THE EFFECTIVENESS OF BBC BITESIZE FOR LEARNING SCIENCE BY KS3 LEARNERS IN THE UK

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Table of Contents

DATA ANALYSIS   **142**

CHAPTER 7   **226**

DISCUSSION CHAPTER   **226**

List of Figures

List of Tables

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Dedication

I ask my GOD to bless my sincere teacher's soul Mr. Ibrahim Harffosh who passed away and who taught me the first letters of alphabet in my life and without him I would be an ignorant and illiterate person.

Abbreviation

Affective Components	Aff
AL-Noor School	Noor
Anxiety	An
Australian Council Educational Research	ACER
Attitudes	Att
Attitudes Toward Computer Technologies	ACT
Attitudes toward the Use of Computers in School	ATCS
Attitudes toward Personal Use of Computers	ATPC
British Broadcasting Channel	BBC
Behavioural Components	Bc
Blended Learning	BL
Computer Assisted Personal Interviewing	CAPI
Computer Anxiety Rating Scale	CARS
Computer-Assisted Instruction	CAI
Computer-Assisted Instruction Material	CAIM
Computer Assisted Learning	CAL
Computer Attitude Scale	CAS
Control components	Cc
Control group	Cg
Criminal Record Bureau	CRB
English as an Additional Language	EAL
English as a foreign language	EFL
Experiment group	EG
Face to Face teaching	FTF
Information Communication Technology	ICT
Interactive whiteboard	IWB
Kaiser-Meyer-Olkin	KMO
Knowledge Integration Environment	KIE
Learners in the UK Schools aged between (11-14) years	KS3
Level of Achievement	Ach
Manchester Academy High School	MA
Massive Open Online Course	MOOC
National Grid for Learning)	NGfL

New South Wales	NSW
Organisation for Economic Co-operation and Development	OECD
Partners in Learning	PiL
Perceived Control	PC
Perceived Easiness	PE
Present, Practice & Feedback	PPF
Perceived Usefulness	Pu
Partial Least Squares-Structural Equation Modelling	PLS_SEM
Qualifications and Curriculum Authority	QCA
Qualifications Credit Framework	QCF
Science Attitude Scale	SAS
Self-efficacy	S-E
Self-efficacy Scale.	SES
Self-efficacy For Computer Technologies	SCT
Stord/Haugesund University College	SHUC
Subjective Norms	SN
Technology Acceptance Model	TAM
Technology-Mediated Virtual Learning Environment	TVLE
Theory of Reasoned Action	TRA
Traditional learning	TL
Usefulness components	Uc
Joint Information System Committee	JISC
Virtual learning environment	VLE
Virtual Reality	VR
Web-Based Learning Tools	WBLTs

Definition of key terms

Achievement:

Achievement can be used for describing a learner's strengths and successes. Therefore, achievement can be defined as the trait of exercises and drills and their results as assessed by some standard of quality (PEKRUN and Linnenbrink-Garcia 2014).

Affective outcomes:

The affective outcomes are defined as the learners' awareness of attitude, satisfaction, appreciation of the learning and approach (Lee et al. 2010).

Anxiety towards Computer:

Computer anxiety is a sense of worry, stress, phobia, and hesitation felt by individuals when they expect that they are going to use Computers or actually when they are using it (Celik and Yesilyurt 2013).

Assessment:

Assessment is the process where the assessor finds out if learning has taken place (Gravells and Simpson 2010). Through assessment, the assessor is enabled to discover if the learners have acquired the required skills, knowledge and attitudes towards their programme of learning (Ibid.).

Attitude:

Attitude is a desirable or undesirable reaction towards something or someone displayed in one's feelings, beliefs or planned behaviour. This reaction is evaluative in nature. It is a social orientation i.e. it is an essential inclination to respond to something either favourably or unfavourably (Fishbein and Ajzen 2010).

BBC Bite Size:

BBC Bitesize is a free Online study resource for School-Age Learners in the UK. It is designed to assist learners in both School work and exams. BBC Bitesize revision is Online revision support for KS1, KS2, KS3 and GCSE's. It provides videos, audio files,

games and interactive test bites to help maximize learning. Learners, by being able to use technology, are more able to take more control of their learning (BBC 2013a)

Behavioural intentions:

Behavioural intentions are reflection on outcome from beliefs about performing the behaviour. Behavioural, normative and control beliefs that people grasp about performing a definite behaviour are affected by a range of background dimensions such as character, temper, values, ethics, education, ethnicity and gender amongst others. These in turn directly influence the construction of an attitude towards the behaviour (Ajzen and Fishbein 2005;McLeod 2014).

Beliefs:

Beliefs are '*the individual's assessment possibility that practicing a specific behaviour will produce a particular effect and outcome*' (Teo et al. 2007).

Blended learning:

Blended learning is mixing more than one teaching method together one of these common methods is Online educational technology. E.g. a teaching lesson can be based on physical learning materials and resources obtained through some educational websites (Wilson 2009).

Bloom's Taxonomy:

Bloom's Taxonomy model is an attempt to distinguish all learning into three types or domains as follows:

a. **Cognitive** domain (mental [intellectual] ability, i.e. knowledge or 'think'), consisting of six levels: (1) remembering or knowledge, 2) comprehension or understanding, 3) applying, 4) analysing, 5) synthesis, and 6) evaluating & creating) (Gravells 2012;Gravells & Simpson 2010;Scales 2008;Wilson 2009).

b. **Affective** domain (feeling, emotions (affection) and behaviour), consisting of five levels: (1) receiving a particular message, 2) responding, value: the learner will be able to adopt ideas and values, 3) organising ideas in a system, 4) and characterising values and ideas and 5) behaving consistently with them) (Ibid.).

c. **Psychomotor** domain (manual and physical skills, i.e. skills or 'do'), consisting of five levels:

> 1) imitation or simulation: the learners will repeat the skills again,
>
> 2) manipulation: the learners will repeat the skills again from their memory,
>
> 3) precision or accuracy: the learners will repeat the skills independently,
>
> 4) articulation: the learners can integrate skills consistently and with expertise, and
>
> 5) naturalisation: the learners demonstrate the skills automatically through strategic plan (Ibid.).

d. Learning effectiveness comprehends all Bloom's domains (knowledge, attitude and skills) or (think-feel-do) and all parts of each domain where suitable to the subject, context and the learner (Gravells & Simpson 2010).

Data logging:

Data logging is the gathering of information over a period of time and is usually used in scientific and laboratory experiments. Data logging systems consist of monitor to observe a process by using sensors linked to a Computer. Data gathering can be done automatically under Computer control (BBC Bitesize GCSE 2014).

Effective teaching

Effective teaching is not just for performance results but also for economy and society. The learners need skills to get on with their life and work (Scales 2008).
.

Formative assessment:

Formative assessment is used to discover learners' needs to support them and to cover their gaps, results of which do not feed into marks for final assessment. This process is providing feedback to learners and teaches on modifying continuing teaching/learning for obtaining effective learning (Hwang and Chang 2011).

Handouts:

Handouts are written information/drawing usually distributed in teaching sessions in hard copy format. These are used to promote and support learning (Race 2010).

Key Stages 3 (KS3):

The National Curriculum in the UK is structured into groups of years named 'key stages' (KS). At the completion of each key stage, teachers will assess their learners' learning outcome as shown in Table 1.

Table 1: The National Curriculum in the UK School (Department For Education 2014)

Age	Year	Key stage	Assessment	Average level of attainment
3-4		Early years		
4-5	Reception	Early years		
5-6	Year 1	KS1	Phonics screening check	
6-7	Year 2	KS1	Teacher assessments in English, maths and Science	2
7-8	Year 3	KS2		
8-9	Year 4	KS2		
9-10	Year 5	KS2		
10-11	Year 6	KS2	National tests and teacher assessments in English, maths and Science	4
11-12	Year 7	KS3	Teacher assessments	
12-13	Year 8	KS3	Teacher assessments	
13-14	Year 9	KS3	Teacher assessments	5/6
14-15	Year 10	KS4	Some learners take GCSEs	
15-16	Year 11	KS4	Most learners take GCSEs or other national qualifications	

KS3 learners (13-14 years old) are the samples in the current research. Science in Key Stage 3, as mentioned in The National Curriculum and Key Stages in England, encourage KS3 learners to use scientific terms, and facts and improve the sense of observation, experimentation, and communication skills. It encourages self-learning and research in the three main scientific subjects of Physics, Chemistry and Biology (Ibid.).

Learning effectiveness:

The effectiveness is the capacity of achieving anticipated findings (desired results) (Nolan and Anderson 2015). However, the effectiveness and the level of achievement are synonymous (Wilson 2009).

Learning effectiveness can be measured, assessed and evaluated by capturing knowledge, skills or attitude (Brown and Green 2015;Miller 2015). This reflects the fact that learning effectiveness is defined by how well the learning goals were achieved. And learner outcome: what a learner learns: cognition (knowledge), (manual & intellectual) skills, and (tendency) attitudes that a learner demonstrates as a result of schooling (Moody and Sindre 2003;Stinggins 2008).

Learning process:

Learning process is a straighforward result of the experiences that people have when they have a direct contact with their surroundings; learning, therefore, is a transformation in behaviour caused by teaching action or experience (Gould 2012).

Learning styles:

Learning style is known as the preferred way of learning by learners. The style is a reliable approach interrelated to the learners thinking processes to structuring and processing information during thinking by realizing (tangible or intangible) information and organising (chronological or random) information. The style can be experimental learning and can be (visual, auditory, tactile (concrete), and kinaesthetic) (Rogowsky et al. 2015).

Models of teaching:

A model of teaching contains guidelines for designing teaching environments and activities. It is a teaching plan that can be applied to form courses of subjects, to design pedagogical topics and material, and to lead teaching process (Pathak 2012).

Motivation:

Atkinson defines motivation as '*the contemporary (immediate) influence on direction, vigour or persistence of action*'. Motivation is believed to have three psychological functions: energising behaviour which means getting individuals involved in an activity,

directing behaviour which means when the individuals choose something over something else; and regulating persistence towards behaviour which means encouraging an individual to continue towards a certain goal (Karami and Ismail 2014).

Negative Attitudes:

An attitude is 'an individual's tendency or predisposition to evaluate an object or a symbol of that object in a certain way' (Arun Kumar 2015). Any attitude has three components: affective, behavioural and cognitive. 'Affective' describes how an individual feels towards an object or another person. 'Behavioural' defines what an individual does or what action they take towards an object or another person; and 'cognitive' is about what an individual thinks about another person or an object. So, negative attitudes mean feeling, thinking or behaving in a negative way towards an object, or person (Ibid.).

Online learning:

Online learning is part of E-learning, which is an electronic learning method supported or improved by using any electronic information and communication technology machine (ICT) which facilitates the learning process (Heinze 2008;Wilson 2009).

Perceived ease:

Perceived ease is defined as '*the extent to which one believes using a technological device will be free from effort*' (Buccoliero et al. 2013).

Perceived control:

The concept of perceived control is defined as 'one's perception of how easy or difficult to perform a behaviour' (Ambali 2014). It is about the individual's perception of his/her ability to perform an action.

Perceived usefulness:

Perceived usefulness is the degree of a person believing and feeling that using a specific technology will improve their performance and job efficiency (Teo et al. 2007). Also, according to Renny et al. (2013, p. 212) 'usefulness affect attitudes toward usability that shapes intention to use' (Renny et al. 2013).

Positive attitudes:

Positive attitude is 'a positive emotional disposition towards the subject' (Di Martino and Zan 2014).

Satisfaction:

Life satisfaction is '*A positive estimate of the status of your life, a judgment (the ability to make considered decisions or come to sensible conclusions) that at least on balance, it measures up positively against your standards or anticipations*.' (UKESSAY 2015).

Science in education:

Applying Science education for all learners in the UK School Curriculum entails the Science content and the learning/teaching methods to be considered (Mijung and Diong 2012). The UK National Curriculum Council identified the scientific knowledge should be taught for learners. The scientific content includes the earth and space science, natural science, chemistry, physics, and life science (Ibid.). Science is an obligatory and challenging subject in the UK National Curriculum for KS1, KS2, KS3 and KS4 and it is an essential part of contemporary culture (Department of education 2013).

Self-efficacy:

Computer Self-efficacy is the individuals' judgement concerning their skills to use Computers (Papastergiou 2010). Self-efficacy concept is derived from the Social Cognitive Theory and it is defined as the conviction, confidence and belief of individuals that they have the capacity to organise and complete tasks or courses of accomplishments to achieve and reach the desired objectives and selected model of performances (Bandura 1977;Zhao et al. 2010).

Smart-PLS: It is important statistical software and can be used for Partial Least Squares Structural Equation Modelling (Hair et al. 2014;Wong Kwong-kay 2013).

Subjective norm:

Subjective norms refer to the individual's awareness that most people who play a role in their lives think that this individual should perform a behaviour or quit it. It is the

understanding that people around a person have their demands on that person to accomplish a task or ignore it such as (using Computers) (Teo et al. 2007).

Summative assessment:

Summative assessment is a test results of which are used to compile the final score for measuring and recording an individual's achievement, it is usually applied in the end of a unit, learning program, course or full qualification (Scales 2008).

Teaching Strategy:

Teaching Strategy is related to the individual's style and what he/she feels most comfortable in doing. There are different teaching strategies to use (e.g. Lecture, demonstration, team teaching, discussion, debate, questions & answers, video, seminar, laboratory/workshop, gaming/quiz, brainstorming, Buzz group, field trip, role play, icebreaker, simulation, case study, project/assignment, tutorial, open/distance learning, one to one and information learning technology (ILT) (Reece and Walker 2006).

Test:

The purpose of a test is investigating the knowledge of learners. There are different questions such as open, closed, and multiple choice (Gravells & Simpson 2010).

Abstract

There are a number of studies arguing for and against the use of Online learning resources for learning facilitation. Some studies attribute the rise of learners' achievement to the use of technology; others believe that technology has changed the learners' attitudes towards learning. Scholars have used learners' attitudes and achievement as indicators of the success or the failure of technology. The majority of extant related research is carried out at University, College and further education levels but limited studies have examined KS3 learners in the UK. In particular, there are not a lot of studies that focus on measuring the learning effectiveness through KS3 learners' attitude and achievement at the same time.

The present study uses both attitudes and achievement and the link between them as a predictor of the BBC Bitesize online learning resource effectiveness. This case study aims to examine the use of BBC Bitesize and identify its effectiveness for learning Science in Year 9 in two Schools in Manchester, UK. Subsequently, the present study investigates these 3 themes:

a. The effect of Computers & BBC Bitesize on KS3 learners' attitudes.
b. The impact of Computers & BBC Bitesize on KS3 learners' achievement and learning effectiveness.
c. The correlation between the learners' attitudes towards BBC Bitesize and their achievement.

This study is a mixed methods study that combines both quantitative and qualitative data. The quantitative research method is reflected through the use of 121 attitudinal questionnaires. The qualitative research method in this study is represented by 11 semi-structured interviews The study traces the learners' achievement by using a written test after they have been given a Science course via BBC Bitesize.

Attitudes have been approached in a way that defines an attitude as the combination of a number of factors: affective component, perceived-usefulness, perceived-control, behavioural component, anxiety component and self-efficacy component. These components have been the base of the study questionnaire based on Selwyn's (1997) model.

The contribution to knowledge is in the area of debate on whether Online learning can improve learner's achievement. In particular, the current study makes the following contributions to knowledge for KS3 -related Online learning using BBC Bitesize:

a. Development of a new scale for measuring learners' attitude using socio-psychological factors and identifying that two of these – control and anxiety- are not significant;

b. The attitude and achievement constructs are studied together using partial correlation analysis and Spearman correlation, and a positive link is found suggesting that positive attitude has a positive impact on achievement;

c. The components of attitudes are confirmed as: affective, usefulness, behavioural and self-efficacy. This amends the original four components from Selwyn.

The current study has a practical contribution in that it confirms that BBC Bitesize has positively affected the learners' achievement and attitudes. BBC Bitesize is found to be effective for facilitating learning of Science by KS3 learners.

Declaration

I declare that the entire thesis is original and no part of it has ever been submitted for applying to another degree or qualification in any University.

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Chapter 1

Introduction Chapter

This Chapter introduces all aspects of the current research such as the rationale of research, the importance of research, the questions, and the organisation of this thesis.

This research focuses on identifying the relationship between KS3 learners' attitudes towards BBC Bitesize and their achievement in learning Science Online. Therefore, the effectiveness of BBC Bitesize for learning will be measured through the learners' attitudes and achievements.

1.1 Overview about technologies and Online learning courses

In the 1990s, technology was deemed as a method to solve all the problems that education faced (Younie and Leask 2013). Considering technology as a solution has been originated in the assumption that technology can help people perform cognitive tasks which are thought to be advantageous. Moreover, technology is believed to impact environment, and education as well as people and learners. These assumptions have led to the creation of the belief that technology is essential and learners and people should know about it (Owen-Jackson 2015).

On the one hand, for some educators and scholars, technology has made a difference in education and has met the expectations for which it has been inserted in education (Hernandez 2011;Overstreet 2015). However, others argue that education has failed technology and learners have not been educated to capacity and did not benefit from technology as was initially anticipated (Bain 2015). According to Bain (2015), technology used in Schools has been expected to make a dramatic improvement in teaching and learning for all learners and to create a massive transformation in educational practices. On the other hand, Andreas Schleicher (the OECD's education director) illustrates that a lot of fake hopes have accompanied using technology in Schools (OECD 2015).

According to Gardner (2015), education will be individualised by technology. This takes place when the learners come to School and each one has different skills and experience. The significance of Gardner's theory is that it has been an alternative to the approach to intelligence which is concentrated on a single definition of intelligence. According to the single approach to defining intelligence, all the learners learn the same subjects. No learning opportunities have been found for learners with different levels and skills. However, the use of technology would enable the assessment of the intellectual achievements of the learners so that information about learning opportunities would be stored. Learning opportunities also will be found for every learner in a way that they match the learner's abilities and needs (Gardner 2015). Teachers in the UK Schools have found evidence of the effects of the Computer use on the learners' achievements as stated by Tom Bennett - the UK government expert on learners' behaviour (OECD 2015). The development of digital technology to the extent that it has become fundamental has created a huge pressure on schools to produce learners who are literate in technology (Fidalgo-Neto et al. 2009). Additionally, the development of Online education which has been witnessed over the past two decades can be reduced to the desire to find distant learning opportunities where a degree can be granted to learners who live in distant communities (Smith and Macdonald 2015).

A Massive Open Online Course (MOOC) is an Online course aimed at unlimited participation and open access via the web (Anabela 2015). In addition to traditional course materials such as filmed lectures, readings, and problem sets, many MOOCs provide interactive courses that boost interactions among learners and professors (Monaghan et al. 2016). Furthermore, Tang & Logonnathan (2015) claim that MOOC is a free distant learning course, whose use is based on having access to the website as it is designed in a way to enable huge numbers of learners from different geographically remote places to participate (Tang and Logonnathan 2015).

Mendoza-Gonzalez (2016, P 98) indicates that *'MOOCs provide interactive user forums to support community interactions among students, professors, and teaching assistants (TAs)'* (Mendoza-Gonzalez 2016). Essentially, a lot of hopes have been raised that Online learning will be possible to everyone at any time and in any place as long as they have access to the Internet. In this way, it is hoped that Online learning will provide world

education for everyone (Nguyen 2015). Moreover, Anabela (2015) states that MOOC pedagogical model gives the learners the opportunity to decide the materials they want to study and the style they want to study through as well as the skills they want to learn (Anabela 2015).

The Internet has made it possible to learn Online. Online learning course has been deemed as a medium of learning for improving the outcome of learners learning and at the same time for minimising the number of resources (Nguyen 2015). In fact, Online learning course is a fresh hope for collaboration. In addition, Online learning model has eliminated the long distances as a hindrance between learning centres and learners. Thus, it is helpful for learning centres to find novel ways to meet learners' needs. Learning Networks were effective in investing Online learning with community colleges (Miller et al. 2013). Also, Online learning courses have become a common and fundamental model because of their possible characteristics and potential for providing more flexible access to content, teaching, and training at any time, from any place (Tankary 2014).

The role of the teacher in Online learning has been changed and it is not authoritarian anymore; rather the teacher's role is to lead the learners towards autonomous learning. This can be done by encouraging the learners to choose the learning models that meet their needs and skills. Learners can follow the same route and learn from the same resources, but they learn different skills experience (Anabela 2015). Subsequently, the role of the teacher is that of the supervisor who makes sure that the learners are having effective experiences through learning Online (Ibid.).

Khan (2016) believes that Online learning courses have some positive qualities such as flexibility in times and space, the language used by Online learning course is clear and simple, and the type is easy. Also, Khan (2016) recommends that pictures and animations should be used for clarity and explanation, automatic assessment should be used as a method of self-assessment, and learners should be motivated through using games and fun in Online learning (Khan 2016). Basically, Online learning gives the learners many opportunities to practice different skills such as planning, revising and drafting as well as editing which all lead to improving the learners' capacity (Briz-Ponce et al. 2016).

Studies conducted on Online learning were focused on the learners' attitudes towards the use of Online learning and how they can affect the learners' achievement and satisfaction (Brady 2012). The main issue is that the effectiveness of Online learning has been manifested in the diversity of learning, learners, and content types (Hendricks and Bailey 2016).

BBC Bitesize is a widespread educational resource that delivers rich instructive material to learners. Moreover, BBC Bitesize is a formal website that has grasped the importance and value of Online learning since the creation of the website (Dong et al. 2016). Eventually, the main aim of the current study is studying the effectiveness of BBC Bitesize for learning as a good example of Online learning courses and MOCC (Massive Open Online Courses).

1.2 The rationale of study

The rationale for the current study is threefold, but there is a general rationale for the study. The general rationale is that technology is present in every detail of human beings' life including education and classroom.

Some studies such as Lawrence (2012) show that Online learning improves learning outcome and increases the scores of learners and the learners' performance is enhanced (Lawrence 2012). And the scientific knowledge can be constructed via Online collaboration (Diviacco et al. 2014).

There are some studies as Zhu's study (2012), suggest that learners have a good satisfaction with Online learning (Zhu 2012). Some educators and researchers claim that ready access to Internet enhances the cognitive skills of the learners in the sense that it strengthens the brain function related to problem-solving, it helps them recognise patterns in data and define their characteristics and analyse them, it can also improve the function of working memory (Savage and McGoun 2013). Ultimately, using Internet in education has a beneficial effect on educational outcomes (Taylor and Hogenbirk 2013).

BBC Bitesize was chosen to be the Online source of information in the present study because it is one of the largest Online resources available free of charge for School age learners in the UK. This website has been designed to help learners in their School work and exams and the content is relevant to the UK education Curriculum and it covers secondary subjects (Millner 2015). Therefore, this study about KS3 learners' attitudes towards BBC Bitesize and their achievement by using BBC Bitesize as a source of information is essential. Eventually, there are some reasons for conducting this study:

a. **Why is studying the effect of Computers & BBC Bitesize on KS3 learners' attitudes important?**

There is an increasing need for deeper attitude studies because it is essential to understand the users' (learners') attitudes toward Computers and Internet for successful education and teaching (Kutluca 2011). To be able to motivate learners' attitudes towards technology

educators need to have a profound perception of the factors which identify attitudes (Ardies et al. 2014).

Sabzian & Gilakjani, (2013) suggest that Computer technology reinforces teaching career and technical instruction. In general, technology can be helpful for teachers as Computer technology helps teachers to prepare learners with latest sort of skills and knowledge that are required in the real life and industries (Sabzian and Gilakjani 2013).

The research of Gordon et al. (2013) aimed to acquire information on the level of E-learning application readiness and the teachers and learners' attitudes in School. This research shows that the teachers and learners have positive attitudes and they are ready to use E-learning technology, but they have limitations in their technical ability (Gordon et al. 2013).

The present case study will survey the attitude towards Online learning and will find out if the socio-psychological factors studied through the attitude deter the positive attitudes. Therefore, this imposes on researchers to study the attitudes of learners and teachers towards Computers & Internet. The Computer & Internet users' attitudes shape the way the users deal with the digital machine and whether they accept or reject it.

Additionally, the infusing of positive attitudes toward technology will assist the education sector to achieve its goal of an information literate society which is able to keep side by side the latest technology development (Faekah et al. 2013). Also, the methods of learning/teaching and Curriculums in all fields are supposed to be amended to match the rapid developments of digital machines which are part of the classroom in these days. But any amendment in the methods and Curriculums is supposed to be made in the light of the learners' attitude towards technology as it is the main factor for efficient learning.

Technology has caused a change in the teaching methods and has created changes in the Curriculum. Course design has been changed after the implementation of technology and it has three features: a) adding technology skills prerequisite to the session, b) requesting a Curriculum change, c) introducing the learners to programme portfolio concepts (Wentworth et al. 2013). So it is crucial that the attitudes of learners towards the new

technology to be studied for identifying the attitude of learners towards the new way of learning/teaching at the same time.

Several studies as Zhang and Bhattacharyya's study (2008), indicate that surveying learners and teachers' attitudes towards technology is indispensable for the success of teaching/learning process and it has been considered that learner's attitude towards E-learning is significant to the success of E-learning (Zhang and Bhattacharyya 2008). Learners' attitudes toward technology are indicators of their readiness to use the technology as a part of their learning process in School (Alghazo 2006;Nimavathi and Gnanadevan 2009).

Hulela et al. (2014) confirm that there is necessity for improving the technical skills of pre-service teachers (learners) and in service teachers because this improves the learning and understanding of learners and they conclude that '*the pre-service teachers' Curriculum needs to be improved so that teachers can be more competent in using advance technology to improve learners' learning. In service courses on ICT should be provided to all teachers as a requirement to enhance teachers' technical*' (Hulela et al. 2014).

The BBC Bitesize is free Online and it covers all the major high School subjects in the UK, and also it is provided with thousands of video clips to support both secondary and primary Curriculums (BBC Bitesize site 2015). BBC Bitesize can be considered as a form of a Massive Open Online Courses (MOOC) as the MOOC experience and course access modes enabling learners' option and activity (Irvine et al. 2013). MOOC provides enormous numbers of learners' access to free and high-class knowledge (Gee 2012). Therefore, it is necessary in the current study that the attitudes of KS3 learners towards Computer and BBC Bitesize are studied.

b. Why is studying the impact of Computer and BBC Bitesize on learners *achievement* important?

The second rationale is the need for examining how the use of Computer and Internet in the teaching learning process can make a difference in the level of the learners' achievement. There has been a greater focus of the development of subject- specific ICT

resources to support learning and teaching in different School subjects (Coates and Friedman 2009;Cox et al. 2003).

Paechter et al. (2010) study was conducted on University learners in Australia and the results show that the learners' achievement goals in E-learning course are the most important predictors for success. Additionally, learners' achievement has been considered the greatest factor for assessing the efficiency of E-learning more than other course features (Paechter et al. 2010).

A lot of studies tried to investigate the influence of technology on achievement and performance in different subjects. For example, Liu et al. (2014) study was conducted in Taiwan and the results show that digital machine is effective for improving the spelling (performance & accuracy) and the performance on reading comprehension in learning English (Liu et al. 2014). There is evidence that learners' engagement in Online coursework has improved learning which is reflected in test scores (Meyer 2014). But there are some studies such as OECD research which shows that using Computers and technologies in classroom enormously lead to worse achievement and lower learners' performance (OECD 2015).

The current study searches for evidence on the effects of Computer and Internet on learners' achievement and it endeavours to discover the consequences of Computer and BBC Bitesize on KS3 learners' achievement in Science course in the UK.

c. **Why should the correlation between the attitudes and *achievement* be studied?**
This research question focuses on the need for a more detailed description and definition of the relationship between attitudes and the level of achievement. Any material learned with proper interest and right attitude will help learners to reach great heights in their academic pursuits (Vidhyageeth and Padama 2012).

This research links between attitudes and learners outcome (achievement). Meta-analysis studies of American Schools generally show a positive achievement of learners when ICT is employed (Bayraktar 2002;Christmann and Badget 2003;Rice 2013;Waxman et al. 2003). Eventually, the correlation between the level of achievement and attitudes will be

studied. And this will help the educationalists and teachers to find out the factors which should be taken into their account to raise the level of achievement and to make the learning process more effective. Positive attitudes will help learners in taking up meaningful ways in their process of learning, leading to the fullest assimilation of the information that is learnt (Ibid.). Educationists always find a one to one relation between academic achievement and attitudes of the learners (Ibid.).

Numerous studies demonstrate that there is a strong relationship between learners' attitudes and their achievement. For example, Barkatsas et al. (2009) study shows that a learner with high level of Mathematics achievement is associated with high levels of positive attitude to learning Mathematics with Computers. In contrast, low level of Mathematics achievement is linked with strong negative level of attitude to learning Mathematics with technology (Barkatsas et al. 2009).

But there are many studies that have surveyed the achievement via technology and the attitude of learners towards technology separately without looking for a link between the two constructs as it is in (Pilli and Aksu 2013).

Therefore, there are many reasons which call a researcher to study the relationship between attitude and achievement. The link between the attitudes and the level of achievement will be studied for the first time for KS3 learners in the UK Schools and that will be effective contributions to literature in the field of technology and education.

1.3 Aims, objectives, and questions

The practical aim of the current study is to understand the effectiveness of BBC Bitesize (Online learning courses). Also, the present research has two objectives as follows:

a. Developing a new scale based on socio-psychological factors for measuring learners' attitudes towards Online courses (BBC Bitesize).
b. Exploring the link between learners' attitudes and their achievement.

Furthermore, the current study will attempt to answer these questions:

a. How does BBC Bitesize affect the KS3 learners' attitudes towards Online learning methods?

b. How does BBC Bitesize (Online learning methods) affect the KS3 learners' achievement?

c. How do the KS3 learners' attitudes affect their achievement?

1.4 Research scope

Selwyn model has formed the essential part of the current study model. Selwyn model has been designed for measuring the attitude of learners of 16-19 years old towards Computers (Selwyn 1997). This model consists of 21 items accompanied by a five point-likert response scale and they reflect 4 independent attitude constructs (affective components, usefulness components, behavioural components, and control components) (Ibid.). Two independent constructs have been added to Selwyn model (anxiety attitude construct and self-efficacy) to develop a new model for measuring the attitude of learner towards Online learning.

Selwyn constructs and the other two constructs have been mixed to be the new model for the current study. The valid reason for choosing Selwyn model and the other two constructs is measuring the attitudes on some socio-psychological constructs.

The findings will focus particularly on the effectiveness of BBC Bitesize and Online learning in general. The present study considers the two elements - attitude and achievement - as complementary and they explain each other. The nature of Schools and their descriptions are shown below in Table 2:

Table 2: The Schools' names, type, location and number of participants

Series	School name	Type	Location	Number of participants
1	Manchester Academy	Academy	Moss Lane East Moss Side Manchester M14 4PX	57
2	Al-Noor	Supplementary School (it is part of Burnage Academy for boys	Burnage Media Arts College Alnoor School , Burnage lane, Burnage Manchester M19 1ER	64

1.5 Conceptual framework

The theoretical framework of this study is based on three principles. The first one is represented by studying attitudes not as a one-dimension issue but as a multi-dimension one. In defining attitudes, three types of components should be considered: affective, behavioural and cognitive. The current study takes into account these considerations. The second principle is that the study of the learners' attitudes towards the use of Computers & BBC Bitesize in their learning is intertwined with the study of the learners' achievement through the use of Computers & BBC Bitesize. Both should be examined to find out how both affect each other and because both are centralised on technology and its use in learning. The third principle is that research findings must find their ways to the classroom in order to benefit from the research conducted on the effectiveness of implementing Computers & BBC Bitesize in the teaching and learning process.

A conceptual framework was developed to exemplify the three themes being examined and their inter-relationships diagrammatically. This will support the reader to comprehend the research topic without difficulty. The conceptual framework is represented in Figure 1 below.

At the top of the conceptual framework is a 'focus question' which can comprehend the main research themes. This framework shows the different socio-psychological factors which affect attitudes towards Computers & BBC Bitesize on the one side and the achievements via using Computers & BBC Bitesize in the classroom on the other side. Additionally, the framework shows the inter-relationships between attitudes and achievement in order to determine the extent of learning efficiency. The direction of arrows in the framework determines the trend of impact. This framework will identify the effectiveness of learning in the light of specific socio-psychological components and attitudes. Subsequently, this framework is mapping the research and is clarifying the links and correlations between the attitudes and achievement when technology is part of the teaching/learning process.

Focus research question: **How the effectiveness of BBC Bitesize (Online learning) can be measured?**

The questions (Observed indicators)	6 constructs (Independent Factors) Latent Variables		
From item 1 to item 6	Affective Attitude	Selwyn constructs	Six constructs
From item 7 to item 11	Usefulness Attitude		
From item 12 to item 17	Control Attitude		
From item 18 to item 22	Behavioural Attitude		
From item 23 to item 37	Anxiety Attitude		
From item 38 to item 47	Self-efficacy Attitude		

Explore → The **general attitude** of learners' towards BBC Bitesize **(Dependent Latent Variable)**

Affect

Indirect Effect → Learners' achievement (Dependent Factor) (Latent Variable)

Learning effectiveness (**The observed Indicator)**

Conclude

Figure 1: Conceptual Framework: Chapter 1:

Psychological factors associated with learners' attitudes towards technology and BBC Bitesize, and learners' achievement via BBC Bitesize

1.6 The significance of the research

The importance of this study stems from its role in bridging the gap of knowledge and contributing to understanding the deep relationship and the latent factors which mediate between the attitudes of KS3 learners and their level of achievement.

1.6.1 Contribution to knowledge

CAS (Computer Attitude Scale) has been used by Abedalaziz et al. (2013) and Larbi-Apau and Moseley (2012). This scale has been designed and used by Selwyn (1997) for the first time to measure Computer attitudes of 16-19 years old learners and the

effectiveness of learning via Computer. The current study has also used CAS but it has added a number of points to the literature that were missed by the other studies.

First, researching attitudes has not been based on psychological theories; it was mainly concerned with studying the learners' points of view (Balakrishnan 2015). This gap is important and should be filled. According to Oxford (2013), studying attitudes against the socio-psychological component is essential. Oxford (2013) points out that the affective aspect is tremendously significant in learning and it interacts with the cognitive element (Oxford 2013). Therefore, studying attitudes on socio-psychological factors in the current study will contribute to finding the best learning strategies for learning Science through Online courses. Subsequently, the present study is the first research for studying socio-psychological factors-based attitudes towards using BBC Bitesize (Online Learning Website) for KS3 learners in the UK.

The second gap that attitude studies have is that in most cases there has been no link between the study of the learners' attitudes towards the Online learning and the Online learning effectiveness in improving the learners' level of achievement. It was demonstrated that learners' attitudes and achievement are connected (Pellegrini and Blatchford 2014). Pepin and Roesken-Winter (2014) indicate the importance of developing scales for measuring the relationship between attitudes and achievement, but research has failed in spite of the significant effort which has been devoted in this field (Pepin and Roesken-Winter 2014). Subsequently, the current study is the first research for studying the relationship between the attitudes towards BBC Bitesize and achievement via using BBC Bitesize for KS3 learners in the UK.

The third gap is that most research concentrates on the learners in higher education (Wright 2015) and most studies are based in Universities (Ololube 2014;Ribeiro et al. 2015). There was efficient and comprehensive research into the learning effectiveness and quality for higher education learners since the 1970s (Biggs and Tang 2011). So far, the studies into constructs influencing the acceptance of electronic learning have focused mostly on learners at higher education (Hrtonova et al. 2015). Eventually, the need to study KS3 learners (13-14 years old) is significant since the vast majority of learners are going through this process and not all learners choose the University route. This means

that studying KS3 learners gives a more representative sample of population compared to University learners.

The fourth gap is that BBC Bitesize KS3 has never been surveyed for effectiveness (please see Appendix 4). According to Rushby and Surry (2016), research studies over the years have recommended that more attention should be paid to design Online courses to support cultural approaches to learning (Rushby and Surry 2016). Thus, the current research represents a significant step for extensively understanding the Online courses and the BBC Bitesize is a good example for studying Online courses. Eventually, BBC Bitesize is worth studying, in a period of time where the learners are learning via Online courses increasingly (Murray et al. 2012).

However, the importance of the current research is that it seeks to contribute to the following areas of knowledge and intends to offer a track for future research projects by identifying the significant factors which impact the KS3 learners' achievements and attitudes towards BBC Bitesize.

1.6.2 Practical contribution

The current research surveys the attitudes of KS3 learners towards (Computer & BBC Bitesize) and their achievement via using BBC Bitesize. Thus, the current study adopts Selwyn's model that encompasses 4 components of attitude added to the element of anxiety and self-efficacy. This is to obtain a more insightful understanding about attitudes and what makes them what they are. The findings of the current study will be implemented in teaching/learning process in order to encourage an effective use of technology in a way which takes into consideration the learners' attitudes.

The practical contribution in the current study is that the Science course is provided with an Online source (BBC Bitisze Science for KS3) and organised handouts because they guide the learners to move step by step through the Science unit Online according to their own pace. The focus in the lesson plan of the researcher is on the three domains of Bloom Taxonomy (cognitive domain (knowledge), psychomotor domain (skills) and affective domain (Values). However, it was noticed that these domains can be found in Manchester Academy lesson plan (please see Appendix 13) but they are more detailed in the lesson

plan of the current research (please see Appendix 7). Additionally, the participants in the current study are independent learners and completely involved in their learning process and they teach themselves. Moreover, the teaching method is learner-centred and not led by the teacher at all and this way of learning is autonomous.

Overall, instructors teaching Science Online or face to face would benefit from this research that is grounded in sound methodology, theory, and that examines specific methods of teaching to improve the learning process for KS3 learners in the light of the attitudes of learners towards Online learning. Overall, the current study shows that understanding the Online attitude will improve the learners' achievement and performance and also, Online courses will encourage the autonomous learning.

1.7 Research organisation

The current research is organised into eight Chapters as follows:

Chapter 2: This Chapter contains the literature review which draws on existing, related work with reference to the current research area. The research questions are based on 3 themes. The first theme is "KS3 Learners' attitudes towards using BBC Bitesize". This theme in this research relies on 6 factors (affective, usefulness, control, behavioural, anxiety, and self-efficacy); therefore, studying attitudes will start with basic perspective and then will be shifted to multiple socio-psychological backgrounds. This study will demonstrate negative and positive attitudes studies.

The second theme is "Impact of BBC Bitesize on KS3 learners' achievement and learning effectiveness". This theme will be explained through different previous studies starting from studies based on different types of using technology in teaching and learning.
The third research theme is "The correlation between the learners' attitudes towards BBC Bitesize and their achievement". This theme will be explained through other studies.

Chapter 3: This Chapter includes research methodology, research philosophy, research approaches, research strategy, and the types of case studies. This research is a

combination of qualitative and quantitative methods and its essential assumptions are based on interpretive and positivist methods.

Chapter 4: This Chapter includes research design, the sample of research, research ethics, and data gathering methods (research instruments). Also, this Chapter explains the reasons behind choosing data collection methods.

Chapter 5: This Chapter includes the practical stage of the research which is described clearly and data analysis methods.

Chapter 6: This Chapter includes analysing the data collected through semi- structured interviews, questionnaires and summative test. This Chapter demonstrates the suitable tests and measures for the current study and data collection sites. This Chapter shows the data with diagnostic and critical text and tables supported with diagrams which present the findings. Moreover, the findings of quantitative and qualitative data will be displayed and clarified with tables and diagrams.

Chapter 7: This Chapter contains associating and comparing the results of data analysis with the literature. Furthermore, this Chapter includes the discussion of the findings because that leads to situating this research in the framework of other similar pieces of research. The results are significantly validated to enrich the relevant literature. This study helps in focusing the light on new areas and contributing and offering new visions to the literature.

Chapter 8: This Chapter presents the conclusion of the research. The discussions, explanations and analysed data in Chapter 7 are the base to recognize the following:

a. The contributions of this research and how these contributions can be implemented, where they can be applied and identifying the recommendations for next research.
b. The limitations of this study and the weaknesses and strengths of the research.
c. The difficulties of research which faced the researcher and their function during the research.

1.8 Summary

This Chapter focused on the aim of the study and the rationale of the current study. The research questions, methods and field (context) were also outlined and the contribution of the current study to both knowledge and practice was also discussed. The context of the current study was defined. The basic point, added to others, is that the study will contribute to the group of studies that examined attitudes by tackling attitudes of the learners against psychological background as integrated with the study of achievement. The study will also track the effectiveness of using technology in teaching/learning process. The Online source of information will be the BBC Bitsize. The methods and strategies of teaching/learning Science play a crucial role in forming the learners' attitudes towards Science and in improving their achievement: adopting methods that encourage the development of positive attitudes towards Science, building the autonomous learning and the curiosity of learners for developing a scientific approach to let the learners deal with complex contexts, strengthening the sense of responsibility of learners, self-confidence, self-assessment and encouraging the learners to record their observations and drawing conclusions from their evidence. The learners would be able to evaluate their evidence critically. It is expected at the end of the current study that the achievement of the participants will fall in some or all levels of attainments. The outcome of this study will help different figures of the educational sectors such as researchers to conduct extra studies in the current research area, (management and policy makers for good planning), teachers to follow effective strategies and methods for teaching Science via technology by taking in their account the psychological factors which affect the learners attitudes towards using technology in the teaching/learning process and for learners to achieve high scores in Science. The findings of this research will guide to better understanding of the relationship between the attitudes and the level of achievement of KS3 learners in the UK Schools.

