14	It was easy to follow the prayer movements using this method	F=10	1	2	6	1	2.30
S15	This method explains the prayer clearly from beginning to end	F=10	1	1	7	1	2.20

Achieved

Video								
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean	Std. Deviation
S16	I can remember the prayer positions after using this method	F=10	2	2	5	1	2.50	0.972
S17	My prayer performance is better after using this method	F=10	1	4	4	1	2.50	0.850
iIP								
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean	
S16	I can remember the prayer positions after using this method	F=10	3	5	1	1	3.00	
S17	My prayer performance is better after using this method	F=10	4	4	1	1	3.10	
Book								
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean	
S16	I can remember the prayer positions after using this method	F=10	1	1	7	1	2.20	
S17	My prayer performance is better after using this method	F=10	1	1	7	1	2.10	

Group C:
Learning Experience

iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S4	Using the iIP Software for learning is very exciting and interesting for me	F=10	3	5	1	1	3.00
S5	This method makes the	F=10	4	3	2	1	2.90

	classroom very relaxed and enjoyable						
S6	This method makes us want to learn to pray and use it more	F=10	6	2	1	1	3.30
Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S4	Using the iIP Software for learning is very exciting and interesting for me	F=10	1	1	7	1	2.20
S5	This method makes the classroom very relaxed and enjoyable	F=10	1	1	7	1	2.20
S6	This method makes us want to learn to pray and use it more	F=10	1	1	7	1	2.20
Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S4	Using the iIP Software for learning is very exciting and interesting for me	F=10	1	2	5	2	2.20
S5	This method makes the classroom very relaxed and enjoyable	F=10	1	2	6	1	2.30
S6	This method makes us want to learn to pray and use it more	F=10	1	2	6	1	2.30

Interaction

iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S7	I found it easy to get involved in the lesson	F=10	5	3	1	1	3.20
S8	It was easy to interact with this method	F=10	4	3	2	1	3.00
S9	This method made me learn by practice	F=10	4	4	1	1	3.10
Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S7	I found it easy to get involved in the lesson	F=10	1	1	7	1	2.20
S8	It was easy to interact with this method	F=10	1	1	7	1	2.20
S9	This method made me learn by practice	F=10	1	1	7	1	2.20
Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S7	I found it easy to get involved in the lesson	F=10	1	3	5	1	2.40
S8	It was easy to interact with this method	F=10	1	3	4	2	2.30
S9	This method made me learn by practice	F=10	2	1	6	1	2.40

Satisfaction

iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S10	I enjoyed the lesson	F=10	4	4	1	1	3.10
S11	Overall, I like this method	F=10	3	4	2	1	2.90
S12	This Method makes me feel more confident when I pray	F=10	5	2	2	1	3.10
Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S10	I enjoyed the lesson	F=10	1	1	7	1	2.20
S11	Overall, I like this method	F=10	1	2	6	1	2.30
S12	This Method makes me feel more confident when I pray	F=10	1	1	7	1	2.20
Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S10	I enjoyed the lesson	F=10	1	2	6	1	2.30
S11	Overall, I like this method	F=10	1	2	5	2	2.20
S12	This Method makes me feel more confident when I pray	F=10	1	3	5	1	2.40

Usability

iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S13	It was easy to learn how to pray using this method	F=10	4	4	1	1	3.10
S14	It was easy to follow the prayer movements using this method	F=10	4	4	1	1	3.10
S15	This method explains the prayer clearly from beginning to end	F=10	4	4	1	1	3.10
Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S13	It was easy to learn how to pray using this method	F=10	1	1	7	1	2.20
S14	It was easy to follow the prayer movements using this method	F=10	1	1	7	1	2.20
S15	This method explains the prayer clearly from beginning to end	F=10	1	1	7	1	2.20
Video							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S13	It was easy to learn how to pray using this method	F=10	1	3	5	1	240
S14	It was easy to follow the prayer	F=10	1	2	6	1	2.30

	movements using this method						
S15	This method explains the prayer clearly from beginning to end	F=10	2	1	7	1	2.40

Achieved

iIP							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S16	I can remember the prayer positions after using this method	F=10	4	4	1	1	3.10
S17	My prayer performance is better after using this method	F=10	4	4	1	1	3.10
Book							
S	Statement	Frequency	SA 4	`A 3	D 2	SD 1	Mean
S16	I can remember the prayer positions after using this method	F=10	1	1	7	1	2.20
		%=100	10.0	10.0	70.0	10.0	
S17	My prayer performance is better after using this method	F=10	1	1	7	1	2.20
		%=100	10.0	10.0	70.0	10.0	
Video							
S	Statement	Frequency & Percentage	SA 4	`A 3	D 2	SD 1	Mean
S16	I can remember the prayer positions after using this method	F=10	1	2	6	1	2.30
S17	My prayer performance is better after using this method	F=10	1	2	6	1	2.30

B Experiment Research Protocol

Experiment Research Protocol

Consent Form

Interactive Islamic Prayer

Date: _____
Candidate ID: _____

Consent Form

Thank you for volunteering to participate in this evaluation of learning the Islamic prayer using different learning styles. You will participate in three experiments: Learning Islamic Prayer from Prayer Book, Prayer Video and iIP Software. All of experiments involve Pre/Post-Test and Pre/Post Questionnaires. The interaction in each experiment will take approximately 40 minutes. Your total time involved is about an hour. The researchers appreciate your candid and direct feedback.

All information you give us will be kept confidential. Your identity will remain confidential to the extent provided by the law. There are no direct risks to you by participating in this study. You may withdraw your participation at any time. Thank you.

(The participant should complete the whole of this sheet himself/herself)

	Please cross out as necessary
Have you read the Participant Information Sheet?	YES / NO
Have you had an opportunity to ask questions and to discuss the study?	YES / NO
Have you received satisfactory answers to all of your questions?	YES / NO
Have you received enough information about the study?	YES / NO
Who have you spoken to? Dr/Mr/Mrs/Ms/Prof.	
Do you consent to participate in the study?	YES/NO
Do you understand that you are free to withdraw from the study:	
* at any time and	
* without having to give a reason for withdrawing?	YES / NO

Signed .....……..... **Date** .....

(NAME IN BLOCK LETTERS) .....…….....

Signature of witness .....…..... **Date** .....

(NAME IN BLOCK LETTERS) .....…….....

Experiment Research Protocol

Participants:

Teachers: 3 **Age**: 20+ **Sex**: Male

Students: 30 **Age**: 7-12 **Sex**: Male

3 **Groups** each group has 10 students and a teacher.

Introduction

This Experiment Research Protocol serves as a guide for researchers to set up the experiment that tests the iIP software against traditional methods of teaching the Islamic prayer. The experiment has been designed specifically for studies relating to primary school students, who are often taught the Islamic prayer (in Arab countries) using teaching styles that include learning directly from a prayer book or by watching a prayer video. However, the iIP software provides a new style of teaching, which uses the "learning by doing" or kinesthetical approach. This means, students use Microsoft Kinect 360 for Windows to interact directly with this learning tool to improve their learning experience of the prayer.