Chapter 2
Literature Review

2.1 Introduction

The current study aims to survey the KS3 learners' attitudes towards the implementation of Online learning in their education or, more specifically, in learning Science. In this study, however, attitudes will be surveyed in a way different to how other studies have approached attitudes. Firstly, attitudes will be examined against the background that an attitude is not only a manifestation of likes or dislikes or favoured/ non –favoured issues. Rather an attitude will be surveyed as the outcome of the combination of three ingredients of Affective, Cognitive and Behavioural Intention. The definition of an attitude has experienced a shift from being an expression of what a participant likes or dislikes to a response to emotional as well as cognitive factors and the behaviour that is shaped by the two types of factors. Secondly, the study of the learners' attitudes will be linked with the study of the learners' achievement in Science after they have been taught via Online learning. This way of approaching an attitude is also based on the definition of an Online effectiveness as the learners' acquiring of skills, knowledge and attitudes.

Therefore, this Chapter will review attitude studies that have used both the simple way of approaching an attitude as showing likes or dislikes and also those which have approached an attitude as a combination of (Affective, Cognitive and Behaviour) factors. The strengths and weaknesses of these studies will be discussed and the advantages of the second approach will be outlined. The gaps of the reviewed studies will be discussed in order the current study theoretical framework attempts to fill these gaps. Studies that have explored the effectiveness of technology and Online learning will also be reviewed in order to trace the approaches used to measure technology effectiveness and the advantages and disadvantages of these approaches. The studies that have approached effectiveness as achieving high scores in the test, and those which combined the learners' attitudes with

the learners' achievement will also be examined. This will be done to infer the most appropriate way to address technology effectiveness and adopt it in the current study.

The website that will be used is BBC Bitesize so the website features and how it works will be reviewed as well as the justification of its adoption in the current study. Learning theories will also be reviewed to investigate what learning theories are involved in using technology or Online learning in the classroom as a medium for learning and which learning theories tenets are more dominant in the context where Online learning is used. Figure 2 below represents the Conceptual Framework for Chapter 2, which essentially draws on the three research questions and outlines the interrelatedness of attitudes towards Online learning, Online learning achievement and defines Online learning effectiveness. The next section will explain the history, importance, and role of BBC Bitesize in the learning process.

Conceptual Framework: Chapter 2

Focus research question: How the effectiveness of BBC Bitesize (Online learning) can be measured?

The socio-psychological components of attitudes					
Selwyn constructs				Anxiety	Self-efficacy
Affective	Usefulness	Control	Behavioural		

Research Questions

How does BBC Bitesize affect the KS3 learners' **attitudes** towards Online learning methods?	How does BBC Bitesize (Online learning source) affect the KS3 learners' **achievement**?	How do the KS3 learners' **attitudes** **affect** **their** **achievement**?

Discussion of approaching **attitudes** on psychological & non psychological background

Discussion of approaching the learners' **achievements** via using technology.

Discussion of the **interrelatedness** between the learners' **attitudes** and their **achievement**.

Discussion of approaching learning **effectiveness**.

Figure 2: Conceptual framework: Chapter 2 – The effectivness of learning plus the correlation between attitudes & achievement

2.2 What is BBC Bitesize

This section will elucidate the role of BBC Bitesize in the learning process in general and especially in improving knowledge and skills.

The BBC has a rich history in learning and teaching since 1924 and currently has education in its mission: '*To enrich people's lives with programmes and services that inform, educate and entertain.*' (BBC 2016). The BBC has developed numerous learning sources and Online learning courses (BBC 2012). Please find below Figure 3 (The home page of BBC Bitesize).
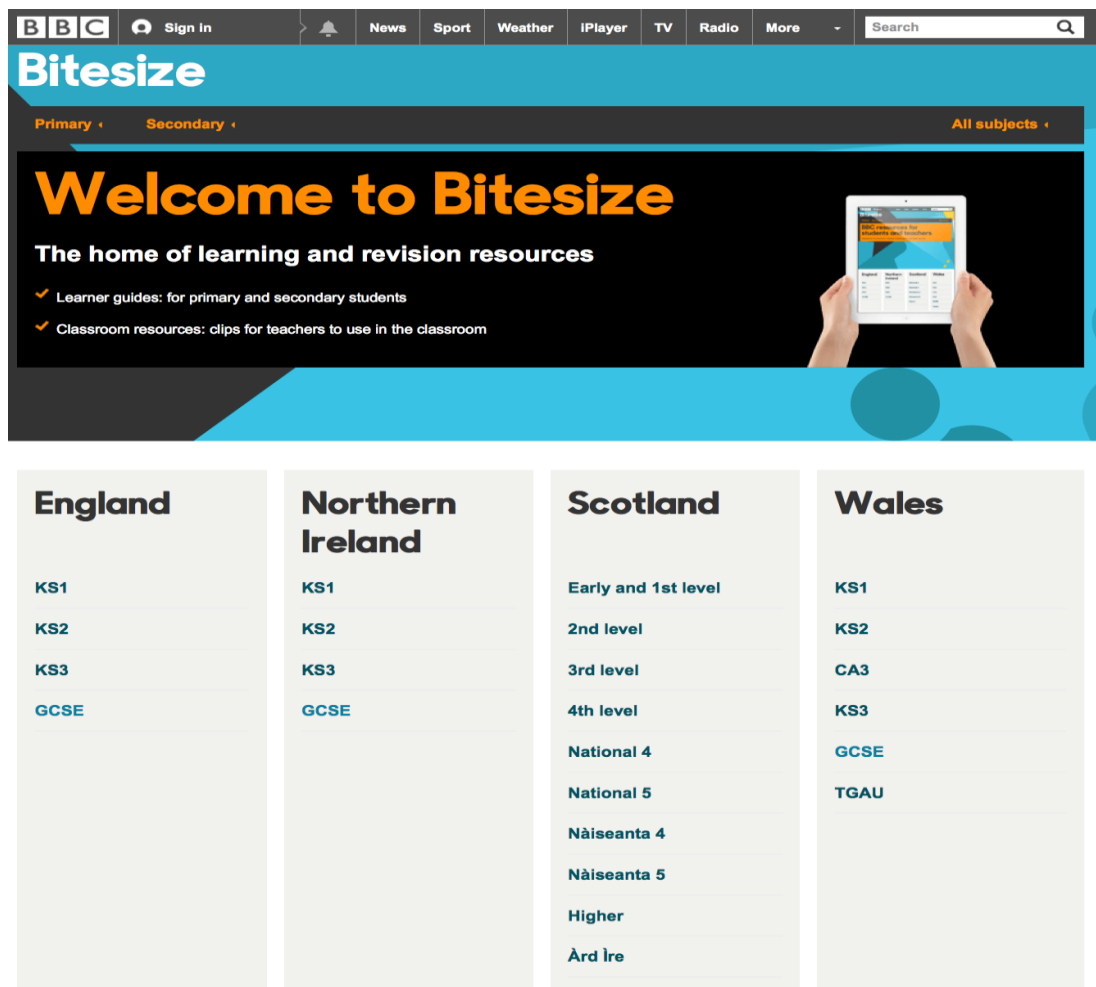
Figure 3: the home page of BBC Bitesize website December 2015 Screenshot

BBC Bitesize website is well-known by learners in the UK on the one hand and it is common and accessible for any learner on the other hand (BBC Bitesize 2012).

The current study uses BBC Bitesize because it is acknowledged by KS3 & KS4 learners to be the second more popular source after Wikipedia but BBC Bitesize is more reliable (Becta 2008). And most learners welcome the Internet in their studies to support learning (Ibid.).

BBC Bitesize has been designed for learners who are concerned to improve their knowledge and skills (BBC 2013b). Therefore BBC website offers a good source which will not make any unease with the learners who participate in a study that uses it as an Online learning resource (Reida and Pruijsenb 2015). BBC Bitesize has been provided with attractive pictures, photos and figures, video, and activities. This website offers the learning sources at different levels of complexity from simple KS1 to difficult GCSE where learners are able to find a course suitable for their level (See screenshot of BBC Bitesize website above). 60% of all KS3 learners use BBC Bitesize to help them with their examination revision by presenting a subject's facts and concepts in straightforward and obvious methods (Ibid.). Every topic is broken up into 'Revision Bites', containing subject information, and 'Test Bites', which test learners' knowledge of the subject. Test activities are created to convoy each section of the Bitesize website (Ibid.). The BBC Bitesize has around 7,000 classroom clips. Also, most of the Secondary guides are available covering Key Stages 3 and 4 of the National Curriculum, and National 4, 5 and Higher in the Scottish Curriculum for Excellence (Ibid.).

All the content is being continuously updated to bring into line with Curriculum changes. Bernal-Merino (2015, p.33) argues that BBC Bitesize is a '*very popular free resource favoured by teachers and parents in the UK*' (Bernal- Merino 2015). This is reduced to the fact that the BBC Bitesize provides guidance for all stages in the National Curriculum.

Pachler & Cook (2009, p. 38) believe that BBC Bitesize is helpful because it provides different ways to support learners as well as it '*break[s] up the monotony of what is an onerous and stressful period. [It also] provides an alternative angel to subject areas which may have been unclear before*' (Pachler and Cook 2009). Chivers & Shoolbred

(2007, p. 157) describe BBC Bitesize as having '*some helpful guidance*' (Chivers and Shoolbred 2007). Haydn et al. (2014) consider BBC Bitesize as helpful because it has a large range of audio files for download (Haydn et al. 2014). Dickinson & Benson (2015), Beveridge (2012), and Doyle (2008) also describe BBC Bitesize as helpful for revising (Beveridge 2012;Dickinson and Benson 2015;Doyle 2008). Valente and Marchetti (2012, p.137) consider BBC Bitesize as a '*collection of Computer-Augmented Exercises*' which require the players to give the right answer (Valente and Marchetti 2012). What is more interesting about the BBC Bitesize is that it creates a concrete context for abstract Mathematical operations. Paget (2012) outlines the advantages and the disadvantages of BBC Bitesize tutorials as follows in

Table 3:

Table 3: the advantages and Disadvantages of BBC Bitesize (Paget 2012)

Advantages	Disadvantages
They are available anytime	The learners cannot ask the teacher questions
No teacher is needed	It is not possible for the learners to skip bits they already know
Learners can answer the questions quickly	
On- screen explanations and demonstrations are available	They proceed at a speed which may not suit all the learners

However, it is not realistic to imagine that the availability of the BBC Bitesize website means that every child can use it. Using the Internet is affected to a large extent with the religious, social and family circumstances of the child. For example, Livingstone (2013) conducted a case study about a child called Anisah while the girl was interviewed with her parents about the use of the Internet at home. The author has concluded that family and the moral values dominant in the family shape the children's use of the Internet. The study children do not login the Internet because the religious and social values of the family which do not allow them to be free in watching what they want. In this case, children will not trust the Internet as a medium of education or even think about using it in education. There will be a barrier between the children and using the Internet (Livingstone 2013). This example has been mentioned here to show that there are still barriers in the face of using the Internet in general and the BCC Bitesize in particular. This section explained the function of BBC Bitesize in education for children and adults. The next section will explain the three types of learning theories.

2.3 Learning theories

This section will review the learning theories (Behaviourist, Cognitivist, and Constructivist). Because reviewing the learning theories is essential in examining technology implementations in education. The rationale to review learning theories is that all learning environments reflect 'underlying beliefs about how knowledge is acquired and used' (Hannafin and Land 1997). Additionally, reviewing learning theories is necessary to identify which theory is used when implementing the Online learning and how knowledge is constructed when Online learning is used in the classroom.

A. Behaviourist theories

Behaviourism states that 'learning is largely unknowable, that is, we can't possibly understand what goes on inside a person the "black box theory" (Siemens 2004). Observable external behaviour is more important than the unobservable internal activities that take place in the brain. Learning is all about behaviour and how it changes through a stimuli-response mechanism (Gould 2012). Behaviourists, who are having Skinner as their major proponent, view learning as '*changing the behaviours of individuals in a process involving some exploration and trial and error until a positive event occurred*' (Semple 2000). Learning takes place when the positive behaviour is rewarded and the negative behaviour is punished. The main point in the Behaviourist theory of learning is that they do not focus on what is inside the learner. Rather they stress the importance of the stimulus-response process and knowledge is seen as objective, given and absolute (Ibid.). Behaviourists focus on the external behaviour because it is observable.

Behaviourist theory is based upon the notion that all behaviours are acquired through conditioning. Watson's theory was a major influence in education. The real valuable behaviour for Watson is the observable behaviour (Ashford and LeCroy 2013). Watson focuses on observable stimuli and observable response (Ibid.). According to Watson, development depends on learning and if proper experience has been given to learners learning will continue (Ibid.).

During the 1940s, 1950s, 1950s and the 1960s, teachers were more concerned with right answers than with learning understanding. Many adults remember being taught their times tables by rote and alphabet as a string. A learner who has been taught by rote without understanding will recite the full table until they get the right answer (Semple 2000). Thorndike theory proposes that learners should be encouraged to learn by themselves rather than rely on teachers for instruction (Gray and Macblain 2012). Skinner disagreed with the system of belief of Pavlov and Watson but he agreed with Thorndike's theory that learners are not passive but active learners whose behaviour is created and maintained by rewards or punishment (consequences) (Gray & Macblain 2012).

Skinner's (1904-1990), his theory is based on a system of positive reinforcement, negative reinforcement, positive punishment, and negative punishment (Mac and LCPC 2014). Reinforcement is related to its effect (consequence). It increases an individual's inclination to do certain response (Weiten 2016). Punishment in operant conditioning is when an operant behaviour is followed by a response that reduces or eliminates the probability that behaviour will happen again in the future, that stimulus is called punishment (Gale 2015).

One of the criticism addressed to Behaviourists is that they deal with observable behaviour while pay little attention to what is going in the child/learner's mind (Stuart et al. 2009). They do not recognise the processes that take place in the brain while learning. The second criticism is that they relate learning to environmental factors rather than to individual and what is inside the person (White et al. 2012).

However, Behaviourism is still used in some aspects of teaching and learning such as recapping, rote learning, and some drills provided by the computer. In the current study, Behaviourist approach has been used at different stages. The stimulus is provided by the BBC to the learners. Formative assessment (questions) is also provided and the learners should answer the questions. If the answer is wrong, the BBC Bitesize will correct it. If the answer is right, the BBC will reinforce it. These processes are the essence of Behaviourist theory.

B. Cognitivist theories

The work of Vygotsky (1896-1934) has been considered as the foundation of a lot of research and the Cognitive theory in the last numerous decades (Tarnopolsky 2012). Vygotsky believes that Learning occurs before development (Ibid.).

Swiss biologist and psychologist Jean Piaget (1896-1980) proposes that the stages of cognitive development through which children and adolescents proceed are based on maturation and experience (Kelcourse 2015). Piaget believes that development precedes learning (Gray and Macblain 2015;Haggarty 2013)

The theory of cognitive development is a comprehensive theory about the nature and development of human intelligence was first developed by Jean Piaget (CTI Reviews 2016). Piaget's theory deals with the nature of knowledge itself and how humans come gradually to acquire it, construct it, and use it (Berman 2016).

The cognitive perspective emphasises meaning and understanding as opposed to the more mechanistic viewpoint adopted by behaviourists (Gould 2012). Cognitivism often takes a Computer information processing model in explaining what learning is:

'learning is viewed as a process of inputs, managed in short term memory, and coded for long-term recall' (Siemens 2004).

Cognitive theory concentrates on the internal process of the learner's brain (Palacios and Evans 2013). In Cognitive theory the learner's brain works like a Computer (Spector et al. 2014). Cognitive theory is interested with what is happening inside the learners' mind and the information is actively processed and learning happens by organising and finding the correlation between different pieces of information (Gould 2012). Cognitive theory concerned with the internal processes involved in making sense of the environment and deciding what action might be suitable (Ibid.).

Critical of the behaviourist approach, Piaget argued that it purely encouraged the repetition of 'meaningless string' and 'circus tricks' but failed to support understanding

(Gray & Macblain 2012). He preferred discovery learning through practical activities (Ibid.). According to Piaget, a teacher taught her/his learners the colours by linking the stories with colours therefore it was noticed that during short time the learners learnt the colours perfectly and they talk about colours confidently (Ibid.). Knowledge is constructed by the knower based on mental activity and learners generate knowledge and meaning from an interaction between their experience and their ideas (Ibid.). The Cognitive theory concentrates on the development of learners' thinking (Ibid.).

Cognitivists are concerned with the mental processes that take place inside the learner's mind (Wan 2015). According to Queen et al. (2013, p 29), learning in the Cognitive theory is '*based on making symbolic, mental constructions involving active mental processing on the part of the individual learner'* (Queen et al. 2013*).*

Cognitivists emphasise the mental processes involved in learning. The learning process is an active process and the learning process is learner-centred (e.g. interactive lectures, organised process, interactive workshop, and problem-based learning. Cognitive approaches to learning are such as 'integrating new with existing knowledge, retrieving and using knowledge and skills, and linking the learning process with the context (Evans and Brown 2015). With Cognitivists there is a shift of interest from the external behaviour of learners to the internal processes which underlie learning (Rubin 2016).

According to Pellone (1991, p 41) Cognitivists believe that *'there are innate qualities in the human mind and that most learning can be adequately explained in terms of a model of thinking, or cognitive process'* (Pellone 1991). Contemporary Cognitive psychologists propose more complex models of learning involving the regular structure of conceptual schemata*.* Schematic learning is the using of formerly learned information, concepts in order to understand and simplify new learning' (Ibid.).

The clear forms of Cognitive theory can be seen in problem-solving models, thinking, imagining, and information processing (Lefrancois 2012). Also, Rao (2014) points out that there are a few concepts relating to the Cognitive theory, such as schemata, assimilation and adaptation, accommodation, and equilibrium (Rao 2014). Schemata means describing the physical and mental performance concerned in understanding (ibid.).

Additionally, assimilation means describing the capability of the learner to address the new problems and conditions through his/her age-specific skills (ibid.). But, accommodation is a person's predisposition to adjust an action to suit a new situation (ibid.). Also, equilibrium refers to changing essential hypotheses following modification in assimilated knowledge subsequently the facts suit better (ibid.).

One of the criticism to Cognitivists is that they do not pay much attention to the role of interaction in child development (Conradie and Golding 2013). The other criticism is that not all people use formal operations in some thinking processes (Ibid.). Indeed, the relevance of Cognitive theory to social cognitive development has been subject to criticism in the sense that the theory is concerned with cognitive factors of development and ignores the social factors (Hala 2013).

The forms of Cognitive theory have been implemented in the current study in a number of aspects. For example, the learners were given some problems and required to find solutions to these problems through the BBC Bitesize. Moreover, though the learners took the information from the BBC Bitesize, they processed this information and made use of it autonomously. The teacher's role was that of the supervisor. The learners also used their imagination to find solutions of the problems they were given.

C. Constructivist theories

According to Gray and Macblain (2015), Constructivism is *'an approach to teaching and learning based on the premise ground that cognition is the result of mental construction'* (Gray & Macblain 2015).

Constructivists consider that knowledge is internally constructed based on the learner's previous knowledge or schemata (physical and mental activities) (Saudelli 2015). Piaget (1952) argues that in the construction of new knowledge there are two schematic processes are engaged assimilation and accommodation (Ibid.).

With Constructivism there is a essential departure in thinking about the kind of knowing, thus of teaching and hence of learning (Tam 2000). According to the Constructivists,

knowledge does not exist outside the human brain (Stanislas 2011). Learners construct their facts and knowledge in their brain because knowledge cannot be transferred unchangeably from teachers' brains to learners' brains (Cantu and Warren 2016).

In Constructivist learning theory learners construct their new knowledge actively on prior experience (Koohang et al. 2009). Vygotsky (1896-1934) believed that learning is based on real-life experience quoted in (Gray & Macblain 2012). Additionally, Vygotsky believed that it is essential to examine the social context in which learners develop (Ibid.).

Murphy (1997) presents a summary of characteristics of constructivism learning theory: Multiple perspectives and of concepts are encouraged, the role of the learner is more positive in the sense that they participate in setting the goals and the objectives of the learning process, the teacher's role is shifted from being authoritarian to that of a guide and facilitator, activities and environments should encourage meta cognition, self-analysis-regulation and awareness, learning contexts and environments are relevant, realistic, authentic and represent the natural complexities of the 'real world'; this can be by using primary sources of data, learning process emphasises learning as a construction of knowledge through social interaction, collaboration and experience not as an acquisition of knowledge by being transmitted from the teacher, and the learners' attitudes, previous experience, already existing knowledge and beliefs are considered in the knowledge construction process qouted in (Koohang et al. 2009). One major characteristic of Constructivist theories of learning is that learners construct their own knowledge (Tompkins et al. 2015).

The most important element in the Constructivists theories of learning is an active process of recreating knowledge because knowledge does not pass unchanged from teacher to learners (Garde et al. 2007). A major theme in the Constructivist learning theory is that learning is an active process in which the learners construct new ideas based on their already existing knowledge (Pritchard and Woollard 2013). Moreover, in Constructivist learning theory learning is not a passive reception of teaching and learners are not passive recipients of what the teacher says (Keengwee 2015). Learning, rather, is an active process which involves the learner's previous experience and the already existing knowledge (Ibid.)

There are two characteristics which are central to the constructivist description of the learning process. The first one is that of 'good' problems which means that constructivists' instruction asks the learners to solve problems by using their already existing knowledge (Jackson 2010). These problems are authentic and reflect the real life situations (Davies and Barnett 2015). The second characteristic of the constructivist description is the learning process occurs through discussion and collaboration (Wang 2014a). The constructivist perspective advocates learning through interaction with others (Spector et al. 2014). Learners work in groups and co-operate to solve a problem (Smith et al. 2015). Each contributes to the solution of the problem with their ideas till they get the opportunity to test and refine their understanding in an on-going learning process (Tam 2000). According to the Social Constructivists, knowledge is constructed from the experience of the learner, it is in the mind and not an external product (Mandal 2015). The learner's experience, beliefs and personal interpretation are used in interpreting events and therefore, in learning, and learning takes place in contexts relevant to the learner (Semple 2000). Constructivism stresses cognition as an individual activity and 'in the head', social constructivists focus mostly on knowledge socially constructed 'in the world' (Hung 2001).

The purpose of learning is constructing one's own meaning, and not to provide the "right" answers by imitating someone else's meaning (Hung 2001). Learning is 'inherently inter-disciplinary, and the only valuable assessment of learning is the assessment that is part of the learning process and that provides learners with information on the quality of their learning' (Ibid.).

Research agrees that constructivism learning theory, which focuses on knowledge construction based on learners' previous experience 'is a good fit for E-learning (Online learning) because it ensures learning among learners' (Koohang et al. 2009). The application of Computer-Enhanced Learning facilitates and opens the door for the Learner-Centred Environment to flourish and be a possible and realistic alternative. Computer-Enhanced Learning also provides meaningful contexts for interrelated learning themes (Hannafin & Land 1997). The activities of the Computer-Enhanced Learning encourage problem solving, interactive learning and deep understanding. Learner-Centred

Learning Environments focus on *'constructing personal meaning by relating new knowledge to existing conceptions and understandings; technology promotes access to resources and tools that facilitate construction'* (Ibid: 170).

Constructivist theory has been subject to criticism for some aspects. First, teaching according to the Constructivist perspective is time-consuming and places more pressure on the learners. Second, teaching through Constructivist perspective may not be appropriate to all learning contexts. Rote learning can be more useful in some contexts than the Constructivist approach. Third, the implementation of the Constructivist approach depends to a large extent on the teachers' abilities and skills as well as on their attitudes and acceptance of the principles of the Constructivist theory such as knowledge is temporary and it is constructed through the discussion between the learners, and that learning is based on real-life tasks (Snowman and McCown 2011).

Constructivist perspective of learning necessitates the collaboration of all learners so the outcomes are usually unpredictable (Alcantara 2015). Constructivism encourages diversity and variety in learning situations and processes (Tynjala et al. 2012). It also emphasises the multiple representations of concept and information (Ibid.). New information is perceived through more than one sense and processed through a variety of ways. By using the constructivist approach, the learners are allowed to use their own learning styles to comprehend the information they obtain from BBC Bitesize and communicate it; this points to the diversity and variety of learning situations which this approach allows. They learn the new information based on the already existing information. They can use different techniques such as asking questions, discussing, recalling and connecting the new information with real life situations. The next section will explain the relationship between the learning theories and contribution.

2.4 Learning theories and contribution

The current section will explain the relationship between the learning theories (Behaviourist, Cognitivist and Constructivist) and contribution.
The study has contributed to the elements of learning theories in some aspects which will be discussed below.

A. Behaviourism and contribution

The study has adopted the Behaviourist approach to learning in delivering the lesson to the learners by adopting the stimulus-response principle. Introducing the contents of the lesson, asking questions to brainstorm the subject and what the learners know about it and activating the learners' schemata are all creating a stimulus for learning to which the learners will respond and provide answers which will be reinforced by the Computer/ BBC Bitesize. The reinforcement may not be direct in the case of BBC Bitesize. The website does not say that the answer brainstormed is correct/ wrong. The learners will conclude from viewing the lesson on the website that the answers which have been provided are not accurate and they receive the correct answers from the flow of information in the lesson. There is, thus, a type of learner-centred reinforcement in the sense that the learners discover whether their answers are correct or not. This will automatically create a response on behalf of the learners who will be more enthusiastic to discover more about whether their answers are accurate and if not they start to learn the accurate information.

One of the criticisms addressed to Behaviourists is that they deal with learning as merely stimulus and response and with learners as vessels that should be filled with knowledge that is transmitted from the knowledge source, which is usually the teacher, and then recall this knowledge and pour it on the exam paper. However, the other contribution of the current study to the Behaviourist approach is that the learners are not passive recipients of knowledge. It is true that they have been given a stimulus and they have responded to it, but they are not passive players in learning. Learning about Microbes through the BBC Bitesize, is a process characterised by short cycles and every cycle is the combination of stimulus followed by the learners' response. The process of learning about Microbes is a combination of these cycles where the learners move from one stimulus-response cycle to another and connect the contents of a cycle with those of the other and make conclusions. The subsequence of cycles enables the learners to form a pyramid which includes all the correct information about the topic. In this case, learners cannot be said to be passive but they have participated in this process of responding and discovering more information. It is worth mentioning that when define learning as a stimulus-response activity, Behaviourists assign an important role to the learners rather than being passive.

Even responding to stimulus involves mental activities and use of skills to provide the accurate responses.

This necessitates re-reading the Behaviourist theory of learning in a different way. It is also essential to reconsider the idea that learning a behaviour through observing and imitating it is not just an external learning; it is involving the learners' mental abilities and strategies. The Behaviourists have not recognised this but this is implied in their response to stimulus which is more complicated than it looks from the outside.

B. Cognitive learning theory and contribution

By using BBC Bitesize, the learners have entered into a process of discovering more about the subject. They connect the knowledge they have been introduced to at one stage with the previous and next knowledge. Therefore, learning is not only responding to a stimulus; it is connecting information together to form a comprehensive understanding of the whole subject. Although it is not possible to observe the mental activities that take place inside the learners' minds, but the questions asked to the learners in the formative assessment at the end of every section denotes that the learners have used different tactics to understand the information they have received. The learners have learned autonomously about the subject using their schemata to understand the new knowledge. BBC Bitesize has enabled the learners to ask questions, solve problems, analyse, connect information, use their knowledge of general life and the world to understand and think aloud.

The contribution of the study within the domain of Cognitivist approach is that the learners are given the opportunity to adopt autonomous learning and connect the information to understand the topic. They should rely heavily on their background knowledge and ability to understand without the help of the teacher. BBC Bitesize has, in fact, introduced information but it does not tell how to learn or comprehend it. Learners depend on their styles of learning. However, whatever different these styles are, they require the involvement of the learners' decisions how to learn and how to plan, use tactics they trust, and depend on their previous knowledge. In the case of Microbes, after the learners were stimulated, they were left the freedom to decide how to understand the topics by using different methods, but whatever these methods were they involved using

mental activities and processes that connect information together and with the background knowledge. This makes the study learners adopt self-autonomous strategies for learning.

The outcome of the formative assessment where the learners have achieved a satisfactory level of achievement without the help of the teacher and with the exposure to the information flow demonstrates that the learners have used strategies and methods to understand the topic. A worth asking question is whether these problem-solving strategies are nature or nurtured.

C. Constructivism and contribution

Constructivists pay the greatest attention to the social interaction. They believe that knowledge is constructed through the interaction between the learners and the context they are in. Knowledge is not transmitted unchangeably from the teacher to the learners. The purpose of learning is constructing one's own meaning.

By using the BBC Bitesize, the learners became in an interaction with the website. The BBC Bitesize enables the learners to construct knowledge through the interaction between the knowledge the learners have and that which the BBC Bitesize provides. The learners are not passive in this interaction even if they do not have knowledge about Microbes, because they have their own knowledge of the world, language and themselves which is vital in understanding the new knowledge offered by the website. The learner, thus, does not learn in a way where they receive the knowledge and store it; they learn through the interaction between their knowledge and that of the Computer and Internet. They attempt to create their own meaning. The website provides the context where the interaction takes place.

2.5   Technology and learners' attitudes

The previous section explained the relationship between the learning theories and contribution. This section is going to discuss critically other researchers' studies about attitude towards technology such as Computers, the Internet etc. The findings of these studies will be demonstrated in the light of contexts, aims of studies, constructs, and the

57

methods used. This part will concentrate on the transformation in approaching attitudes and which has been influenced by the development in the definition of an attitude in psychology. The part will also focus on relating learners' attitudes with the learners' achievements. It will also address technology effectiveness from a different angle rather than just from how much information the learners retain as a result to exposure technology. These issues will be addressed because the present study will adopt them in studying the participants' attitudes, achievement, and technology effectiveness. There is a diversity of studies that will be reviewed in this part of the Literature Review and they will be criticised and analysed in accordance to the issues mentioned above. For example, a study will be analysed whether it has adopted a simple definition of an attitude or a more sophisticated one, whether it connects learners' attitudes towards technology with the learners' achievement when the use this technology in their learning. The following section will explain the necessity to study the learner's attitude towards technologies and Online courses.

2.6 The need for studying the learners' attitudes

This section will explain why studying the learner's attitude towards technologies is necessary. The study of the learners' attitudes has been a necessity because human beings and their feelings and thoughts about education technology are essential for the success of implementing technology in education (Adeoye 2015). The success of educational technology can be predicted and investigated through the relationship between learners' attitudes towards technology and learners academic success (Ibid.). It is widely agreed that the successful integration of the Computer in education depends to a large extent on the learners' attitudes towards the Computer (Palaigeorgious et al. 2005). Deborah (2008) argues that researchers have been interested in understanding how users' beliefs and attitudes affect their technology usage behaviour for many years quoted in (Teo 2009).

It is proposed that influencing beliefs about contemporary learning via Computer may be central to supporting teachers and learners to develop familiarity and confidence in the use of ICT and in adopting it as a learning source (Deborah 2008). It has been argued that success of Online learning is based on the learners' attitudes towards technology (Fedirici and Scherer 2012;Simonson and Schlosser 2005;Sushil 2012). Therefore, for many

decades, researchers have been interested to understand how users' beliefs and attitudes affect their technology usage behaviour (Teo 2009). Attitude is considered as one of the most important motives behind a number of processes performed by humans and it is often related to motivation and interest. Consequently, the study of attitudes has been the subject of many studies (De Vries et al. 2012).

It has become essential to explore the learners' attitudes towards using of technology in learning to find the extent to which the learners are motivated and interested in the implementation of technology in their learning. The literature shows that there is a need to examine the learners' attitudes towards the use of Online learning in a more in-depth approach (Dajani 2014). Dajani (2014) recommends a further research of the learners' attitudes towards Online courses in order to understand the phenomenon of the learners feeling frustrated after their initial Online courses and their failure to continue additional Online courses. How far the learners are interested in learning via technology is believed to affect how they learn and what they learn: a learner's attitude towards a subject is a crucial factor in learning and achieving in this subject (Ibid.).

Researchers have surveyed how the learners' attitudes affect technology acceptance because they have assumed that attitudes play a crucial role in the learners' acceptance of technology (Dajani 2014). Studies of attitudes have been conducted for the purpose of finding the best ways to implement technology in education in a way that meets the learners' needs and expectations (Adeoye 2015). This can happen by linking the learners' attitudes and the success of implementing technology in education. Research conclusions have been that learners' attitudes towards technology play a vital role in determining the successful integration of technology in the learners' learning process Fedirici and Scherer (2012); Palaigeorgious et al. (2005); Simonson and Schlosser (2005); Sushil (2012).

This explains why the present study will survey how effective BBC Bitesize is in learning Science for KS3 learners partly through exploring the learners' attitudes towards the website and how they feel towards it, believe it helps them and how they respond to these emotional and cognitive states. The next section will discuss what learners' attitudes are.

2.7 What are learners' attitudes

This section will discuss the changes that the definition of an attitude has experienced and the outcome of this on attitude studies. Expanding to what has been mentioned in Table 4 below, the key points are that the definition of an attitude has been transferred from being defining what the participants like/dislike to being a combination of Affective, Cognitive and Behaviour intention components. The second definition of an attitude has been represented by CAS (Computer Attitude Scale) by Selwyn (1997). CAS has been subject to criticism by Peñalvo and José (2012) who state that in CAS the participants'attitudes are studied as isolated from action. Despite the criticism, the current study will adopt CAS because as Chip et al. (2015) point out that CAS provides a comprehensive and in-depth picture of the learners' attitudes because it is based on socio-psychological background. Overall, CAS is the skeleton of the current study scale.

Table 4: What are the learner's attitudes

Author (year)	The references	The Key findings
Teo (2009)	Modelling technology acceptance in education: A study of pre-service teachers	Researchers have been interested in understanding how users' attitudes affect their technology usage behaviour.
Falomir (2015)	Multilingualism and Very Young Learners: An Analysis of Pragmatic Awareness and Language Attitudes	Favourable and unfavourable attitude is called the "simple way". And learners' attitudes are based on the learners' views and whether they like or dislike.
De Vries et al. (2012)	Professional Development for Primary Teachers in Science and Technology: The Dutch VTB-Pro Project in an International Perspective	The study of attitudes has been the subject of many studies.
Selwyn (1997)	Students' attitudes toward Computers: Validation of a Computer attitude scale for 16-19 education	Attitudes have been surveyed as related to psychological components (Affective, Usefulness, Behavioural, and Control). This way of studying attitude is called cognitive style. Selwyn model (Computer Attitude Scale) was found reliable and valid. Also, the scale can be used to examine the effectiveness of Computer instruction.

Abedalaziz et al. (2013)	Measuring Attitudes Towards Computer And Internet Usage Among Postgraduate Students In Malaysia	The validity of Selwyn model was confirmed.
Graff et al. (2004)	Cognitive Styles and Cross Cultural Differences in Internet Use and Computer Attitude	The validity of Selwyn's (CAS) was examined. Also, the influence of attitude on technology-based performance was investigated(Graff, Davies, & McNorton 2004).
Teo et al. (2008)	Beliefs about teaching and uses of technology among pre-service teachers	The validity of Selwyn model was confirmed.
Larbi-Apau & Mosely (2012)	Computer Attitude of Teaching Faculty: Implications for Technology-Based Performance in Higher Education	The validity of Selwyn model was confirmed.
Peñalvo and José (2012)	Multiculturalism in Technology-Based Education: Case Studies on ICT-Supported Approaches: Case Studies on ICT-Supported Approaches	A critique of the literature about measuring the learners' attitudes by using CAS is that the learners' perceptions have been measured in isolation or as isolated constructs separated from action.
Chip et al. (2015)	Impact of Information Society Research in the Global South	The attitudes through socio-psychological definition of attitude provides a more in-depth and comprehensive picture about the learners' attitudes towards technology.

The section above has discussed that the definition of an attitude is not a static issue but it is a flexible issue that has experienced transformation as a result of the development in socio-psychology. In the next section, a detailed discussion of how the definition of an attitude has changed will be presented.

2.7.1 Changing the attitude definition

In this section the detailed description of the changes that the definition of an attitude has experienced will be outlined by discussing the two main theories that have been adopted to define an attitude. As Table 5 demonstrates, two theories have been used in surveying an attitude. The first theory is the Behaviourist where the terms of favour and disfavour have been synonymous with an attitude. Behaviourists consider an attitude as explicit and

observable responses to a stimulus. The second theory is the Cognitivist which defines an attitude as something that is not directly observable, but it can be inferred from the 'subject's introspection'. An attitude by Cognitivist theory is related to an individual's belief and their action generally guided by this belief. Hewstone (2015) defines an attitude in terms of three dimensions: Affective, Cognitive, and Behavioural. The current study will be based on Hewstone's approach to defining the attitudes because it is comprehensive and updating. The current study adopts the definition of an attitude as detailed by Hewstone (2015).

Table 5: The different types of attitudes

Author (year)	The reference name	The definition of attitude
Eagly and Chaiken (1993, 1998) quoted in Fiske et al. (2010, P 356)	Handbook of Social Psychology	*'A psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour'.*
Crano and Prislin (2006) quoted in Fisk et al. (2010, p.357)	The same as above.	*'Evaluative judgements that integrate and summarise cognitive/affective reactions'.*
Schwarz (2007, P 639)	Attitude construction: Evaluation in context	*'Attitudes do not necessarily exist in some performed state but can be built, created, generated, on the spot, in fine-tuned response to contextual demands. Attitudes, conceived in this way, are viewed as potentially adaptive reaction to environmental demands'.*
Calvo et al. (2015)	The Oxford Handbook of Affective Computing	Affective components: related to the automatic or rapid response towards a stimulus which is evaluated and led by emotions.
Hewstone (2015)	An Introduction to Social Psychology	An attitude consists of : a. Affective includes an individual's feelings/emotions about the attitude object. b. Cognitive includes an individual's belief, thoughts, and knowledge about an attitude object. c. Behavioural component: the attitude refers to behaviours people have acted or might act in the future.
Rubie-Davies et al. (2015)	Routledge International	Cognitive: related to an individual's belief

	Handbook of Social Psychology of the Classroom	and their action generally guided by this belief. Hence, self-efficacy is an individual's confidence in their capability to make an action; to solve a problem. Certain individuals have a strong self-efficacy and others have a lack in self-efficacy.
Cram101 (2017)	Invitation to Psychology	Behaviour is the system or individual's response to different stimuli, whether, conscious, or subconscious, explicit or invisible, internal or external, and optional or involuntary.
Dietz-Verrier (2015)	Language Attitudes in Hawick: An Empirical Study	The **behaviourist** view explains attitudes as people's responses to social situations. Attitudes are 'explicit & observable responses or behaviour to a stimulus'. The **mentalist (cognitive)** theory defines an attitude as something that is not directly observable, but it can be inferred from the 'subject's introspection'. Hence, the attitude is 'a mental and neural state of readiness. This approach includes the psychological background but with more focus on socio cultural and psychological approaches.
Longhofer and Winchester (2016)	Social Theory Re-Wired: New Connections to Classical and Contemporary Perspectives	An attitude represents the reaction, response, or behaviour of an individual in different situations.
Bordens and Horowitz (2013, P 159)	Social Psychology	*'an Attitude is made up of four components: cognition, affective responses, behavioural intentions and behaviour'*
Schiffman & Kanuk (2004) quoted in Vishal (2014)	3D MODEL OF ATTITUDE	Attitude is composed of cognition (beliefs), affection (feelings) and cognitive component (behavioural intentions).

In the section above, the two main theories that have been adopted to define an attitude have been discussed and the tenants of every theory have been outlined. In the following section, studies will be reviewed that represent the simple approach (favour and disfavour) of an attitude, and it can be called the Behaviourist definition.

2.7.2 Learners' attitudes through a simple approach

In this section, some studies will be reviewed as an example of the Behaviourist approach to studying an attitude. These studies have approached an attitude as an expression of likes and dislikes by the participants. The method used for data collection in these studies is a questionnaire or self-report. The data collected reflect favours or disfavours of the topic under study as shown in Table 6. The current study, however, will not only adopt the Behaviourist definition of an attitude because it does not present a comprehensive and in-depth description of attitudes.

Table 6: Learners' attitudes through a simple approach

Author (year)	The references title	The Key findings
Domino and Domino (2006)	Psychological Testing: An Introduction.	The simple way of studying attitudes is asking the participants directly about their attitudes "self-report". The "implicit" or "unconscious" attitude – which is observed based on an individual behaviour.
Ardies et al. (2014)	Students attitudes towards technology	The researchers have not examined the components of the attitudes as defined by psychology. The learners' attitudes towards technology were positive.
Reed (2014)	Staff experience and attitudes towards technology-enhanced learning initiatives in one Faculty of Health and Life Sciences	The study approaches the attitude towards E-learning on a simple background. The results suggest that the teaching staff agree that there is a need for consistency in the virtual learning environment. This study has been based on a behaviourist definition of an attitude.
Ardies et al. (2013)	Reconstructing the Pupils Attitude Towards Technology survey	The data collected in this study reflect either favourable or unfavourable attitude to the subject under investigation.
Sarjou (2012)	A Study of Iranian Students' Attitude towards Science and technology, School Science and Environment, Based on the ROSE Project	The study examined the learners' attitudes towards Science and technology. The scholar has also dealt with attitudes as visibly observable responses to a stimulus.