This protocol provides specific instructions and guidelines for researchers to conduct this experiment, which takes place over five Steps. It outlines how the three separate groups are to be arranged, including the details of what happens on each Step. This allows the researcher to test each of the three methods of learning the prayer (i.e. learning from a prayer book, video and iIP software). Lastly, the various data collection tools that are used to assess the effectiveness and user experience of the iIP software in comparison to the other teaching methods are outlined. This also explains when each instrument should be used.

Group "A" Experiment

Step 1:

- The students and teachers will be requested to complete the **Students' Demographic Questionnaire and Teachers' Pre Experiment Questionnaire** (Document **1** and 2).

Step 2:

- Students are given the **Pre-Test** to ascertain what aspects of the prayer they know and are familiar with (Document 3).
- The teacher then gives a lesson from the specific chapters in the **Prayer Book** whilst the researcher observes the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- When they have completed the lesson, Students are then given a **Post-Test** (Document 5).
- The students and teacher are requested to complete the **Post Questionnaire** (Document 6 and **7).**

Step 3:

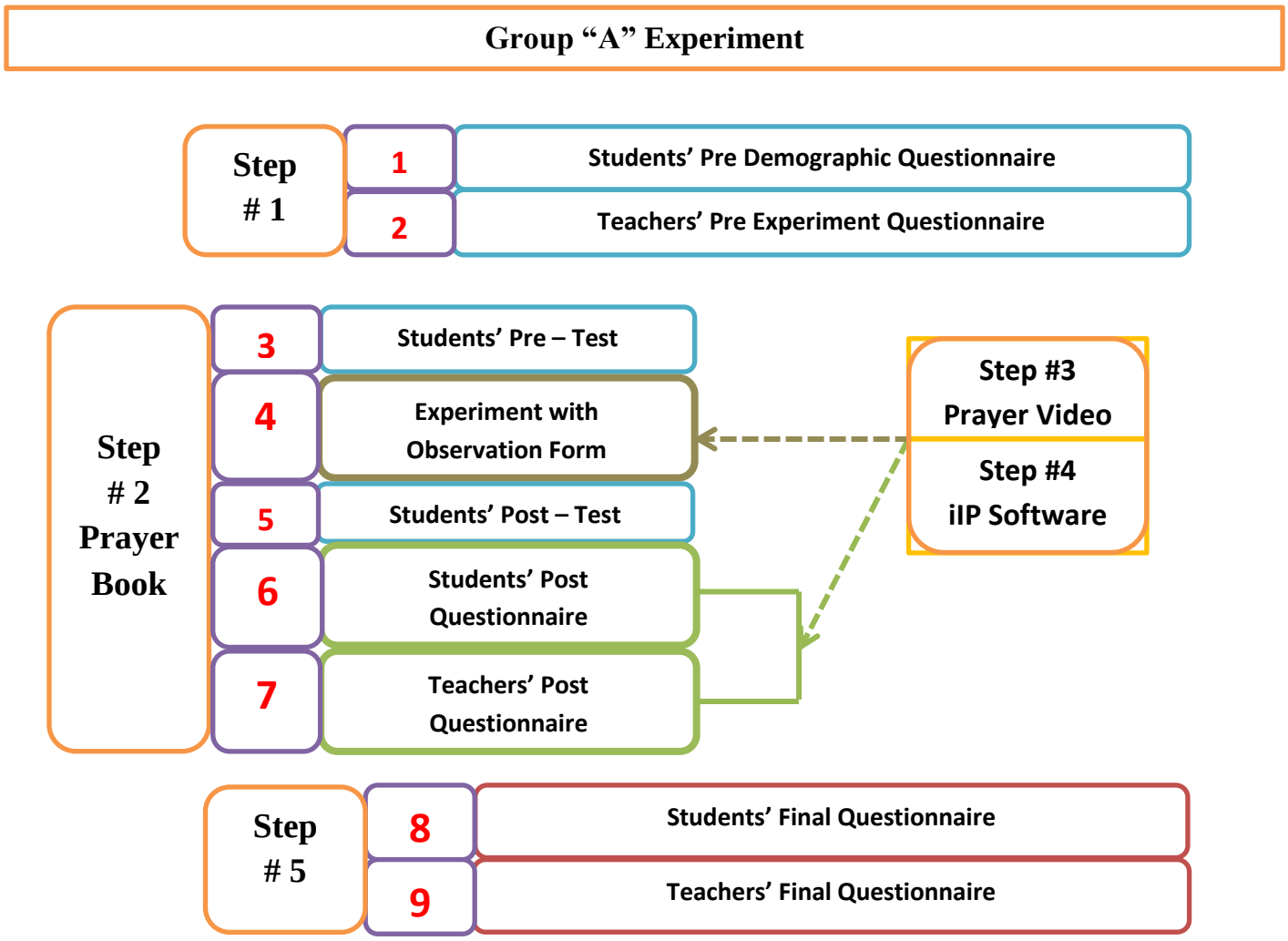
- The teacher gives a lesson from the **Prayer Video** whilst the researcher observes the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- The students and teacher are requested to complete the **Post Questionnaire** (Document **6** and **7).**

Step 4:

- The teacher informs and instructs the class that they will learn the prayer using the **iIP Software**; however, in order to assess ease of use, the teacher did give the students any indication of how it works.
- Each student is called up to interact and complete the prayer directly with the **iIP Software** within 5-8 minutes, while the other students observed and waited for their turn.
- It should also be noted that the teacher did not give any instructions to the students, except for reading out what is on the screen if they required.
- During the experiment the researcher observes the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- The students and teacher are requested to complete the **Post Questionnaire** (Document 6 and **7).**

Step 5:

- The students and teachers are finally given the **Final Questionnaire** to rank preferences in specific areas for all three approaches (Document 8 and **9)**.


Group "A" Experiment
Step # 1
1
Students' Pre Demographic Questionnaire
2
Teachers' Pre Experiment Questionnaire
Step # 2 Prayer Book
3
Students' Pre – Test
4
Experiment with Observation Form
5
Students' Post – Test
6
Students' Post Questionnaire
7
Teachers' Post Questionnaire
Step #3 Prayer Video
Step #4 iIP Software
Step # 5
8
Students' Final Questionnaire
9
Teachers' Final Questionnaire

Group "B" Experiment

Step 1:

- The students and teachers will be requested to complete the **Students' Demographic Questionnaire and Teachers' Pre Experiment Questionnaire** (Document **1** and 2).