In this section, some studies were reviewed as an example of the Behaviourist approach to studying an attitude. These studies have approached an attitude as defined by the Behaviourist theory. In the next section, the studies that have integrated some socio-psychological elements in the study of an attitude will be reviewed. This review is essential because it reveals the development of the study of attitudes from a simple background towards a more compound and sophisticated background.

2.7.3 Learners' attitudes based on self-efficacy and anxiety

This section reviews some studies where the study of an attitude and the study of Computer self-efficacy and Computer anxiety are integrated. A link has been found between the attitudes towards using technology in learning and self-efficacy and Computer anxiety: Lower Computer anxiety and higher Computer self-efficacy contribute to positive attitudes as shown in Table 7. The key issue, however, about the significance of these studies is the rising awareness that attitudes need to be investigated in companion with other socio-psychological dimensions which explain and shed more light on these attitudes. The current study will also survey the relationship between the study participants' attitudes towards the use of Computer and Internet in their study of Science and their self-efficacy and Computer and Internt anxiety.

Table 7: Some studies about learners' attitudes based on self-efficacy and anxiety

Author (year)	The references' titles	The Key findings
Okhakhume and Ogunlude (2015)	Perceived Computer Self-efficacy As Determinants of Attitudes towards Computer Use among Secondary School	The findings revealed that Computer self-efficacy has significant effect on attitudes toward Computer use among secondary School learners.
Liaw (2015)	Investigating Learner Attitudes toward Mobile Learning Environments: Based on Gender Perspectives	The results showed that perceived self-efficacy has a positive significant predictor on attitudes for male learners whilst perceived anxiety is a positively significant predictor on attitudes for female learners.
Papastergiou (2010)	Enhancing Physical Education and Sport Science students' self-efficacy and attitudes regarding Information and Communication Technologies	The result demonstrated that the attitudes are positive on Internet and Computer self efficacy but for Computer anxiety the mean scores decreased.

	through a Computer literacy course	
Adebowale et al. (2009)	Correlates of Computer Attitude among Secondary School. Students in Lagos State	Computer self-efficacy, gender, and very low levels of Computer anxiety were found to be the significant predictors of Computer attitude.
Sam et al. (2005)	Computer Self-Efficacy, Computer Anxiety, and Attitudes toward the Internet: A Study among Undergraduates in Unimas	The learners have high Computer self-efficacy i.e. the learners' attitude is positive. Learners also do not show significant differences in their Computer anxiety levels and attitudes toward the Internet.
Eachus et al. (2006)	Further Development of the Web User Self-Efficacy Scale (WUSE)	The study suggests that negative web-user self-efficacy will hinder successful Internet use.
Simsek (2011)	The Relationship between Computer Anxiety and Computer Self-Efficacy	Lower Computer anxiety and higher Computer self-efficacy may be important factors in learning Computer skills and employing them efficiently.
Huang and Hsu (2006)	Factors that Influence Students' Learning Attitudes toward Computer Courses	There is a positive correlation between self-efficacy and positive attitudes and there is a negative correlation between anxiety and positive attitudes.
Thatcher and Perrewe (2002)	An Empirical Examination Of Individual Traits As Antecedents To Computer Anxiety And Computer Self-efficacy	The learners who have a high level of Computer anxiety will show low level of Computer self-efficacy.
Zhao et al. (2010)	Internet inequality: The relationship between high school students' Internet use in different locations and their Internet self-efficacy	The social support from School has a great impact on ISE (Internet Self-Efficacy).

The section above has been about the studies that integrated the study of an attitude with the study of self-efficacy and anxiety of an attitude. In the next section studies which have adopted Selwyn model (CAS) in defining an attitude will be reviewed.

2.7.4 Learners' attitudes on Selwyn model (CAS)

This section is about reviewing studies that have integrated the Selwyn model in the study of the learners' attitudes towards technology. There are varied results but the main point in

these studies is that the adoption of the (Cognitivist, Behaviourist, and Behaviour) approaches support in understanding the attitudes and what makes them what they are Table 8. The other important point is the use of CAS by Selwyn by many studies and whose significance emanates from its ability to provide a detailed and clear explanation of attitudes. The current study will adopt Selwyn model (CAS) to provide an in-depth insight of the study participants' attitudes.

Table 8: Studies about learners' attitudes on socio-psychology factors

Author (year)	The references' titles	The Key findings
Toe et al. (2007)	Understanding pre-service teachers' Computer attitudes: applying and extending the technology acceptance model	The findings showed that perceived usefulness and perceived ease of use are significant factors of pre-service teachers' attitudes towards Computers.
Teo (2008)	Pre-service teachers' attitudes towards Computer use: A Singapore survey	The result showed that the participants' scores are: the lowest on the perceived control followed by the perceived usefulness subscale. The mean scores for the affective and behavioural intention subscales are the same.
Abedalaziz et al. (2013)	Measuring Attitudes Towards Computer And Internet Usage Among Postgraduate Students In Malaysia	The mean scores of learners' attitudes on the perceived usefulness of Computer is the highest followed by perceived control then by affective and then by behavioural intention.
Larbi-Apau & Moseley (2012)	Computer attitude, and the impact of personal characteristics and information and communication technology adoption patterns on performance of teaching faculty in higher education	The results reveal that the affective was the highest contributor of Computer attitude followed by usefulness, behaviour, and behavioural control attitudes.
Evangelos and Panagiotis (2008)	University students' differences on attitudes towards Computer use. Comparison with students' attitudes towards physical activity	The results indicated gender differences of learners' attitude towards Computer on two factors, "affect" and "perceived usefulness".
Teo and Noyes (2010)	A Cross-Cultural Validation of the Selwyn's Computer attitude scale (CAS)	The result showed that there is a positive Computer attitude among the learners.
Kirmizi (2014)	Measuring Technology Acceptance level of Turkish pre-service English	Selwyn model was used and the result reveals that the learners (the expected English

	teachers by using technology acceptance Model	teachers) have positive attitudes towards technology and towards using technology in lessons.
Saricoban (2013)	Pre-Service ELT Teachers' Attitudes towards Computer Use: A Turkish Survey	The results revealed that the affective components have a positive significant correlation with behavioural intention, but a significant negative correlation with perceived usefulness. The learners were very attracted by Computers but they do not belief in using Computers in classrooms as part of their future teaching.
Sexton et al. (1999)	Measuring and Evaluating Early Childhood Prospective Practitioners' Attitudes toward Computers	The majority of learners have positive attitudes towards Computer on Selwyn scale (CAS).
Yushau (2006)	Computer Attitude, Use, Experience, Software Familiarity And Perceived Pedagogical Usefulness: The Case Of Mathematics Professors	The result indicates that Mathematics teachers have positive attitude towards Computers on CAS Selwyn scale. Additionally, the teachers were also convinced that that Computers play positive role in the learning/teaching of Mathematics.

The section above was about reviewing the studies that adopted Selwyn model of an attitude. In the next section, the studies that have been conducted on the learners' attitudes towards technology in education will be reviewed in the sense that there is no explicit answer to whether the learners' attitudes are positive.

2.7.5 Learners' attitudes towards technology: no definitive answer

As Table 9 reveals, this section reviews the studies that have been carried out to explore the extent to which the learners have positive attitudes towards the use of technology in their education. There is a diversity of results in the sense that there is no definite answer to whether the learners' attitudes are positive towards the integration of technology in education. The current study will add to the literature in this area and trace whether the study participants' attitudes are positive or negative towards BBC Bitesize and what makes them so.

Table 9: Learners' attitudes towards technology: no definitive answer

Author (year)	The references' titles	The Key findings
Heafner (2014)	Exploring the Effectiveness of Online Education in K-12 Environments	More research is required on learners' attitudes.
Hartshorne (2012)	Teacher Education Programs and Online Learning Tools: Innovations in Teacher Preparation: Innovations in Teacher Preparation	The instructors should benefit from the Online learners' attitudes. Further research is required about these attitudes.
Helm et al. (2015)	Critical CALL - Proceedings of the 2015 EUROCALL Conference	Learners' attitudes towards technology implemented in education are positive.
Pelet (2013)	E-Learning 2.0 Technologies and Web Applications in Higher Education	The same as above in Helm et al. (2015).
Dew (2015)	Handbook of Research on Digital Media and Creative Technologies	Learners' attitudes towards the integration of technology in the learning process are negative.
Keengwee (2015)	Handbook of Research on Educational Technology Integration and Active Learning	The same as above in Dew.
Surry (2010)	Technology Integration in Higher Education: Social and Organizational Aspects: Social and Organizational Aspects	The learners are not interested in the extensive integration of technology in their education. They prefer purposeful and moderate application of technology in their learning process.
Adewole-Odeshi (2014)	Attitude of Learners Towards E-learning in South-West Nigerian Universities: An Application of Technology Acceptance Model	The result showed that learners resist the use of Computers as a complete replacement of the regular traditional teaching.
Kalanzadeh et al. (2014)	Exploring the Influence of Using Technology on Iranian EFL Students' Motivation	The result showed that 87% of the learners have positive attitude towards technology but 13% of the learners have negative attitude.

The section above has reviewed the perspectives that more research is needed for tracing the impact of technology on learning. The following section will review the studies that have probed the impact of technology on the learners' achievement.

2.8 The impact of technology on learners' achievement

This section will review the studies that have been conducted on the effectiveness of technology on the learners' achievement in education. This section will be divided into two main sub-sections. The first sub-section reviews the studies which have concluded that technology can be effective in enhancing the learners' achievement in education. The second sub-section reviews the studies which have found that technology makes no difference in enhancing the learners' achievement or learning.

2.8.1 The impact of technology on learners' achievement (it has made a difference)

As Table 9and Table 11 reveal, this sub-section reviews the studies that have been carried out to explore the extent to which technologies have positive impacts on the learners' achievements. As Table 10 demonstrates, the role of technology and Online courses in enhancing cognitive levels, problem-solving skills, and the higher-order thinking. As Table 11 reveals, that technology enhances autonomous learning. Also, Table 11 shows that the use of technology has shifted the learning/teaching process from traditional methods to more learner-centred and autonomous learning. The new methods of learning provide an effective chance for self-learning (autonomous learning).

The current study takes as a point of departure the assumption that the effectiveness of Online learning is translated into acquiring knowledge, attitudes and skills. This gives a good and more in-depth idea about learning effectiveness and learners' achievement.

A. Technology enhances cognitive and problem-solving skills

As Table 10 demonstrates, technology enhances cognitive levels, problem-solving skills, and critical thinking. Subsequently, Online courses have a positive impact on the learners' achievements.

Table 10: Technology enhances cognitive and problem-solving skills

Author (year)	The references' titles	The Key findings
Savage & McGoun (2013)	Teaching Contemporary Themes in Secondary Education: Technology, Culture and Communication.	The authors claimed that Internet enhances the cognitive skills of the learners and their ability to solve problems.
Younie et al. (2014)	Teaching and Learning with ICT in the Primary School	The researcher claimed that using the Internet help in: a) Involving the learner's previous knowledge in comprehending new knowledge, b) Developing the higher-order thinking, problem solving, and critical thinking, and c) Stimulating the sense of wonder and curiosity within the learners.
Heppen et al. (2015)	Turning to Online Courses to Expand Access: A Rigorous Study of the Impact of Online Algebra I for Eighth Grade In Large-Scale Studies in Mathematics Education	The result showed that Online Algebra courses have a positive impact on the learners' achievement at the end of Grade eight.
Higgins (2013)	Matching Style of Learning	The result showed that learners who did Online learning have achieved better than learners who took the same course in traditional classroom settings.
Hussain et al. (2010)	Technology Based Learning Environment and Student Achievement in English as a Foreign Language in Pakistan	The result indicated that teaching through technology based learning environment enhanced the achievement level of the learners
Jaffar (2012)	YouTube: An emerging tool in anatomy education	The result showed that YouTube is an effective tool to reinforce the instruction in a PBL (problem based-learning) classroom.
Delen and Bulut (2011)	The Relationship between Students' Exposure to Technology and their Achievement in Science and Math	The result demonstrated that the learners' exposure to technology raises the level of achievement.
Irvine et al. (2013)	Realigning Higher Education for the 21st-Century Learner through Multi-Access Learning	The majority of learners revealed that there is an effect of multi-access on the quality of teaching.
Wenglinsky (2006)	Technology and Achievement: The Bottom Line	The result showed that the best boost to learner's achievement can be when Computer cultivates the learners' Computer skills.

B. Technology improves the level of learning and enhances autonomous learning

As Table 11 reveals, technology enhances autonomous learning. Additionally, the use of technology has made teaching/learning less teacher-centred (facilitator) and more learner-centred.

Table 11: Some studies about technology enhances autonomous learning

Author (year)	The references' titles	The Key findings
Audain (2014)	The Ultimate Guide to Using ICT Across the Curriculum (For Primary Teachers): Web, widgets, whiteboards and beyond!	In the traditional system the teacher stands in front of the class and transmits knowledge this is called the didactic method. The technological revolution has changed the practical methods as well as the instructive ways of teaching.
Green and Tones (2010)	Health Promotion: Planning and Strategies	The problem with traditional methods is: It considers the learners as unfilled containers that should be filled with knowledge.
Tooms and Boske (2009)	Bridge Leadership: Connecting Educational Leadership and Social Justice to Improve Schools	The same as above.
Idrus and Zainuddin (2016)	ICEL2016-Proceedings of the 11th International Conference on e-Learning: ICEl2016	Learners become active in their learning process. The use of technology has made teaching/learning less teacher-centred (facilitator) and more learner-centred.
Wang (2014b)	Handbook of Research on Education and Technology in a Changing Society	Results showed that the use of Computer is very effective in strengthening learner operational ability and with the aid of image learners can understand the new concepts.
Wentworth et al. (2013)	Integrating Information Technology into the Teacher Education Curriculum: Process and Products of Change	The author claimed that technology has changed the teaching methods and the curricula by adding technology skills to the session and by introducing the learners to programme portfolio concepts.
Meyer (2014)	Student Engagement Online: What Works and Why: ASHE Higher Education Report	There is evidence that learners' engagement in Online coursework has improved learning which is reflected in test scores.

Lou et al. (2013)	A study on a Problem-Based Learning Method Using Facebook at a Vocational School	The authors claim that parents, teachers and learners can browse the learning portfolios Online to assess learning effectiveness.
Jaffar (2012)	YouTube: An emerging tool in anatomy education	YouTube is an effective tool supports self-learning (autonomous learning).
Brosche and Feavel (2011)	Successful Online Learning: Managing the Online Learning Environment Efficiently and Effectively	Online programmes are effective and they provide learners with access to education.
Coppola (2015)	Do Real Work, Not Homework	The author points out that using Online teaching and learning systems help the learners to analyse and to integrate environmental chemistry subject matter into laboratory course.
Pelgrum and Anderson quoted in Schofield (2007)	Realising the Internet Educational Potential.	Teachers rate improving academic achievement seventh out of eight teaching objectives for the use of the Internet
Billings and Halstead (2016)	Teaching in Nursing: A Guide for Faculty	The authors point out that Online learning courses can be effective and can lead to positive outcomes.
Attwel and Hughes (2010)	Pedagogical Approached to Using Technology for Learning	More research is necessary on the effectiveness of the application of technology in education that examines the long-term effects of implantation technology in education.
Corno and Anderman (2015)	Handbook of Educational Psychology	The same as above.
Dillenbourg and Specht (2008)	Times of Convergence. Technologies Across Learning Contexts	The same as above.

The studies reviewed above have indicated that technology has a positive impact on the learner's achievement in education by enhancing cognitive levels and problem-solving skills and autonomous learning. The next sub-section will review the studies that have yielded the conclusions that technology has no impact on the learners' achievement in education.

2.8.2 Technology has no impact on learners' achievement (it has made no difference)

This sub-section is about studies that have concluded that using technology has not improved learning and the learners' achievement. The shared conlusion among these studies is that the presence of technology can be problematic and may lead to declining effects. The current study will contribute to the literature regarding the impact of technology on the learners' achievement in Science by carrying out a written test after the learners have been attended an Online course in Science.

Table 12: Studies about technology has no impact on learners' achievement

Author (year)	The references' titles	The Key findings
Gunter and Gunter (2014)	Teachers Discovering Computers: Integrating Technology in a Changing World	Studies showed that Computers have had a declining influence on teaching and learning in UK Schools.
Jin and Lin (2012)	Advances in Electronic Commerce, Web Application and Communication: Volume 2	The same as above.
Liguo (2014)	Overcoming Challenges in Software Engineering Education: Delivering Non-Technical Knowledge and Skills: Delivering Non-Technical Knowledge and Skills	The same as above.
Moreira et al. (2011)	Media in Education: Results from the 2011 ICEM and SIIE joint Conference	ICT often fails to meet the full potential of many organisations around the world.
Peñalvo and José (2012)	Multiculturalism in Technology-Based Education: Case Studies on ICT-Supported Approaches: Case Studies on ICT-Supported Approaches	The same as above.
Cuban et al. (2001) quoted in Wozney et al. (2006)	Implementing Computer technologies: Teachers' perceptions and practices	Technology integration is problematic and that without fundamental changes to the organisation of Schools, product, cost and reliability and finally technical support only little modifications will appear in Schools and teaching and learning.
Stuart et al.	Key Issues in Teacher Education: A	With increasing investments in ICT in

(2009)	Sourcebook for Teacher Educators in Developing Countries	Schools, ICT project failure is an important concern for Schools.
Haydn (2006)	Multimedia, interactivity and learning: some lessons from the United Kingdom	Disappointing returns and uncertain benefits of the massive investment in ICT in UK Schools'.
OECD (2015)	Computers 'do not improve' pupil results, says OECD	Learners who frequently use Computers at school have achieved worse results. Also, Computers do not improve learners' results and performance. Computers do not improve learners' achievement in Science, Reading, or Mathematics.
Pei-Chen et al. (2008)	What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner	The availability of Internet can have negative side effects on the academic achievement of learners. Also, it is not explainable why many Online learning users refrain from Online learning after their first experience.
Bellur et al. (2015)	Make it our time: In class multitaskers have lower academic performance	The result showed that multitasking (texting, reading, and using social media) during class or homework has a negative influence on the academic performance of learners.
Skarupova et al. (2015)	Excessive Internet Use and its association with negative experiences: Quasi-validation of a short scale in 25 European countries	The result has indicated that the excessive use of the Internet by learners makes parents and teachers predict negative consequences in behaviour, health and scores.
Riley et al. (2014)	Implementation of Blended Learning for the Improvement of Student Learning	With Online learning courses the geographical barriers have been broken down, but there is no a detrimental effect on the level of learning' of learners.
Richard (2012)	Teacher Education Programs and Online Learning Tools: Innovations in Teacher Preparation: Innovations in Teacher Preparation	The learners did not get a true sense of connection with the instructor Online, which made them feel that something was missing. Eventually, this affects the effectiveness of learning.
Wang (2015)	Handbook of Research on Learning Outcomes and Opportunities in the Digital Age	Online learning has added nothing different to instruction and learning.
Ermolayev et al.	Information and Communication	The relationship between Schools or

(2014)	Technologies in Education, Research, and Industrial Applications: 10th International Conference, ICTERI 2014	education and technology as 'antagonism'.
UNESCO (2015)	Education for All 2000-2015: Achievements and challenges: EFA Global Monitoring Report	The results show that: In USA, ICT did not have a positive impact on test scores. In Brazil, Computers' laboratories did not support the learners to acquire Mathematics and Reading skills. In Peru' the programme of one-laptop-per-learner had no impact on test scores in Mathematics and Language.
Haydn (2001)	Subject Discipline Dimensions of ICT and Learning: History, A Case Study	Computers are not 'an unproblematic educational miracle'.
Sharma (2015)	Response of Teachers towards the use of Educational Technology in Schools in India	The implementation of technology in Schools and education in general is still a complex and challenging process.
Hwang et al. quoted in Rovai (2009)	The Internet and Higher Education: Achieving Global Reach	The result showed that learners with collectivistic orientation have achieved and performed less in Online courses with a less sense of community; they are also less involved.
Schofield (2007)	Realising the Internet Educational Potential.	The Internet does not achieve the goal for which the Internet has been implemented in education; therefore, the Internet will not create the change aimed by its proponents.
Martin & Loomis (2013)	Building Teachers: A Constructivist Approach to Introducing Education	The authors point out that merely using the Internet does not make teaching effective. It is teachers who make the use of the Internet effective.
Cuban et al. (2001) quoted in Wozney et al. (2006)	Implementing Computer technologies: Teachers' perceptions and practices	Technology integration is problematic and that without fundamental changes to the organisation of Schools, product, cost and reliability and finally technical support only little modifications will appear in Schools and teaching and learning.
Haydn (2006)	Multimedia, interactivity and	The beneficial outcomes of new technology

	learning: some lessons from the United Kingdom	would vary from one subject to another. For example, for the physics teacher, data logging is an important application but it is of no use or interest to teachers of history or geography.

The sub-section above has reviewed studies that concluded that the integration of technology can be problematic and that using technology does not mean effective learning. The next section is about perspectives and suggestions that the study of attitudes should be integrated with the study of the learners' achievement.

2.9 The correlation between learners' attitude and achievement

This section is about the perspectives and views that call for the integration of the study of attitudes with the study of the learners' achievement. There is a correlation between the learners' attitudes and their achievement in the course they have learned Online. There is a shared conclusion among the reviewed studies that learners with positive attitudes can achieve more satisfactorily in the course they have learned Online.

This section supports the present study in its orientation to integrate the study of the learners' attitudes with the study of the learners' achievement in order to obtain a comprehensive picture about the effectiveness of Online learning in Science in KS3. The scholars and educators are in favour of surveying Online learning effectiveness through the study of the learners' attitudes and their achievement when instructed via Online learning courses. Table 13 below includes some studies about the correlation between learners' attitude and achievement.

Table 13: Studies about the correlation between learners' attitude and achievement

Author (year)	The references' titles	The Key findings
Brown and Green (2015)	The Essentials of Instructional Design: Connecting Fundamental Principles with Process and Practice	Learning effectiveness can be measured, assessed and evaluated by capturing knowledge, skills or attitude.
Miller (2015)	The WOW Factor - 7 Secrets to Great Presentations	The same as above.
(Huang 2008)	The Relationship Between Computer Use and Academic Achievements	Learners with positive attitudes towards Computers and technology have achieved high scores in Mathematics, Science and English.
Chien (2008)	Factors Influencing Computer Anxiety and Its Impact on E-Learning Effectiveness: A Review of Literature	Learners with high level of Computer anxiety gain low level of achievement and vice-versa.
Zhao et al. (2010)	Internet inequality: The relationship between high school students' Internet use in different locations and their Internet self-efficacy	High levels of ISE (Internet Self-efficacy) have a positive impact of the learners' behaviour and academic performance.
Cepni et al. (2006)	The effects of Computer-assisted material on students' cognitive levels, misconceptions and attitudes towards science	The result showed that the Online learning could improve the learners' achievement and their cognitive levels but it did not change learners' attitudes towards Science lessons.
Barkatsas el al. (2009)	Learning secondary mathematics with technology: Exploring the complex interrelationship between learners' attitudes, engagement, gender and achievement	There is correlation between low level of Mathematics achievement and with negative attitudes to learning Mathematics through technology and vice versa.
Lou et al. (2013)	A study on a Problem-Based Learning Method Using Facebook at a Vocational School	The result showed that Facebook platform has a positive impact on the learners' attitudes and achievement and there is a positive correlation between the learners' attitudes and their achievement.
Kareem (2015)	Effects of Computer Assisted Instruction on Students' Academic Achievement and Attitude in Biology In Osun State	The result showed that there is a significant impact of the instruction method (Computer-Assisted Instruction) on learners' achievement in Biology. However, there is no significant impact of attitude on learners'

		achievement in Biology.
Kalelioglu (2015)	A new way of teaching programming skills to K-12 learners: Code.org	The results revealed that the learners' performances (achievement) on the code.org website are much higher than for their normal classroom activities.
Chalak and Nasri (2015)	The Interplay of Locus of Control, Academic Achievement, and Biological Variables among Iranian Online EFL Learners	No relationship between the control construct (control attitude) and achievement for males and females and for all groups of age.
Joo et al. (2012)	A Model for Predicting Learning Flow and Achievement in Corporate e-Learning	The result showed that anxiety and usefulness (anxiety and usefulness are part of the attitudes scale) are significant predictors of achievement.
Ersoy and Akbulut (2014)	Cognitive and affective implications of persuasive technology use on mathematics instruction	The result showed that Wolfram Alpha (Semantic Search Engine) is effective for learning/teaching Maths. And the attitudes of learners towards this technology are positive and self-efficacy attitudes of learner towards the Internet are positive.
Rhema and Miliszewska (2014)	Analysis of Student Attitudes towards E-learning: The Case of Engineering Students in Libya	There is a significant medium positive correlation between learners' attitudes towards ICT and Online learning, and their levels of skills in technology.
Hairston and Nafukho (2015)	A Study of Trainee Attitude and Satisfaction between E-Learning Training versus Traditional Training	There is a link between the learners' attitudes and their achievement when they have learned via technology (E-learning).

The section above has been about views that called for integrating the study of the learners' attitudes with the study of their achievement because studies concluded that there is a correlation between the two. The next section will be about the theoretical framework of the present study.

2.10 The theoretical model of the presents study

This section presents the theoretical framework of the present study and the justification of the choice of the theories and the areas that will be investigated.

The aim of the present study is to survey the learners' attitudes towards the implementation of Online learning in Science, KS3 in two high Schools in Manchester. However, it differs from studies by Ardies (2014); Reed (2014), Ardies et al. (2013), and Sarjou (2012) in that it approaches an attitude as a combination of interconnected components which are affective, cognitive, behavioural intentions and behaviour. These components have been included in the items of a questionnaire in the present study. The rationale for adopting this cognitive approach to studying attitudes is to create a comprehensive insight of an attitude and what makes it what it is. This will require the adoption of the attitude definition as the assembly of affective, cognitive and behavioural components, and tracing how they interact with each other and contribute to the constitution of an attitude. Studies that have adopted the simple way of surveying attitudes did not provide detailed results and complete understanding of what made an attitude.

This study adopts Selwyn's CAS: Computer Attitude Scale which is a 21-item questionnaire that consists of four components of Computer attitudes. 'Affect' component is composed of six items and it measures the individuals' feelings towards Computers and using them. 'Perceived Usefulness' consists of five items that measure the individual's beliefs about how useful Computer and Internet are. 'Perceived Control', is composed of six items that measure how difficult or easy Computers are and the level of comfort or difficulty of using Computers. 'Behavioural Intention', is composed of 5 items that measure Behavioural intentions and what the learners do with the Computers. Anxiety has also been added to the questionnaire through 15 items, self-efficacy 10 items.

The rationale for adopting Selwyn CAS model is that it has been found valid and reliable by a number of studies which have been reviewed in this section, and it provides a strong background for studying attitudes according to cognitive approach which the present study adopts. Self-efficacy and anxiety have been added because they have been concluded to shape attitudes and impact them. In addition to the recruitment of CAS in addressing the learners' attitudes, the present study surveys the elements of self-efficacy and Computer anxiety and how they affect the learners' attitudes. This is because the study aims to draw as much as a comprehensive picture of the KS3 learners' attitudes and what shape them. CAS has been proved to be reliable and the addition of the study of self-efficacy and Computer anxiety will widen knowledge about attitudes.

Additionally, this study addresses the effectiveness of the integration of Online learning with the learner participants' education. A number of studies have searched the effectiveness topic: Cheung and Slavin (2013); Delen and Bulut (2011); Grubišiæ et al. (2009); Heppen et al. (2015); Higgins (2013); Hussain et al. (2010); Lee et al. (2010), Pei-Chen et al. (2008); and Wang (2014b). However, these studies have examined the effectiveness of Online learning in isolation of the learners' attitudes. Effectiveness has been addressed as an independent issue to attitudes. The present study will shed light on effectiveness as acquiring knowledge and attitude. It is worth mentioning that the learners' knowledge and skills will be measured through a written test. Written test is considered as an effective way to test the learner's knowledge (Haladyna and Rodriguez 2013;Lund and Kirk 2010).

Also, the learners' attitudes will be measured through a questionnaire and semi-structured interview. Questionnaires are assumed to be an effective way to measure attitudes (Kalat 2013). The presentation of study framework has two objectives. The first one is to draw the features of the present study and guide the reader to understand its background. The second objective is to concentrate on the present study contribution to the literature.

This section has presented the theoretical framework of the present study and the theories and views that will be used in the presnet study and the justification of their integration in the current study. The next section is a summary of the Literature Review Chapter.

2.11 Summary

This Chapter reviewed studies about attitudes and the effectiveness of Online learning in enhancing the learners' achievement. The attitude studies reviewed can be grouped into two cohorts. The first cohort is that of the studies that surveyed an attitude from a simple way in the sense that an attitude was approached as expressing likes and dislikes. The weaknesses of this approach have been discussed and it was explained why the current study did not adopt this simple way which did not present a detailed and comprehensive picture about attitudes. The second cohort of studies is that one that has approached attitudes based on defining an attitude as the combination of Affective, Cognitive and

Behaviour factors. This Chapter has shed light on the strengths and advantages of these studies which provide an in-depth idea about attitudes.

This Chapter reviews studies about the learners' attitudes towards the implementation of Online learning in the classroom. Chapter 2 has presented the development of the study of the learner's attitudes starting from being only as questionnaires to elicit data about whether the learners like/dislike the Computer or the Online learning in their study (simple attitude, such as favourable or unfavourable, good or bad, and yes or no). By the development of the psychological research of the attitudes and the transformation of the attitude definition (from simple attitude to socio-psychological attitude) as encompassing components such as affective, cognitive and behaviour, researching attitudes has also changed and there has been a tendency to study attitudes as the combination of those components.

Studies have been undertaken to survey attitudes and the two other variables have been added which are self-efficacy and Computer anxiety. The integration of these two variables is driven by the belief that they are significant in the attitudes of the learners and that they shape them. Studies have been conducted on attitudes and attempts have been made to integrate these variables or factors in the study of the learners' attitudes. However, the majority of the studies reviewed in this study have gaps in approaching attitudes in the sense that they focus on self-efficacy and anxiety at the expense of the other three components.

The compound definition of effectiveness as acquiring skills, knowledge and attitude, also supports addressing attitudes in a special way. Attitudes are connected with effectiveness and vice versa, and the study of one requires the study of the other. This is an absent element in th e studies reviewed in this Chapter. Effectiveness and attitudes have been studied seperately.

This Chapter reviewed the learning theories. Also, this Chapter explained the relationship between the learning theories and the learning process. There is a need to find out how knowledge is constructed when the learners learn by Computer or through Online courses. This is important because it can tell the teachers how learners interact with Computers and

Internet, and whether the way they learn with Online learning makes a difference or affects the learners' academic performance, thus, they can develop this way and adopt it in their teaching. Moreover, this will be the base for understanding the effectiveness of Online learning courses, such as BBC Bitesize.

The present study is about surveying the KS3 learners' attitudes towards the application of Online learning in their learning Science. The study uses a questionnaire whose items are not focused on like or dislike of Online learning by the learners. Rather, the questionnaire, which is adopted from Selwyn CAS (Computer Attitude Scale), approaches attitudes as a combination of three components: affective, cognitive and behaviour as well as the two additional variables which are found to affect the learners' attitudes: anxiety and self-efficacy. Moreover, the study will link investigating attitudes towards the Online learning with the achievement and Online learning effectiveness.

Chapter 3

Research Methodology

3.1 Introduction

 In Chapter 2 studies have been reviewed about the development in the definition of an attitude and the refelction of this on approaching attitudes. The Chapter has also surveyed the different learners' attitudes towards the integration of Online learning in their education.

The research methodology in the current study is embodied into two Chapters (3 and 4).

a. The current Chapter (Chapter 3) explains the research philosophy, research approach, and the types of case studies.

b. Research design (Chapter 4) explains how the data collection instruments can be designed, piloting the instruments, and the validity and reliability of the instruments.

This Chapter is about the methods that will be used to conduct the practical part of the study. It will be based on Saunders et al's. (2009) onion in the sense that it will discuss every layer of the onion and relate it to the current study. It is helpful if at first, to recognise the difference the four different idioms (ontology, epistemology, axiology, and methodology).

a. **Ontology** is a terminology that refers to the issues of existence. Ontology studies what kinds of things and entities exist in the universe. It is a branch of metaphysics which searches the essence of things (Gaevic et al. 2009).

b. **Epistemology** that means "knowledge, understanding", and it is concerned with the study of nature and scope of knowledge. It is also called "theory of knowledge" through which the nature of knowledge should be recognised (Cram101 Textbook Reviews 2014).

c. **Axiology** is synonymous with (value, worth, and logos). It is the philosophical study of value. It refers to the collective term for ethics (Sanderson and Pugliese 2012)

d. **Methodology** points to the theory that underlies research and the reasons for the way the research has been designed (Shi 2014). It explains the research questions and why the questions are important. Methodology is differentiated from the term 'method' which refers to procedures or techniques for gathering evidence, methodology has a wider meaning and supports the types of questions that can be tackled and the nature of the evidence gathered (Al Zefeiti and Mohamad 2015).

The types of research (quantitative, qualitative and mixed) will be identified, designing the suitable research instruments for the current study and justifying why these instruments were chosen, and how data is analysed and how will be explained.

The "Research Process Onion" (RPO) as suggested by Saunders et al. (2009) has been advocated by Michalisky (2013) who believes that the onion model guides the researcher to identify the issues that underlie the data collection methods. Every layer of the onion model refers to a step towards research design. In summation, the onion model provides a guide to the researcher in order to achieve research design in an organised way. Due to its structure and the benefits of offering a common framework for the discussion of research process adopted in the current study, to allow the reader to follow a common structure (Michaliski 2013). (Please see below Figure 4 the research onion).
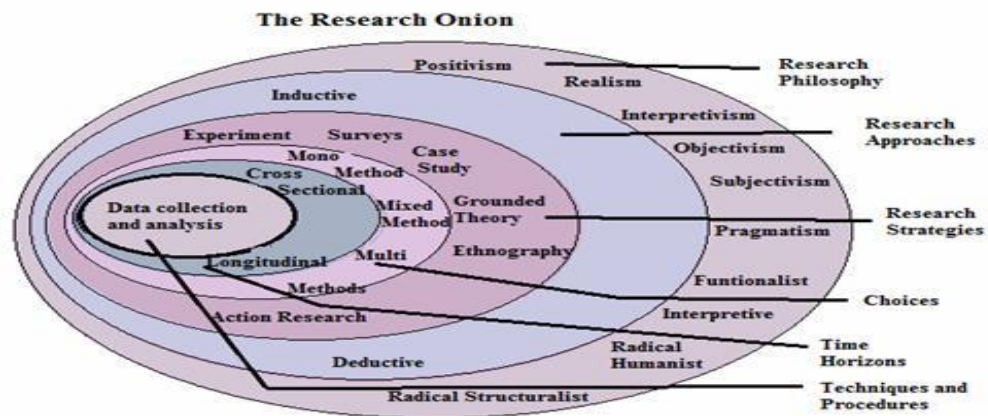
Figure 4:The "Research Process Onion" (RPO) as suggested by Saunders et al. (2009)

3.2 Research Methodology

Research methodology is a term about assumptions that underlie the research and which used by the researcher about the world. These assumptions shape the methods (individula techniques) for data collection and analysis methods, and methodology. The association of techniques used to examine a particular case (Carsrud and Brännback 2014). The factor that plays a role in determining these assumptions i.e. research methodology is the relationship that exists between knowledge and how it is developed in the research. The next section will explain the research philosophy.

3.2.1 Research philosophy

In this section the research philosophy will be clarified. Every research has its own philosophy that underlies its process of data collection and analysis as well as research questions and hypotheses. The two philosophies that will be discussed in this study are Positivism and Interpretivism because the principles of both of them will be adopted in data collection and analysis and in developing the knowledge of the topic under investigation. Positivism, Interpretivism, and Pragmatism that control the method in which the researcher thinks about the research development (Al Zefeiti & Mohamad

2015). For example, the philosophy of the researcher who is seeking facts will be different from that of the researcher who is tracing beliefs and attitudes (Ibid.).

a. Positivism

From a positivist point of view, 'the world is 'objective' and knowledge exists independently of people who apply it, study it, and transfer it (Boughzala and Ermine 2010). Positivists believe that the world consists of events or phenomena which are lawful (Tracy 2012) and orderly and there is a single clear-cut connection between cause and effect (Broeder et al. 2014).

Positivists assume that laws of human behaviour can be discovered by the collection of objective facts about the social world in a statistical form, by the careful analysis of these facts, and by repeated checking of findings in a series of contexts (Muijs 2011;Rubin and Babbie 2010). This philosophy disregards everything from its account except natural phenomena and their connections (Tavakoli 2012).

Positivists use the best quality of observation for studying the real world and they believe that reality is what can be explored by senses (smell, touch, seen, and etc...) (Gray 2014). The inquiry should be based on scientific observation (empirical investigation), so the researcher's values, interpretations, feelings have no place in the positivist's view of scientific inquiry (Ibid.). This is why positivists use the quantitative method to gather their data to ensure maximum objectivity and detachment (Ibid.). There is a need for accurate measurement by positivists so **quantitative** research methods are always used (McNabb 2015). Konidari & Abernot in Moogan (2011, p. 576) point out that '*quantitative data via surveys for exploring behaviour and attitudes can be very informative*' quoted in (Moogan 2011). Advocates of quantitative research use quantitative methods: experiments and surveys (Vogt 2011).

To the positivists, the goal of knowledge is simply to expect and control the natural and human phenomenon. For instance, in education Positivism endeavours to foresee the correlation between the educational objects (learners) and the educational process (teaching) (Kincheloe 2012).

Quantitative research is 'the numerical symbol and strategy of observations for the purpose of explaining the phenomena that those observations reflect (Saini 2010). So quantitative research the emphasis is on numbers (Coolican 2013).

Data do not emerge in quantitative structure but they can be collected in a quantitative way by designing research methods meant for converting phenomena that do not naturally exist in quantitative form which we can analyse statistically (e.g. attitudes & believes) (Muijs 2004;Muijs 2011;Punch 2014). Quantitative research begins with the collection of statistics; based on real data, for example, test, observations or questionnaires' (Ibid.). In the current study the data of the attitudes of learners towards BBC Bitesize were collected via a questionnaire. These attitudes do not exist in quantitative form so a questionnaire was developed to ask the learners to rate a number of statements (e.g. I don't feel frightened about using BBC Bitesize) and the learners choose one of the following (strongly agree=4, agree=3, neither agree nor disagree=2, disagree=1 or strongly disagree=0). Therefore, in this way quantitative data can be obtained about the learners' attitudes towards BBC Bitesize. Overall, quantitative data are used as a synonym for any data collection techniques (such as a questionnaire, graphs, or statistics) that generate or use numerical data (Saunders et al. 2007). Quantitative research involves 'describing reality through numbers' (Tolmie et al. 2011). The role of the researcher in quantitative research is objective (O'Dwyer and Bernauer 2014). In the quantitative research the relationship between concept formation, observation and measurement is central (Sparkes and Smith 2014). The quantitative approach is highly objective, valid, and reliable (Newby 2013).

The measurement process is essential for scientific experiment and without that concepts and statements are meaningless (Coolican 2013). Quantitative research typically is deductive, objective, and general (Morgan 2014).

The weaknesses of the Positivism are: a) Methods have a tendency to be flexible and artificial (Armstrong 2010), b) Not very efficient in understanding processes (Ibid.), c) Not very helpful in generating theories (ibid.), d) Data gathering can be time consuming and may need different resources (Ibid.), e) There is a difficulty in analysing and interpreting the data (Ibid.).

b. Interpretivism

Unlike Positivism which is concerned with studying facts independently from people's beliefs and attitudes, Interpretivism concentrates on how the people's attitudes and beliefs shape reality and add meaning to it (Punch and Oancea 2014). In an Interpretivist research there is a description in details of people experiences and the interpretations of the world they bring with them (Lederman and Abell 2014). This paradigm is based on the view of subjectivity (Cox 2014). Shalin (2015) argues that Interpretivist research enables the researcher to obtain a deep insight of what is taking place and of how knowledge develops in a particular context (Shalin 2015). In an Interpretivist research people build their understanding of the phenomenon under study depending on their experience and context (Lederman and Abell 2014). This is what creates the Interpretivism point of weakness which is that in this paradigm research the researcher cannot make generalisations from the findings of the study because these findings are related to a particular context that can be different from another context and yields different results (Ibid.).

Interpretivist research methods include focus groups, interviews, research diaries, that is, particularly methods that allow for as many variables to be recorded as possible (Nelson et al. 2014).
There is a need for truthful results by Interpretivists so qualitative research methods are usually used.

Qualitative research is a study that focuses on the natural setting of a certain phenomenon or a group or a person (Wimmer and Dominick 2014). The context of the phenomenon or group is essential in qualitative research (Saunders et al. 2009;Wallace and Van Fleet 2012). The common features of the qualitative studies are that the researcher's subjectivity and that researcher is not external observer; rather they move to study the phenomenon from inside (Potter 2013). In addition, qualitative data refers to all no-numeric data or data that has not been quantified and can be a product of all research strategies (Ritchie et al. 2013;Saunders et al. 2007). So, qualitative research focuses on words, meaning, and experience (Coolican 2013).