Step 2:

- Students are then given the **Pre-Test** to ascertain what aspects of the prayer they know and are familiar with (Document 3).
- The teacher gives a lesson for the specific chapters in the **Prayer Video** whilst the researcher observed the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- When they have completed the lesson, Students are then given a **Post-Test** (Document 5).
- The students and teacher are requested to complete the **Post Questionnaire** (Document 6 and **7).**

Step 3:

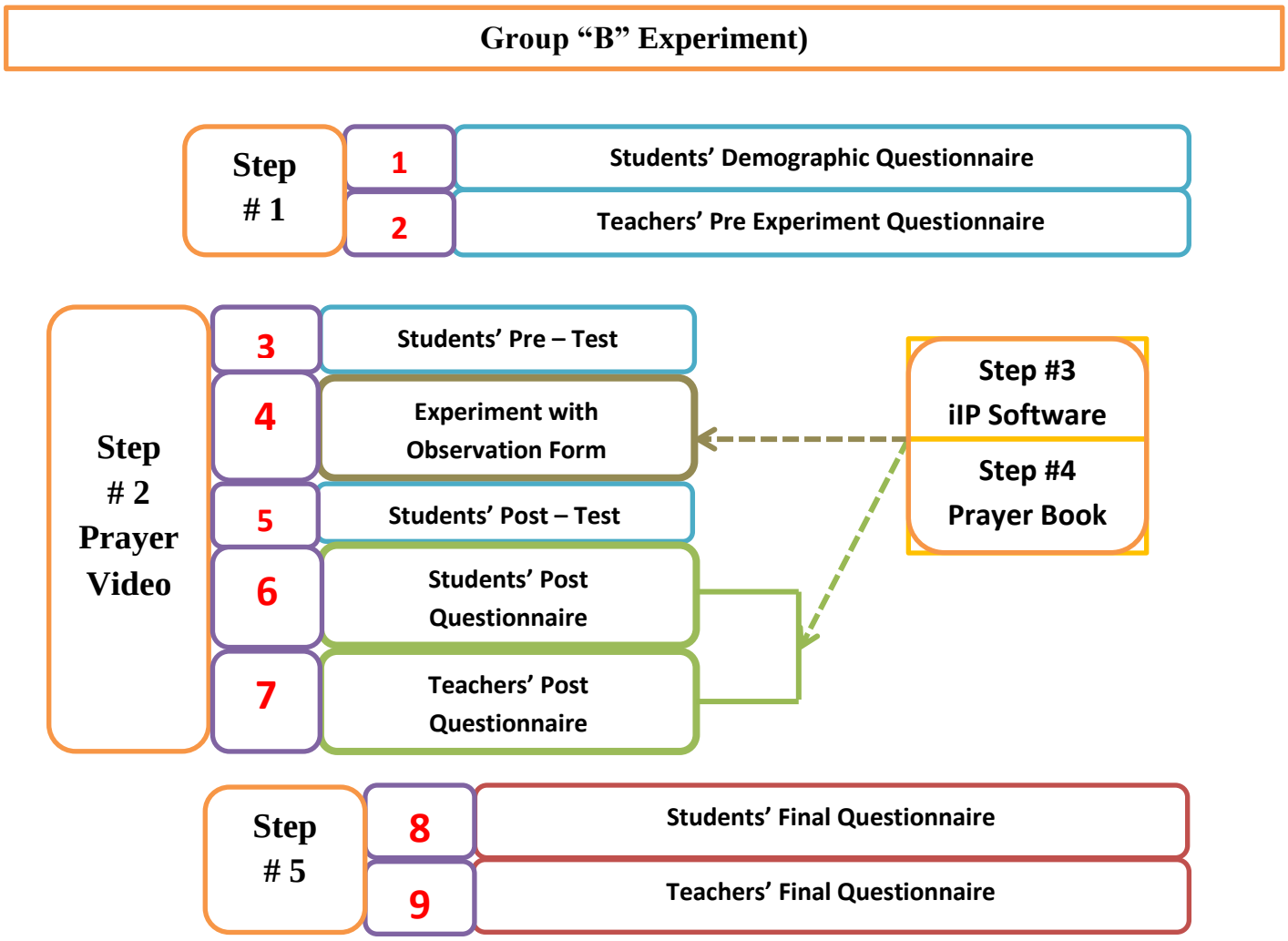
- The teacher informed and instructed the class that they will learn the prayer using the **iIP Software**; however, in order to assess ease of use, the teacher did give the students any indication of how it worked.
- Each student was called up to interact and complete the prayer directly with the **iIP Software** within 5-8 minutes, while the other students observed and waited for their turn. It should also be noted that the teacher did not give any instructions to the students, except for reading out what is on the screen if they required. Upon completion, the teacher asked certain questions about the prayer.
- During the experiment the researcher observed the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- The students and teacher are requested to complete the **Post Questionnaire** (Document 6 and **7).**

Step 4:

- The teacher gives a lesson from the specific chapters in the **Prayer Book** whilst the researcher observes the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- The students and teacher are requested to complete the **Post Questionnaire** (Document 6 and **7).**

Step 5:

- The students and teachers are finally given the **Final Questionnaire** to rank preferences in specific areas for all three approaches (Document 8 and **9)**.


Group "B" Experiment)
Step # 1
1
Students' Demographic Questionnaire
2
Teachers' Pre Experiment Questionnaire
Step # 2 Prayer Video
3
Students' Pre – Test
4
Experiment with Observation Form
5
Students' Post – Test
6
Students' Post Questionnaire
7
Teachers' Post Questionnaire
Step #3 iIP Software
Step #4 Prayer Book
Step # 5
8
Students' Final Questionnaire
9
Teachers' Final Questionnaire

Group "C" Experiment

Step 1:

- The students and teachers will be requested to complete the **Students' Demographic Questionnaire and Teachers' Pre Experiment Questionnaire** (Document **1** and 2).

Step 2:

- Students are then given the **Pre-Test** to ascertain what aspects of the prayer they know and are familiar with (Document 3).
- The teacher informed and instructed the class that they will learn the prayer using the **iIP Software**; however, in order to assess ease of use, the teacher did give the students any indication of how it worked.
- Each student was called up to interact and complete the prayer directly with the **iIP Software** within 5-8 minutes, while the other students observed and waited for their turn. It should also be noted that the teacher did not give any instructions to the students, except for reading out what is on the screen if they required. Upon completion, the teacher asked certain questions about the prayer.
- During the experiment the researcher observes the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- The students and teacher are requested to complete the **Post Questionnaire** (Document 6 and **7).**

Step 3:

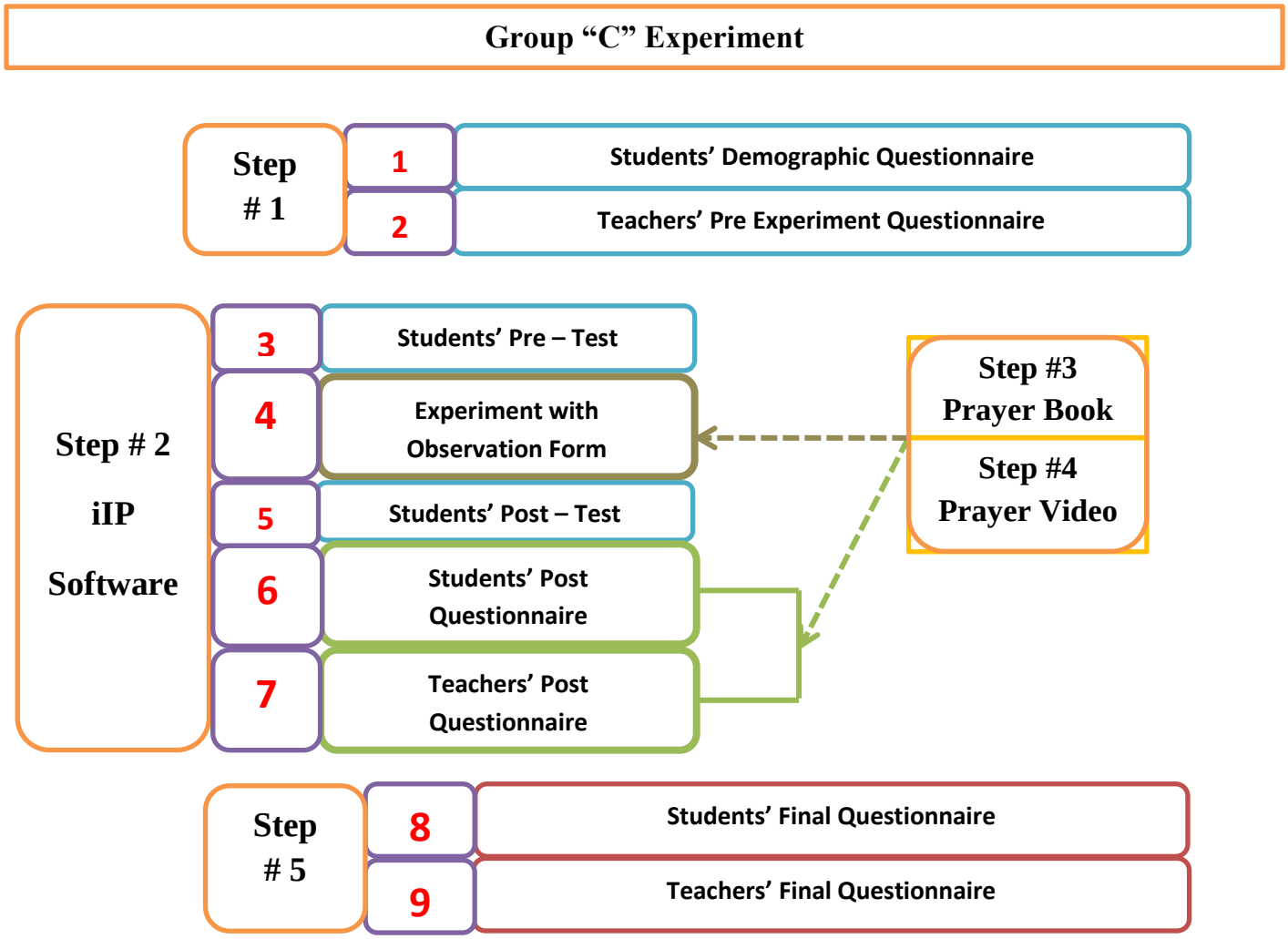
- The teacher gives a lesson for the specific chapters in the **Prayer Book** whilst the researcher observed the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- The students and teacher are requested to complete the **Post Questionnaire** (Document 6 and **7).**

Step 4:

- The procedures are identical with the exception that the **Pre** and **Post-Tests** are **not given.**
- The teacher then completed the specific chapters in the **Prayer Video** whilst the researcher observed the group for engagement and interaction and writes his note in the **Observation Form (**Document **4)**.
- The students and teacher are requested to complete the **Post-Session Questionnaire** (Document 6 and **7).**

Step 5:

- The students and teachers are finally given the **Final Questionnaire** to rank preferences in specific areas for all three approaches (Document 8 and **9)**.


Group "C" Experiment
Step # 1
1
Students' Demographic Questionnaire
2
Teachers' Pre Experiment Questionnaire
Step # 2
iIP
Software
3
Students' Pre – Test
4
Experiment with Observation Form
5
Students' Post – Test
6
Students' Post Questionnaire
7
Teachers' Post Questionnaire
Step #3
Prayer Book
Step #4
Prayer Video
Step # 5
8
Students' Final Questionnaire
9
Teachers' Final Questionnaire

C Questionnaire

1 Surdents' Pre- Demographic Questionnaire

Primary School Students

Name: _____

Age: _____

Are you a boy or a girl?
BOY GIRL

Do you know how to pray?
YES NO

Where did you learn how to pray?

- Parent ☐
- Teacher ☐
- Mosque ☐
- Friend ☐
- School ☐
- Book ☐
- Internet ☐
- Video ☐
- Other ……

Which way do you think is the best way to learn the prayer?

- Listening to your teacher/parent ☐
- Watching a prayer video ☐
- Reading from a prayer book ☐
- Learning by doing ☐
- Going to Mosque ☐

Do you pray?
YES NO

If yes, how many times do you pray per day?

- Once ☐
- 2 times ☐
- 3 times ☐
- 4 times ☐
- 5 times ☐
- More than 5 times ☐

Did you enjoy praying?
YES NO

Do you know the names for each position in the prayer?
YES NO

Thank you

2 Teachers' Pre-Experiment Questionnaire

Primary School Teachers

Name: _____

Sex: _____

How long have you been teaching Islamic studies (including the prayer)? _____

How do you normally teach the Islamic prayer to primary school children?

What are the difficulties in teaching the Islamic prayer to children?

Do you use computers or games consoles in your teaching?

YES NO

If yes, as it been successful? Why or why not?

Thank you

3 Students' Pre-Test

In this test, choose the correct name for the prayer position in the picture

1- What is this position called?

- Ruku
- Sujood
- Qiyaam
- Takbeetul-Ihram
- Jalsa
- Taslim

2- What is this position called?

- Ruku
- Sujood
- Qiyaam
- Takbeetul-Ihram
- Jalsa
- Taslim

3- What is this position called?

- Ruku
- Sujood
- Qiyaam
- Takbeetul-Ihram
- Jalsa
- Taslim

4- What is this position called?

- Ruku
- Sujood
- Qiyaam
- Takbeetul-Ihram
- Jalsa
- Taslim

5- What is the position called?

- Ruku
- Sujood
- Qiyaam
- Takbeetul-Ihram
- Jalsa
- Taslim

6- What should you say in Ruku?

- Subhana Rabbiyal Adhim
- Subhana Rabbiyal A'la
- Allahu Akbar
- Rabbighfir li.
- Assalamu alaikum wa rahmatullah

7- What should you say in Sujood?

- Subhana Rabbiyal Adhim
- Subhana Rabbiyal A'la
- Allahu Akbar
- Rabbighfir li.
- Assalamu alaikum wa rahmatullah
-

8- What should you say in Jalsa between tow Sujood ?

- Subhana Rabbiyal Adhim
- Subhana Rabbiyal A'la
- Allahu Akbar
- Rabbighfir li.
- Assalamu alaikum wa rahmatullah

9- What should you say in Taslim?

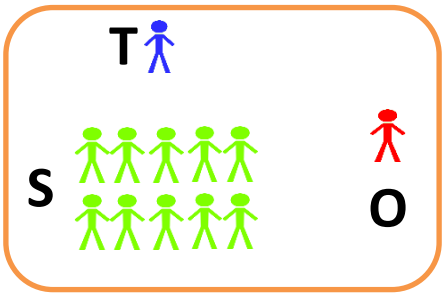
- Subhana Rabbiyal Adhim
- Subhana Rabbiyal A'la
- Allahu Akbar
- Rabbighfir li.
- Assalamu alaikum wa rahmatullah

10 What should you say in Takbeetul-Ihram?

- Subhana Rabbiyal Adhim
- Subhana Rabbiyal A'la
- Allahu Akbar
- Rabbighfir li.
- Assalamu alaikum wa rahmatullah

Thank you

4 Experiment Observation Form



Lesson Type:
Day:

Observing interaction during class

(Frequency of interactions)

Students	Raised hands to answer questions	Raised hands to ask questions.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Questions asked by teacher:	

Observing engagement during class

(1= Very Bad/No action, 4= Very Good)

Students	Eye contact with teacher	Attentive during class	Follows instructions from the teacher	Participates during tasks.
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Observer's comments (i.e. body language, daydreaming, etc)

Student	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

5 Students' Post-Test

In this test, choose the correct name for the prayer position in the picture

1- What is this position called?