The methods of data collection used in qualitative research are: interviews, diaries, and observations (Patton 2015). The role of the researcher in qualitative research is subjective (McNabb 2015). According to qualitative researchers, 'reality is socially constructed' (Johnson and Christensen 2004;Sparkes & Smith 2014). Qualitative research can reinforce behavioural studies by analysing individual voices, stories, and points of view (Otis 2015). Qualitative research is about finding out what is inside the interviewees' mind and what they think and why they think. It is about getting interviewees to express themselves and to speak about their opinions. Face-to-face interviews are the best way to get this kind of in-depth feedback and they can provide important insight about something. Qualitative methods are useful to test the learners' reactions and to enlarge their answers so that the researcher can get more insight into their attitudes and behaviour (Bryman and Bell 2011;Denzin 2009;Donut-Resources for your Business 2014). Qualitative research typically is inductive, subjective, and contextual (Morgan 2014). Qualitative research uses inductive thinking which means that the social phenomenon is explored in order to find empirical patterns and start a theory (Boeije 2009).

There are some weaknesses in Interpretive approach such as: a) The subjective nature of the Interpretive approach keeps a probability for bias of researcher (Coan and Allen 2007), b) The data generated cannot be generalized because the data is influenced profoundly by personal opinion and values (Roberts and Watkins 2009). Hence, the reliability of data is damaged to some degree.

c. **Pragmatism**

Pragmatism was created at the end of the nineteenth century and the beginning of the twentieth century in the USA by philosophers: Charles Pierce, William James and John Dewey (Schultz 2010).

Pragmatism is about lived experience, and is part of the history of social science (Phillips 2014). Pragmatism argues that research questions are the most important determinant of the epistemology, ontology and axiology adopted in a study (Yan Li 2016). Additionally, Pragmatism concentrates on the research questions under inquiry (Morgan 2014). Moreover, Pragmatism focuses on the practical consequences of experimental action

(Gava and Stern 2016). This suggests that the research questions are the most important factors in determining research philosophy.

For the pragmatists, working with different types of knowledge and methods is possible in one study (DePoy and Gitlin 2015). Hence, a mixed method research has been used for exploratory fieldwork studies and surveys, evaluation research, and instrument development (Rumsey and Harcourt 2012). Thus, it can be argued that mixed methods, both qualitative and quantitative, are possible, and highly appropriate, within one study (Bellotti 2015). So, Pragmatism is a paradigm that supports the use of mixed methods in research (Baran and Jones 2016). Technically, a mixed-method research can be defined as the combination of both purposeful and probability sampling and open-ended and closed-ended data collection techniques (Johnson et al. 2007). In a mixed-method research, narrative and multivariable analyses can be found in which different techniques can be used together (Punch 2014).

Furthermore, Pragmatic method is related to the practical impacts of the objects of your conception. Hence, your conception of those effects is the conception of the object in its entirety (Harman 2013). Additionally, Pragmatists consider thought to be a product of interaction between organism and environment. Thus, the purpose of thinking is an instrument for forecast, problem solving and performance (Jarosek 2016). Subsequently, Pragmatism focuses on the practical consequences of research (Holloway and Galvin 2017).

Pragmatism is concerned more with the relationships among things and phenomena (Reis and CharlJudd 2014). Therefore, the **pragmatist** view will be suitable for the current study to explore the relationship between learners' attitudes towards BBC Bitesize and their achievement.

Pragmatism combines between two philosophical approaches qualitative and quantitative (Collins 2010). Therefore, the current research is mixed research methods adopts a Pragmatism philosophy which comprehends qualitative and quantitative approaches together.

The main aim of the present study is to understand the effectiveness of BBC Bitesize (Online learning courses) through the learners' attitudes and achievement. The attitude construct was approached and addressed by using the study model which was based on the Positivism principles in the empirical study. Additionally, the same construct has been based on the Interpretivism rules for getting a full picture about the study of attitudes. Moreover, the implication of the prescriptive of Positivism philosophy was used for the construct of achievement.

The quantitative research methods can be used for gaining a considerable number of observations and for measuring the relationship between two constructs or more (Siah-Hwee 2014). Furthermore, the level of significance of relationship is quantified (Ibid.). It is oblivious that measuring the degree of relationship between the two constructs (attitude and achievement) is essential in the current study. Therefore, the applications of the quantitative research are important for the present study.

The reason for using qualitative study is to explore an in-depth understanding of the study concern and issue as experienced by the participants of the research (Aveyard and Sharp 2013). The findings of the qualitative research can be explained in interpretive ways and descriptive themes (Ibid.). As it is in the present study, the main reason for using qualitative research is obtaining an in-depth insight about the participants' responses regarding their experience in using technologies, such as Computers and Internet in their learning. Likewise, exploring, describing, and interpreting the attitude of learners towards technology showed that this attitude was either negative or positive. Subsequently, the current study will explain in-depth the participants' prescriptive about the attitudes towards BBC Bitesize and technology.

Moreover, for achieving the aim and objectives of the present study, organised steps were followed. In the onset, the appropriate literature has been chosen and analysed for describing the main themes of the current study, then the research instruments were designed before conducting the practical stage. Next, the data collected were analysed for obtaining the findings. In the end, the results of the current study were discussed.

Please find below in Table 14. the three types of philosophies (Positivism, Interpretivism, and Pragmatism). Additionally, please find below in Table 15 the differences between (Qualitative and Quantitative).

Table 14: The three types of philosophies (Positivism and Interpretivism) adopted from (Buckler and Walliman 2016) and the Pragmatism adopted from (Ahmed et al. 2016)

The philosophy	Ontology- nature of reality	Epistemology- how reality is known	Axiology-role of value	Methodology- enquiry approach	Specific design
Positivism	Objective	Explore	Detached	Quantitative data collection approaches	Surveys Experiments
Interpretivism	Subjective	Explain	Involved	Qualitative data collection approaches	Case studies grounded theory Phenomenology Ethnography
Pragmatism	Reality is what is useful, What is practical, and what works	Reality is known through deduction, induction, and abduction; through the use of many research tools, reality is inferred from evidence	Values are derived from the way that knowledge indicates the perceptions of the researchers and participants	The collection of data and analysis in the research process includes both qualitative and quantitative approaches	-

Table 15: The differences between Qualitative and Quantitative adopted from (Davis and Buchanan 2016)

	Purpose	Perspective	Research process	Data format	Data analysis	Findings	Research questions
Qualitative	To explore; To describe; To explain why variables are related; To develop a theory	Believes the subjective experience of the insider provides the most meaningful data	Personal perspectives; Unknown variables; Fixable guidelines	Textual; Images; Informal; Reality changes; Small sample	Themes; Categories; Subjective; Inductive reasoning; Allows all normally occurring; Variables to influence results	Words; Narratives; Personal	Research questions; Probe questions
Quantitative	To predict; To confirm; To explain how variables are related; To validate;	Objectively tries to understand the facts from outside perspective	Focused; Known variables; Pre-planned methods	Numerical; Standardised instruments; Facts do not change; Large sample	Statistics; Objective; Deductive reasoning; Attempts to control extraneous; Variables	Numbers; Formal	Research questions; Null hypotheses

3.2.2 Research approaches

In the light of studying the Positivism and Interpretivism for educational research the main differences between the two philosophies can be identified so the suitable philosophy can be determined for the current study. Research approaches are about whether the researcher uses the deductive or inductive approach in their research (Ekinci 2015).

In the research where the validity of assumptions or (theories/hypotheses) is tested, deductive approach is used, whereas in the research where new theories and generalizations emerge, inductive approach is appropriate. Discussion of research approach is a vital part of any scientific study regardless of the research area. The theories and hypotheses existence and the placement determine the research approach. When the researcher uses a set of hypotheses and theories to test, the research approach in this case will be deductive. However, when the researcher starts research without hypotheses and theories which will emerge at the end of data collection and analysis, the research approach in this case is inductive (Collins 2010).

a. Deductive Approach

Starts and applies with a well-known theory. It is about applying a tested theory rather than contributing to a new theory (Wilson 2014). The deductive approach is when the researcher develops a theory and hypothesis and designs a research strategy to test the hypothesis (Murugan 2013).

In the research where the deductive approach is used hypotheses are tested and then the principles are either confirmed, modified or refuted (Gray 2014). A deductive approach means the development of a theory or a hypothesis and testing this theory via an appropriate research strategy (Morris 2011). It is associated with Positivist philosophy. Quantitative approaches assume 'interval or ordinal data which is amenable to statistical manipulation' (Allan and Skinner 1991;Zhu 2014). The stages of deductive research (Collins 2010):

a. Producing a testable proposition with details on the relationship between variables.
b. Referring to how the variables can be measured
c. Testing the proposition
d. Surveying the outcome of the research either confirming the theory or indicating how the proposition needs to be modified

Riazi (2016) argues that deductive approach is associated with quantitative research methods and based on a top-bottom approach where the researcher starts with a theory and then collects data trying to test hypotheses related to that theory (Riazi 2016). The researcher moves from the general to the specific (Ibid.). In the deductive approach to research there is a tendency to explain the relationships between variables and generalise the patterns, which is the case in the current study (the relationship between the attitude of KS3 learners towards BBC Bitesize and their achievement through using BBC Bitesize for studying Science). There is a tendency to quantify the data collection and analysis using objective and non-personal standpoint.

b. Inductive Approach

Inductive approach is described as a theory-building process where the researcher starts with observation of specific instances and then establishes generalisations about the topic under study (Wilson 2014). Through this observation the researcher seeks to contribute to a new theory (Ibid.). In Inductive approach, the researcher starts with data collection, then data analysis then constructs generalisations and theories (Gray 2014). On the other hand, the inductive approach is when the researcher develops theory after collecting and analysing the data (Murugan 2013).

Pre-existing theories are not considered in an inductive approach (Ibid.). Inductive approach to research entails the generation of theories and tends to qualify in data collection and analysis (Morris 2011). The inductive approach is associated with Constructivist paradigm. The strength of inductive approach lies in the fact that it is concerned with the context where the events appear (Collins 2010). According to Bryman (2015), inductive approach is associated with qualitative research methods (Bryman 2015). It is based on a bottom-up approach where the researcher starts with an observation and data collection to make inferences by generating hypotheses or theoretical principles (Hissong et al. 2015). It is expected that this research approach delivers an in-depth overview about (what KS3 learners think and feel about using BBC Bitesize? and what motivate them to use it, and how BBC Bitesize influences KS3 learners?. Newby (2014, P 107) distinguishes between deductive and inductive research approaches as demonstrated in Table 16 below.

Table 16: A comparison between inductive approach and deductive approach (Newby 2014)

Inductive (theory building)	Observation	Analysis and Assessment	Conjecture Hypothesis	Generalisation or Theory
Deductive (theory testing)	Idea or Theory	Hypothesis	Evidence	Conclusion

3.3 Research strategy: Case study

Research strategy was defined by Singh (2010, p 188) in the following style *'a generalised plan for a problem which includes structure, desired solution in terms objectives of research and an outline of planned devices necessary to implement the strategy'* (Singh 2010). Bhattacherjee & Fitzgerald (2012, p. 73) define the research strategy as follows: *'strategy refers to the essential nature of the data and the process by which it is found and analysed'* (Bhattacherjee and Fitzgerald 2012).

The case study method is used by the researcher who is interested to gain a rich understanding of the context of the research and the processes being enacted (Saunders et al. 2007). Case study can be defined as an empirical inquiry that investigates 'a contemporary phenomenon within its real life context especially when the boundary between phenomenon and context are not clearly evident'(Duff 2012). The case study approaches assumes that the case under investigation is typical of cases of a certain type so, through intensive analysis, generalisations may be made that will include all other cases of the same type (Kumar 2014). Moreover, a case study is a "systematic inquiry" into an event or a set of related events which aims to form a description or explanation of the phenomenon of interest" (Zucker 2009). The key features of a "case study" are its scientific testimonial and its evidence base for professional applications (Ibid.).

Case study is a strategy for doing research which involves an empirical investigation of a particular phenomenon within its real life context by using multiple sources of evidence (Saunders et al. 2007). Kumar defines case study as 'a method of studying social phenomena through the analysis of an individual case' (Kumar 2014). The case study strategy is a special interest for gaining a rich understanding of the context of the research and the processes being enacted and to generate answers to the question 'why', 'what' and 'how' (Saunders et al. 2009). Multiple sources of data should be used if a case study strategy was used and this is called triangulation (Kelemen 2013). Triangulation involves adopting more than one data collection technique in one study to look at the phenomenon from different angles to reinforce the findings (Ibid.). For example, qualitative data collected using semi-structured group interviews may be a valuable way of triangulating quantitative data collected by other means such as a questionnaire (Saunders et al. 2007). Research case studies may be conducted alone in or in combination with other research methods (Yin 2012).

There are six principal advantages of adopting case study as a research technique: a) strong in reality: this is because the researcher collects the data from the informants' experiences and practices directly (Blaxter et al. 2010); b) case studies can present a data source. This source can be used for further research work (Ibid.); c) good case studies are based on the complexity of social life and they can support alternative interpretations (Ibid.); d) the results obtained from a case study can be generalised to a more general issue

97

(whole class or group of people) (Ibid.); e) case studies maybe parts of larger action research projects and built on real practices and experiences and they can be correlated to action and their understanding helps in changing practice (Ibid.); f) case studies contain the data which are close to people experience so they are convincing and attainable (Ibid.). A case study is small in size compared with other types of survey research. A case study is a focused, intensive and in-depth analysis. Conducting a broad analysis can be at the expense of detailed in-depth description. In other words, conducting a broader analysis in the case study will have a negative impact on the effectiveness of a case study (Wynsberghe and Khan 2007).

3.3.1 The types of case studies

Case studies can have three types: descriptive, explorative, and explanatory case study. By descriptive case study it is meant that the case study is based merely on describing the case (Kyburz-Graber 2007). There are no measures taken to go deeper and analyse the cause and effect in this case. Descriptive case studies are focused, and the questions about the phenomenon are scrutinised. This type of case studies is supportive to specify the boundaries of the case being studies. This type of case studies has the potential of mining of abstract interpretation and developing of theory (Mills et al. 2010). In the case of descriptive case study the research is concerned with providing a detailed focused description of the phenomenon in its natural setting. Here the case is not explored but only described with the aim that this description will aid in creating an insight of the phenomenon under investigation. By contrast, in the explanatory case studies the researcher is concerned with generating explanations of the occurrences being studied. There is description in the explanatory case studies but supported with explanations (Willig 2013).

Explanatory case study goes beyond description and tries to provide a further understanding of the case and what causes it. This is all done against the background of the context of the case study. In the explanatory-casual case a more detailed study is aimed at and the researcher attempts to answer questions such as why on a theoretical basis. This type of case studies demands a more sophisticated research approach (Kyburz-Graber 2007). In the explanatory case study the researcher frames the research problem so that the investigation can follow (McNabb 2015).

The case study method can be determined by the kind of research questions that a study is trying to address (Yin 2012). If research questions begin with "who", "where" and ("how many" or "how much") that means they are usually describing incidence, or predicting specific results of social phenomenon (Shi 2014). Case studies are relevant to research nature eventually if a research is descriptive then the research question will be "what is happening or has happened" (Yin 2012). An explanatory case study questions such as "how or why did something happen" (Green et al. 2012). An explanatory case study requires to be well designed for concluding causative relationship (e.g. the effect of new educational program on improving learners' performance) (Ibid.).

Research questions are asking "what" normally leads to an exploratory case study, or histories and experiments as the preferred research methods (Shi 2014). Because such questions deal with operational links needing to be traced over time, rather than mere frequencies or incidence (Shi 2014;Yin 2012). Exploratory case study is aimed to explore the **situations** in which the intervention **evaluated** has **no obvious** single set of outcomes (Abramowicz 2013;Nkwake 2015). In this type of case study, collecting the data and the field work in general are conducted before identifying the ultimate research questions and definite methodological measures (Yin 2012).

3.4 Summary

This Chapter has discussed the research philosophy (Positivism and Interpretivism), research approach (Inductive and Deductive**),** and research strategy adopted in this study. As far as research philosophy is concerned the current study is a mixed of a positivist study and interprterevist study. The study recruites both quantitative approach and qualitative approach. Additionally, the usefulness of using research approaches (qualitative and quantitative) has been clarified.

The study also adopts the case study as a strategy. The strategy is a generic plan for the resrach problem. The plan includes the preferred conclusion and the tools in the light of the objectives of research. The next Chapter (Research Design) will discuss the present research methods and how the research will be designed. The Chpater will also include

justification of why the methods are used and how they can answer the research questions and achieve the research objectives. There will be a more detailed explanation of the questionnaire, semi-structured interviews and written tests, because they will be used in the current study.

Chapter 4

Research design

4.1 Introduction

The previouse Chapter has been about research methodology that will be used to carry out the emperical part of the study. The research philosophy has been explained and justified. Also, the research approaches and research strategies especially case studies have been illustrated.

The goal of this Chapter determines to a large extent its methods of data collection as well as the research design. The current research is both positivist and interpretivist that uses both quantitative and qualitative. Quantitative research is 'the numerical representation and manipulation of observations for the purpose of describing and explaining the phenomena that those observations reflect' (Saunders et al. 2007). In the qualitative research the focus is on experience, circumstances and meaning (Hesse-Biber 2016). And the data can be represented by words (Ibid.).

The current research is quantitative and qualitative in terms of:

a. This study aims to measure quantitatively KS3 learners' attitudes towards BBC Bitesize through a questionnaire, and the same construct will be explored in-depth qualitatively via semi-structured interviews. Moreover, the achievement of KS3 learners via learning through BBC Bitesize (Online method) will be measured via a summative test. The correlation between the attitudes and achievement will be studied.

b. The researcher role: The researcher role should be objective for quantitative data (Curtis and Drennan 2013). What will be taken into account are the statistical facts. The role of the researcher will be subjective for qualitative data (Takhar-Lail and Ghorbani 2014). After all, choosing the research methods, data collection methods

and research sample rely largely on the researcher as an individual and as a professional (Saunders et al. 2007).

c. Construct as a terminology stands for what is to be measured. A construct is a labelled phenomenon (Wong 2013). In the current study the construct is the components of the subjects' attitudes towards learning via BBC Bitesize (this construct is measured via a questionnaire and semi-structured interview) and the skills and knowledge (achievement) gained via learning through BBC Bitesize (this construct is measured via a written test).

4.2 Why mixed research approach used

The current study is a combination of two research methods (qualitative and quantitative methods). Some researchers support the mixed studies (Bryman & Bell 2011). In a response to the researchers who oppose the mixed studies, they point out that epistemology is just a tendency of research and thus a combination of research methods seems not to be impossible (Ibid.). Some researchers support mixed approach and they find that this approach is popular marketing (Bryman 1988;Bryman et al. 2009;Bryman & Bell 2011;Buchanan and Bryman 2009). While the social survey is the current dominant, paradigmatic form, there is no uniform 'quantitative research'. Similarly, there is no uniform 'qualitative research' either. In other words, there is a tendency to mix the two methods in a way which makes talking about qualitative and quantitative methods as two complements a welcome trend (Alasuutari et al. 2008). Meehan (2014) has conducted a study on social housing where she has used only quantitative methods. She considers that the limitation of the study is that the quantitative approach adopted for the study does not allow further interrogation and explanation of respondents' answers, and thus there is a potential for different interpretations of concepts by respondents. Further research is needed where qualitative research methods are used with quantitative methods in order to provide an in-depth insight into the participants' responses (Meehan 2014).

The accuracy of findings can be improved and a more complete picture can be gained by combining both methods (Denscompe 2007). It has been recommended that a mixed research method as this is the only way to avoid the weakness of both methods (Denzin

2009). Moreover, multiple methods are useful for providing better opportunities for answering the research questions and allowing the researcher to better the extent to which research findings can be trusted and inferences made for them (Saunders et al. 2007). In addition, using mixed methods enables triangulation to take place (Turner-Cobb 2014).

Triangulation is the term that describes the use of more than one research method. It is about blending qualitative and quantitative approaches through the use of combined methods (Gerrish and Lathlean 2015). There are four types of triangulation in qualitative research: researcher, data, method and theory(Hair 2015). Researcher triangulation points to the involvement of a multiple researchers in the research, usually from different research backgrounds. Data triangulation requires collecting data from different resources. Method triangulation involves using different methods in conducting the research and comparing the findings including findings from both qualitative and quantitative approaches. Theory triangulation is using a multiple of perspectives and theories to interpret the data (Ibid.).

Additionally, the use of qualitative and quantitative techniques facilitates the collection of a huge amount of different data (Soderman and Dolles 2013). Using multiple data sources enables for triangulation which helps the explanation of the data and increasing the validity and reliability of the study results (Ibid.). For example, both qualitative and qualitative approaches and different data collection instruments can be used (surveys, interviews, documentation reviews, and artefact collection). Any researcher should aim to "triangulate" their research instruments or techniques so they provide different views of the case. This avoids the problem of observer bias (Yin 2012). For example, in the current research a semi-structured interview, a questionnaire and a summative test were used. All research methods and procedures will have different effects; it makes sense to use different methods to cancel out the 'method effect' (Saunders et al. 2009). That will lead to a greater confidence being placed in research (Ibid.).

4.3 The sample of research

The first three years of secondary School education in the UK are called Key Stage 3 and the learners are aged 11 to 14 (BBC 2015). The total numbers of the study participants were 121.

The reason for choosing the KS3 learners of School for this research was that they had a good experience in technology in general and especially Computer & Internet because teenagers usually use technology equipment for games, and they have studied ICT since nursery. The chosen topic was part of the year of KS3 of the British National Curriculum. KS3 Science which is a very important part of BBC Bitesize and this web site covers the British Curriculum (BBC Bitesize site 2015). The context of the study belong to two secondary Schools in Manchester, the School names, types, locations (address) and numbers of participants have been detailed in Table 2.

The sample of population consisted of 121 KS3 learners of both Schools (57 learners from Manchester Academy & 64 learners from Al-Noor) and they were questioned via a questionnaire for exploring the learners' attitudes and they were tested by a written test for exploring the learners' achievement. 11 learners from both Schools were interviewed (about their attitudes towards BBC Bitesize) by using multi-option questions and they were asked to justify their options. In the current research 121 learners approved to be involved in both Schools. The learner group age was 13-14 years old. Parents signed the consent which showed their approval. This issue was explained in detailes in the next section (The Research Ethics). The participants have been chosen by the School management according to the parents' consent.

When there is a gap in the sample of the quantitative approach in a research study such as the sample of the study is small, using triangulation can be supportive. By using triangulation, the researcher uses both qualitative and quantitative approaches. The sample of quantitative is expected to be large, but if it is smaller than expected, the qualitative data from the small group will fill the gaps of information about the quantitative sample (Clark and Ivankova 2015).

Additionally, using mixed methods enables triangulation to take place (Turner-Cobb 2014, Saunders et al. 2007). Therefore, using (3 research instruments) as it is in the current study will form a good chance to support the available number of participants in this research. Manchester Academy is an academy that benefits from the support of many businesses and organisations in the local and wider community (Manchester Academy website). Al-Noor School is a supplementary School and also funded by learners fees, business, organisations and individual donations .

a. The learners in Manchester Academy belong originally to many racial and language backgrounds (British, Asian, African and Europe) but most learners in Al-Noor belong to Arabic background.

b. Both Schools learners are taught the National Curriculum in the UK but the learners in Manchester Academy attend School from Monday to Friday while Al-Noor School learners attend School on the weekends only for learning Arabic language but they attend from Monday to Friday in different British Schools in Manchester. The managements in both Schools welcomed the researcher and they offered all kinds of help and co-operation.

c. Data was collected in 2012 and the time spent in both Schools was the same.

4.4 The research ethics

The research cannot be conducted without taking into account the research ethics. Ethics prevent abuse of the human rights of the participants. Three approaches of ethics are to be considered.

The first one is the **deontological** approach that takes the position that ethical issues 'must be judged on the basis of some universal code' (British Sociological Association 2002;Johnson and Christensen 2013). This includes rejecting the use of deception to obtain data from the informants by lying to them.

The second approach used when considering ethical issues in research is ethical **scepticism** which takes the position that 'ethical rules are arbitrary and relative to one's culture and time' (Tijhuis and Fellows 2012). Ethical values, according to this approach are derived from inside the researcher and their conscience and it is the researcher who decides what is right and what is wrong.

The third approach to ethical issues in research is that of **utilitarianism**. This position maintains that the ethical value of research depends to a large extent on the outcomes of this research. If the benefits of research are sufficiently large relative to the costs, then it is said that the study is ethically acceptable (Johnson & Christensen 2013).

There are a number of ethical issues which are essential to any researcher. There are three areas of ethical concern for researcher: the relationship between society and Science, professional issues, and the treatment of research participants (Johnson & Christensen 2013). By the relationship between society and Science in the ethical issues it is meant that research and education in general are affected by the social context surrounding them. When a society decides that certain topics are to be prioritised, researchers will commit to these topics because research funders will decide to spend money on these issues rather than on topics which are considered peripheral (Saunders et al. 2007; Social Research Association 2002).

By professional issues it is basically meant the increasing problem of research misconduct. A study misconduct was defined as (Fabrication, Falsification, or Plagiarism) (FFP) in suggesting, implementing, or revising research, or reporting research findings (Johnson and Christensen 2010). The combination of personal and non-personal seems to contribute to scientific misconduct. Personal factors concentrate on the individual's psychological makeup (e.g. personality, and value direction) (Ibid.). Non-personal factors focus on things such as the competition for research funding and the stress for publication. Personal and non-personal factors add people inclination to share fraudulent activity, there is no excuse for adopting such behaviour (Ibid.). The third area of ethical concern is the treatment of research participants. A researcher must take into account that dealing with human beings extremely necessitates that their human rights and their physical and psychological wellbeing are a red line that cannot be crossed (Johnson & Christensen 2013). Participants must be protected against any physical, psychological or sexual abuse. This can be done by giving informed consent to the participants before the study.

Moreover, before starting the study, the researcher must give the participants a description of the study and the features that may influence their willingness to participate in the study. In the case where the participants are too young, parents are given the informed consent after they have been aware of the features of the study which might affect the young participants or the minors. After the informed consent has been obtained from the minors' parents, assent must also be obtained from the minor. To be able to give an assent, the child must be able to understand what is being asked and realise the features and the description of the study (British Sociological Association 2002;Johnson & Christensen 2013;Social Research Association 2002). Two types of consent are to be distinguished: active and passive consents. Active consent is when the consent is obtained from the participants before actual participating in the study. Or in the case of the participants are young learners, parents are required to give the consent (Graham et al. 2014). Passive consent, on the other hand, is when the participants' parents do not return the consent; they do return it only when they do not want their children to participate in the study but the researchers may practise their obligation to attain the consent of parents (Bastien and Holmarsdottir 2015). There are cases when telling the participants the real purpose of research can alter and influence the outcome of the results (Trull and Prinstein 2013). For example, in eliciting data about the attitudes towards BBC Bitesize in the present study,

telling the participants about the goal of the study will enhance their consciousness of Internet and data will not be spontaneous.

Anonymity is a keyword in research ethics which means that the identity of research participants is not known to the researcher by changing their names and giving every participant a pseudonym (Curtis et al. 2014). In the current study each participant was given a number instead of his/her name. **Confidentiality** is another keyword in research which means that the research participants' identity may be known to the researcher and research staff but it is not known to any other people (Ibid.). Both anonymity and confidentiality are important to protect the research participants from harm or abuse especially in the case of learners.

In the current study the rules and regulations of ethics have been taken into the researcher's account. The information was used only by the researcher and was uploaded to a Computer for analysis without names. The collected data will be destroyed on the completion of this research. The anonymity and confidentiality and privacy of all participants in the research process were respected. In fact, no personal information concerning research participants was collected at all and numbers instead of the learners' names were used to protect the privacy and confidentiality of participants. The Schools have received the approval of parents or guardians of learners to get them involved in the study. It is worth mentioning that the Schools have asked the researcher for CRB (Criminal Record Bureau) (please see Appendix 3) and ethical approval from the University before conducting the study (please see Appendix 1).

4.5 Data gathering methods

The current study focuses on examining group phenomena which are studied through a case study in two contexts (Schools). According to Yin '*case study is an empirical study that investigates a contemporary phenomenon within its real-life context; when the boundaries between the phenomenon and context are not clearly evident; and in which multiple sources of evidence are used*' quoted in (Damon et al. 2011).

They represent a method of learning about a complex instance through description and contextual analysis'. 'The utility of a case study is that it encourages educators to consider additional steps in a caring educational Curriculum that emphasizes communication and relationships between human beings' (Garner et al. 2009;Scott 2005). This research is an explanatory case study that identifies the attitudes of KS3 learners towards BBC Bitesize and their achievement and the association between the attitudes and achievement. This present study has used three research instruments (semi-structured interviews, questionnaire and written tests) and they will be explained in more details in this Chapter.

4.5.1 Questionnaire design for measuring KS3 learners' attitudes

The questionnaire used in the current study (please see Appendix 9) borrows its aspects from the following questionnaire designs:

a. **Selwyn** (1997) has used his own questionnaire to measure the attitudes of learners towards Computer and in the current study **Selwyn** questionnaire was used after simplifying and piloting the questions to be appropriate to KS3 learners' age. Larbi-Apau & Moseley (2012) have found that **Selwyn** questionnaire is valid and reliable.

b. **Cohen & Waugh** (1989) have used their own questionnaire to measure the attitudes based on anxiety components and they have found that the instrument is valid and reliable (Cohen and Waugh 1989). In the current study this questionnaire was used to measure the attitudes after amending the questions and piloting them to be suitable for KS3 Learners.

c. **Schwarzer & Jerusalem** (1995) have used their own questionnaire to measure the attitude based on self–efficacy and they have concluded that the instrument is valid and reliable (Schwarzer and Jerusalem 1995). In the current study this questionnaire was used to measure the attitudes after amending the questions and piloting them to be suitable for KS3 Learners.

The term questionnaire refers to a form or a document that contains a set of questions that may differ in degree of complexity or depth of inquiry, the answers to which are to be provided personally by respondents (Pahuja 2015). A questionnaire is a systematic data collection method for a purpose (Grover et al. 2010). A questionnaire can be either

administered by the interviewer or given to the respondents to complete and return (Babbie 2016). A questionnaire can be administered by an interviewer either face to face or over the telephone (Babbie 2012). Computer-Administered Questionnaires are another example of a Self-Completion Method (Hersen and Turner 2013). This requires that all participants have an access to the Computer (Vaus 2013). A questionnaire is also defined in a more elaborated way as: 'A questionnaire is a self-report data-collection instrument used to obtain information about the thoughts, feelings, attitudes, beliefs, values, perceptions, personality, and Behavioural intentions of research participants'(Johnson & Christensen 2013) A questionnaire should always correspond to the research objectives to achieve the most complete and truthful information (Rossi et al. 2013).). In general, the characteristics of good questionnaire can be outlined as follows:

a. Clear explanation in first page of questionnaire about why the questionnaire should be completed by the respondents (the aim of the questionnaire) because this helps in getting a high response rate (Saunders et al. 2007). The current study questionnaire started with defining the purpose of the questionnaire.

b. A good questionnaire is the one that takes into account the characteristics of respondents, the nature of the volume of the data to be collected, the format of data-gathering, and plans for analyses (Denscompe 2007). The researcher also should take into account the different educational levels of the participants, their cultural differences, and different abilities to understand (Johnson & Christensen 2004; Saunders et al. 2007). The current study questionnaire takes into account the participants' age and level of the study.

c. The questionnaire questions have to elicit the information the researcher requires for their topic and they should also be appropriate to the form of administration the researcher is going to use (Denscompe 2007). The current study examines the factors that contribute to the learners' attitudes towards BBC Bitesize in their learning.

d. Wording should be simple and unambiguous and the questions should not lead to a particular response. There are two main kinds of questions: open-ended and

pre-coded (Krosnick and Presser 2010). The questions that indicate different meanings to different learners can subsequently lead to ambiguity, imprecision and supposition should be avoided (Bell 2010). Therefore, the researcher should use a language understandable by all participants. The questionnaire items should be understandable, clear, precise, and relatively short (Johnson & Christensen 2013). The current study questionnaire was worded clearly easy to be read and understood, simple and unambiguous and each question has a single meaning.

e. Understanding the questionnaire participants is a key to a successful questionnaire (Johnson & Christensen 2013). This can be done by the researcher's being empathetic and being able to 'think like' the research participants (Ibid.), therefore, the questions of the questionnaire should not rely too heavily on learners' memories which may be unreliable for example "what level of basic skills did you achieve at School ? (Armitag et al. 2012).

f. Double-barreled questions that contain two meanings and concepts should be avoided (Abdelhak and Hanken 2016). This question combines two or more issues, attitudes, or objects in a single item. For example "Do not agree that the School management has poor caring in technology?" (Ibid.).

g. Testing is 'the process of measuring variables by means of devices and procedures designed to obtain a sample of behaviour' (Johnson & Christensen 2013). When conducting a test, the researcher must always consider the issues of reliability and validity (Ibid.). A good quality questionnaire should be valid and reliable (Ross 2012). Construct validity is the most important element in validation work. Construct validity comprehends five sources of evidence such as evidence based on test content, evidence based on response processes, evidence based on internal structure, evidence based on relations to other variables, and evidence based on consequences (Zumbo and Chan 2014). In the current study, the items of the questionnaire and the content of the test are designed to elicit data that answer the

research questions and fulfil the research objectives. Also, if a test, scale, or research instrument is reliable and the same instrument was used again under the same condition the same result will be obtained (Kumar 2010).

h. The role of attitude scales has been identified as follows: 'attitude scales have to be developed which use the most suitable evaluative terms, allow for gradations in responses, and minimize bias by covering the same range of positive and negative evaluations' (Graham and Skinner 2006). A rating scale is 'a continuum of response choices that participants are told to use in indicating their responses. Rating scales produce numerical (quantitative) data rather than qualitative data' (Krosnick & Presser 2010). A numerical rating scale consists of a set of numbers and "anchored" endpoints. An anchored point on a rating scale means that the researcher labels the point with a written descriptor as shown in Table 17:

Table 17: A numerical rating scale

1 Very Low	2	3	4	5	6	7 Very High

The first endpoint (1) is anchored with the words (Very Low) and the endpoint (7) is anchored with the words (Very High). This is a seven-point rating scale because there is a total of seven points on the scale (Ibid.). A similar type of rating scale is called a fully anchored rating scale which has all the points anchored with descriptors. An example of fully anchored rating scale is shown in Table 18:

Table 18: A fully anchored rating scale

BBC Bitesize help me understand my School lessons better	4 Strongly Agree	3 Agree	2 Neutral	1 Disagree	0 Strongly Disagree

The scale is a five-point rating scale because there are five points on the scale. Ranking refers to the ordering of responses in ascending or descending order. The role of the ranking has ben identified: 'a ranking indicates the importance or priority assigned by a participant to an attitudinal object' (Johnson & Christensen 2013). For instance, in the

questionnaire the participants will mention their opinion about the role of Computers and BBC Bitesize in understanding the School lessons (please see Table 18 above).

4.5.2 Content of questionnaire

The two main parts which embody the questions in the questionnaire are as follows:

The first part deals with the demographic information about participants, age, year of study but they were not considered as variables in the study, and the participants' names were not required. There is no question about the participant's name or gender (every participant has been given a number instead of their name). Additionally, this part introduces the questionnaire to the participants and explains the purpose of the study.

The second part includes closed questions, all of them require the respondents to tick one of five options (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree).

Closed questions are used in the questionnaire in order to obtain quantitative data; their advantage is that they make the questions easier to complete (Saunders et al. 2007). Closed questions are highly structured and useful in that they can generate frequencies of responses amenable to statistical treatment and analysis (Ibid.).

4.5.3 Semi-structured interviews design for exploring KS3 learners' attitudes

This is a data-gathering method to explore the participants' opinions face-to-face (Erford 2014). It involves an interactive dialogue between the researcher and the participants (Ibid.). Qualitative interviewing aims to explore the interviewee's subjective point of view (Bryman & Bell 2011). The time of interview ranged from one and a half hours to two hours per person (Briggs et al. 2012). Semi-structured interviewe is a research technique normally considered to address popular themes more effectively and it allows some adequate freedom to explore specific condition of interest to interviewees (Ibid.). The interview, however, did not take such a time. The interview lasted 45 minutes for every learner. The learner was given break from one time to another. Standardised interviews can either be in person (face-to-face) or over the phone and Computer (Donsbach 2015)

Actually, there are two differences between self-administered questionnaire and structured interviews. The first is: the absence versus presence of the interviewer and for a questionnaire the effect of interviewer on the respondents' answers is eliminated (Bryman 2015). Interviewers may convince reluctant respondents, motivate respondents and provide additional instruction or explanations during the data collection (Tourangeau et al. 2014). The second point of difference is: in self-administered questionnaires the respondents read and answer the questions themselves (Bradburn et al. 2015). The respondents do not see the questions during the structured interviews (Alasuutari et al. 2008). Moreover, an interview is going beyond the respondents' answers (Frost 2011). And others point out that conducting interviews is essential to explore some issues in greater depth (O'Reilly 2012). The relationship between the interviewer and the interviewee will affect how they value what is being said (Wilson 2012). The interviewer is required to interact with the person being interviewed; it is a process of entering another person's world, and their perspective (Johnson and Christensen 2013). The interviewer's must create trust and relationship, making it simple for the interviewee to supply information about his/her inside world (Ibid.). The most important quality of interview is the ability of interviewer to listen to interviewees (Ibid.).

There are two types of interview: qualitative and quantitative interview. Qualitative interviews consist of open-ended questions and provide qualitative data. This type of interviews enables the researcher to get into the inner world of the interviewee because it involves information about the participants' thoughts, feelings, and knowledge (Johnson and Christensen 2013).

In the quantitative type of interviews the questions and answers are organised beforehand (Phakiti 2014). The quantitative interview is a method for collecting data and it is similar to structured questionnaire but collecting the data is carried out orally in the quantitative interview (Ibid.). The goal of the quantitative interview is to standardise what is presented to the interviewees and this means that all is said to the interviewees is the same or as similar as possible. The interview protocol of quantitative data will often include a few open-ended items (Johnson & Christensen 2013). Each participant is exposed to the questions and the way of interviewing. To a large extent a quantitative interview looks like a questionnaire with a key difference

which is that in the quantitative interview the interviewer reads the questions and writes the answer in the specified spaces, while in a questionnaire the participant reads the questions and writes the answers in the spaces provided on the questionnaire.

The semi-structured interview is oral qualitative data collection methods and it is the most common of all interviews. It represents the framework of interview and based on the interview guide (Walther 2014). Semi-structured interview gathers the use of open ended questions and close ended questions (Klenke 2008). It is a direct face-to- face exchange between the participant and the interviewer (Cullity 2010). It follows a pre-determined structure (Heffernan 2015). It allows both people (interviewers and interviewees) a degree of freedom to say what they genuinely think (Posthumus 2015). It, therefore, falls between two other techniques: discussion/conversation and question and answer (Underhill 1987;Williams et al. 2014). The order of questions may also be varied depending on the flow of conversation (Ibid.). Many other questions are required to explore the research question and objectives (Ibid.). The data collected will be recorded by audio-recording or note taking. An interview is structured in the sense that the interviewer maintain firm control, and keep the initiative as well; whatever the interviewee says is in more or less direct response to her/his questions or statements (Alasuutari et al. 2008). However, the interviewee still has the freedom to answer as he/she likes, or to develop her/his comments and opinions (Ibid.).

It is essential that a kind of rapport should be established between the interviewer and the interviewees, and the interview should have a friendly atmosphere in the sense that the interviewee should trust the interviewer (Johnson & Christensen 2013). As far as the semi-structured interview questions are concerned, the following points were considered:

a. **Relevance** means that questions should be directly related to the purpose of the study (Galletta 2013), and elicited the kind of data desired (Moule and Goodman 2009). There should be consistency between research questions and objectives (Saunders et al. 2007).

b. **Ease of response** means that questions need to be relatively easy to answer and should not be sensitive (Ebrahim and Bowling 2005). In addition, a semi-structured interview can be used where the order and logic of questions may need to be varied (Saunders et al. 2007).

The semi-structured interview questions were created from different sources in the current study. Firstly, the questions of the interviews were derived in a way to answer the research questions, so the latter were the first source of the interview questions. Secondly, the interview questions were also designed to meet the research objectives, so the current research aim and objectives shaped the interview questions. Thirdly, the literature review of the present study determined some of the aspects of the interview questions by following some examples from previous studies, especially the part that dealt with socio-psychological components of an attitude Selwyn (1997), Evangelos and Panagiotis (2008), Teo (2008), Cohen & Waugh (1989), Schwarzer & Jerusalem (1995), Papastergiou (2010), and Adebowale et al. (2009). Fourthly, the questionnaire questions helped in shaping and extracting the interview questions as they helped in more comprehension of technology and its use in education.

The semi-structured interview used in the current study (please see Appendix 10) shows the following: Every interviewee of KS3 learners was given a number to use instead of their names, all questions were introduced and explained for the interviewees in a friendly, gently and kindly way, interviewee's confidence was taken into consideration by filling embarrassed pauses, repeating the question and speaking clearly; moving smoothly from one question to another; semi-structured interviews contain 47 questions to explore the attitudes of the learners towards technology and BBC Bitesize; multiple choice questions were used: the interviewee chooses one of three answers then he/she explains why this option was chosen. There was a teacher from the School who remained with the study author to ensure that the interviews were complying to the rules of interviewing and School rules.

4.5.4 Content of semi-structures interviews

The two main parts which embody questions in the semi-structured interview are as follows:
The first part deals with demographic information about participants; such as age and year of study but there is no question about the participant's name or gender (every participant has been given a number instead of their name). The second part consists of multi-option

questions (explained in details in this Chapter), which requires the respondents to select one of three options.