- Ruku
- Sujood
- Qiyaam
- Takbeetul-Ihram
- Jalsa
- Taslim

2- What is this position called?

- Ruku
- Sujood
- Qiyaam
- Takbeetul-Ihram
- Jalsa
- Taslim

3- What is this position called?

- Ruku
- Sujood
- Qiyaam
- Takbeetul-Ihram
- Jalsa
- Taslim

4- What is this position called?

- Ruku
- Sujood
- Qiyaam
- Takbeetul-Ihram
- Jalsa
- Taslim

5- What is the position called?

- Ruku
- Sujood
- Qiyaam
- Takbeetul-Ihram
- Jalsa
- Taslim

6- What should you say in Ruku?

- Subhana Rabbiyal Adhim
- Subhana Rabbiyal A'la
- Allahu Akbar
- Rabbighfir li.
- Assalamu alaikum wa rahmatullah

7- What should you say in Sujood?

- Subhana Rabbiyal Adhim
- Subhana Rabbiyal A'la
- Allahu Akbar
- Rabbighfir li.
- Assalamu alaikum wa rahmatullah
-

8- What should you say in Jalsa between tow Sujood ?

- Subhana Rabbiyal Adhim
- Subhana Rabbiyal A'la
- Allahu Akbar
- Rabbighfir li.
- Assalamu alaikum wa rahmatullah

9- What should you say in Taslim?

- Subhana Rabbiyal Adhim
- Subhana Rabbiyal A'la
- Allahu Akbar
- Rabbighfir li.
- Assalamu alaikum wa rahmatullah

10 What should you say in Takbeetul-Ihram?

- Subhana Rabbiyal Adhim
- Subhana Rabbiyal A'la
- Allahu Akbar
- Rabbighfir li.
- Assalamu alaikum wa rahmatullah

Thank you

6 Surdents' Post- Session Questionnaire (iIP Software)

Primary School Students

S	Statement	Strongly agree ☺☺	Agree ☺	Disagree ☹	Strongly disagree ☹☹
COMPREHENSION					
S1	The iIP makes me better understand the prayer.				
S2	I know the prayer positions when using the iIP.				
S3	I learnt a lot about the prayer using the iIP.				
Learning Experience					
S4	Using the iIP Software for learning is very exciting and interesting for me				
S5	This method makes the classroom very relaxed and enjoyable				
S6	This method makes us want to learn to pray and use it more				
Interaction					
S7	I found it easy to get involved in the lesson				
S8	It was easy to interact with this method				
S9	This method made me learn by practice				
Satisfaction					
S10	I enjoyed the lesson				
S11	Overall, I like this method				
S12	This Method makes me feel more confident when I pray				
Usability					
S13	It was easy to learn how to pray using this method				
S14	It was easy to follow the prayer movements using this method				
S15	This method explains the prayer clearly from beginning to end				
Achievement					
S16	I can remember the prayer positions after using this method				
S17	My prayer performance is better after using this method				

Thank you

6 Students' Post- Session Questionnaire (Prayer Book)

Primary School Students

S	Statement	Strongly agree ☺☺	Agree ☺	Disagree ☹	Strongly disagree ☹☹
COMPREHENSION					
S1	The Book makes me better understand the prayer.				
S2	I know the prayer positions when using the Book.				
S3	I learnt a lot about the prayer using the Book.				
Learning Experience					
S4	Using the Book for learning is very exciting and interesting for me				
S5	This method makes the classroom very relaxed and enjoyable				
S6	This method makes us want to learn to pray and use it more				
Interaction					
S7	I found it easy to get involved in the lesson				
S8	It was easy to interact with this method				
S9	This method made me learn by practice				
Satisfaction					
S10	I enjoyed the lesson				
S11	Overall, I like this method				
S12	This Method makes me feel more confident when I pray				
Usability					
S13	It was easy to learn how to pray using this method				
S14	It was easy to follow the prayer movements using this method				
S15	This method explains the prayer clearly from beginning to end				
Achievement					
S16	I can remember the prayer positions after using this method				
S17	My prayer performance is better after using this method				

Thank you

6 Students' Post- Session Questionnaire (Prayer Video)

Primary School Students

S	Statement	Strongly agree ☺☺	Agree ☺	Disagree ☹	Strongly disagree ☹☹
COMPREHENSION					
S1	The Video makes me better understand the prayer.				
S2	I know the prayer positions when using the Video.				
S3	I learnt a lot about the prayer using the Video.				
Learning Experience					
S4	Using the Video for learning is very exciting and interesting for me				
S5	This method makes the classroom very relaxed and enjoyable				
S6	This method makes us want to learn to pray and use it more				
Interaction					
S7	I found it easy to get involved in the lesson				
S8	It was easy to interact with this method				
S9	This method made me learn by practice				
Satisfaction					
S10	I enjoyed the lesson				
S11	Overall, I like this method				
S12	This Method makes me feel more confident when I pray				
Usability					
S13	It was easy to learn how to pray using this method				
S14	It was easy to follow the prayer movements using this method				
S15	This method explains the prayer clearly from beginning to end				
Achievement					
S16	I can remember the prayer positions after using this method				
S17	My prayer performance is better after using this method				

Thank you

7 Teachers' Post- Session Questionnaire (iIP Software)

Primary School Teachers

What did you like/dislike about this method?

What was the best thing about this method?

What was the worst thing about this method?

What would you improve?

Would you incorporate this method in your classroom when teaching the Islamic prayer?

YES NO

Please expand on your answer (why/why not)

Thank you

7 Teachers' Post- Session Questionnaire (Prayer Book)

Primary School Teachers

What did you like/dislike about this method?

What was the best thing about this method?

What was the worst thing about this method?

What would you improve?

Would you incorporate this method in your classroom when teaching the Islamic prayer?

YES NO

Please expand on your answer (why/why not)

Thank you

7 Teachers' Post- Session Questionnaire (Prayer Video)

Primary School Teachers

What did you like/dislike about this method?

What was the best thing about this method?

What was the worst thing about this method?

What would you improve?

Would you incorporate this method in your classroom when teaching the Islamic prayer?

YES NO

Please expand on your answer (why/why not)

Thank you

8 Final Questionnaire

Primary School Students

You have completed all three types of learning for the prayer. You have different smiley faces (1, 2 or 3). Read the sentences and rank each of the types of prayer by giving them a smiley face.

☺☺☺ ☺☺ ☺

		Prayer Book	Prayer Video	iIP Software
1	It was very attracting and eye-catching			
2	It helped me understand the prayer better			
3	It made me get involved in the class			
4	It made me interact physically			
5	It made me very happy			

Which method do you prefer the most?

- Prayer Book
- Prayer Video
- iIP software

Why?

Thank you

9 Final Questionnaire

Primary School Teachers

You have experienced all three types of teaching styles for the prayer. Please rank them (1st, 2nd or 3rd place) for each of the sentences below.

		Prayer Book	Prayer Video	iIP Software
1	It was very appealing.			
2	It helped the students to comprehend the prayer			
3	It made the students get more involved in the class			
4	It made the students physically interact more in the lesson.			
5	This method makes me satisfied.			

Which method do you prefer the most?

- Prayer Book
- Prayer Video
- iIP software

Why?

Thank you

References:

2010 Horizon Report, Austin, TX: The New Media Consortium, 2010.

2011 Horizon Report, Austin, TX: The New Media Consortium, 2011.

Abdel-Al, A. R. (1994). Education in the Kingdom of Saudi Arabia. S.A.: The New National Publisher and Distributers

Adjibolosoo, S. B. K. (1995). The human factor in developing Africa. Greenwood Publishing Group.

Al-Ali, N. (2007). Comparing the effectiveness of computer-assisted instruction with conventional teaching on students' achievement at Yarmouk University. The Journal of Education and Psychology, Faculty of Education, Bahrain, 3, (8), pp. 213-232.

Alamri, M. (2011). Higher Education in Saudi Arabia. Journal of Higher Education Theory and Practice vol. 11(4)

Al-Asiri, A. (2005). Designing a computer program and its application on inheritance issues which constitute part of the Islamic Figh syllabus for the students of the second year secondary (Islamic). MA. University of King Khalid, Saudi Arabia.

Alaya. N,A,R., Mendivil, E,G., Salinas, P., Rios, H. (2013). Kinesthetic Learning Applied to Mathematics Using Kinect. Procedia Computer Science 25:131–135

Alharbi, F. (2014). The Development of Curriculum for Girls in Saudi Arabia. Creative Education

Alireza, M. (1987). Women of Saudi Arabia. National Geographic, 172(4), 422-453.

Al-Muaayrah, M. (1999). The effects of scientific specialisation of the teaching staff of the faculty of education on the methods of teaching. The Arab magazine for Education, 19 (2).

Al-Qurashi, M. and Al-Thubaiti, J. (2001). The methods of reconstruction of education in the graduate schools in Saudi Arabia universities. In: King Abdul-Aziz University, Symposium of graduate schools in Saudi Arabia universities: future trends. (17-18 April 2001), Jeddah: Saudi Arabia.

Al-Rawaf, H.S., and Simmons, C. (1991). The education of women in Saudi Arabia. Comparative Education, 27 (3), 287-295.

Al-Shirbini, A. & Yasir, A. (2003). The Technologies of Modern Communication and the Numerous Media in Distance Learning: The experiment of the National Institute for Telecommunication. In: Damascus, A working paper presented at the Regional Symposium

on the Investment of Information Technologies and Telecommunication in Education, and Distance Learning, (15-17July 2003). Syria.

Augé, W. K., and Auge, S. M. (1999). Naturalistic observation of athletic drug-use patterns and behavior in professional-caliber bodybuilders. Substance use and misuse, 34(2), 217-249.

Ausubel, D. P. (1967). Learning theory and classroom practice. Ontario Institute for Studies in EducationBulletin.Availableat:http://www.ituarabic.org/PreviousEvents/2003/E-Education/Doc15-NTI.doc (Accessed January 2013).

Baecker, R. M., and Buxton, W. A. (2014). Readings in human-computer interaction. Elsevier Science.

Baer, J., Kaufman, J. C. and Baumeister, R. F. (2008). Are We Free Psychology and Free Will. New York Oxford University Press,Inc. 21-33.

Bara, F., Gentaz, E., and Cole´, P. (2004). The visuo-haptic and haptic exploration of letters increases the kindergarten-children's reading acquisition. Cognitive Development.

Becta. (2010). Using technology to enhance religious Education teaching. http://www.mmiweb.org.uk/publications/re/21stcentury_re.pdf(access on 2015)

Bennett, J. L. (1972). The user interface in interactive systems. Annual Review of Information Science and Technology, 7(159-196).

Benson, J. B. (2011). Advances in Child Development and Behavior, Elsevier Science., Academic Press.

Biggs, J. (1993). What do inventories of students' learning processes really measure? A theoretical review and clarification. British Journal of Educational Psychology, 63(1), 3-19.

Biggs, J. B. (1987). Student Approaches to Learning and Studying. Research Monograph. Australian Council for Educational Research Ltd., Radford House, Frederick St., Hawthorn 3122, Australia..

Biggs, J. B. (2003). Teaching for Quality Learning at University, (2nd ed.), Maindenhead, UK: The Society for Research into Higher Education and Open University Press.

Boddy, J. and Oliver, C. (2010). Research governance in children's services: the scope for new advice. London: Institute of Education.

Boling, E. C. (2003). The Transformation of Instruction through Technology: Promoting Inclusive Learning Communities in Teacher Education Courses, Action in Teacher Education, 24 (4): 64- 73.

Bor,H .(2013). Training Educators to Use Technology in the Jewish Classroom. Journal of Jewish Communal Service, Volume 88, Nos. 1/2, Winter/Spring 2013

Boutsika, Evgenia. (2014). Kinect in Education: A Proposal for Children with Autism. Procedia Computer Science 27, 123-129.

Bryman, A. (2008). Social Research Methods, (third edition) Oxford: Oxford University Press

Burns, C.M. (2000). Navigation strategies with ecological displays. International Journal of Human–Computer Studies 52 (1), 111–129.

Calvert, T.W. Bruderlin, A., Mah, S., Schiphorst, T., and Welman, C. (1993). The evolution of an interface for choreographers. 115-122

Carroll, J.W. and Thomas, J.C. (1988). Fun. SIGCHI Bulletin. January 1988, Vol.19 No.3.

Charbonneau, E., Miller, A., and LaViola J. (2011). Teach Me to Dance: Exploring Player Experience and Performance in Full Body Dance Games, Proceedings of the Eighth International Conference on Advances in Computer Entertainment Technology (ACE 2011), Article 43(8). November 2011.

Chen, J. (2007). Flow in games. Communications of the ACM Magazine, 50(4), 31-34

Clark, R.C. and Mayer, R.E. (2008). E-learning and the science of instruction (2nd ed.). San Francisco: Jossey-Bass/Pfeiffer.

Cockburn, A., and McKenzie, B. (2001, March). 3D or not 3D?: evaluating the effect of the third dimension in a document management system. In Proceedings of the SIGCHI conference on Human factors in computing systems (pp. 434-441). ACM.

Coker, C. A. (1996). Accommodating students' learning styles in physical education, Journal of Physical Education, Recreation and Dance, vol. 67, pp. 66-68.

Cook, D.A., Thompson, W.G., Thomas, K.G., & Thomas, M.R. (2009). Lack of interaction between sensing-intuitive learning styles and problem-first versus information-first instruction: A randomized crossover trial. Advances in Health Science Education, 14, 79–90.

Csikszentmihalyi, M. (1975). Beyond boredom and anxiety. San Francisco: Jossey-Bass.

Czikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. Praha: Lidové Noviny.

D'Angelo, J. M. and Woosley S. A. (2007). Technology in the classroom: Friend or foe. Education. 127: 462-471.

De Vaus, D. (2002). Surveys in Social Research (5th ed.). London: Routledge.