4.5.5 Written test design for measuring KS3 learners' achievement

The purpose of the process of assessment is evaluating an individual's learning qualitatively and quantitatively to make decision about the learners' outcomes (Utley 2010). It involves generating and collecting evidence of a learner's attainment of knowledge and skills and judging that evidence against defined standards (Scottish Qualifications Authority 2008). The desired outcome (result) means that the objectives of the lesson were carried out (Wilson 2009) i.e. the learner outcome is what will the participants of study learn based on the programme of study (the lesson). The method of assessment in the current research is a written test (questions papers) which is used for gathering evidence which proves the competence (Ibid.). The evidence means a collection of information about the learners' achievement and performance of the learners' outcomes in programmes of study incorporating data and samples from a variety of assessments administered throughout the School year (Stinggins 2008). In the current study the test was carefully designed to match the learning aim and objectives of the lesson which was delivered through Online method in both Schools.

Achievement test is a test that is designed to measure the degree of learning that has taken place after exposing the participants to a specific learning experience (Johnson and Christensen 2013). This test is the most common test in the classroom. The teacher covers a subject and then conducts achievement test to find out how much learning takes place. Achievement test varies from measuring general achievement to measuring achievement in a specific subject area. Achievement tests attempt to measure accomplishment in specific information that is acquired in a formal and structured environment in definable conditions (Ibid.). For example, learners' performance can be measured by a test (Phakiti 2014). An innovative and dynamic approach to summative test (achievement test) revision can help learners learn more effectively (Armitag et al. 2012;Black et al. 2002).

A written test measures the achievement of the learners and there is a set of scales for weighing articles (Reece & Walker 2006). Tests need to be accurate within limits

(Ibid.). The quality of questions in the test is determined by their characteristic which is affected by:

a. **Power of discrimination**: discriminatory power is like the reliability (Kline 2015). If the test includes easy items it cannot clarify the differences in the achievement of learners. In this case, all learners will achieve the same scores, and soothe test will not be effective in differentiating between good and poor learners. A good test should have different levels of questions difficulty which is called a discriminatory power (Reece & Walker 2006).

b. **Objectivity of scoring**: the test will be either objective or subjective. If different teachers are asked to independently score an essay question they will probably award different marks. Because subjective judgment or personal preference of the marker will influence the score. In an objective test the same scores will be awarded by different markers or assessors (Reece & Walker 2006). For example, **multi-choice type of question** has only one correct answer and can be marked by Computer (Ibid.) eventually a test made up of multiple-choice questions is **objective** in its marking (Ibid.). Standardised tests endeavour to guarantee objectivity, which is realised as being tremendously significant when the results of testing will have a strong, immediate, and long lasting impact on learners, teachers, and School. Standardised tests maintain objectivity of dominating the test content and shape by providing clear directions for test organization, outcome, and scoring (Levinson et al. 2014). It is worth mentioning that in the current research the test of multi-choice questions has been conducted with alternative response questions (true/false) because these types of questions are used in Manchester Academy School to test the learners' achievement (Manchester Academy 2013).

In the current research the post-test based on the content of the Microbes' lesson of BBC-BBC Bitesize (please find the written test in Appendix 8). Every member of the sample of KS3 learners was given a number to use it instead of their names; therefore, all learners are anonymous for everybody including the researcher. Tests 'are commonly used in quantitative research to measure attitudes, personality, self-perceptions, aptitude and performance of research participants' (Johnson & Christensen 2013). Measuring something is identifying the dimensions, quantity, capacity or degree

of something. This can be done by assigning symbols or numbers to objects, events, and people. And the distinction between test and assessment is ambiguous (Ibid.).

When conducting an assessment or a test, the researcher must always consider the issues of reliability and validity. **Reliability** refers to the **consistency** of the test scores, and **validity** refers to the **accuracy** of the inferences or interpretations a researcher makes from the test scores (Johnson & Christensen 2013).

In a reliable test, the scores will be similar on every time the test is taken. **Validity** in a test or assessment is how appropriate the interpretations, inferences, and actions a researcher makes based on scores. Validity evidence is also an essential term found when conducting a test or an assessment. Validity evidence can be based on content, the researcher makes a judgement of the degree to which the evidence suggests that the items, tasks or questions on test adequately represent the domain of interest. Moreover, the construct validity is the extent to which a test may be said to measure what it has been designed to measure (Deligiannis et al. 2002;Grubišiæ et al. 2009).

In the current study the assessment papers will be marked by numbers and it is known that the mark usually is a letter, number or comment reported as a statement of learner achievement and performance (Stinggins 2008).

4.5.6 Multiple choice questions in the achievement test

Multiple choice questions or items consist of an incomplete statement or a question, known as the 'stem', followed by four plausible alternative responses from which the learner has to select the correct one. The correct response is known as the 'key', while the incorrect ones are referred to as 'distractors'. Multiple choice questions are often called 'objective tests' (Scottish Qualification Authority 2008).

Multiple choice questions are frequently used to assess at the level of recall and understanding and, if carefully constructed, can also be used to assess higher-order cognitive skills (Ibid.). Scottish Qualification Authority (2008) identifies some advantages to this type of questions:
   a. allow considerable coverage of content

b. can be marked objectively

c. can be offered and marked Online

d. are generally reliable

e. make less demand on learners' writing skills than free response answers

f. can provide a rapid feedback to learners and assessors

g. can be used for diagnostic purposes

h. can be used to access a wide range of cognitive skills

i. reduce the element of guessing found in alternative response items

This type of questions was used in the summative test (written test) of the current study to collect evidence about the learners' outcome and the test consisted of 11 questions. This type of questions is good for discovering the learners' understanding, performance and achievement (please see Appendix 8). BBC Bitesize uses this type of questions for assessment (please find a copy of the BBC test in Appendix 12). Moreover, this type of questions is good for the restricted time which has been given to the researcher to conduct the practical study.

4.5.7 Alternative response questions (true/false) in the achievement test

In this type of questions, the learner is presented with a statement which is followed by two alternatives (for example true/false, yes/no), only one of which is correct (Scottish Qualification Authority 2008). Alternative response items may be used to assess outcomes concerned with the recall of information or the ability to discriminate (Ibid.). Scottish Qualification Authority (2008) identifies some advantages to this type of questions:

a. easy to construct and mark

b. can be used as a self-assessment and diagnostic tool

c. can be used to generate discussion with learners

d. can be offered and marked Online

This type of questions was used in the written test of the current research to collect evidence about the learners' outcome, understanding, performance and achievement. The test consisted of 16 questions. Manchester Academy uses this type of questions for

assessing the learners eventually this was the reason behind using it in the summative test in the current study. In addition, this type of questions suit the tight time which has been given to the researcher by the School to conduct the study.

4.6 Piloting the research instruments

The main reason for piloting the research questions is attempting to guarantee that survey questions work well. Additionally, piloting process has a function in ensuring that the whole survey instrument works appropriately (Bryman and Bell 2015). The research instrument also should be piloted for other reasons as follows: Piloting an interview can provide the researcher with confidence and good experience of using it in the factual empirical study, removing the kind of questions which makes the participants feel unhappy, telling how long answering the questionnaire questions will take, identifying the unclear and uneasy questions, and revealing comments on the content and lay out of instrument (Ibid.). The pilot study members should not be part of the original study (Ibid.). The participants in the pilot study have been chosen by the School staff and all of them have been removed from the real empirical study. Moreover, the instruments in the current study were piloted three times as follows:

a. First time of piloting was conducted on two KS3 learners; this attempt helped to remove all ambiguous questions. The researcher met the learners with the presence of one of the School teachers. The researcher made the learners watch the lesson on the BBC Bitesize. Then they were given the written test to which they answered. The researcher asked them about ambigious questions and these questions were modified which they suggested. Then the learners were given the questionnaire. They were also asked to decide the difficult or ambigious questions to be modified.

b. Second time was on three KS3 learners to eliminate all the questions irrelevant to the purpose of the research. This second time the researcher began with the same procedure as the first time. This time more focus was placed on the questions which the learners believed as irrelevant to the research goal. So, these questions were eliminated.

c. Finally, third time was on five KS3 learners, to omit all difficult and incoherent, questions. This time the same procdures were followed, but this time the questions that were over the level of KS3 were focused on. The questions that could be linguistically incoherent were also omitted.

4.7 The reliability and validity of research instruments

Validity and reliability test should be used for every instrument of any research such as the questionnaire and summative test in the current research to present correct measures of the research questions. Also validity and reliability tests are significant for examining the quality of any study (Yin 2009). The reliability of instrument means achieving the same results when this instrument is used again in another time (Saunders et al. 2007). The validity of instruments can be outlined by answering the following question:

This leads the researcher to check the reliability and validity of the research instruments. Therefore, the first task that should be done is verifying the strength and validity and reliability of the questionnaire and the written test.

4.7.1 The reliability of questionnaire

The reliability is the degree to which a questionnaire will produce the same result if administered again, or the "test-retest" concept was used. It is also a measure of the degree to which a questionnaire can reflect a true change (Bryman & Bell 2011). Reliability points to the degree at which data collection techniques or analysis procedures will provide consistent findings and results (Saunders et al. 2007). There are two separate aspects of reliability- external and internal reliability (Bryman and Cramer 2011). External reliability refers to the degree of consistency of measure over the time and it can be assessed by administrating a test on two occasions to the same group of participants, test-retest reliability is being examined internal reliability is very important in connection with multiple-item scales. It raises the question of whether each scale is measuring a single idea and if the procedures for estimating internal reliability exist (Ibid.).

One of the most commonly used technique for measuring reliability and internal consistency is Cronbach's Alpha coefficient test (Bryman & Cramer 2011; Pallant 2010). This test will be explained and applied in Chapter 6 (Data Analysis Chapter).

4.7.2 The reliability of written test

The reliability of test refers to the extent to which it consistently measures what it is supposed to measure (Kruglanski 2013;Scottish Qualifications Authority 2008). The test is reliable if the following should be noticed:

Different assessors assessing the same work should award the same scores (Scottish Qualifications Authority 2008). Examiners award the same score to the same script if they score it again on subsequent occasion, and learners get the same scores on the test when it is administered at different times.

The aims and objectives of assessment (test) should be clear. The aims are what the teacher and assessor wants his/her learners to achieve (outcome of learning). The objectives of assessment are as how they will achieve the outcome (methods) (Gravells 2012).

Gravells and Simpson (2010) point out that to be effective and reliable all assessed works (the written test) should be Valid, Authentic, Current, Sufficient and Reliable **(VACSR)** (Gravells & Simpson 2010).

a. Valid: the work (the test) is relevant to the standards/learning outcome (learning objective) being assessed. By revising the lesson plan it can be noted that the general aims are to recognise the disease/microbes by providing the learners with knowledge (Cognitive Domain) (to understand the scientific ideas and facts), skills (Psychomotor Domain) and some values (Affective Domain). By revising the written test it can be noticed that the questions of the written test reflect the general aim of the lesson and it is supposed to be achieved by the participants and the level of achievement can be covered by the scores of learners (participants) (please see Appendix 7 & Appendix 8).

b. Reliable: the work (test) is consistent across all learners, and if the written test is carried out again with similar learners, similar results will be achieved. Therefore,

the questions of test were clear, understandable, and the same questions shape the standard exam questions which are used in Manchester Academy (Manchester Academy 2013). Also the used questions in the test are multiple choice questions and they are often called 'objective tests' (Scottish Qualification Authority 2008) as well multi-choice type of question has only one correct answer and it is objective in its marking (Reece & Walker 2006). In addition, alternative response questions were used in the test and this type of questions assesses the outcomes concerned with the recall of information or the ability to discriminate (Scottish Qualification Authority 2008). This makes the test reliable.

c. Authentic: the work (the test is related to the real life) and (the answers of questions) have been produced solely by the learners (Gravells & Simpson 2010; Scottish Qualifications Authority 2008).

d. Current: the work (test) is relevant to the time of assessment (up to date) (Ibid.). The used test is correlated and related to the lesson in the current study.

e. Sufficient: the work (test) covers all the standards/learning outcomes (the objectives of the lesson) (Ibid.) (please see Appendix 8). The test reflects and covers the aims, objectives and outcomes of the lesson plan (please see Appendix 7).

f. By checking the written test in Appendix 8 it can be noted that all the above rules have been met, therefore, the used test in the current study is reliable.

4.7.3 The validity of questionnaire

Validity: the degree to which a questionnaire reflects reality (Trzcielinski and Karwowski 2014). There are a number of different facets to validity (Milano and Grasso 2013).

Validity is an evidence that a study allows correct inferences about the questions it was aimed to answer or that a test measures what it is set out to measure conceptually (Field 2009;Yin 2009). In addition, validity is mainly a matter of constructing an appropriate

theoretical relationship between a concept and its indicators (Gobo and Mauceri 2014;Treiman et al. 2009).

Furthermore, validity demonstrates if the instrument actually measures what it sets out to measure (Falchikov 2013). There are three types of validity:

a. Content validity that assesses the degree to which individual items represent the construct being measured, and covers the full range of the construct (Field 2009). Content validity is related to objectives and their sampling and this validity aims to ensure that the research methods adequately measure the concept (Sekaran and Bougie 2010). Moreover, content validity refers to the adequacy with which a measure or scale has sampled from the intended universe or domain of content (Pallant 2016;Papastergiou 2010).

b. Construct validity involves testing a scale not against a single criterion but in terms of theoretically hypotheses concerning the nature of the underlying variable or construct (Ibid.). Field (2009) points out that the instrument is measuring what it claims to measure. And it aims to ensure that the questions reflect the concept they were designed to measure (Bryman et al. 2009). Construct validity is related to the theory underlying the concept (Snijkers et al. 2013). Construct validity is established if the questionnaire measures what it was designed to measure and construct validity tests do not adopt a single criterion in measuring a scale but they measure it in terms of hypotheses which are theoretically derived (Field 2009; Pallant 2010). The construct validity investigates its relationship with other constructs, both related (convergent validity) and unrelated (discriminate validity) (Pallant 2010).

c. Convergent validity is established when the score obtained with two different instruments measuring the same concept are highly correlated, while discriminate validity is established when two variables are predicted to be uncorrelated, and the score obtained by measuring them are indeed empirically found to be so" (Sekaran & Bougie 2010).

d. Criterion validity is related to concrete criteria in the real world. Criterion validity concerns the relationship between scale scores and specified, measurable criterion (Pallant 2007;Pallant 2010). Criterion validity is whether the instruments is measuring what it claims to measure and the validity of criterion can be assessed by relating scores of the measure to real-world observations (Field 2009). One of the most commonly used technique for measuring validity is Kaiser–Meyer–Olkin (KMO) test and Barlett's test of Sphericity test (Bryman & Cramer 2011; Pallant 2010, Pallant 2013). (This test will be explained in this Chapter and will be applied in the data analysis Chapter).

4.7.4 The validity of written test

The validity of test is related to how well the test measures what it is supposed to measure (Nairne 2013). A valid test is one which assesses a representative sample of the content field of interest (Baltes et al. 2014). The high validity of test is based on:

a. A sample of the objectives in a Curriculum (Scottish Qualifications Authority 2008).

b. The questions are relevant to the objectives which have been chosen from the sample (Ibid.).

In the current study the questions in written test papers are related to the objectives and aims of study unit, lesson plan (please see Appendix 7), and learners' instruction sheets (please see Appendix 6) therefore the test is appropriate and valid.

The educational organisations in the UK adopt Bloom's taxonomy (1956, 1964) in the teaching/learning process. Bloom's Taxonomy consists of three domains (Cognitive, Affective and Psychomotor domains) and the teachers should establish what they want from the assessment especially the test as follows:

a. Domain of cognitive: Think of cognitive as the head (thinking)(Gravells 2012) and to recall knowledge (Cognitive skills) (Wilson 2009).

b. Domain of Affective: As the heart (emotions) (Gravells 2012) to value or appreciate an opinion (Affective skills) (Wilson 2009).

c. Domain of Psychomotor: As the hand (actions) (Gravells 2012) to demonstrate practical skill (Psychomotor skills) (Wilson 2009).

Eventually any test should shape the above domains to be effective and valid, therefore, the instruction sheets of learners and the written test papers in the experiment shaped Bloom's Taxonomy.

4.8 Summary

This Chapter has defined the sample of research and also the ethics of research was defined. The measures for keeping the privacy and confidentiality of participants safely were explained. In addition, this Chapter has explained how the data gathering methods (questionnaire, semi-structured interview, and written tests) are designed. Moreover, it has been explained how the research methods can be suitable for answering the research questions. Every research instrument was chosen in this research was justified. Also, the advantages and disadvantages of every instrument were outlined.

Furthermore, this Chapter has clarified how the validity and reliability of research methods can be measured. Overall, the valid and reliable research methods will be ready for the empirical study.

Chapter 5

The empirical study

5.1 Introduction

The previous Chapter has discussed how the current study instruments (questionnaire, semi-structured interviews, and written test) are designed and how they can be valid and reliable.

This Chapter is going to study the practical stage of this study. This Chapter explains how the data collection methods (questionnaire, semi-structured interviews, and written test) were used to answer the research questions. And the conditions and circumstances of the research will be explained.

The current study is an explanatory case study which attempts to to explore the socio-psychological factors which contribute to the learners' attitudes towards the integration of BBC Bitesize in the teaching/learning process. It will also investigate the relationship between the learners' attitudes toward BBC Bitesize and the learners' achievement via using BBC Bitesize.

The teaching/learning method in this study is based on Online instruction (BBC Bitesize) plus handouts for organizing the learning process. The role of the teacher was that of a facilitator and organiser.

Handouts (instructions sheets) including the guide lines were delivered to the participants in the beginning of the lesson. These sheets informed the learners how to go through the sheets step by step.

A written-test was used directly after the course (no gap of time) to measure the participants' achievements.

A questionnaire was given directly to every participant after the test and all learners' responses were received directly to measure the participants' attitude.

Semi Structured interviews: (face-to-face) interview were conducted to obtain in-depth responses of the participants (learners' attitude).

The current study is not a comparative study to compare between two types of teaching/learning methods so no control group was needed. It is rather a study for exploring the effectiveness of Online learning course and BBC Bitesize is an example of that. Selwyn (1997) has originated CAS model for measuring the learners' attitudes towards learning through Computer. The attitude construct has been considered by Selwyn is a significant construct for measuring how effective learning through Computer is. Abedalaziz et al. (2013); Larbi-Apau and Moseley (2012); Teo (2008) used Selwyn's model in different learning contexts. All these authors have supported that Selwyn's model is effective and efficient. In the current study, not only Selwyn's model has been used, but also the achievement construct has been implemented. Therefore, the effectiveness in the current study has been determined not only by one construct but by two constructs (attitude and achievement). The effectiveness of BBC Bitesize for learning, according to the definition of effectiveness, is capturing knowledge, skills, anf attitude. So, the two constructs i.e. the attitude and achievement will determine the effectiveness of BBC Bitesize course as an example for Online learning courses.

Using the above instruments enabled the researcher to obtain answers to the present research questions. Please see below Figure 5 (the conceptual framework of the practical stag).

Conceptual Framework: Chapter 5

Explanatory Case study
(Investigating the effectiveness of BBC Bitesize through KS3 learners' attitude & achievement).

Transmitting the information (the lesson of Microbes) from BBC Bitesize

Teacher=facilitator

BBC Bitsize delivers the Microbes lesson

Handouts (passed to the learners)

The learners receive and interact with the information independently

Formative assessment (questions on the handouts should be answered independently by learners

Revising the Internet

Is the answer correct?

Feedback

NO

YES

The learner goes to next step of the lesson and so on

Interviews (learners' attitudes)

Questionnaire (learners' attitudes)

Written Test (learners' achievement)

Attitude

Learning Effectiveness

Achievement

Figure 5: Conceptual Framework: Chapter 5 – Data collection methods

5.1.1 The unit name for learning

The lesson which has been delivered is Microbes of Science subject (please find a copy of the lesson in Appendix 5, a copy of the lesson plan in Appendix 7, and a copy of the instruction sheets (handouts) in Appendix 6). This lesson was chosen because the topic of Microbes is very common and related to the human health so that these reasons make the topic attractive and interesting for learners. Additionally, the lesson was chosen because the teacher was asked if the lesson was delivered to the learners, and the answer was No.

5.1.2 The teaching method

The used teaching method is: Online instruction based on BBC Bitsize Science website (as a source of information) and handouts were given to every learner to guide them to go through the lesson bit by bit. There are different ways of instructional planning in the Online environment. Usually, there is a short term and long term planning by urging teachers to concentrate on learning outcomes (learners achievement) and then to define how effectively to obtain the course objectives (Journell 2013). Only one teaching/learning method was used because the current study is not a comparative study. The justification of that has been explained in the introduction of this Chapter.

5.1.3 The environment of the practical study

The environment and the setting of the current study were checked in the beginning by the researcher as follows:

Making sure that the room is suitable, accessible and does not create any unnecessary barriers. The light of room is checked. Chairs and tables are set and comfortable. Making sure the room is quite and no noise hinders the communication (Wilson 2009). Computers have been tested for the learners' safety and to make sure they are working in a very good way (please find the check lists in Appendix 11). Eventually a positive and quite environment was created to make the learners able to interact with the Computer, Internet, and Learning Programme (Wilson 2009). Being healthy: enjoying good physical and mental health and living a healthy lifestyle (Department For Education 2013). Staying safe: being protected from harm and neglect (Ibid.). Enjoying and achieving: getting the most

out of life and developing the skills for adulthood (Ibid.). Links to functional/basic skills for Life: some ICT skills are required to use Computer and Internet.

5.1.4 The lesson aims

In the end of the lesson the learners will know the following (as shown in the Table 19):

Table 19: The aims of lesson

a. Recognize the Disease/Microbes by providing the learners with knowledge (Cognitive Domain).
b. To understand the scientific ideas and facts, skills (Psychomotor Domain) and some Values (Affective Domain).
c. Initial assessment: will take place in the beginning of the experiment for two reasons:
- To make link between the learners experience and the new knowledge in the experiment.
- To assess the learners needs. The teacher/researcher will ask the participants some questions orally (verbally) to stimulate the learner brain (brain storming).

The teacher starts the lesson by a warming up stage by asking the participants some questions to stimulate them and make them active during the lesson as shown in Table 20. What the researcher noticed was that the learners had limited information about the topic; which confirmed what the teacher said that they did not receive the lesson.

Table 20: Pre-teaching stage

a. Pre-teaching (warming up).
b. What are "Living things"?
c. Can you define Microbes?
d. Can you mention the three types of Microbes?
- Slow learners and less experienced learners in the topic (Microbes) are given extra chance for interaction with the website.

After completing the unit successfully, the researcher will be ready to conduct the written test (summative test) to find out the level of achievement cross the studied unit (please see Appendix 8).

5.1.5 The lesson objectives

Table 21 clarifies that in the end of lesson the learners will be able to answer the following:

Table 21: The objectives of lesson

The objectives	The Type of Domain	The level
Define Living things and Microbes?	Cognitive	Knowledge
Recognize the diagram of Fungi?	Cognitive	Knowledge
Recognize the diagram of Bactria?	Cognitive	Knowledge
Recognize the diagram of Viruses?	Cognitive	Knowledge
Repeat drawing the Fungi diagram?	Psychomotor	-
Repeat drawing the Bactria diagram?	Psychomotor	-
Repeat drawing the viruses' diagram?	Psychomotor	-
Name the three types of Microbes?	Cognitive	Knowledge
Define Microorganisms?	Cognitive	Knowledge
Clarify if Mushrooms are Microbes and why?	Cognitive	Comprehension
Can you divide microbes according the size?	Cognitive	Analysis
Mention the biggest and the smallest microbes?	Cognitive	Knowledge
Predict the number of Bactria shapes?	Cognitive	Knowledge
Demonstrate if some Bactria has tails?	Cognitive	Knowledge
Compare between the cell membrane in all types of Microbes?	Cognitive	Evaluation
Define bacterium.	Cognitive	Knowledge
Compare between the cell	Cognitive	Evaluation

133

wall in all types of Microbes?		
Compare between the Cell nucleuses in all types of Microbes?	Cognitive	Evaluation
Classify the microbes in two types?	Cognitive	Analysis
Classify Yeast cell?	Cognitive	Application
Demonstrate how yogurt can be made?	Cognitive	Application

Diagnose the causes of the following illnesses:
   a. Athlete's foot.
   b. Thrush.
	Cognitive	Analysis

Diagnose the causes of the following illnesses:
   a. Tuberculosis
   b. Salmonella
   c. Whooping cough.
	Cognitive	Analysis

Mention the personal hygienic rules and beliefs you practise in your daily life to protect yourselves from any disease?	Affection	

5.1.6 The formative assessment

The formative assessment [the mentioned questions in the handouts (instruction sheets)] will take place during the lesson and will be applied by the learners themselves after studying every point of the lesson (every point accompanied with the appropriate questions). Therefore, the learners will make sure that the point of information has been understood by them (please find the instruction sheets in Appendix 6). Formative assessment is a process for discovering the learning in specific and it can be implemented in classroom and Online (Yang and Wang 2013). Also, it is a valuable process using the formative assessment for the web-supported environment (Bristol and Zerwekh 2011). The formative assessment should be well designed, developed, and clearly explained for

encouraging the independence and freedom of learners (Ibid.). After finishing all the points of the unit of Microbes summative test will be implemented to find out if the learners have achieved the unit aims and goals (please find the test in Appendix 8).

5.1.7 The role of the instruction sheets

The instruction sheets are handouts that were circulated to the participants at the beginning of the lesson and the handouts role is that of guidelines for the learners. The instruction sheets are a plan for learners and they direct and organise the learners' work (please see Appendix 6). The instruction sheets include information about the web site of BBC Bitesize and how to log in. There is a note at the beginning of the sheets that confirms that the teacher is available around the learners to sort out any technical problem. Every page of the instruction sheets is designed like a table which includes 4 columns as follow:

a. The first column includes the features of information which should be studied by the learner from BBC Bitesize and the information is provided with some gestures. Following the directions of the handouts the learners will structure their ideas from the BBC Bitesize web site autonomously by linking the new ideas with their previous ideas on one side and with real world on the other side. The inquiry-based learning (IBL) approach is a method of learning that gives the learners opportunities for active searching about the content under investigation (Blessinger and Carfora 2014).

b. The second column includes one question or more about the studied topic and the learners try to answer them to make sure that the idea was understood. In case some learners are stuck in some ideas he/she should re-read the information from the website again and this dynamic can be called feedback.

c. The third column includes the estimate (expected) time for every idea. Of course some learners finish the idea before the expected time, some learners finish on time and others need extra time; every learner goes according to his/her own pace. This principal in education is called differentiation or individual differences.

d. The fourth column is empty but it is required to be ticked by the learner when he/she finishes the piece of information.

In the end of the sheets there are some questions and it is required from the learners to answer them because these questions represent a mock exam and training for the summative test. The instruction sheets were designed according to Bloom's Taxonomy, and Behaviourist theory. Learner movement is led through the instruction sheets from one point to another. Bloom (1956) in his taxonomy has set six educational objectives. These are: knowledge, comprehension, application, analysis, synthesis , and evaluation (Fleurmons et al. 2015). Bloom's Taxonomy has been explained in details in the 'the definition of key terms' in the Introduction Chapter.

This approach of teaching/learning relies on Behaviourist theory (stimulus-response process). The information of BBC Bitesize represents the (stimulus) and the learner answer represents the (response). In addition, the learners study the points by themselves from the Computer and BBC Bitesize following the instruction sheets direction. Subsequently, the learners extract the information from the Computer and BBC Bitesize and they process the information by themselves and they answer the questions in the instruction sheet autonomously. The Behaviourist approach was also used during the lesson by the BBC Bitesize. When the learners gave the correct answer, they were given reinforcement. This is a feedback process whih gives the right answer.

5.2 Data analysis methods

This section explains all statistical techniques and tests that will be used via **SPSS** and **Smart-PLS** in (Chapter 6) for analysing the collected data and for extracting the significant findings.

1. **SPSS** Statistics is defined a statistical programme manufactured by IBM, Inc. IBM SPSS is aimed to perform a variety of statistical procedures, explain how to choose the appropriate statistics and present the results in a usable form (Cronk 2017). These techniques can be exposed as follows:

   a. **Cronbach's Alpha coefficient test for measuring the reliability**: Reliability measures the skill to obtain consistent scores from the participants' answers (Treiman et al. 2009). Reliability can be tested through the internal–consistency of questionnaire (Ibid.). Cronbach's Alpha coefficient is a test and technique for

measuring the reliability of the research instruments eventually when the value is above 0.7 they are considered acceptable but when values are above 0.8 they are preferable and suggesting a good internal consistency reliability for the scale with this sample (Bryman & Cramer 2011;Pallant 2007;Pallant 2010;Tavakol and Dennick 2011). This test has been used in Chapter 6 (data analysis Chapter) for measuring the reliability of the current study constructs.

b. **KMO Kaiser-Meyer-Olkin test and Barlett's test of Sphericity for measuring the validity**: This test ensures and measures the validity of research instruments (sub-scales and items) (Comrey and Lee 1992;Sekaran & Bougie 2010). KMO and Barlett's test of Sphericity measure of sampling adequacy (Pallant 2007;Pallant 2010). The KMO index ranges from 0 to 1 with 0.6 suggested the minimum value for a good factor analysis (Field 2009; Pallant 2007; Pallant 2010). Bartlett's test of Sphericity should be significant (the value of Sig should be less than .05) (Ibid.). It is suggested that the Correlation matrix for evidence of coefficients is greater than 0.3 (Pallant 2010;Tabchnick and Fidell 2007). If the researcher does not find so many values more than 0.3 he/she should reconsider the use of factor analysis. This test has been used in Chapter 6 (data analysis Chapter) for measuring the validity of the current study constructs.

c. **Skewness & Kurtosis tests for testing the normality:** Normality is used for identifying the sample distribution and the distribution of scores on the dependent variable if it is normal i.e. normality test is used to describe a symmetrical, well-shaped curve which has the greatest frequency of scores in the middle, with smaller frequencies towards the extremes (Gravetter and Wallnau 2004;Pallant 2010). It is important for researchers to understand the normality because if this assumption is not met then the logic behind hypothesis testing is flawed (Field 2009). The Skewness provides an indication of the symmetry of distribution and if Skewness values are positive that means the scores are clustered to the left at the low values and if the values are negative that means the scores are clustered to the right at the high values (Pallant 2010; Pallant 2007). But Kurtosis provides information about the 'Peakedness' of the distribution if kurtosis values are positive that means the distribution is rather peaked (clustered in the centre with

long thin tails) and if the values are negative that means the distribution is flat (too many cases in the extremes) (Ibid.). If the distribution is normal the Skewness and Kurtosis value must be 0 (Ibid.). This test has been used in Chapter 6 (data analysis Chapter) for measuring the sample distribution and the distribution of scores (normality test) in the current study.

d. **Kolmogorov- Smirnov test:** This test measures the normality if the results are not significant (Sig. Value > .05) that means the value indicates normality. If the values are Significant (Sig. Value < .05 or less) that means the distributions of scores are not normal (Pallant 2016). This test has been used in Chapter 6 (data analysis Chapter) for identifying the nature of distribution (normality test) in the current study. The aim of using this test is to explore the normality test to identify the kind of tests supposed to be used statically for analysing the data (Ibid.).

e. **The difference between the Original Mean and 5% Trimmed Mean for accepting or refusing the outliers:** Outliers are cases with scores that are quite different from the remainder of the sample, either much higher or much lower (Pallant 2010; Pallant 2016). Sometimes these values should be removed and sometimes can be retained (Ibid.). According to Pallant if the difference between the **Original Mean** and **5% Trimmed Mean** is too little so there are no extreme scores having a big influence on the Mean, eventually, the data does not need further investigation and it is appropriate for more statistical analysis and the values are not so different from the remaining distribution therefore the extreme cases can be retained (Ibid.). This test has been used in Chapter 6 (data analysis Chapter).

f. **The Mean** is the measure of central tendency that you are most likely to have heard of because it is simply the average score. To calculate the mean we simply add up all of the scores and then divide by the total number of scores we have (Field 2009). We can write this in equation form as:

$$\bar{x} = \frac{\sum x}{N}$$

(TutorVista.com Website 2013).

$$\sum \text{ represents the summation}$$

X represents scores

N represents number of scores

This test has been used in Chapter 6 (data analysis Chapter).

g. **The Median** is a way to quantify the centre of a distribution and to look at the middle score when scores are ranked in order of values (Field 2009). The median is relatively not affected by extreme scores at either end of the distribution and it is also relatively unaffected by skewed distributions and can be used with interval, ordinal and ratio data (it cannot be used with nominal data because these data have no numerical order) (Ibid.). If the total number of numbers (n) is an odd number, then the formula is given below:

$$Median = \left(\frac{n+1}{2}\right)^{th} term$$ (TutorVista.com Website 2013).

If the total number of the numbers (n) is an even number, then the formula is given below:

$$Median = \frac{\left(\frac{n}{2}\right)^{th} term + \left(\frac{n}{2}+1\right)^{th} term}{2}$$ (Ibid.).

This test has been used in Chapter 6 (data analysis Chapter).

h. **The Correlation (Spearman correlation)** is used when the scores are not normally distributed and when you want to explore the strength of the relationship between two continuous variables (Pallant 2016). This gives indication of both the direction (positive or negative) and the strength of the relationship (Ibid.). A positive correlation indicates that as one variable increases, so does the other (Ibid.). A negative correlation indicates that as one variable increases, the other decreases (Ibid.). Additionaly, the effect sizes are interpreted according to **Cohen's (1988) criteria** of .10 for small effect, .30 for medium effect and .50 for

large effect (Weast-Knapp et al. 2015). This technique has been used in the next Chapter (Chapter 6).

2. **Smart-PLS 3** is an objective statistical program, easy to use, and can be used for latent variable modelling. It uses the art methods to design the graphical user interface (Hair et al. 2014). Additionally, it is good software function for Partial Least Squares Structural Equation Modelling (PLS-SEM) (Wong Kwong-kay 2013). This programme and its techniques have been used in Chapter 6. The data analysis methods can be defined as follows:

a. **Structural Equation Modelling (SEM)** method helps researchers to integrate unobservable variables measured indirectly by indicator variables and to assist computing the measurement error in observed variables (Hair et al. 2014).

b. **Partial Least Squares-Structural Equation Modelling PLS-SEM (PLS path modelling):** is used for exploring the variance in the dependent variables through examining the model (Hair et al. 2014).

5.3 Summary

This Chapter has been about the empirical part of teaching which involves delivering a lesson via Online. The Chapter has explained the teaching methods, the selected unit of learning, the participants, the context of the study, the formative assessment, the role of the instruction sheets, and the course aims and objectives have been defined. After the teaching course three research methods are used (a- written test for collecting quantitative data), (b- questionnaire for collecting quantitative data) and (c- semi-structured interview for collecting qualitative data). The semi-structured interview and the questionnaire were designed for understanding KS3 learners' attitudes. But the written test was designed for measuring KS3 learners' achievement. In this Chapter the data analysis methods were defined and explained and these methods will be used statistically in Chapter 6. The

Chapters of (research methodology, research design, and the empirical study) can be summed as shown in Table 22.

Table 22: Outline of the Chapters of 3,4, &5

The point	Description
Research questions	a. How does BBC Bitesize affect the KS3 learners' attitudes towards Online learning methods? b. How does BBC Bitesize (Online learning source) affect the KS3 learners' achievement? c. How do the KS3 learners' attitudes affect their achievement?
The philosophy of research	Pragmatism paradigm (Positivism & Interpretivism)
Data Collection methods	a. Semi-structured interview. b. A questionnaire. c. A written test.
Data Analysis methods	a- Quantitative data will be analysed by SPSS (program) & Smart-PLS program and some data analysis methods will be used such as: Cronbach's Alpha, KMO, Skewness & Kurtosis, Kolmogorov- Smirnov test, the outliers' tests, the Mean & Median, Spearman correlation, Cohen's criteria, and Fisher's exact test. b- The findings will be developed via using Smart-PLS statistical software and some methods will be used such as: PLS-SEM (Partial Least Squares- Structural Equation Modelling). c- Qualitative data will be analysed and interpreted by the researcher.

Chapter 6

Data Analysis

6.1 Introduction

In the previous Chapter (Chapter 5) the instruments (the data collection methods) used in the present study have been identified. The semi-structured interview and the questionnaire were used for investigating KS3 learners' attitudes qualitatively and quantitatively. In addition the written test was used for measuring KS3 learners' achievement. The current Chapter focuses on the data collected via a questionnaire, written test, and semi-structured interviews. The data collected will be analysed and evaluated. All results will be presented in three sections:

A. **The first section i**ncludes analysing the quantitative data collected by the questionnaire with 121 KS3 learners.

B. **The second section** includes analysing the quantitative data collected by the written test with 121 KS3 learners.

C. **The third section** includes analysing the qualitative data collected by the semi-structured interviews with 11 KS3 learners.

6.2 Quantitative data analysis

The current section analyses the findings of learners' attitudes which were measured via questionnaires. This section reveals the findings of the summative test and these results will be discussed.

6.3 Preparing, entering the data and creating SPSS file for analysis

In the current study SPSS software will be used for analysing the data. SPSS is one of many software tools considered for this work. It is used in this study because:

a. SPSS is a suitable software for analysing quantitative data thus Computer and SPSS software make data analysis faster and more accurate (Anastas 2012).

b. SPSS is a software for analyzing statistical data and it offers an effective methods, charts and graphs (Field 2013;Hinton et al. 2014).

c. SPSS can keep the information and data for further analysis (Blunch 2012).

d. In SPSS the output and results can be kept separately from the data itself (Pallant 2010).

Therefore, at the beginning of data preparation the codebook (Pallant 2007;Pallant 2010; Pallant 2013) was prepared so that every variable was defined and labelled, then every possible response was given a number. The summative test (Appendix 8) was a data collection method chosen to measure the learners' achievements. The summative test papers were marked by the researcher because SPSS cannot mark the test papers and the data should be ready for analysis before using SPSS software. The maximum score of the written test is 28 over 28 but it has been converted to be over 100. The 100 is a benchmark for assessment and it is a common grade because the learner scores from KS1-KS2 and from KS2-KS3 are averaged for the School to award a score that is

represented as a number based on 100 in the UK (Morris 2015). In addition, the same learners were administered a questionnaire to explore KS3 learners' attitudes towards BBC Bitesize. The KS3 learners' attitudes will be calculated on 5-point Likert scales as used by (Selwyn 1997):

strongly disagree	Disagree	neither agree nor disagree	agree	strongly agree
0	1	2	3	4

It is expected that the outcome of this questionnaire will be supported by the qualitative data which were collected via semi-structured interviews and vice versa.

There are some negatively worded items in the questionnaire, therefore it was essential to reverse these items (Pallant 2013) before a total score can be calculated for this scale. The old values of 5 Likert type scale which were mentioned above were changed for (negatively worded items) according to (Pallant 2007; Pallant 2010) to become the new values as follows:

strongly disagree	Disagree	neither agree nor disagree	agree	strongly agree	An example from the questionnaire
4	3	2	1	0	Q4- BBC Bitesize makes me feel uncomfortable.

All the learners' questionnaires were received and the next stage was entering and preparing the data for creating the data file before analysing the data. According to Pallant (2010) there are a few steps which should be followed for preparing the data file for SPSS analysis:

   a. Checking and modifying where necessary
   b. Structuring the data file and defining the variables
   c. Entering the data (the values obtained from each participant for each dimension)

All Pallant (2010) steps were followed for achieving a correct data file for preparing the collected data for statistical analysis.

6.4 The reliability of the questionnaire

The reliability refers to obtaining the same scores every time in the same instrument over time (Laat et al. 2012;Pallant 2013). The reliability of a scale is testing the extent of free of accidental mistakes in a measure and measurement consistency (Rubin and Babbie 2015).

The acceptable values of Cronbach's Alpha for any research instrument ranging from 0.70 to 0.95 (Tavakol & Dennick 2011). The value of Cronbach's Alpha in the reliability statistics Table 23 is 0.95 for all constructs together (the full questionnaire) and the reliability for every construct separately is either 7 or above, suggesting very good internal consistency reliability for (all constructs, Selwyn constructs, affetive construct, usfulness construct, control construct, behavioural construct, anxiety construct, and self-efficacy construct).

Table 23: Reliability Statistics

The construct	Cronbach's Alpha
All constructs (the present study scale)	0.95
Selwyn scale	0.88
Affetive components	0.81
Prceived usfulness	0.70
Percevied Control	0.70
Behavioural components	0.75
Anxiety components	0.90
Self-efficacy components	0.90

Selwyn questionnaire represents 4 sub-scales (affective, usefulness, control, and behavioural) and it was conducted in a previous research and Selwyn proved that the questionnaire was reliable and Cronbach's coefficient alpha was significantly high for each of the four sub-scales and for whole scale eventually the internal consistency of the constructs and overall scale was satisfactory (Selwyn 1997, Larbi-Apau & Moseley 2012).

Computer anxiety scale uses Cohen & Waugh (1989), as was used before and was shown to be also reliable in the current study. The same positive outcome for the coefficient of reliability is recorded for the Computer Self-efficacy Scale, which supports previous studies by Ralf Schwarzer & Matthias Jerualem (1995) who recorded Cronbach's Alphas ranges between 0.76 to 0.90, with the majority in the high 0.80 (Schwarzer & Jerusalem 1995). The results from the Crombach Alpa's coefficient of reliability for the data collection tool used in the current study are reliable. Whilst the questions have to be simplified to the KS3 learners, the reliability of their results is comparable with results achieved by other studies.