Dede C. (2009). Immersive Interfaces for Engagement and Learning. Science 323:66-69

DePriest, D. and Barilovits, K. (2011). LIVE: Xbox Kinect's Virtual Realities to Learning Games. TCC 2011 Proceedings

Dillon, A. (2001). The evaluation of software usability. Encyclopedia of Human Factors and Ergonomics.

Duffy, T., Cunningham, D. (1996). Constructivism: Implications for the design and delivery of instruction. New York, Simon and Schuster.

DuFour R, DuFour R, Eakey R, and Many, T (2006). Learning by Doing A Handbook for Professional Learning Communities at Work Solution Tree USA

Dyck, J., Pinelle, D., Brown, B., and Gutwin, C. (2003). Learning from games: HCI design innovations in entertainment software. In Proc. Graphics Interface.

Eaves, DL. Breslin, G., vanSchaik, P. Robinson, E. and Spears, I.R (2011). The short-term effects of real-time virtual reality feedback on motor learning in dance.

Eberts, R. (1994). User Interface Design. Prentice-Hall, international edition.

Felder, RM., and Silverman, L. K. (1988). Learning and Teaching Styles: In Engineering Education. Engineering Education, 78, 674 - 681.

Field, A. and Hole, G (2003). How to design and report experiments. London: Sage.

Fleming, N., Dunn, J., and Bonwell, C. (2001). VARK a Guide to Learning Styles, retrieved from http://www.vark-learn.com/english/index.asp (access on September 2013)

Ford, R. (2007). Enhancing Collaborative Learning with Multitouch Technology. Durham University Science Laboratories, Durham, England.

Gameiro, J. M. F. (2014). About using serious games to teach (Portuguese) sign language.

Gao, Z., Podlog, L., and Huang, C. (2013). Associations among children's situational motivation, physical activity participation, and enjoyment in an active dance video game. Journal of Sport and Health Science, 2(2), 122-128.

García, J., Zalevsky, Z., García-Martínez, P., Ferreira, C., Teicher, M., and Beiderman, Y. (2008). Projection of speckle patterns for 3d sensing. Journal of Physics: Conference Series 139, 012026.

Gardner, H. (1995). Multiple Intelligences as a Catalyst, The English Journal, vol. 84, no. 8, pp. 16-18

Ghasemi A. and Zahediasl S. (2012). Normality Tests for Statistical Analysis: A Guide for Non-Statisticians. International Journal of Endocrinology and Metabolism. 2012;10 (2):486-489. doi:10.5812/ijem.3505.

Gilley, J. W., Dean, P. J., and Bierema, L. L. (2001). Philosophy and practice of organizational learning, performance, and change. Cambridge, MA: Perseus

Glasersfeld, E. V. (1989). Constructivism in education. The international encyclopedia of education.

Golightly, D., Hone, K.S. and Ritter, F.E. (1999). Speech interaction can support problem solving. IFIP TC.13 International Conference on Human–Computer Interaction. IOS Press, Amsterdam, pp. 149–155

Good, T. L. and Brophy, J. E. (1990). Educational psychology: A realistic approach (4th ed.), White Plains, US-NY: Longman.

Goodbourn.R., Hartley.T., Higgins.T. and Wall,K. (2009) learning to Learn for Life 3: research and practical examples for the secondary stage Network Continuum Press

Gutwin, C. (2002). Improved focus targeting in interactive fisheye views. In: Proceedings of ACM Conference on Human Factors in Computing Systems.

Hadjerrouit, S. (1998). A Constructivist Framework for Integrating the Java Paradigm into the Undergraduate Curriculum. ACM SIGCSE Bulletin.

Hamdan, A. (2005). Women and Education in Saudi Arabia: Challenges and Achievements. International Education Journal.

Hannafin, M., S. and Oliver K. (1999). Open learning environments: Foundations, methods, and models. Instructional design theories and models Volume II. C.

Hoffman, D.L. and Thomas P.N. (1996). Marketing in hypermedia computer-mediated environments: conceptual foundations. The Journal of Marketing.

Hornbaek, K. (2006). Current practice in measuring usability: Challenges to usability studies and research. Int. J. Human-Computer Studies.

Hsu, H. M. J. (2011). The potential of Kinect in education. International Journal of Information and Education Technology.Institute for Telecommunication. In: Damascus, A working paper presented at the

International Constitutional Law. (2005). Article 1: Saudi Arabian constitution. Retrieved February 31, 2013, from. http://www.servat.unibe.ch/icl/sa00000_.html

Isbister, K. and Naas, C. (2000). Consistency of personality in interactive characters: verbal cues, non-verbal cues, and user characteristics. International Journal of Human–Computer Studies.

ISO, W. (1998). Ergonomic requirements for office work with visual display terminals (VDTs). The international organization for standardization.

Jackson, M. W. (1995). Skimming the Surface or Going Deep? PS: Political Science and Politics.

Jamjoom, M. I. (2010). Female Islamic studies teachers in Saudi Arabia: A phenomenological study. Teaching and Teacher Education.

Jansen, BJ. (1998). The graphical user interface. ACM SIGCHI Bulletin.

Jurich, S. (1999). The Impact of Video Technology in Education: From Here to Where. International Journal of Technologies for the Advancement of Knowledge and Learning.

Kelly, P., Healy, A., Moran, K. and O'Connor, NE. (2010). A virtual coaching environment for improving golf swing technique. ACM Workshop on Surreal Media and Virtual Cloning.

Kember, D. (1996). The Intention to Both Memorise and Understand: Another Approach to Learning? Higher Education.

Kinchloe, J. L. and Horn, R. A. (2008). The Praeger Handbook of Education and Psychology, Praeger. Greenwood Publishing Group.

Kissco, J. (2011). Kinect in education: The new technology focal point. Retrieved from K-12 Mobile Learning website: http://www.k12mobilelearning.com/2011/01/kinect-the-new-technology-focal-point-ofclassrooms/ (Access on May 2012).

Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development (Vol. 1). Englewood Cliffs, NJ: Prentice-Hall.

Lacina, J. (2009). Technology in the Classroom Interactive Whiteboards: Creating Higher-level, Technological Thinkers? Childhood Education.

Lai, Y., Wang, S. and Yang, J. (2012). An Investigation of the Exergames Experience with Flow State, Enjoyment, and Physical Fitness. 2012 12th IEEE International Conference on Advanced Learning Technologies.

Lambert, N. M. and McCombs, B. L. (1998). Learner-Centered Schools and Classrooms as a Direction for School Reform, in N. M. Lambert and B. L. McCombs (eds), How Students Learn: Reforming Schools Through Learner-Centered Education, Washington, D. C., US: American Psychological Association: 1-22.

Lazar, J., Feng, J. H. and Hochheiser, H. (2010). Research methods in human-computer interaction.

Lee, W., Huang, C., Wu, C., Huang, S. and Chen, G (2012). The Effects of Using Embodied Interactions to Improve Learning Performance. 2012 12th IEEE International Conference on Advanced Learning Technologies.

Lefoe, G. (1998) Creating Constructivist Learning Environments on the Web: The Challenge in Higher Education. Australasian Society for Computers in Learning in Tertiary Education.

Leonard, D. (2002). Learning Theories: A to Z. Westport. London. Greenwood Press.

MacIntyre, P. D., MacMaster, K., and Baker, S. C. (2001). The convergence of multiple models of motivation for second language learning: Gardner, Pintrich, Kuhl, and McCroskey. Motivation and second language acquisition.

Manninen, T. (2002). Towards Communicative, Collaborative and Constructive Multi-player Games. CGDC Conference 2002.

Marton, F. and Säljö, R. (1976). On Qualitative Differences in Learning I: Outcome and Process, British Journal of Educational Psychology.

Massa, L.J., & Mayer, R.E. (2006). Testing the ATI hypothesis: Should multimedia instruction accommodate verbalizer-visualizer cognitive style? Learning and Individual Differences, 16, 321–336.

Mayer, R. E., Hegarty, M., Mayer, S., and Campbell, J. (2005). When static media promote active learning: annotated illustrations versus narrated animations in multimedia instruction. Journal of Experimental Psychology: Applied.

Mergel, B. (1998). Instructional Design and Learning Theory, University of Saskatchewan.

Meyers, C. and Jones, T.B. (1993). Developing and Assessing Instructional Expertise. Promoting Active Learning.

Miles, H., Pop, S., Watt, S., Lawrence, G. and John, N. (2012) A review of virtual environments for training in ball sports, 714-26. In Computers and Graphics 36 (6).

Miller, J. (2002). Examining the Interplay Between Constructivism and Different Learning Styles. The Sixth International Conference on Teaching Statistics (ICOTS). Cape Town, South Africa, The International Association for Statistical Education (IASE).

Morency, L. P., Sidner, C., Lee, C., and Darrell, T. (2005). Contextual recognition of head gestures. 7th international conference on Multimodal interfaces.

Multon, F., Kulpa, R., and Bideau, B. (2011). Special issue: Virtual reality and sports guest editors' introduction. Teleoperators and Virtual Environments.

Myers, B, A. (1998). A brief history of human-computer interaction technology.

Neisser, U. (1997). Rising scores on intelligence tests. American Scientist.

Nielsen (2012). Usability 101: Introduction to Usability. http://www.nngroup.com/articles/usability-101-introduction-to-usability/ (Access on 2015)

Oates, B. (2006). Researching Information Systems and Computing. Sage Publications :London.

Osunkoya, T., and Chern, J. C. (2013). Gesture-Based Human-Computer-Interaction using Kinect for Windows Mouse Control and Power Point Presentation. Department of Mathematics and Computer Science, Chicago State University.

Papastergiou, M. (2009). Digital Game-Based Learning in high school computer science education: Impact on educational effectiveness and student motivation. Computers and Education.

Pashler, H., McDaniel, M., Rohrer, D. and Bjork, R., 2008. Learning styles concepts and evidence. Psychological science in the public interest, 9(3), pp.105-119.

Piaget, J. (2002), The Psychology of Intelligence, London, UK: Routledge Classics.

Piet.M. (2011). The Last Hour, retrieved from https://markpiet.wordpress.com (access on September 2013)

Pivec, M., Dziabenko, O., and Schinnerl, I. (2003). Aspects of game-based learning. 3rd International Conference on Knowledge Management, Graz, Austria.

Poland, R., La Velle, L. B. and Nichol, J. (2003). The Virtual Field Station (VFS): Using a Virtual Reality Environment for Ecological Fieldwork in A-Level Biological Studies – Case Study 3, British Journal of Educational Technology.

Prince, M. (2004). Does Active Learning Work? A Review of the Research, Journal of Engineering Education.

Prokop, M. (2003). Saudi Arabia: the politics of education. International Affairs.

Ramsden, P. (1988). Studying learning: improving teaching. In Ramsden, P. (Ed.).Improving Learning: New Perspectives. London: Kogan Page, 13-31.

Rieber, L. P. (1996). Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games. Educational Technology Research and Development.

Robson, C. (2002). Real World Research: A Resource for Social Scientists and Practitioner-Researchers, Wiley.

Ross, S. M., and Morrison, G. R. (2007). Getting Started in Instructional Technology Research (4th ed.): The Association for Educational Communications and Technology.

Rui, Y., Gupta, A., Cadiz, J. (2001). Viewing meeting captured by an omnidirectional camera. Conference on Human Factors in Computing Systems. ACM Press, New York.

Sabri, N. (1986). Modern approaches in teaching managerial and economic sciences at the university level. The Arab Magazine of Higher Education Research.

Salkind, N. J. (2004). An Introduction to Theories of Human Development, Sage Publications.

Salomon, Gavriel, and David N. Perkins. (1998). Individual and social aspects of learning. Review of Research in Education.

Seltman, H.J. (2012). Experimental design and analysis. Online at: http://www.ssnpstudents.com/wp/wp-content/uploads/2015/02/Experimental-Design-and-anlysis.pdf (Accessed March 2013)

Sessoms, D. (2008). Interactive instruction: Creating interactive learning environments through tomorrow's teachers. International Journal of Technology in Teaching and Learning.

Shackel, B. (1959), Ergonomics for a computer. Design, No. 120, 36-39.

Shackel, B. (1991). Usability-context, framework, definition, design and evaluation. Human Factors for Informatics Usability. (pp. 21-38). Cambridge: Cambridge University Press.

Simmons, S., McCrindle, R., Sperrin, M. and Smith, A. (2013) Prescription software for recovery and rehabilitation using Microsoft Kinect. Pervasive Computing Technologies for Healthcare (PervasiveHealth), 2013 7th International Conference on, 5-8 May 2013, Venice, 323-326.

Simons, P. R-J. (1997), Definitions and Theories of Active Learning, in D. Stern and G. L. Huber eds.), Active Learning for Students and Teachers: Reports from Eight Countries.

Squire, K. D. (2007). Games, learning, and society: Building a field. Educational Technology4 (5), 51-54.

Tanaka, K., Parker, J. R., Baradoy, G., Sheehan, D., Holash, J. R., and Katz, L. (2012). A comparison of exergaming interfaces for use in rehabilitation programs and research.

Tractinsky, N. (1997). Aesthetics and apparent usability: empirically assessing cultural and methodological issues. CHI 97 Conference Proceedings, Atlanta, 22 - 27 March, ACM, New York, pp. 115-122.

Vegas, E., UmanskyY, I. and Bank, W. (2005). Improving Teaching and Learning Through Effective Incentives: What Can We Learn from Education Reforms in Latin America? The World Bank.

Vygotsky, L.S. (1962). Thought and Language. Cambridge MA: MIT Press.

Wang, Y. (2012). Application of Action Research in Translation Teaching. Education and Educational Technology , 719-724 . Springer Berlin Heidelberg.

Watkins, C., Carnell, E. and Lodge, C. (2007), Effective Learning in Classrooms, London, UK: Paul Chapman Publishing.

Whittaker, S., Hircshberg, J., Amento, B., Stark, L., Bacchiani, M., Isenhour, P., Stead, L., Zamchick, G., and Rosenberg, A., (2002). SCANMail: a voicemail interface that makes speech browsable, readable and searchable. ACM Conference on Human Factors in Computing. ACM Press, New York, NY.

Zeid, A., Taqi, A., Elkhatib, O. Al-Yaseen, T., and AlMayyan, T. (2014). KinEd: A Kinect based E-learning Platform to Enhance Collaborative and Kinesthetic Learning. International Journal of Computer Applications. 88(10). 1-6.