6.5 The validity of the questionnaire

Construct validity is a type of test for identifying if a research instrument measures what a researcher thinks he/she is measuring (Etchegaray and Fischer 2010). Construct validity refers to testing if a measure links to other variables according to theoretical anticipation (Rubin & Babbie 2015).
For example, in the current research does the questionnaire measure the KS3 learners' attitudes towards Computer & BBC Bitesize?

There are different types of data analysis methods for measuring the validity. The KMO (Kaiser-Meyer-Olkin) and Bartlett's tests were chosen for measuring the validity in the current study. The questionnaire can be valid when the KMO result is greater than 0.5 as a bare minimum (Field 2009) and when Bartlett's test of Sphericity is significant (the value is less than 0.05) (Ibid.).

From Table 24 it can be seen that Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) value is 0.85 for all constructs (full questionnaire) which is above 0.6 and Bartlett's Test of Sphericity value is significant (P= 0.000000) which is smaller than 0.05. Therefore, the questionnaire in the current study is valid. Additionally, the KMO value is higher than 0.5 for every construct separately - Selwyn, affective, usefulness, control, behavioural, anxiety, and self-efficacy. And P value is smaller than 0.05 for every construct, Therefore, the P is significant and every construct in the questionnaire is valid. Selwyn's research confirms that his questionnaire and the first four sub-scales were valid

and were recorded as P < 0.001) (Selwyn 1997). This result is confirmed by Larbi-Apau & Moseley results in their research, which identified significant construct validity (p < 0.001) (Larbi-Apau 2011).

Similarly, Computer Anxiety Scale from Cohen & Waugh (1989) was used and validated before and it was used in the current study. Ralf Schwarzer & Matthias Jerusalem (1995) developed a questionnaire for measuring Self-efficacy-based attitude and it was used and validated before and it was used in the current study. Furthermore, the content validity of a questionnaire was established by using constructs that have already been validated by other researchers (Nunnally 1978) and this content was therefore successfully adjusted for KS3 research audience in the current study.

Table 24: KMO and Bartlett's Test

The construct	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Bartlett's Test of Sphericity
All construct	0.85	0.000000
Selwyn constructs (scale)	0.82	0.000000
Affective factor	0.80	0.000000
Perceived Usefulness	0.71	0.000000
Perceived Control	0.75	0.000000
Behavioural factor	0.75	0.000000
Anxiety factor	0.90	0.000000
Self-efficacy factor	0.90	0.000000

6.6 Testing the normality

The normal distribution of data is a bell-shaped curve. And it can take different forms depending upon the degree to which the data are distributed and parametric tests can be used for data analysis (Bryman and Cramer 2011). The perfect normal distribution can be shown as in Figure 6 below:
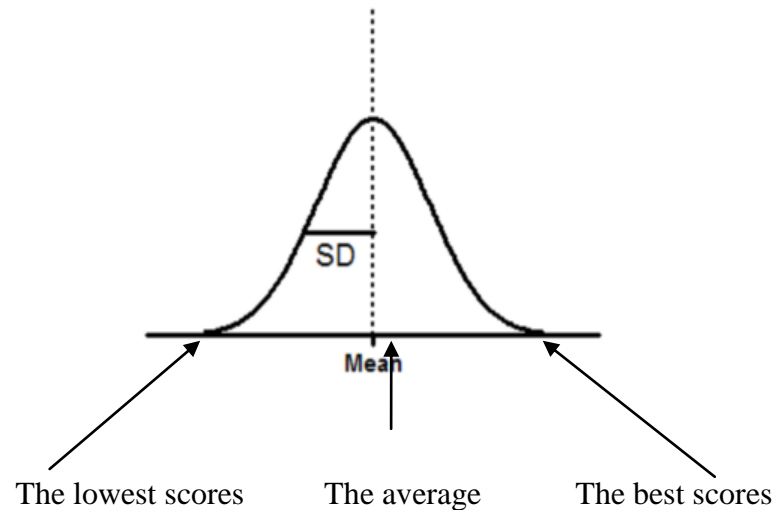
Figure 6: Standard normal disruption (GraphPad Software 2014)

If the distribution of data swerves towards the left or right (scores gathered to the left or right) that indicates that the distribution of data (scores) is not normal and non parametric tests can be used (Pallant 2010). The right and left distribution of scores can be shown graphically in the Figure 7 below:
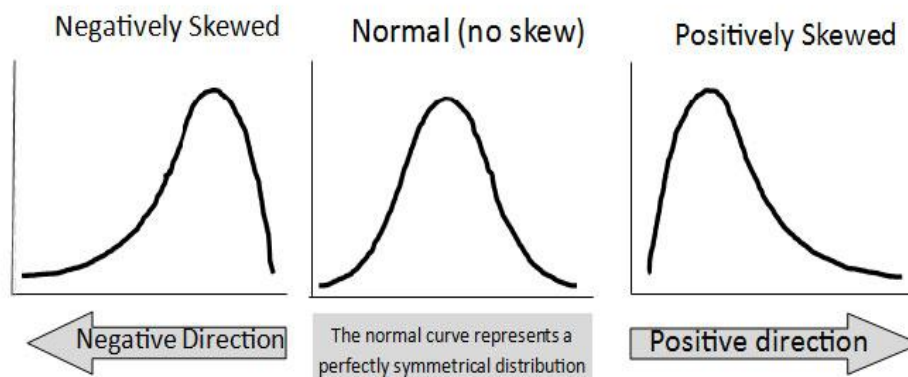
Figure 7: Representing (left and right) distribution graphically (Ai Source 2016)

This section is going to identify if the sample distribution in the current data set is normal or not, and discover the outliers and realise the effect of the extreme scores. This will be explored through the following techniques:

a. Skewness and Kurtosis statistic.

b. Graphs for clarifying the distribution

c. Kolmogorov-Smirnov and Shapiro-Wilk statistics.

6.6.1 Skewness and Kurtosis

The Skewness value provides an indication of the symmetry of the distribution of scores (Pallant 2010, p57). According to Pallant (2007 and 2010), if the Skewness and Kurtosis is 0 that means the distribution of scores is perfectly normal. Visually, Skewness shows if the data is symmetric either side of the bell-shaped curve (please see Figure 6) and Kurtosis highlights if it has a peak or flatness related to normal distribution. But, if the Skewness > 0 that means the distribution is right skewed (positively skewed) and most values are clustered on left of the mean, with extreme values to the right (Field 2013;Pallant 2013). And if the Skewness < 0 that means the distribution is left skewed (negatively skewed) and most of the values are clustered on the right of the mean, with extreme values to the left (Pallant 2010:57). Table 25 below demonstrates that the Skewness in the current dataset is < 0 and the distribution of scores for all factors are left skewed and most values are concentrated on the right of the mean. Therefore the distribution of scores in the current study **is not normal.**

Table 25: Testing the normality of distribution

The scale	Skewness	Kurtosis	Distribution	The example
Affective components'	-1.760422	3.293738	**Not normal because:** Skewness and Kurtosis is not 0 Skewness <0 so the data (negatively skewed).	Please check Figure 7.
Perceived usefulness'	-1.317316	2.578962	The same as above	Please Figure 7.
Perceived control	-0.829953	1.319325	The same as above	Please Figure 7.
Behavioural components'	-0.867266	0.240701	The same as above	Please Figure 7.
Anxiety components'	-1.217298	2.459538	The same as above	Please Figure 7.
Self-efficacy components'	-0.715164	1.428153	The same as above	Please Figure 7.
Selwyn model	-1.589460	4.673456	The same as above	Please Figure 7.
Full questionnaire (attitude)	-1.559280	5.413669	The same as above	Please Figure 7.
Achievement (Test)	-1.141825	1.992911	The same as above	Please Figure 7.

6.7 Graphs for clarifying the distribution

There is another method to find out the distribution of data by checking the histogram of the frequency of data. The selected variables can be compared with normal distribution (Field 2009;Field 2013). From Figure 8, Figure 9, Figure 10, Figure 11, Figure 12, Figure 13, Figure 14, Figure 15, and Figure 16   below it can be concluded that the scores of learners on (affective, usefulness, control, behavioural, anxiety, self-efficacy, and Selwyn) scales are clustered on the right and negatively skewed towards the left also the scores of learners' achievement are negatively directed (please compare the graphs from 8 to 16 below with the graphs in figures (6 & 7). Subsequently the distributions of scores are not normal.
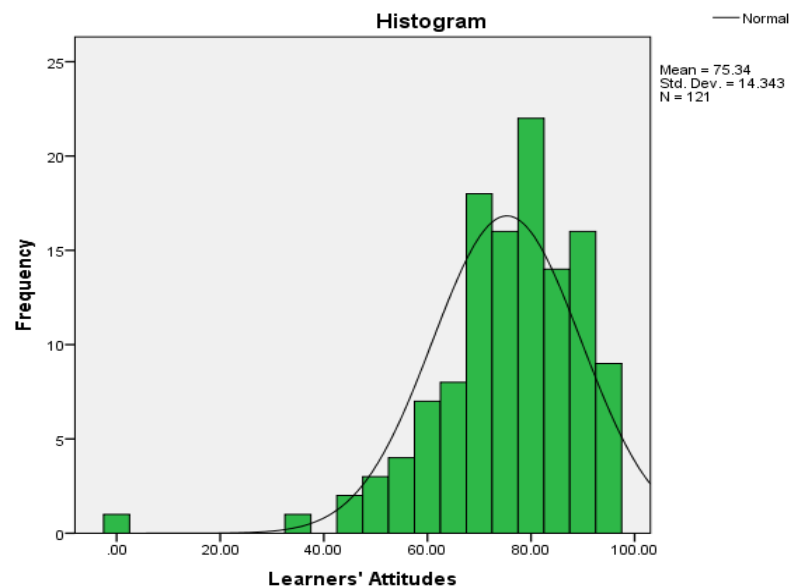
Figure 8: The frequency of the learners' attitude scores on the full scale (6 constructs)
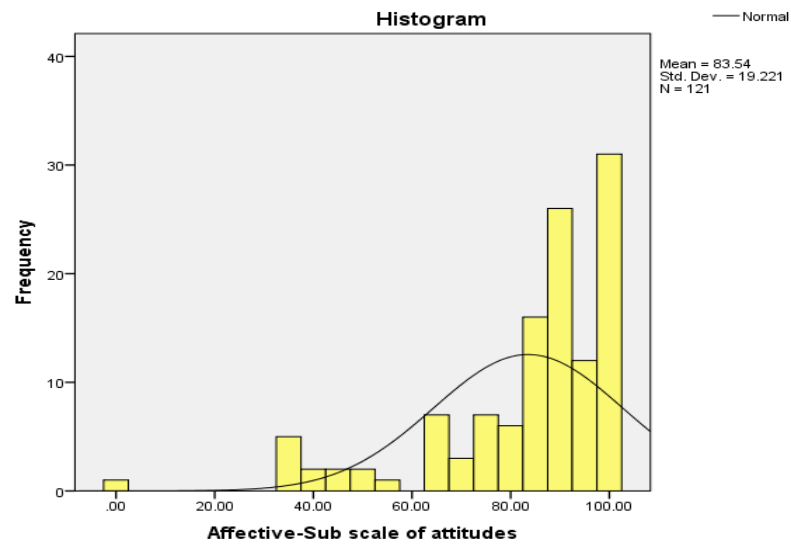
Figure 9: The frequency of the learners' attitude scores on affective sub-scale
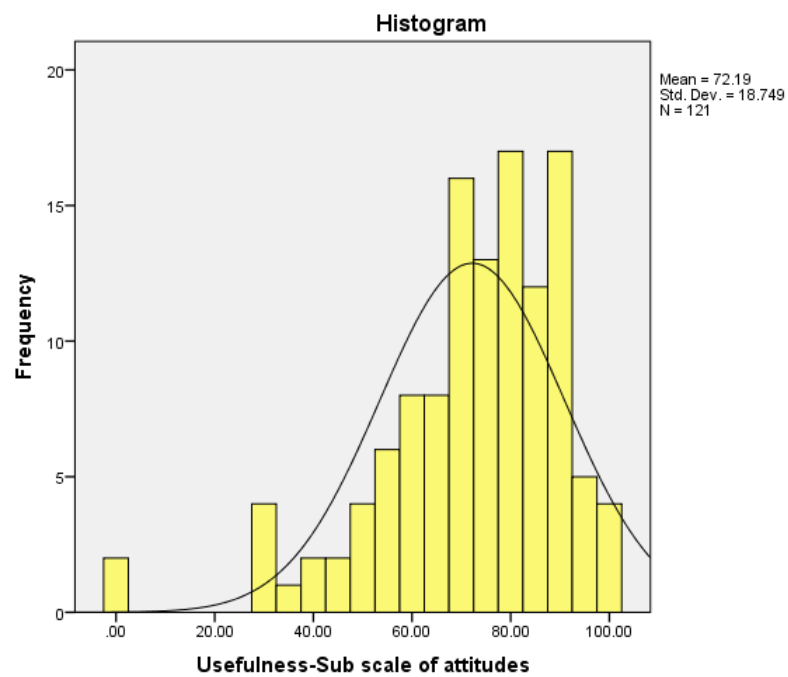
Figure 10: The frequency of the learners' attitude scores on usfulness sub-scale
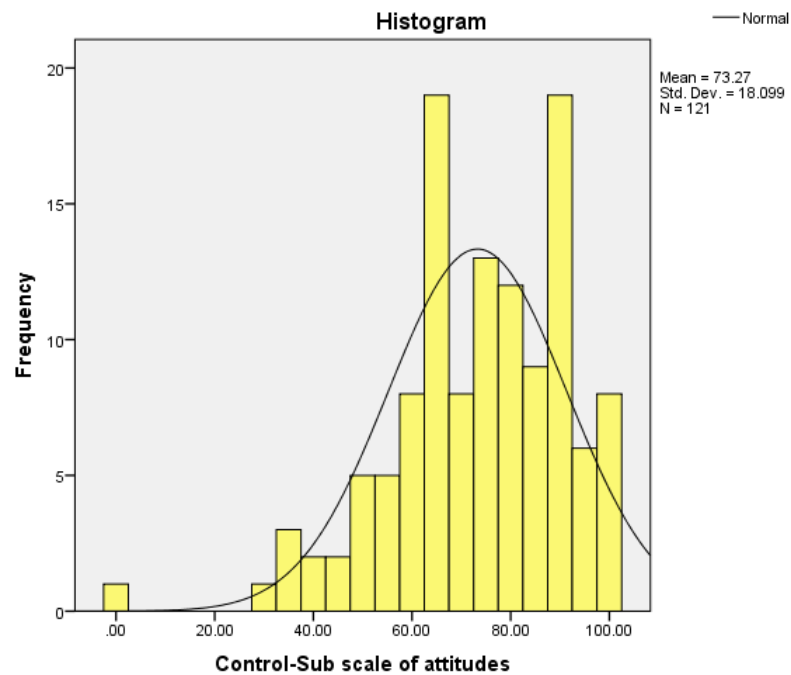
Figure 11: The frequency of the learners' attitude scores on control sub-scale
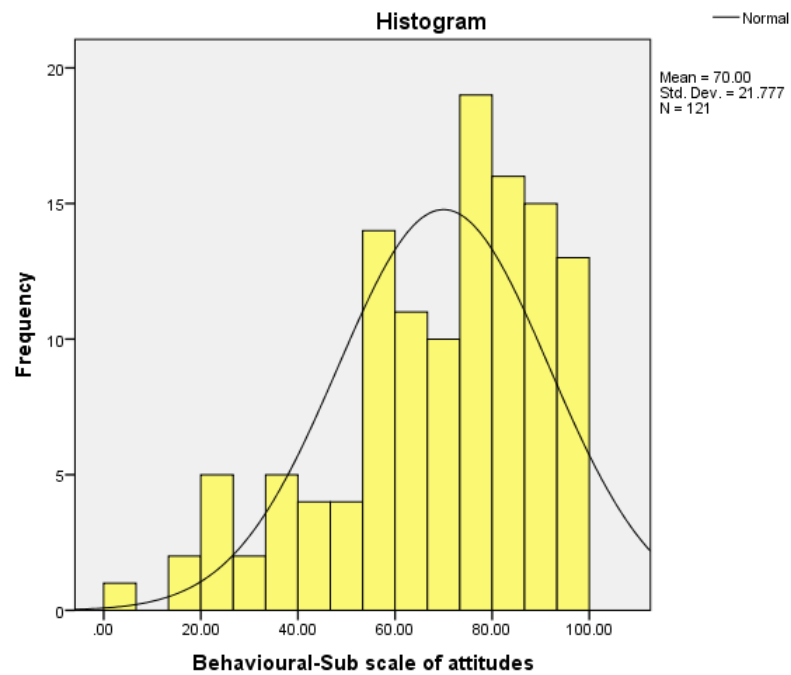
Figure 12: The frequency of the learners' attitude scores on behavioural sub-scale
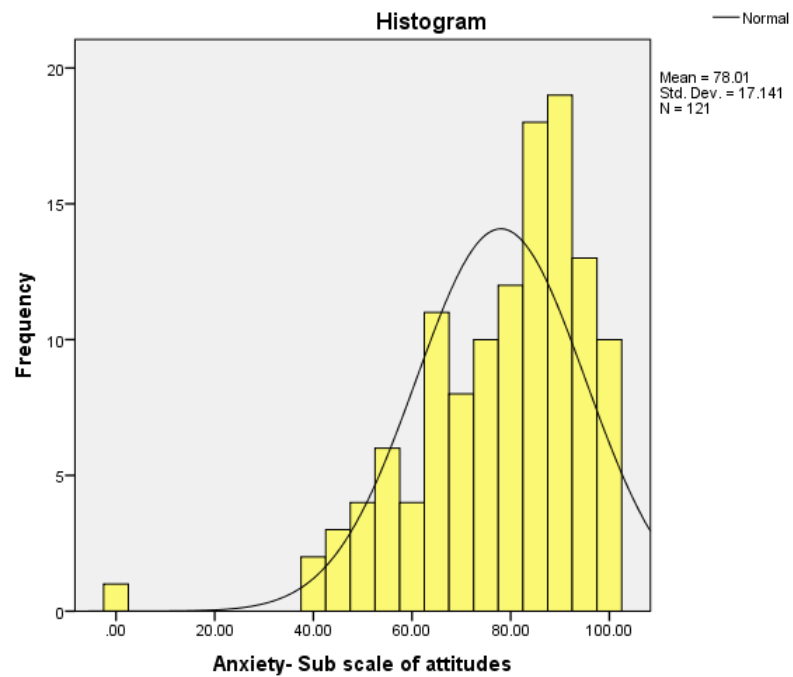
Figure 13: The frequency of the learners' attitude scores on anxiety sub-scale
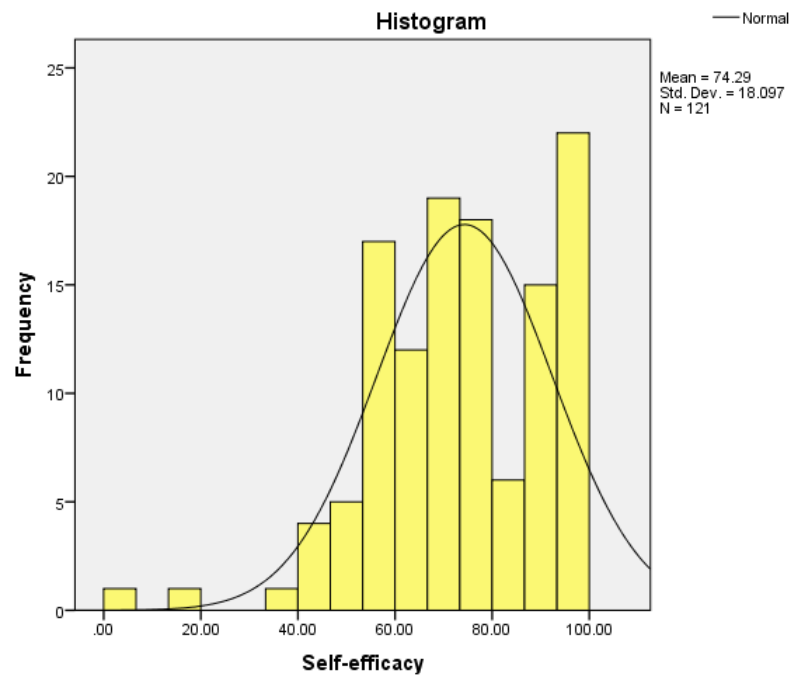
Figure 14: The frequency of the learners' attitude scores on self-efficacy sub-scale
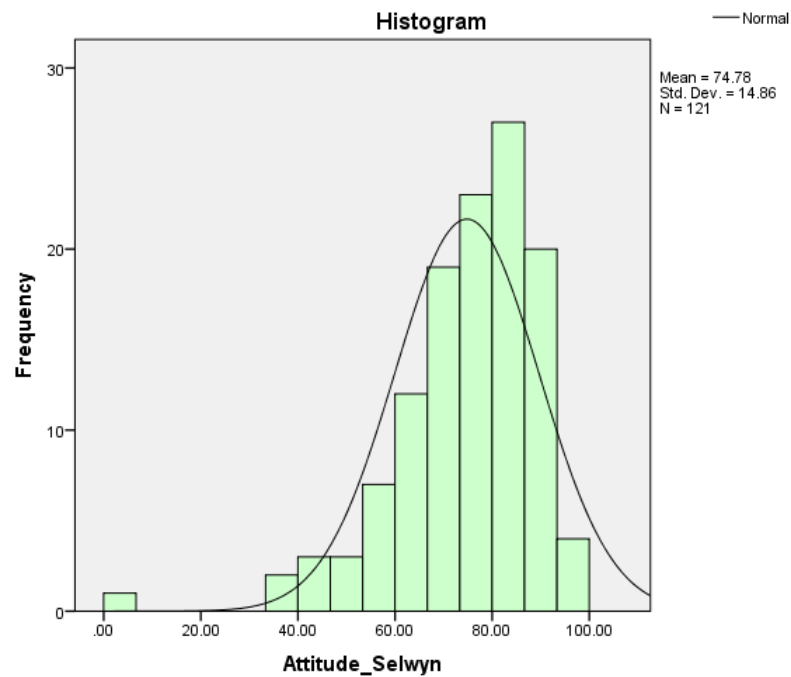
Figure 15: The frequency of the learners' attitude scores on Selwyn model
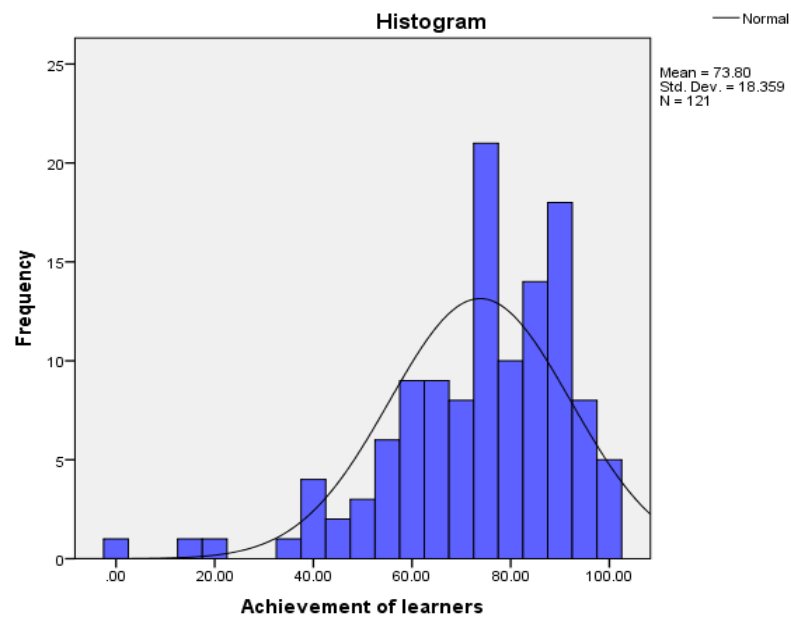
Figure 16: The frequency of the learners' achievement scores

The above figures (8, 9, 10, 11, 12, 13, 14, 15, and 16) indicate that the scores are clustering on the right end (right-hand side of the graphs) and the tail on the left side. Subsequently, the above graphs are negatively distributed (negatively Skewed) and the

scores of learners on all constructs (the current study model, affective, usefulness, control, behavioural, anxiety, self-efficacy, Selwyn model, and achievement) are not normally distributed.

6.7.1 Kolmogorov- Smirnov and Shapiro-Wilk statistics

Kolmogorov-Smirnov and Shapiro-Wilk are two data analysis tests and they can be used for checking the assumptions of normality (Field 2013, Pallant 2013). If the results of either test are significant ($P < 0.05$) the assumption of normal distribution is violated (Ibid.). It can be noted from Table 26 below that P value is smaller than 0.05 in either test for all constructs (the current study model, affective, usefulness, control, behavioural, anxiety, self-efficacy, Selwyn model, and achievement).

Table 26: Testing the normality of distribution

The scale	Kolmogorov-Smirnov	Shapiro-Wilk
	Sig. (P)	Sig. (P)
All constructs (questionnaire)	0.034204	0.000002
Selwyn Attitude	0.000405	0.000000
Affective	0.000000	0.000000
Usefulness	0.000001	0.000000
Control	0.0200000	0.000207
Behavioural	0.000078	0.000014
Anxiety	0.000068	0.000002
Self-efficacy	0.035090	0.000072
Achievement (Test)	0.000649	0.000000

The results in Table 26 above indicate that the data set is significant $P < 0.05$ for all factors, therefore the distribution of scores is **not normal**.

6.8 The outlier

The outliers mean that the extreme values and scores which are in the data set and are at the extreme sides of the bell-shaped curve. The range of effect can be known through counting the difference between the Original Mean and 5% Trimmed Mean (Pallant 2013; Pallant 2010). It can be noted from the Table 27 below that the difference between the **Original Mean** and **5% Trimmed Mean** is too little (1% to 2%), so there are no extreme scores having a big influence on the mean.

Table 27: The difference between original mean and 5% trimmed mean

The scale	Original Mean Out of 100	5% Trimmed Mean Out of 100	Difference
Full questionnaire (Attitude)	75.00	76.00	1%
Affective Attitude	84.00	86.00	2%
Usefulness Attitude	72.00	74.00	2%
Control Attitude	73.00	74.00	1%
Behavioural Attitude	70.00	71.00	1%
Anxiety Attitude	78.00	79.00	1%
Self-efficacy Attitude	74.00	75.00	1%
Selwyn Attitude	75.00	76.00	1%
Achievement (Test)	74.00	75.00	1%

From Table 27 above it can be concluded that the outliers do not need further investigation, and the result is appropriate for further statistical analysis. The values are not so different between Original Mean 5% Trimmed Mean. Therefore, the extreme cases can be retained (Pallant 2016).

6.9 The findings of KS3 learners' attitudes via a questionnaire

This section demonstrates the results which were achieved by using a questionnaire based on 6 psychological factors for identifying the KS3 learners' attitudes towards technology in classroom as shown below in Figure 17. Subsequently; this section will answer the first research question "**How does BBC Bitesize affect the KS3 learners' *attitudes* towards Online learning methods**?"
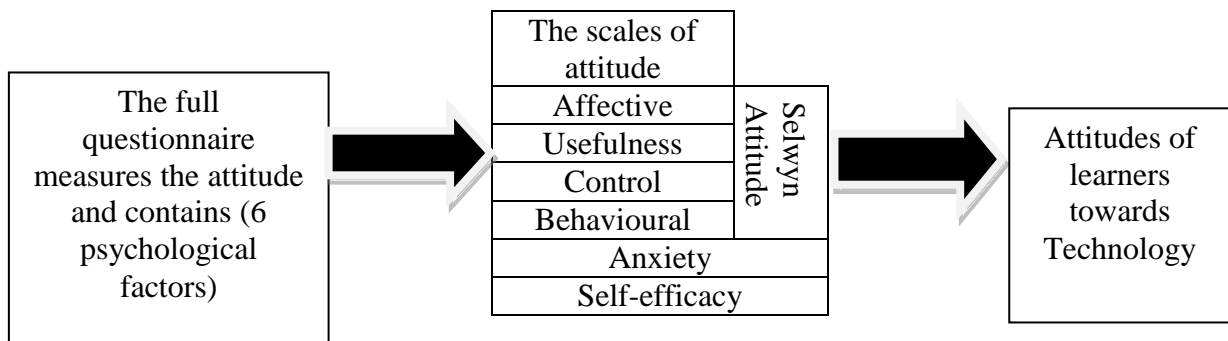
Figure 17: The full scales of questionnaire for measuring KS3 learners' attitudes towards technology

This section is going to demonstrate the following findings:

a. The mean & median of attitudes scores of learners based on full questionnaire, *Selwyn* scales, anxiety scale, & self-efficacy scales.

b. The percentage of KS3 learners who have (positive & negative) attitudes towards technology.

c. The relationship between KS3 learners' attitude and its sub-scales.

6.9.1 The mean and median

The mean is the average of a set of scores and it can be calculated by aggregating all the scores and dividing them on the number of participants. The mean is the favourite measure when the scores are normally distributed (Anderson 2015). The median is the middle of distribution of the scores (50% of the scores located before it). The median can

be used when there are extreme values (the scores are not normally distributed) (Ibid.), which is the case in this study. So the results of median will be more considered.

Table 28 and Figure 18 & Figure 19 below show the means and medians of KS3 learners' attitudes scores towards BBC Bitesize.

The mean and median of scores of attitudes of KS3 learners are positive towards BBC Bitesize for every construct. Moreover, it can be noticed that the mean of scores of affective attitude is the highest followed by anxiety attitude, then the full model attitude, then Selwyn attitude, then self-efficacy attitude, then control attitude, then usefulness attitude, and the last one is behavioural attitude. Regarding the median of scores the anxiety attitude is the highest followed by the affective attitude, then both full model attitude and Selwyn attitude with the same value, then are a few constructs such as (usefulness attitude, control attitude, and behavioural attitude) with the same values, and the last one is self-efficacy attitude with the lowest value. The results can be explained as follows:

a) **Affective attitude:**

The results denote that the KS3 learners have positive attitudes against affective standards such as positive (feeling, satisfaction, approach, and appreciation) towards learning Science via BBC Bitesize.

b) **Usefulness attitude**

The results point out that KS3 learners have the intention and determination to use BBC Bitesize for learning Science. Additionally KS3 learners believe and feel that using BBC Bitesize will enhance their performance.

c) **Control attitude**

The results show that KS3 learners believe that they are able to use BBC Bitesize easily without any difficulty or problem for learning Science. This means KS3 learners have enough skills and knowledge to use BBC Bitesize and technology for learning.

d) Behavioural attitude

The results illustrate that KS3 learners have a **positive** behaviour towards BBC Bitesize which is derived from the learners belief. This means KS3 learners perform positive behaviour towards BBC Bitesize because their beliefs and philosophy accept and welcome using technology for learning Science.

e) Selwyn attitude

The results demonstrate that KS3 learners have positive attitude against Selwyn model. This was explained in the first four constructs above because Selwyn model comprehends (affective, usefulness, control, and behavioural) constructs.

f) Anxiety attitude

The results demonstrate that KS3 learners have positive attitudes against anxiety construct. This can be explained by saying that KS3 learners do not have any feeling of fear, tension, worry, or hesitation when they use BBC Bitesize for learning Science.

g) Self-efficacy attitude

The results point out that KS3 learners have positive attitude against self-efficacy construct. This means KS3 learners have a sense of confidence and faith that they have the capability to achieve the target of the course of Science by using BBC Bitesize.

h) Full scale attitude

The full scale of attitude comprehends the above 6 constructs (affective, usefulness, control, behavioural, anxiety, and self-efficacy). The findings show that KS3 learners have positive attitude against the full scale. Also, the learners are motivated to study Science via BBC Bitesize because of their beliefs, feelings, and satisfaction. Moreover, they are directed by their satisfaction to be involved in the course activity via BBC Bitesize autonomously. Furthermore, the learners do not

get fed up of using BBC Bitesize and they continue towards the objectives of the course of Science. Also, the attitude of learners stem from positive emotional disposition towards studying Science via BBC Bitesize. Overall, KS3 learners respond positively and favourably for learning Science through BBC Bitesize.

Table 28: The means and medians of scores of attitudes for 121 learners

The factors	The number of items	Learners number	Minimum	Maximum	Mean	Mean out of 100	Median	Median out of 100
Affective attitude	6	121	0	24	20.047/24	83.53	19/24	79
Usefulness attitude	5	121	0	20	14.438/20	72.19	15/ 20	75
Control attitude	6	121	0	24	17.584/24	73.27	18/ 24	75
Behavioural attitude	5	121	0	20	14/20	70.00	15/20	75
Anxiety attitude	15	121	0	60	46.8/60	78	49/60	82
Self-efficacy attitude	10	121	0	40	29.716/40	74.29	29/40	73
Selwyn attitude based on 4 factors	22	121	0	88	65.80/88	74.78	69/88	78
The attitude based on 6 factors	47	121	0	188	141.64/188	75.34	146/188	78
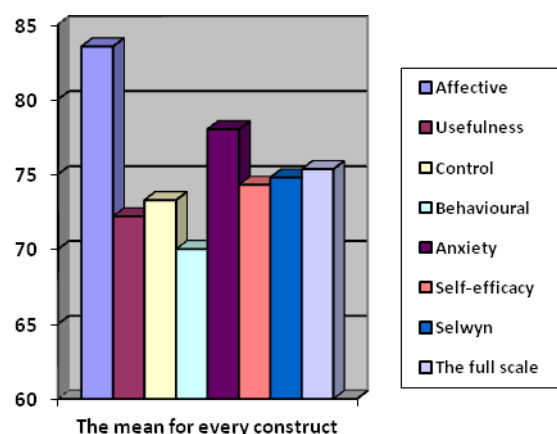
Figure 18: The means scores of 121 KS3 learners' attitudes
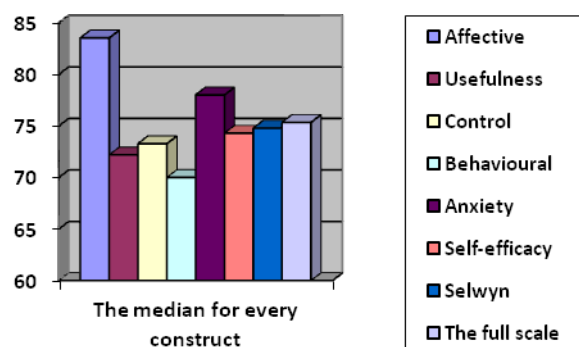
Figure 19: The median scores of 121 KS3 learners' attitudes

6.9.2 The percentage of learners who have positive and negative attitudes

Table 29, Figure 20, Figure 21, Figure 22, & Figure 23 below show the percentage of learners who have positive and negative attitudes towards BBC Bitesize. It can be noted that the percentage of KS3 learners who have positive attitudes is high especially if it has been compared with the percentage of learners who have negative attitude towards BBC Bitesize. The high percentage of positive attitude in every construct is another factor to let teachers, educators, and researchers understand that KS3 learners are satisfied in using BBC Bitsize for studying Science. Overall, the vast majority of KS3 learners accept using BBC Bitesize for learning Science.

Table 29: The percentage of KS3 learners who have positive & negative attitudes

The scales	Positive attitude	Negative attitude
Affective	93%	7%
Usefulness	91%	9%
Control	93%	7%
Behavioural	85%	15%
Anxiety attitude	94%	6%
Self-efficacy attitude	94%	6%
Selwyn attitude	91%	9%
The attitude based on full questionnaire (all scales)	92%	8%
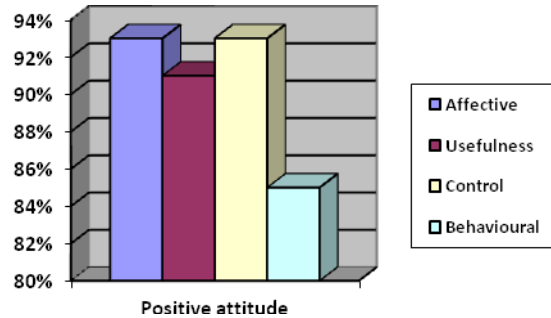
Figure 20: The percentage of KS3 learners who have positive attitude on (affective, usefulness, control, and behavioural)
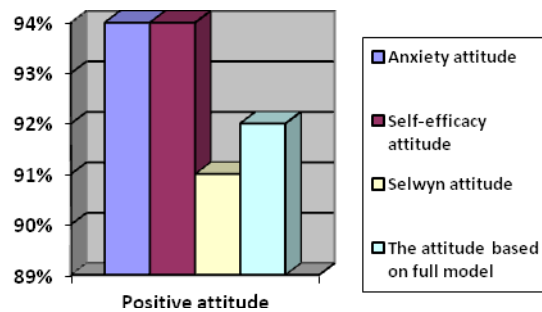
Figure 21: The percentage of KS3 learners who have positive attitude on (anxiety, self-efficacy, Selwyn, and full model)
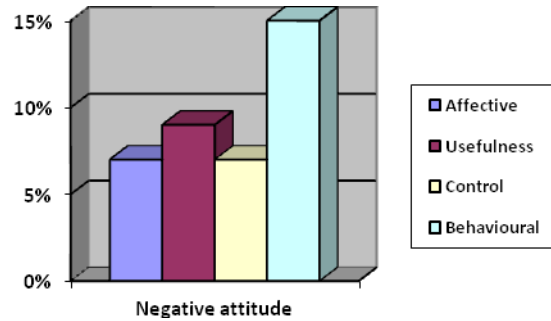
Figure 22: The percentage of KS3 learners who have negative attitude on (affective, usefulness, control, and behavioural)
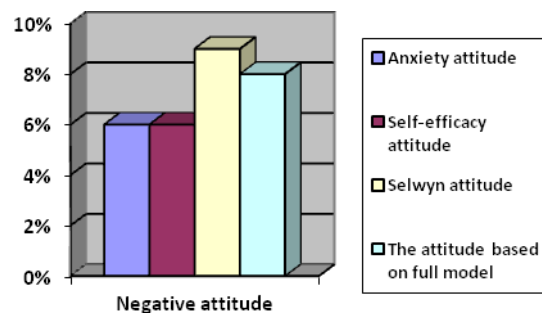
Figure 23: The percentage of KS3 learners who have negative attitude on (affective, usefulness, control, and behavioural)

6.9.3 The relationship (collinearity) between KS3 learners' attitudes and the 6 socio-psychological constructs

Studying the relationship among the attitude and its components enriches the current study and helps in depicting a more comprehensive picture of attitude as well as it presents a profound insight of attitude. Studying the influence among the components will demonstrate the interrelatedness between them. Understanding the interrelatedness can be applicable in the classroom. In other words, if the correlation between KS3 learners' attitudes and the attitude components is negative, classroom teachers are advised to endeavour to reduce the negative factors, and if the relationship between KS3 learners' attitudes and the attitude components is positive classroom teachers are encouraged to reinforce these factors. There are two types of correlation coefficient tests can be used:

a- Correlation coefficient (Spearman's Rho test) (the non-parametric test) which can be used when the distribution of data is not normal as it is in the present study (Pallant 2010, 2013).

b- Correlation coefficient (Person) which can be used for the distribution of data is normal (Ibid.).

Actually, there are rules for determining the strength of the relationship between two variables. The value of correlation coefficient ranges between -1 and 1.

A correlation of 0 indicates no relationship at all (Pallant 2007;Pallant 2010).

A correlation of 1 indicates a perfect positive correlation (Ibid.).

A correlation of -1 indicates a perfect negative correlation (Ibid.).

Cohen (1988) suggests the following guidelines:

r = .10 to .29 (small correlation) (Ibid.).

r = .30 to .49 (medium correlation) (Ibid.).

r = .50 to 1.0 (large correlation) (Ibid.).

The significant results can be recognised as follows:

P <= 0.05 means that the result value is significant (Field 2009; Pallant 2010).

P < 0.01 means that the result value is highly significant (Ibid.).

Table 30, Figure 24, Figure 25, Figure 26, Figure 27, Figure 28, & Figure 29 show that there is a strong uphill (positive) linear relationship between the attitude and (affective, control, behavioural, anxiety, and self-efficacy). But there is a medium uphill (positive) linear relationship between the attitude and usefulness. And all the results are highly significant because P < 0.01. The size of effect of the components of attitude on the attitude is different. The highest is anxiety, followed by behavioural, control, self-efficacy, affective, and then usefulness. Overall, all the attitude components are important for identifying KS3 learners' attitudes towards BBC Bitesiz and for encouraging KS3 learners to learn through BBC Bitesize.

Table 30: The Spearman's rho correlation between KS3 learners' attitude & its socio-psychological constructs

	The model constructs (6 factors)					
	Affective	**Usefulness**	**Control**	**Behavioural**	**Anxiety**	**Self-efficacy**
Attitude (all scales)	(r)	(r)	(r)	(r)	(r)	(r)
	0.55	0.46	0.78	0.81	0.86	0.72
	(P)	(P)	(P)	(P)	(P)	(P)
	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).
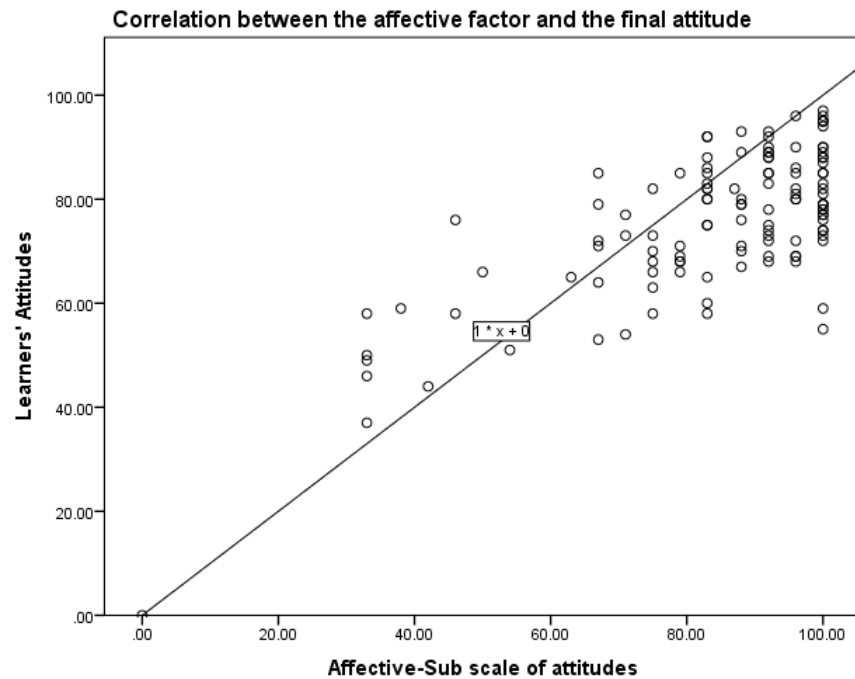
Figure 24: The correlation of 0.55 between the affective factor and the final attitude
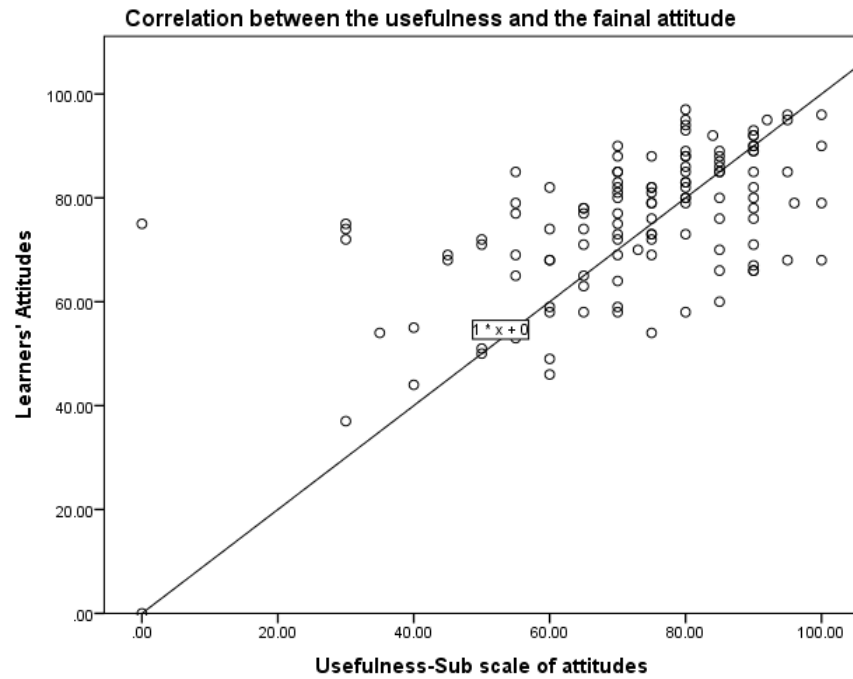
Figure 25: The correlation of 0.46 between the usefulness factor and the final attitude
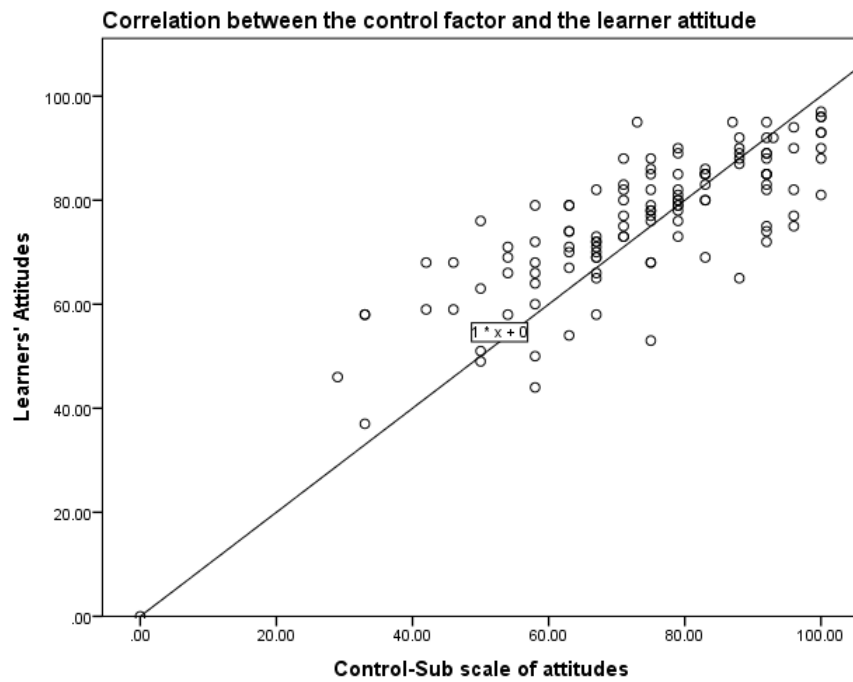
Figure 26: The correlation of 0.78 between the control factor and the final attitude
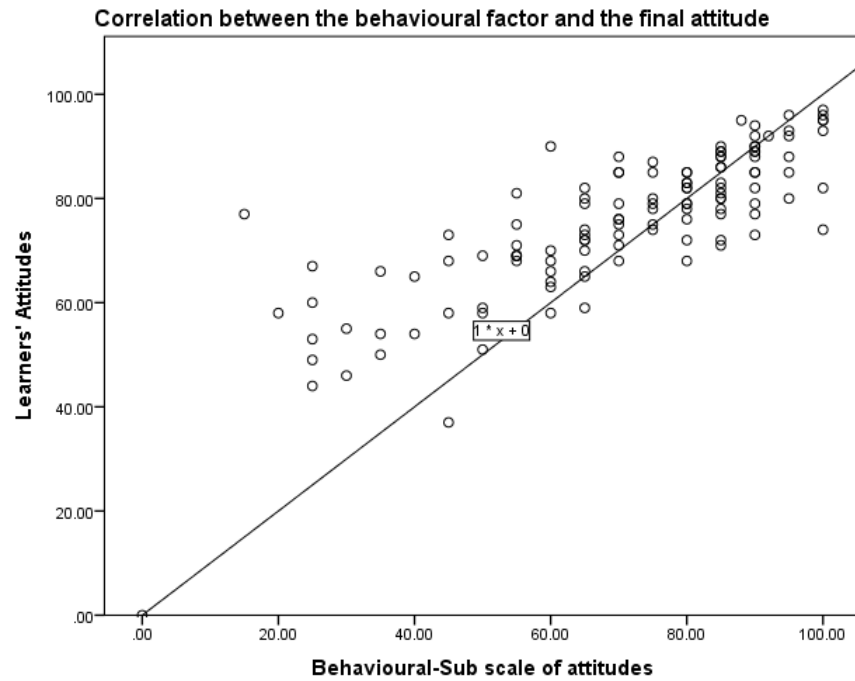
Figure 27: The correlation of 0.81 between the behavioural factor and the final attitude
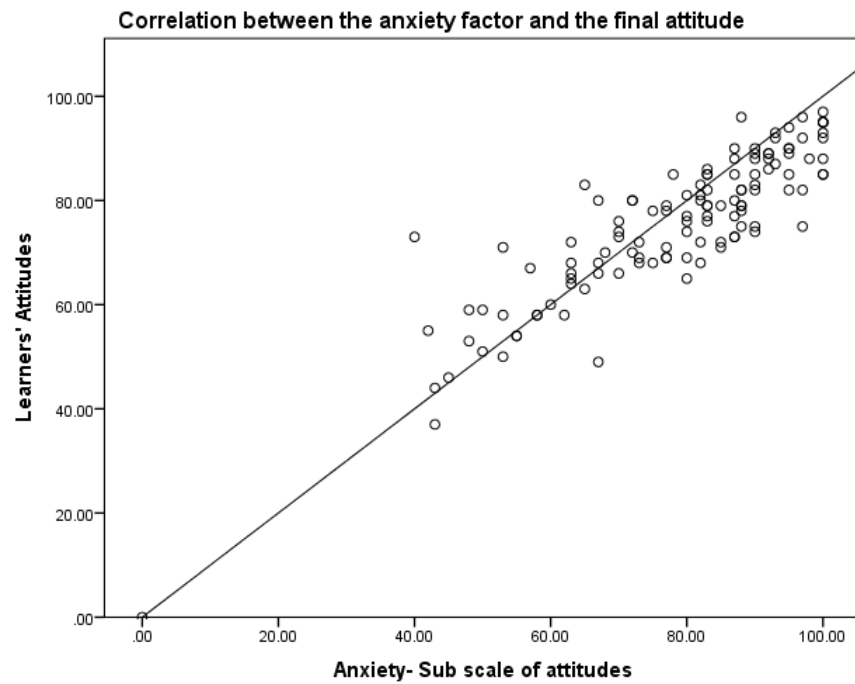
Figure 28: The correlation of 0.86 between the anxiety factor and the final attitude

167
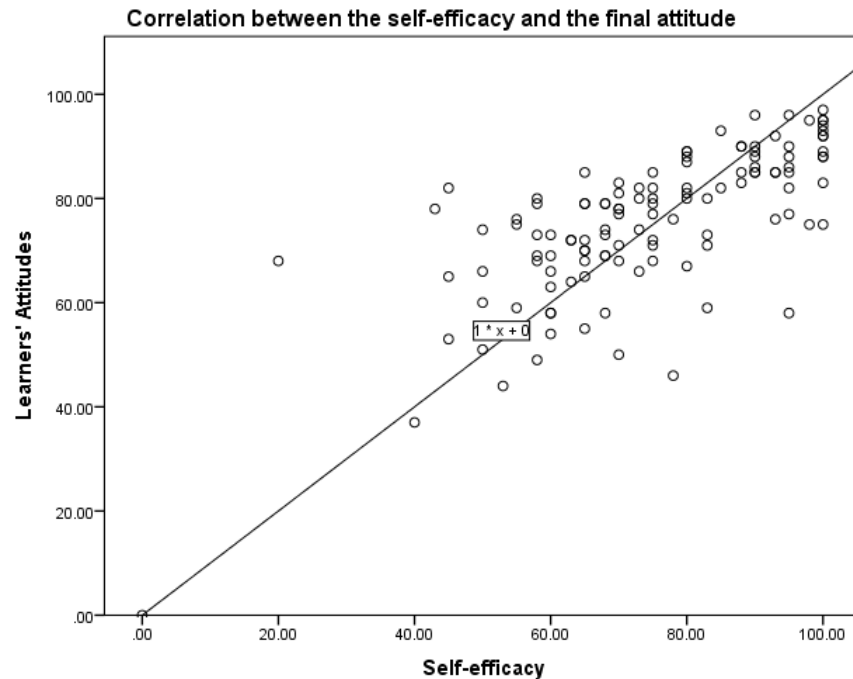
Figure 29: The correlation of 0.72 between the self-efficacy factor and the final attitude

6.9.4 The relationship (collinearity) between Selwyn attitude of KS3 learners and its 4 socio-psychological constructs

Conducting the test of correlation (Spearman's rho) between Selwyn attitude and its components (affective, usefulness, control, and behavioural) measures the consistency between Selwyn model and its components. This will help in realising the validity and the importance of Selwyn model for studying the attitudes of KS3 towards Online learning (BBC Bitesize). Table 31, Figure 30, Figure 31, Figure 32, & Figure 33 show that there is a strong uphill (positive) linear relationship between the Selwyn attitude and (affective, usefulness, control, and behavioural) and all results are highly significant because p-value< 0.01. The strongest impact of the components on Selwyn attitude is behavioural followed by control, then usefulness and affective as they have same size of effect.

Table 31: The Spearman's rho correlation between Selwyn attitude of KS3 learners & its 4 socio-psychological constructs

	Selwyn model components (4 constructs)			
	Affective	**Usefulness**	**Control**	**Behavioural**
Selwyn	(r)	(r)	(r)	(r)
Attitude	0.60	0.60	0.74	0.86
	(P)	(P)	(P)	(P)
	0.000000	0.000000	0.000000	0.000000
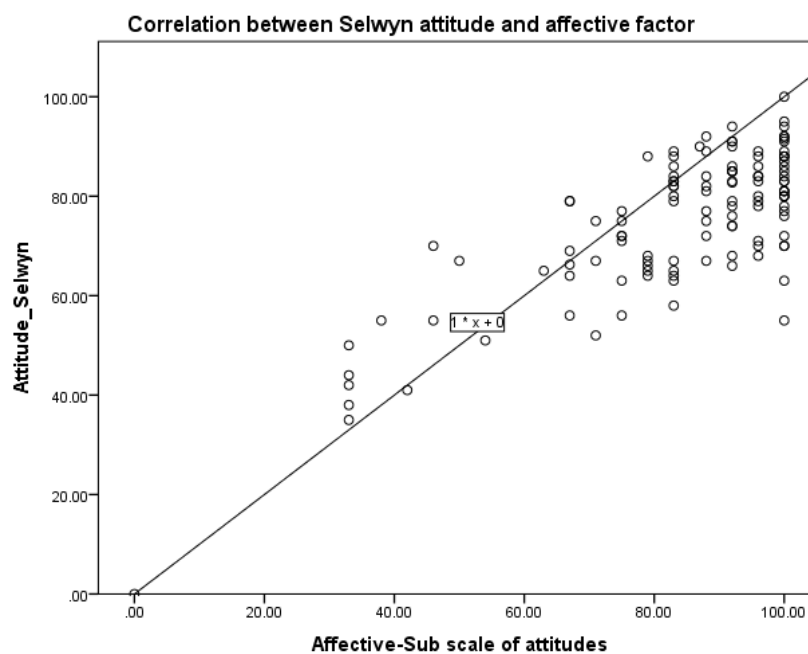
Figure 30: The correlation of 0.60 between the Selwyn attitude and the affective components
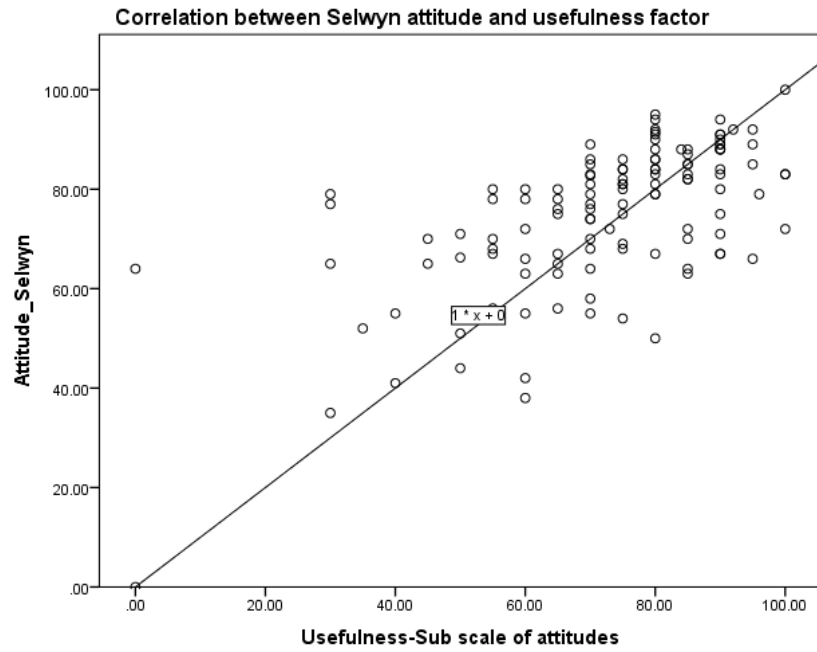
Figure 31: The correlation of 0.60 between the Selwyn attitude and the usefulness components
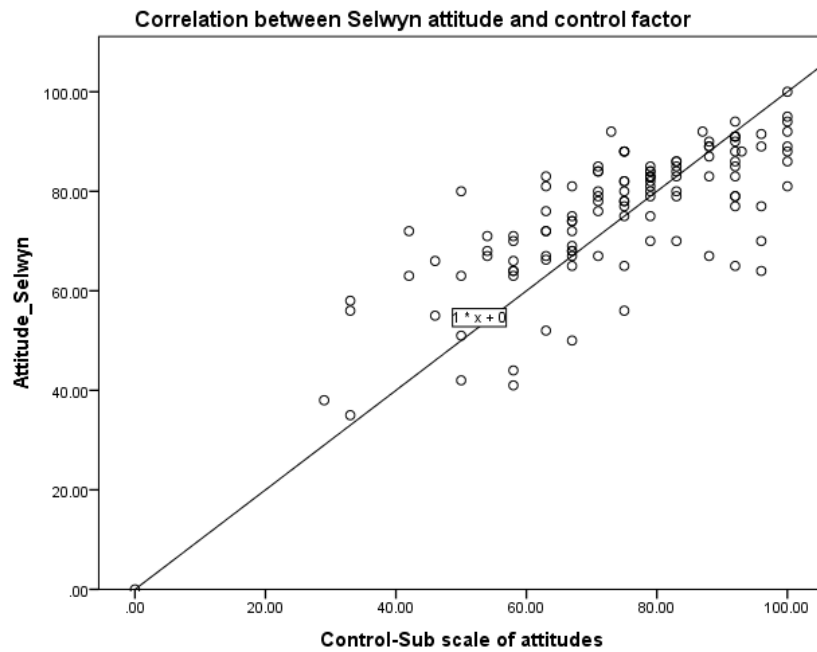
Figure 32: The correlation of 0.74 between the Selwyn attitude and the control component
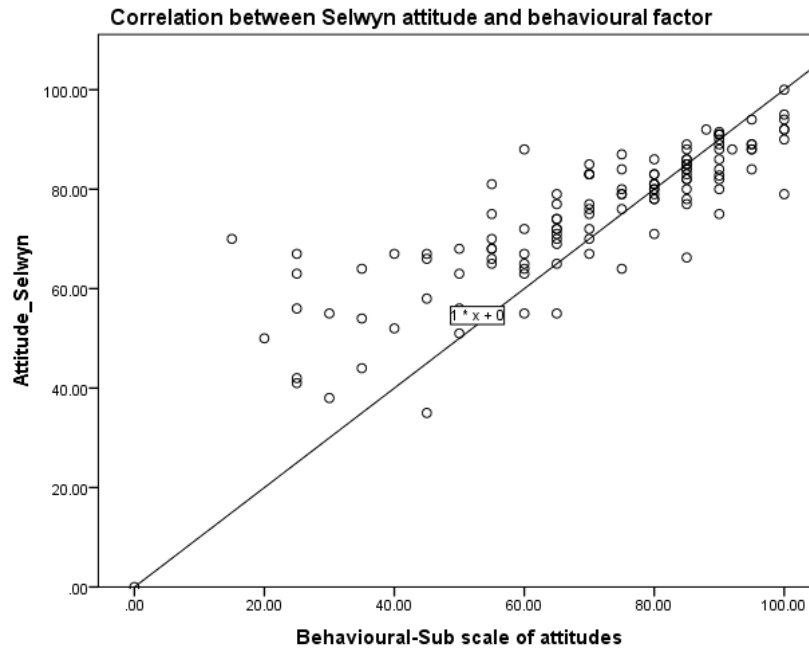
Figure 33: The correlation of 0.86 between the Selwyn attitude and the behavioural component

6.10 The findings of KS3 learners achievement

This section displays the tangible results which were achieved by using summative test for exploring KS3 learners' attainment and this section is going to answer the second research question "**How does BBC Bitesize (Online learning source) affect the KS3 learners' achievement**?"

These findings will be demonstrated as follows:

   a. The mean & median of achievement scores of KS3 learners.

   b. The percentage of successful learners.

6.10.1   The mean & median

Table 32 & Figure 34 below show that the mean scores of achievement for 121 KS3 learners is 73 out of 100 and the median scores is 77 out of 100. It can be noticed that the mean and median scores are satisfactory if they have been compared with successful score (50 out of 100). So, it can be concluded that the outcome of KS3 learners by using BBC Bitesize for learning Science autonomously is acceptable.

171

Table 32: The means and the medians of achievement for KS3 learners

The School	Learners' Numbers	Means	Medians
Manchester Academy	57	69	73
AL-Noor School	64	78	80
Both Schools	121	73	77
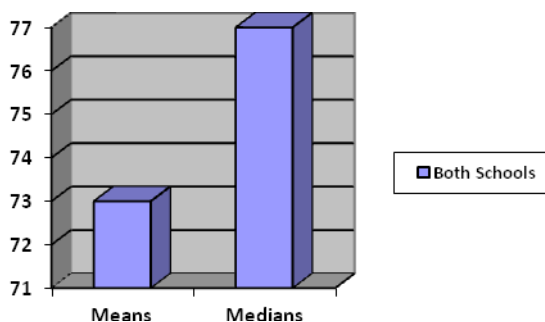
Figure 34: The means and the medians of achievement

6.10.2 The percentage of learners who passed the test

The threshold for successful completion of the test is set at 50 out of 100. This achievement level is chosen for the current test.

Table 33 & Figure 35 below show that the percentage of KS3 learners who passed the test is 92% i.e. 92% of KS3 learners answered 50% or more of the test questions. On the other hand 8% of the learners did not pass because they did not answer 50% of the test questions. There can be a number of reasons why the result of unsuccessful learners is not in line with the majority of learners and theses reasons are:

a. The learners do not have satisfaction or motivation to use technology.
b. They have technophobia or they find it difficult to use technology.
c. They do not feel they are skilled and trained enough to use technology.

Overall, they do not have positive attitude towards technology. Or they do not believe that BBC Bitesize is attractive enough to be used for learning autonomously.

Table 33: The percentage of successful & unsuccessful learners in the test

The factor	Learners number	Successful learners	Unsuccessful learners
The achievement	121	92%	8%
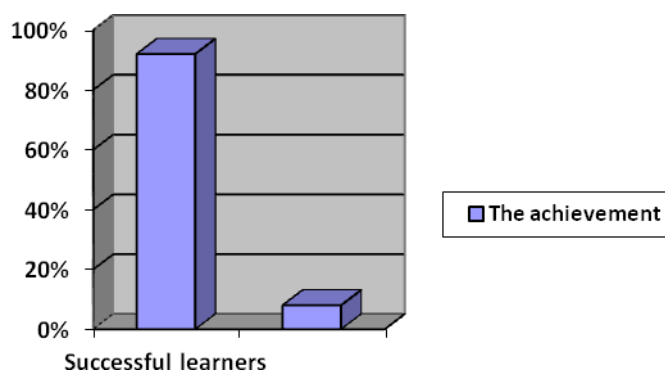
Figure 35:The percentage of successfull learners

6.11 The effectiveness of BBC Bitesize for learning

As defined before, the effectiveness of learning is measured by gaining knowledge, skills and attitudes (the effectiveness in the definition section). Table 34, Figure 36, & Figure 37 below show the effectiveness as follows:

1. It can be noted that the attitude of KS3 learners towards BBC Bitesize show that 92% of KS3 learners have positive attitudes and their mean of scores on all attitude scales is (141.64 out of 188 or 75 out of 100) and the median is (146 out of 188 or 78 out of 100), therefore the effectiveness of BBC Bitesize for learning is satisfactory.

2. It can be noted that Selwyn attitude of KS3 learners towards BBC Bitesize show that 91% of KS3 learners have positive attitudes and their mean of scores on all attitude scales is (66 out of 88 or 75 out of 100) and the median is (69 out of 88 or

173

78 out of 100), therefore the effectiveness of BBC Bitesize for learning is satisfactory.

3. It can be noted that the achievement of KS3 learners in the test shows that 92% of KS3 learners, who have passed the test, and their mean of scores of achievement is 74 out of 100 and the median is 77 out of 100, the effectiveness of BBC Bitesize for learning is acceptable.

Table 34: The effectiveness of BBC Bitesize for learning

The factor	Learners number	The effectiveness	The mean of KS3 learners scores	The median of KS3 learners scores
The attitudes based on six factors	121	92% of the KS3 learners have positive attitude towards BBC Bitesize.	75 out of 100	78 out of 100
The attitudes based on 4 factors (Selwyn)	121	91% of the KS3 learners have positive attitude towards BBC Bitesize.	75 out of 100	78 out of 100
The achievement	121	92% of the KS3 learners achieved the successful score via using BBC Bitesize .	74 out of 100	77 out of 100
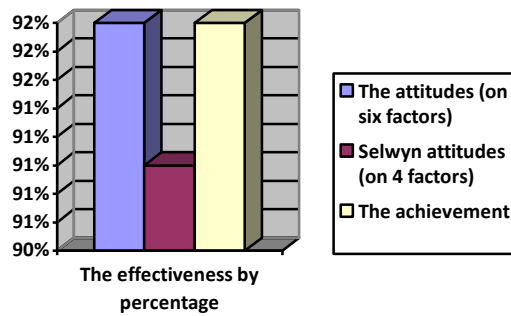
Figure 36: The effectiveness of BBC Bitesize according the percentage of attitude based on (study model, & Selwyn model), & achievement
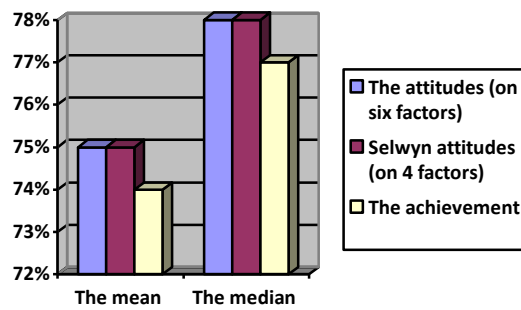
Figure 37: The effectiveness of BBC Bitesize according the mean & median of attitude based on (study model, & Selwyn model), & achievement

The results of attitude and achievement demnostrate that using BBC Bitesize is helpful for learning . But, as it will be discussed in the recommendation section for the future studies, measuring the effectiveness of BBC Bitesize by comparing it with other kinds of technology or other learning websites for understanding the learning/teaching process efficiency.

6.12 The relationship between attitudes and achievement

This section shows the association between the attitudes (all scales) and achievement and the relationship between the achievement and the different kinds of attitudes scales (*Selwyn* scales, anxiety scale and self-efficacy scale). This section is going to answer the third research question **"How do the KS3 learners' *attitudes* affect their achievement?"** All the findings were concluded via using non-parametric test (Spearman's Rho test) because the distribution of scores is not normal.

The current study attempts to find out the rapport between KS3 learners' achievement and their attitudes towards Computer & BBC Bitesize. Understanding the relationship between the attitudes and achievement will encourage KS3 teachers to plan their lessons in the light of the current results for raising up KS3 learners' achievement. Therefore, Table 35 reveals that there is a medium significant relationship between KS3 learners' achievement and their attitudes (all scales). This is because $r = 0.48$ and it falls into the 0.30 to 0.49 medium correlation range as well as $p = 0.000020$ and therefore < 0.01 means that the result value is highly significant (please see Figure 45).

Additionally, there is a medium significant relationship between KS3 learners' achievement and, affective, behavioural, anxiety, and Selwyn attitude because $r > 0.30$ and it falls into the 0.30 to 0.49, where the results are highly significant because $p < 0.01$ (please see Table 35, Figure 38, Figure 41, Figure 42, & Figure 44). But there is a small correlation between KS3 learners' achievement and usefulness, control, and self-efficacy because $r < 0.30$ and it falls into the 0.15 to 0.29 and the result is significant ($p < 0.05$) (please see Table 35, Figure 39, Figure 40, & Figure 43).

Table 35:The relationship between the (attitude & attitude components) and achievement

The correlation (Spearman's rho)	(r)	Significant (p)
Affective attitude X The achievement	0.31	0.000595
Usefulness attitude X The achievement	0.25	0.006154
Control attitude X The achievement	0.26	0.003333
Behavioural attitude X The achievement	0.31	0.000516
Anxiety-attitude X The achievement	0.32	0.000427
Self-efficacy-attitude X The achievement	0.20	0.027116
Selwyn attitude X The achievement	0.38	0.000014
Attitude (all scales) X The achievement	0.48	0.000000

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).
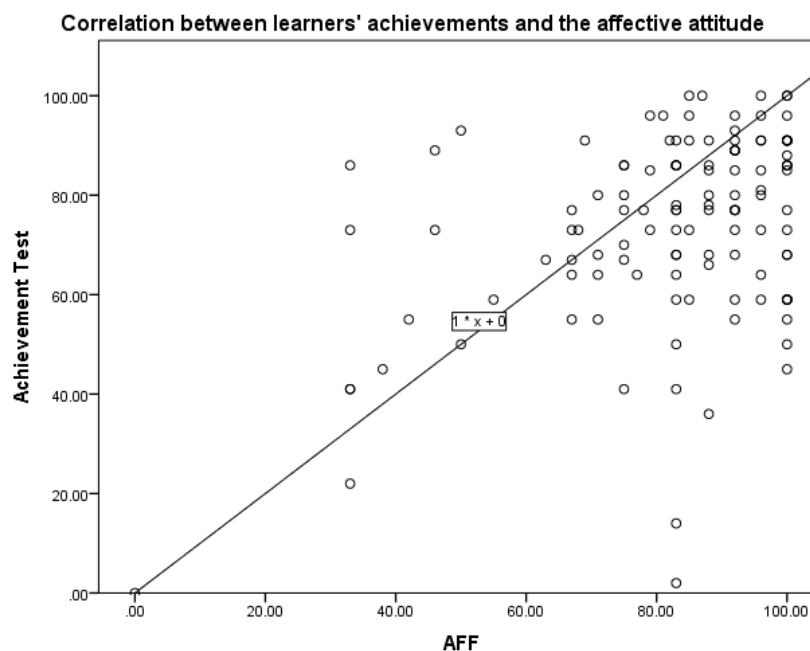
Figure 38: Correlation of 0.31 between learners' achievements and affective attitude
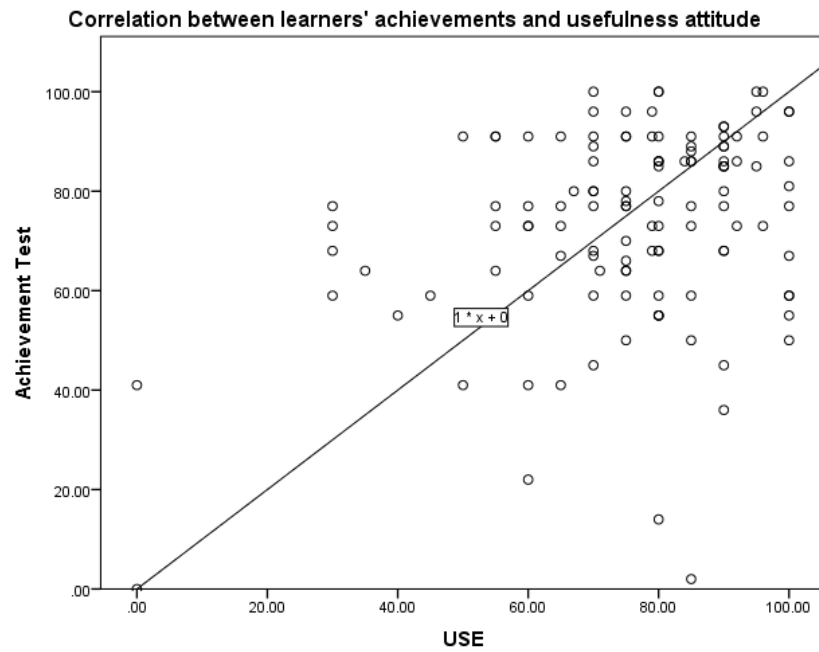
Figure 39: Correlation of 0.25 between learners' achievements and usefulness attitude
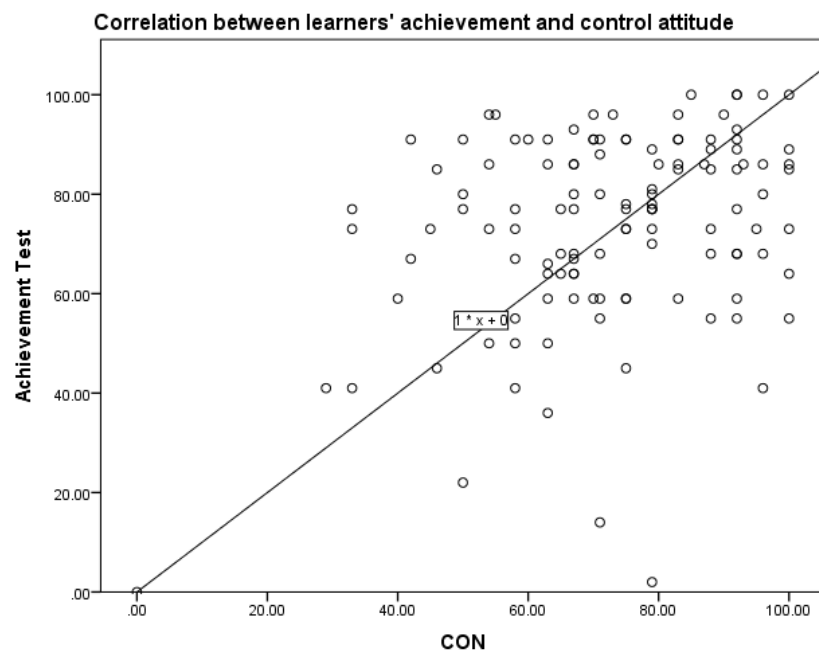
Figure 40: Correlation of 0.26 between learners' achievements and control attitude
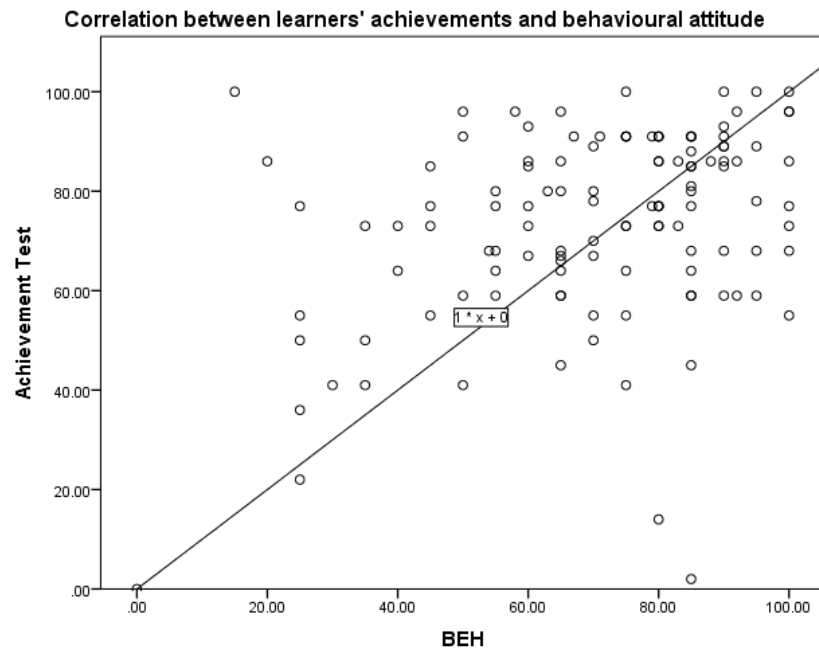
Figure 41: Correlation of 0.31 between learners' achievements and behavioural attitude
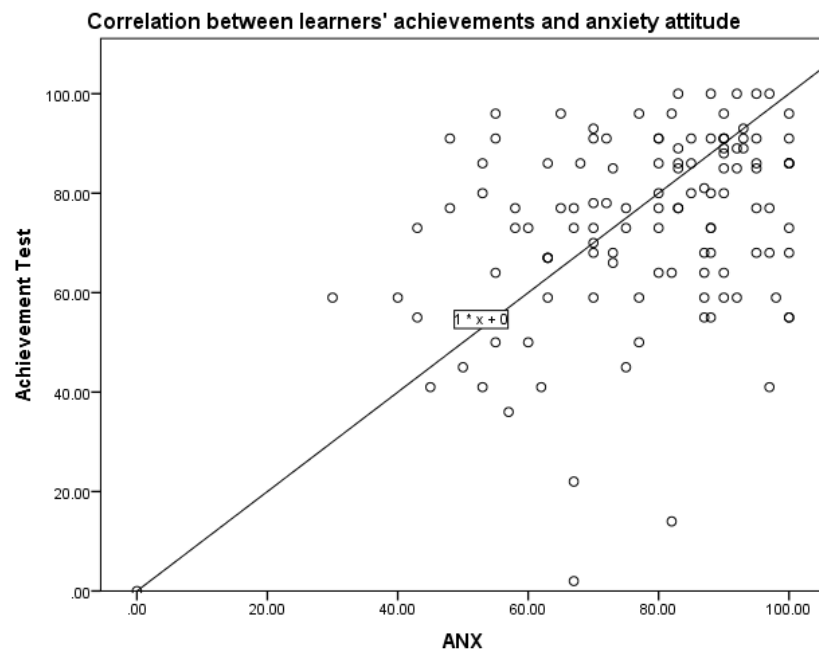
Figure 42: Correlation of 0.32 between learners' achievements and anxiety attitude
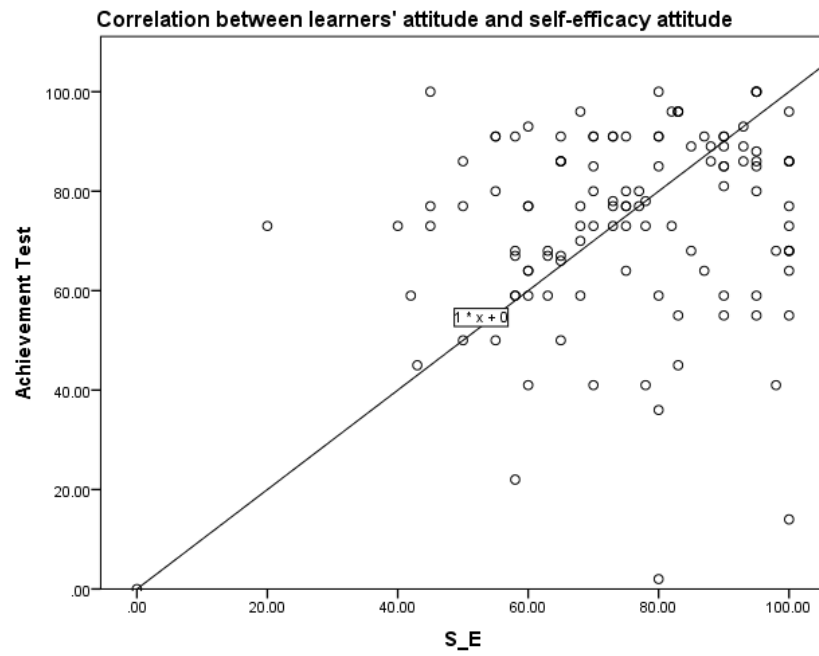
Figure 43: Correlation of 0.20 between learners' achievements and self-efficacy attitude
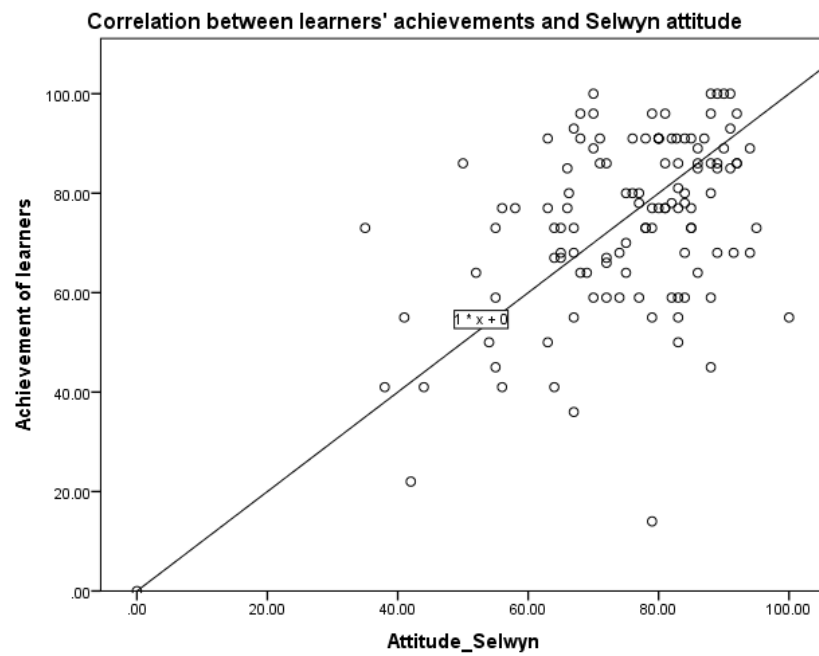
Figure 44: Correlation of 0.38 between learners' achievements and Selwyn attitude
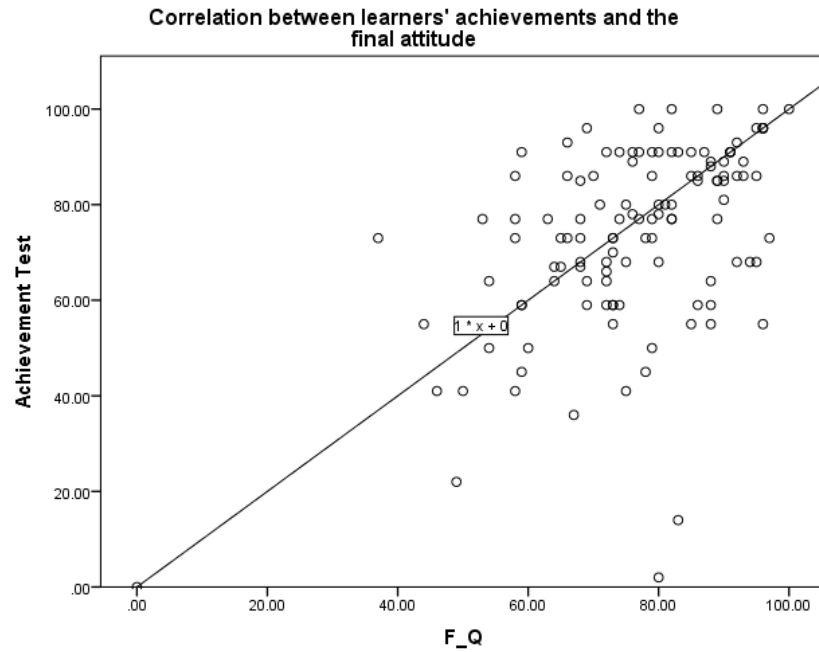
Figure 45: Correlation of 0.48 between learners' achievements and full model attitude

The current results will encourage the KS3 teachers and educational developers to take the studied socio-psychological factors of attitude in their account for preparing the lessons' plans and for designing the Curriculum. The scale with (6 constructs) of attitude is the strongest effect on KS3 learners' achievements followed with Selwyn model, anxiety scale, affective scale & behavioural scale (the same size effect), control scale, usefulness scale, and then self-efficacy is the lowest effect.

6.13 Developing the analysis of findings by using Smart-PLS software

Usually, multiple regression tests follow correlation test for exploring the predictive capacity and effect of a set of independent variables on one dependent variable (Pallant 2010). But because the data distribution is not normal for all independent and dependent variables, SPSS software cannot be used for running multiple regressions (Ibid.). But partial correlation measure can be used by Smart-PLS software when the sample is not normally distributed (Hair et al. 2014). Partial correlation test can be used for studying the linear relationship between a continuous dependent variable and one continuous independent variable after excluding one or more continuous independent variables. This measure is functional when the researcher suspects that the two variables are influenced by the effect of a third variable (Pallant 2016). The main goal of using partial correlation in the current study is to find out the most significant socio-psychological components that contribute to the attitudes and their role in affecting achievement.

Smart-PLS was developed in 2005 by Ringle and Will and this software was attractive since its start in 2005, because it is easy to use and it is free for academic use (Wong Kwong-kay 2013). The second and latest generation of this software uses Partial Least Squares Structural Equation Modelling (PLS_SEM) method for developing theories in research by concentrating on interpreting the variation in the dependent variables when testing the model and the independent variables (Wong Kwong-kay 2013, Hair et al. 2014).

PLS-SEM is a nonparametric statistical method which does not need the sample to be normally distributed and it works effectively with small sizes and complex models and makes practically no assumptions about the underlying data (Ibid.). PLS-SEM examines the correlation between the independent latent variable and latent dependent variable. Additionally, this data analysis method explores the correlation between the latent variables and the observed indicators (Wong Kwong-kay 2013). Additionally, through

PLS-SEM the associations among variables can be examined in order to prioritize affecting factors (Ibid.).

6.13.1   Types of sub-models and the variables in the SEM

There are two sub-models and two variables in the SEM as shown in Figure 46 below:

A. **The inner model** represents the relationships between the independent variables and latent (underlying) dependent variables (Hair et al. 2014; Wong Kwong-kay 2013).

B. **The outer model** represents the relationships between the latent (underlying) dependent variables and their observed indicators (Ibid.). This model is linking the indicators to independent or dependent (latent variables).

C. Exogenous variable: has path arrows pointing outwards and none leading to it (Ibid.).

D. Endogenous variable: has at least one path leading to it and represents the effects of other variable (ibid.).
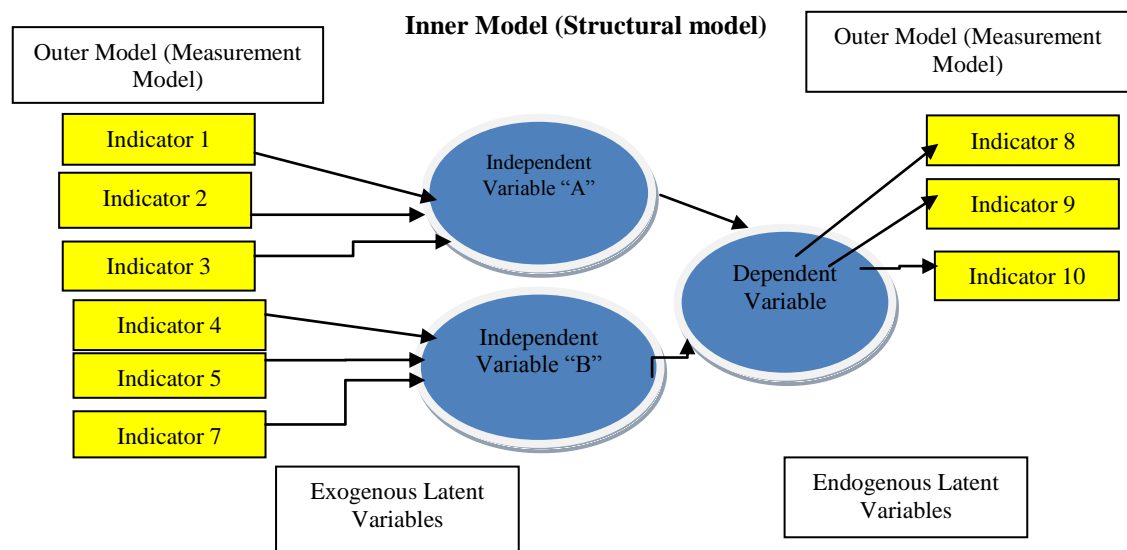
Figure 46: Inner & Outer Model in a SEM diagram

Source: Wong Kwong-kay, K (2013) Page 2

6.13.2   The acceptable sample size for analysis

According to Wong Kwong-kay (2013 :5) the number of arrows pointing at the latent variables (the constructs) decides the sample size. In the current research there are 6 arrows that point at the dependent latent variable (the attitude) so the minimum sample

size required is 75. Additionally, Wong Kwong-kay (2013) suggests that the sample size of 100 to 200 in research that uses PLS for data analysis is a good starting point for path modelling. Therefore, the sample size of 121 participants in the current study is appropriate for implementing PLS_SEM.

6.13.3   Defining the two types of measurement scales

There are two types of measurement scales as follows:

A. Formative Measurement Scales:

a. The indicators cause the latent variable and they are not interchangeable.

b.   The latent variable cannot be measured directly (for example employee stress or as the attitudes of KS3 learners towards BBC Bitesize in the current study).

c. The direction of indicators is from yellow to blue (Please see Figure 47).

d. Wong Kwong-kay (2013, p. 22) points out that '*No need to report indicator reliability, internal consistency reliability, and discriminate validity because outer loadings, composite reliability, and square root of average variance extracted (AVE) are meaningless for a latent variable made up of uncorrelated measured.*'
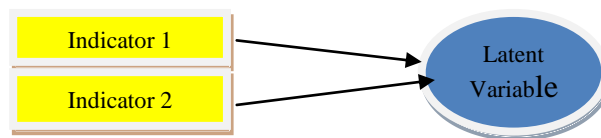
Figure 47: The direction of arrows in formative measurement scale

The measurement scale in the current study is formative because the KS3 learners attitude towards BBC Bitesize is formative as the attitude cannot be measured directly and because the observed indictors belong to more than one domain and so they cannot be interchangeable.

B. Reflective Measurement Scales:

a. The indicators are correlated and interchangeable.

b. The direction of indicators is from blue to yellow (Please see Figure 48).

c. For example, restaurant quality can be explored by food taste, service professionalism, and bill accuracy.
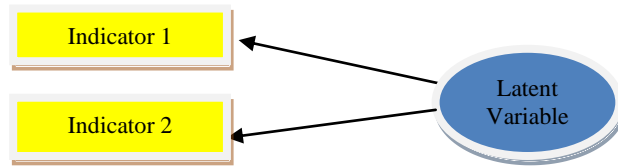
Figure 48: The direction of arrows in a reflective measurement scale

6.13.4   The findings by using PLS_SEM

Every PLS-SEM diagram usually includes numbers inside the blue circles which explain (R^2) the variance of latent variable through other latent variables (Wong Kwong-kay 2013 & Hair et al. 2014). Additionally, the numbers on the arrows represent the path coefficients and explain the degree of strength of effect for one variable on another variable. The difference of weights of path coefficients helps in ranking the affecting variables according to their statistical importance (Ibid.). Moreover, R^2 of 0.75 is substantial, 0.50 is moderate and 0.25 is weak (Ibid.). And the results are summed up below in Table 36:

Table 36: Partial Least Square between attitude and achievement by using Smart-PLS

	Attitude based on Selwyn scale	Attitude based on 6 factors (Affective, Usefulness, Control, Behavioural, Anxiety, & Self-efficacy)	Attitude based on 4 factors (after omitting Control, & Anxiety)
The Achievement	0.510 (Figure 49)	0.544 (Figure 51)	0.544 (Figure 53)
The significance	4.740 (Figure 50)	5.522 (Figure 52)	5.557 (Figure 54)

Overall, the current research explains the PLS_SEM diagrams which represent the correlation between the attitude and achievement in the next sections.

185

6.13.4.1   PLS_SEM diagram based on Selwyn constructs

Figure 49 below demonstrates the coefficient of determination, (the variance of latent through other variables), R^2 as follows:

a. The variance of endogenous latent variable (the attitudes of KS3 learners towards BBC Bitesize) based on Selwyn constructs (affective, usefulness, control, and behavioural) is 0.93. This means that the four constructs (affective, usefulness, control, and behavioural) substantially and strongly affect the attitude and explain 93% of the variance in the KS3 learners' attitudes towards BBC Bitesize.

b. The variance of endogenous latent variable (The achievement of KS3 learners in learning science course through BBC Bitesize) is 0.26. This means the final attitude moderately explains 26% of the variance in the KS3 learners' achievement via BBC Bitesize.

c. The inner model (the relationships between latent independent variable and dependent latent variable), this means the relationship between the four constructs of Selwyn model and Selwyn attitude. The inner model shows that affective factor has the strongest effect on the KS3 learners' attitudes towards learning via BBC Bitesize (0.358) followed by behavioural (0.351), then usefulness (0.294), then control (0.209).

d. The outer model loading demonstrates that there is a strong correlation (0.510) between the latent variables (attitudes of KS3 learners towards BBC Bitesize) and their achievement.

Smart-PLS bootstrapping procedure can be used for exploring the significance of structural path coefficient in the inner and outer model through T-statistics two tailed. The path coefficient can be significant if T-statistics is larger than 1.96 (Hair et al. 2014, Wong Kwong-kay 2013). T-statistics of path coefficients in the inner model that can be seen in

Figure 50. This figure shows that the results of T-statistics of path coefficient between Selwyn attitudes towards BBC Bitesize and affective, usefulness, control, and behavioural is more than 1.96. That means the results are significant. In the outer model T-statistics of path coefficients between Selwyn attitudes of KS3 learners towards BBC Bitesize and KS3 learners' achievement via learning through BBC Bitesize is more than 1.96 so this result is significant. The above results show that all results are significant.
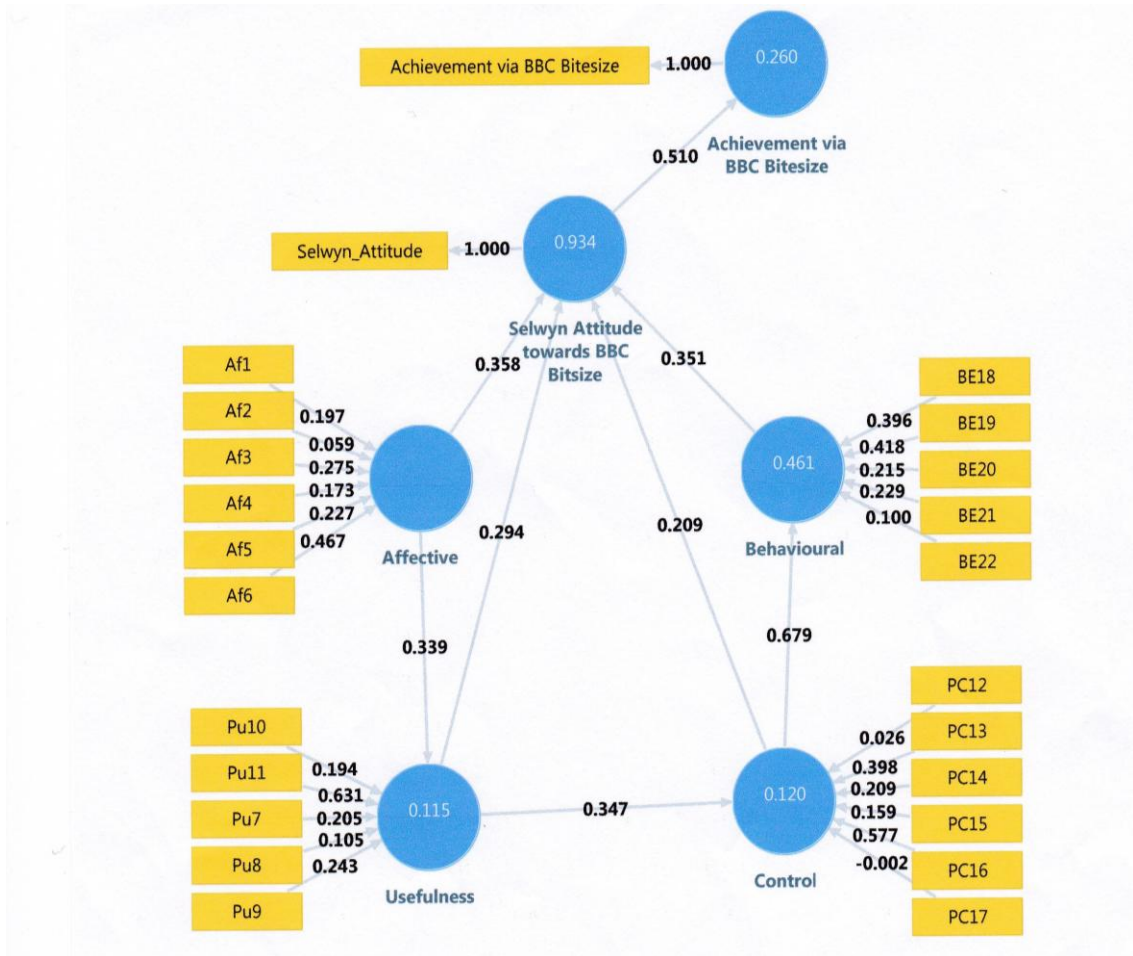
Figure 49: PLS_SEM diagram based on Selwyn constructs

(The variance of KS3 learners' attitude & achievement, the relationship between the four constructs of Selwyn scale and the final attitudes, and the relationship between KS3 learners' attitude & achievement)
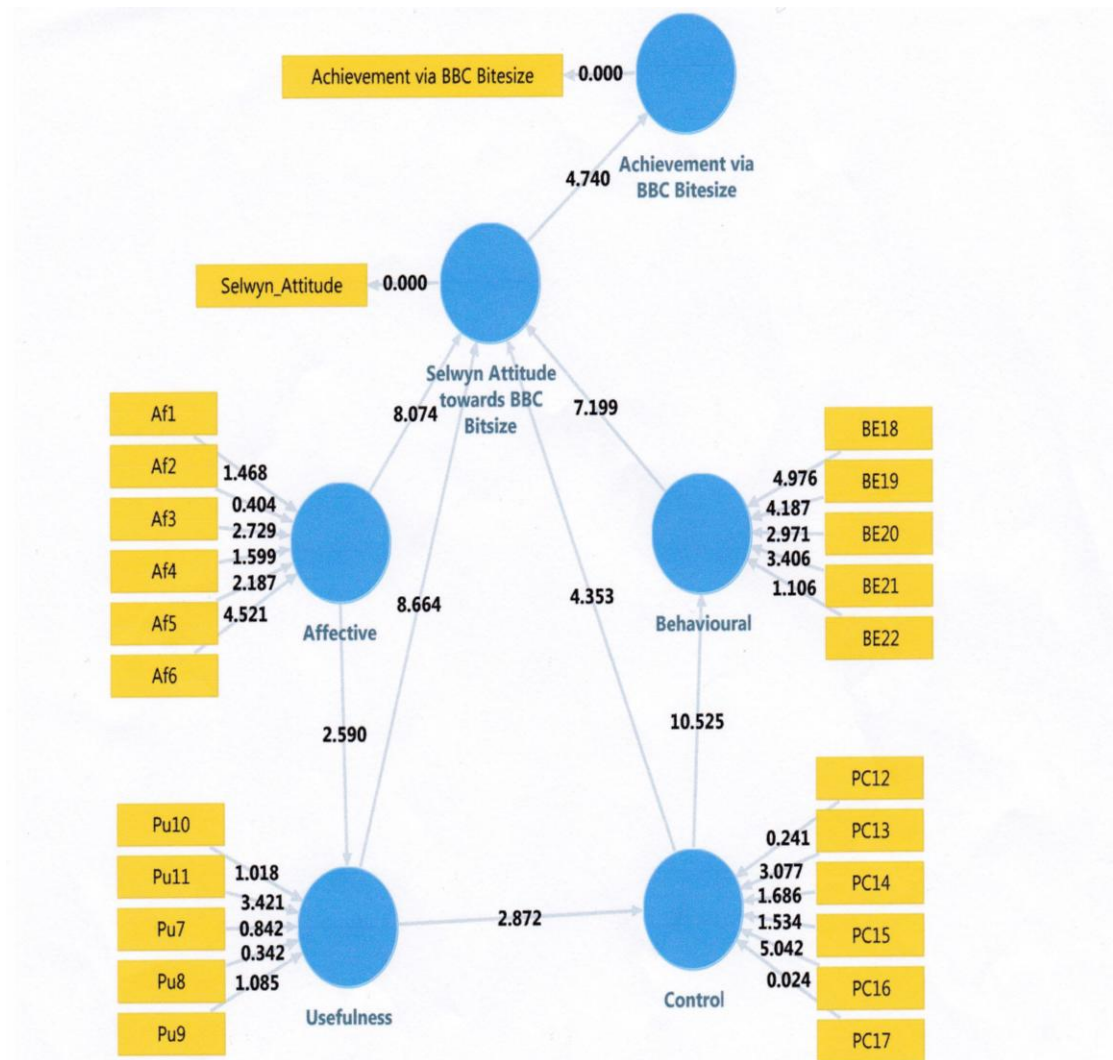
Figure 50: The significance of structural path coefficient (Selwyn scale)

T-statistics of path coefficient between Selwyn attitudes towards BBC Bitesize and (affective, usefulness, control, and behavioural) are more than 1.96

6.13.4.2 PLS_SEM diagram is based on six constructs (Selwyn model & anxiety & self-efficacy) (the model of study)

Figure 51 demonstrates the coefficient of determination, (the variance of latent through other variables), R^2 as follows:

a. The **variance** of the attitude of KS3 learners towards BBC Bitesize based on six constructs (affective, usefulness, control, behavioural, anxiety, and self-efficacy) is 0.85. This means the six constructs substantially (strongly) affect

the attitude and explain 85% of the variance in the KS3 learners' attitudes towards BBC Bitesize.

b. The **variance** of the achievement of KS3 learners in learning Science course through BBC Bitesize is 0.29. This means the final attitude moderately explains 29% of the variance in the KS3 learners' achievement via BBC Bitesize.

c. The relationships between the Six constructs (affective, usefulness, control, and behavioural, anxiety and self-efficacy) and the KS3 learners' attitudes towards BBC Bitesize show that behavioural factor has the strongest effect on the KS3 learners' attitude towards learning via BBC Bitesize (0.411) followed by control (0.396), then affective (0.373), then self-efficacy (0.339), then usefulness (0.311), then anxiety.

d. There is a strong relationship (0.544) between the attitude of KS3 learners towards BBC Bitesize and their achievement via learning through BBC Bitesize.

e. The Figure 52 below shows that the results of T-statistics of path coefficient between the final attitude of KS3 learners towards BBC Bitesize and (affective, usefulness, behavioural, and self-efficacy) are more than 1.96. Therefore the results are significant. But T-statistics of path coefficient between the final attitude and (control & anxiety) is less than 1.96, therefore the results are not significant. The above results show that all results are significant except the correlation between attitudes and (control and anxiety).
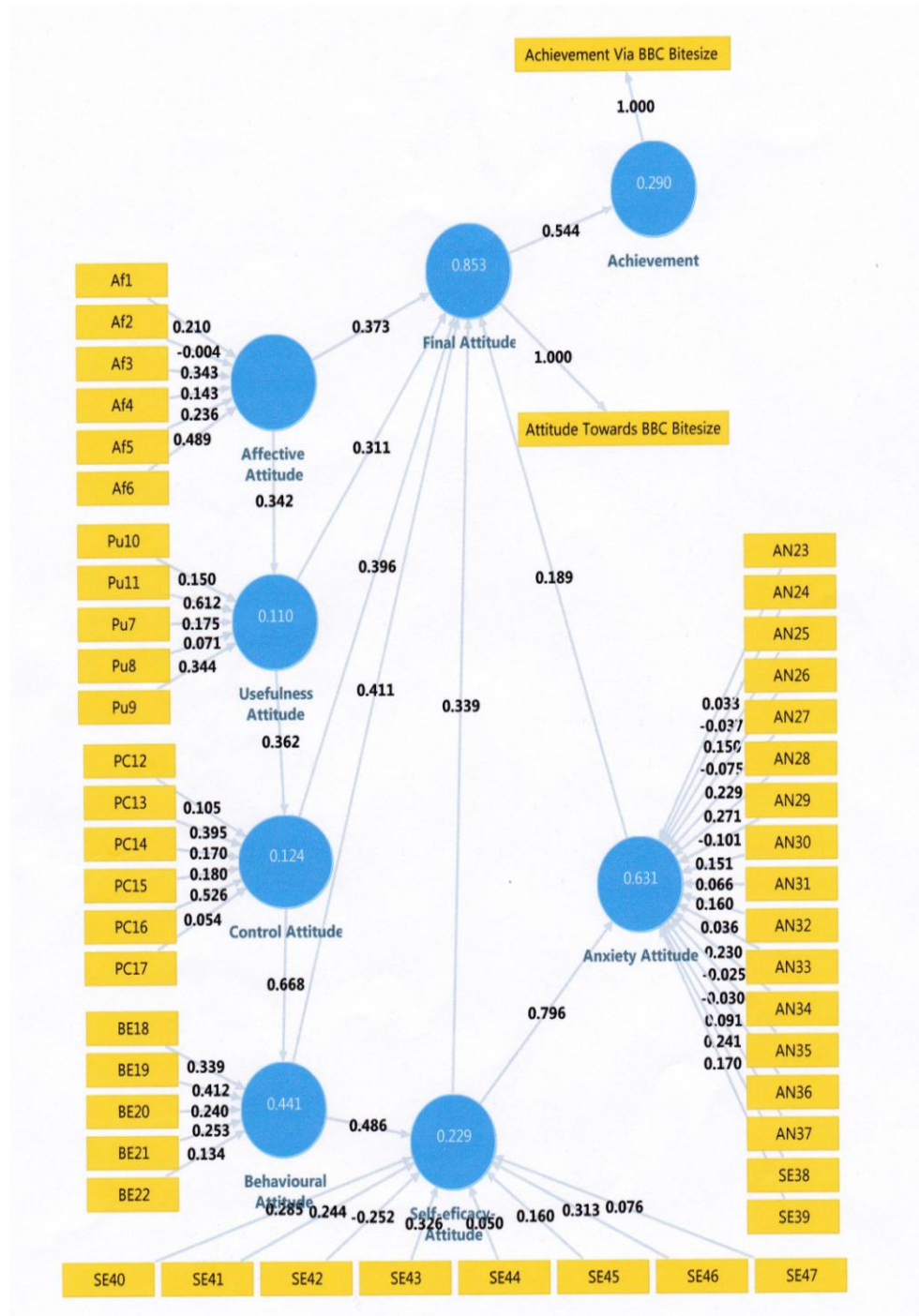
Figure 51: PLS_SEM diagram is based on six constructs (Selwyn scale & two other constructs)
(The variance of KS3 learners' attitudes & achievement, the relationship between the 6
constructs (Selwyn scale, anxiety, & self-efficacy) and the final attitudes, and the relationship
between KS3 learners' attitude & achievement)

190
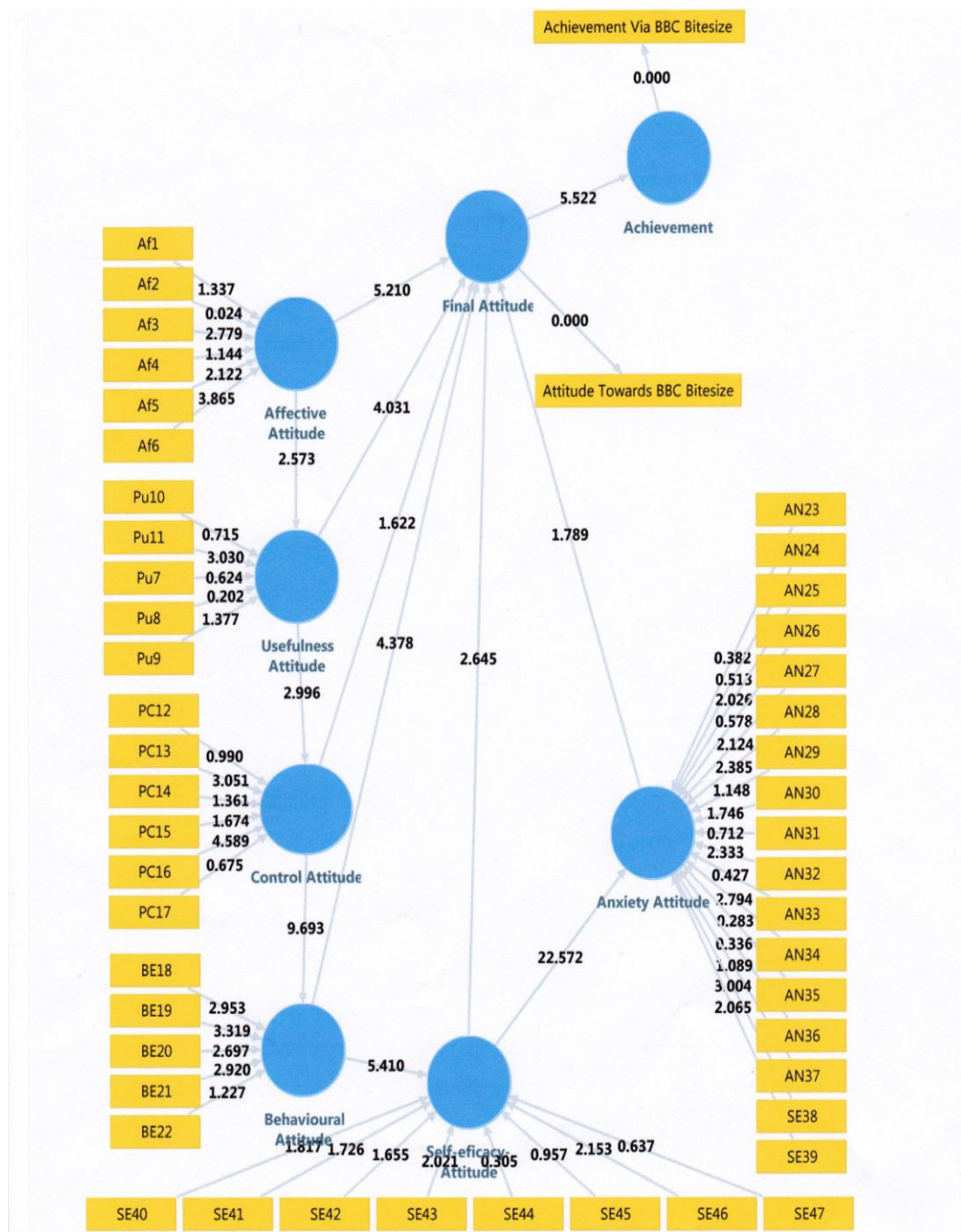
Figure 52: The significance of structural path coefficient (affective, usefulness, control, behavioural, anxiety & self-efficacy)

T-statistics of path coefficient between KS3 learners' attitudes towards BBC Bitesize and (affective, usefulness, control, behavioural, anxiety, & self-efficacy) are more than 1.96 for all construct except anxiety & control

191

6.13.4.3 The PLS_SEM diagram based on 4 constructs after omitting two constructs (control & anxiety)

T-statistics of path coefficient between the final attitude and (control & anxiety) is not significant as shown above in Figure 52. Therefore; anxiety and control have been excluded. Figure 53 demonstrates the coefficient of determination, (the variance of latent through other variables), R^2 as follows:

a. The **variance** of the attitudes of KS3 learners towards BBC Bitesize based on 4 constructs (affective, usefulness, behavioural, and self-efficacy) is 0.825. This means that the 4 constructs (affective, usefulness, behavioural, and self-efficacy) substantially (strongly) explain 82.5% of the variance in the KS3 learners' attitudes towards BBC Bitesize.

b. The **variance** of the achievement of KS3 learners in learning Science course through BBC Bitesize is 0.29. This means that the final attitude moderately explains 29% of the variance in the KS3 learners' achievement via BBC Bitesize.

c. The relationships between the 4 constructs (affective, usefulness, behavioural, and self-efficacy) and the KS3 learners attitudes towards BBC Bitesize show that affective factor has the strongest effect on the KS3 learners' attitude towards learning via BBC Bitesize (0.483) followed by behavioural (0.481), then usefulness (0.392), then self-efficacy (0.337).

d. The correlation between KS3 learners' attitudes and their achievement shows that there is a strong relationship (0.544) between the attitudes of KS3 learners towards BBC Bitesize and their achievement via BBC Bitesize for learning.

e. Figure 54 below shows that the results of T-statistics of path coefficient between the final attitude of KS3 learners towards BBC Bitesize and (affective, usefulness, behavioural, and self-efficacy) are more than 1.96

Therefore, the results are significant. The above results show that all results are significant.
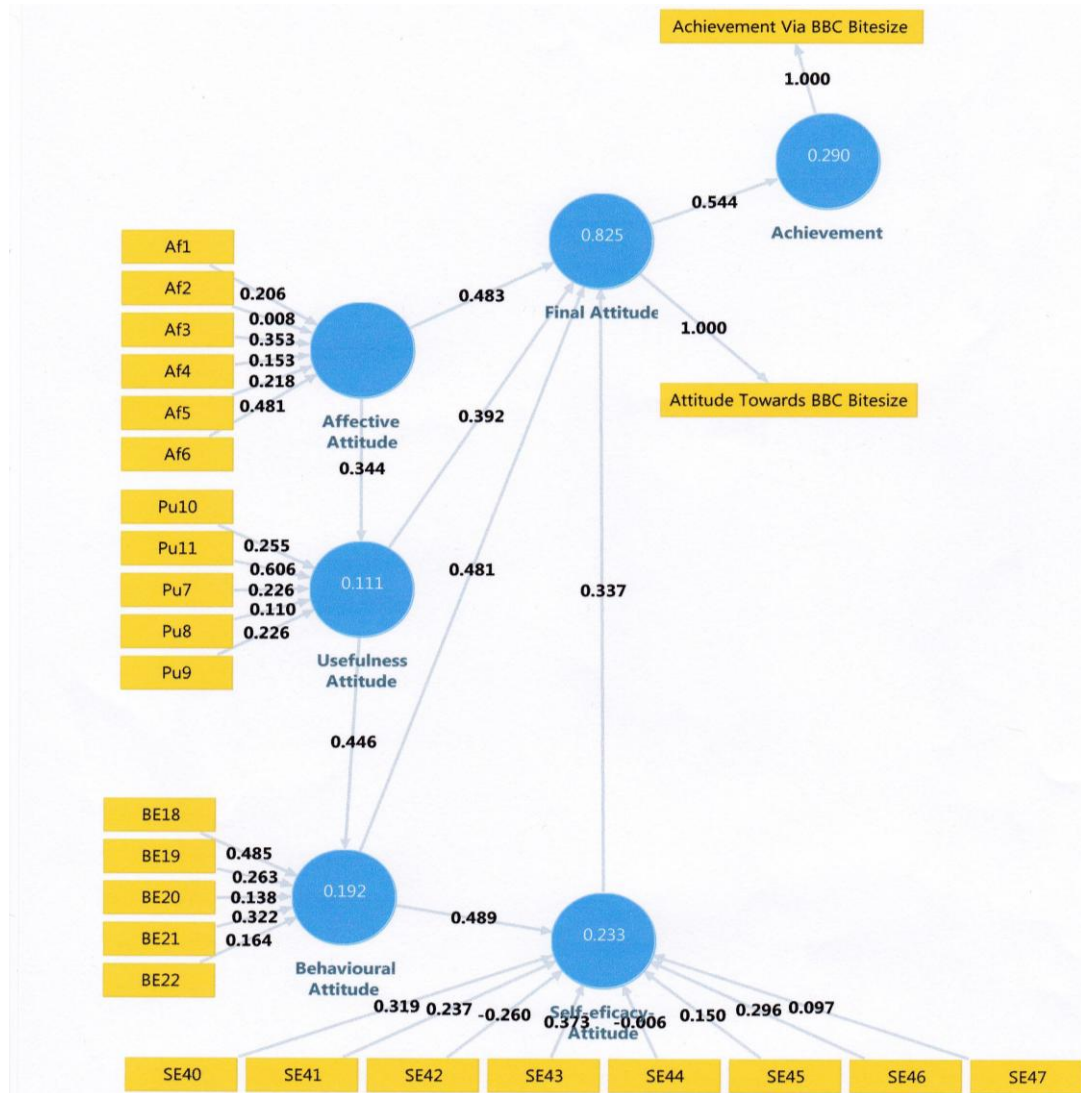
Figure 53: PLS_SEM diagram based on 4 constructs after omitting two constructs (control & anxiety) (The variance of KS3 learners' attitude & achievement, the relationship between the 4 constructs (affective, usefulness, behavioural, & self-efficacy) and the final attitudes, and the relationship between KS3 learners' attitude & achievement)
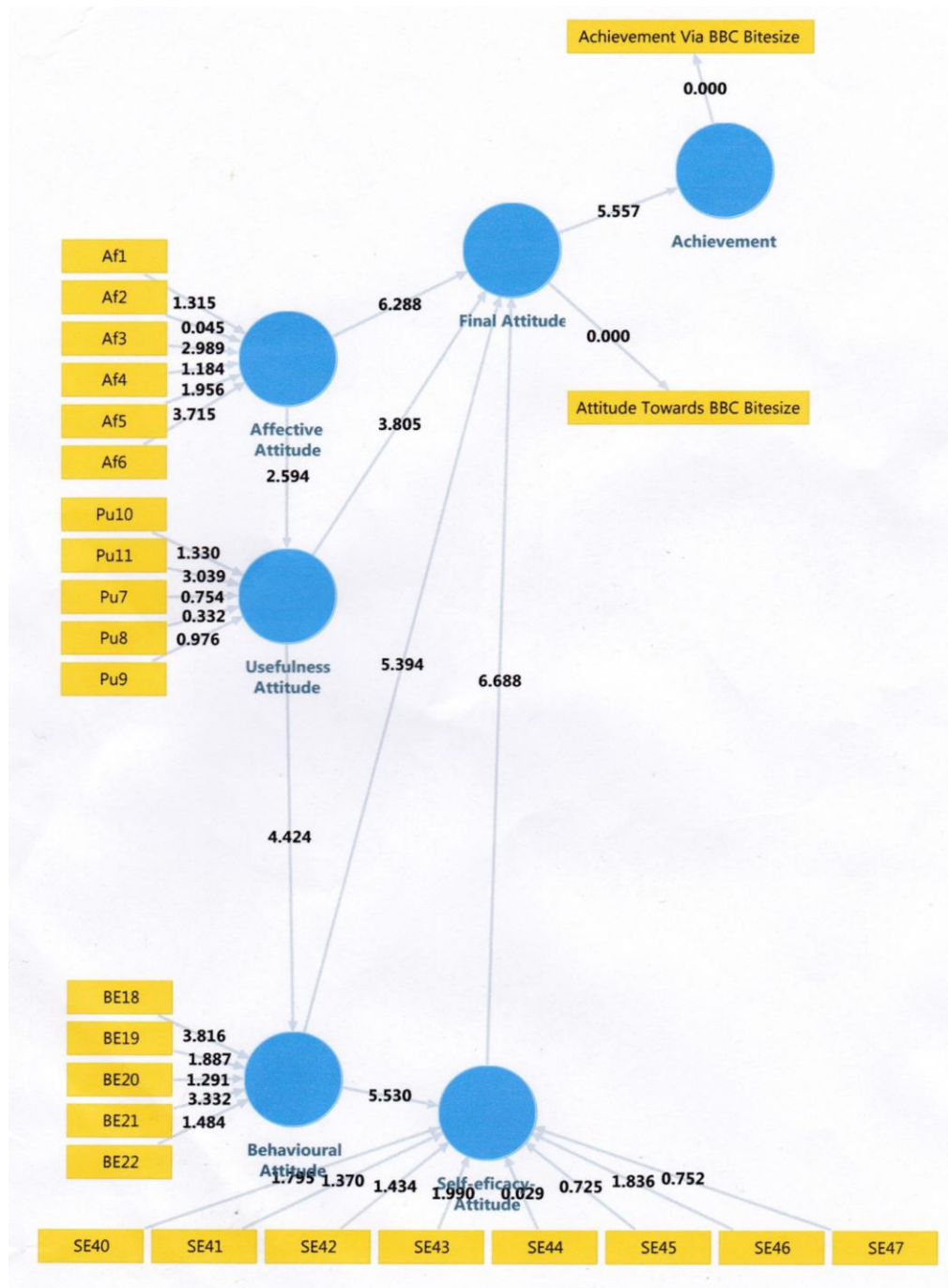
Figure 54: The significance of structural path coefficient (affective, usefulness, behavioural, & self-efficacy) T-statistics of path coefficient between KS3 learners' attitudes towards BBC Bitesize and (affective, usefulness, behavioural, & self-efficacy) is more than 1.96

6.14 Comparison between Selwyn model and the study model through the findings

This part compares the original Selwyn attitudinal model on which the current study has been based and the current study model where two other constructs (anxiety and self-efficacy) are added to Selwyn constructs. The goal of the comparison is to find out whether the two models are valid and suitable for studies in contexts similar to the current study context.

From revising Table 37 and Figure 55 below it can be noticed that the values of (mean and median) of attitude for Selwyn model and the current study model are the same. Subsequently, there is not any difference between the attitudes of KS3 learners towards Online learning as BBC Bitesize in the current study if they were based on *Selwyn* model or on the new model. Eventually, regardless of the model used, KS3 learners have positive behaviour towards using Online learning (BBC Bitesize).

Table 37: The mean and median of attitude based on Selwyn model and the current study model

	Mean out of 100	Median out of 100
Selwyn attitude based on 4 factors (affective, usefulness, control, and behavioural)	75	78
Attitude based on 6 factors (affective, usefulness, control, behavioural, anxiety, and self-efficacy)	75	78
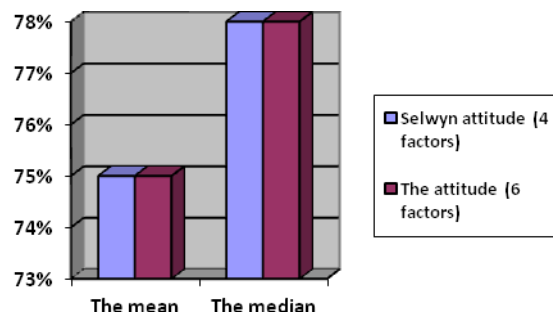
Figure 55: The mean and median of KS3 learners' attitude based on Selwyn model and the study model

Also, it can be noticed from Table 38 below that the correlation between Selwyn model components and the attitude is strong and highly significant. And there is similar result between the 5 components (affective, control, behavioural, anxiety, and self-efficacy) of the new model and the attitude but there is moderate and highly significant correlation between usefulness and attitude. So it can be concluded that Selwyn constructs and the new model constructs affect the attitudes of KS3 learners towards Online learning (BBC Bitesize) positively.

But there is a difference between the two models (Selwyn & the new one) in terms of the size effect of the components on the attitude. In Selwyn model behavioural construct is the strongest followed by control, then usefulness and affective (the same size of effect). But in the new model anxiety is the most important construct, followed by control, then behavioural, then self-efficacy, then affective, and then usefulness in the end.

Table 38: The correlation between the components of (Selwyn & new scale) and attitude

| | The components | | | | | | The size effect |
	Affective	Usefulness	Control	Behaviour al	Anxiety	Self-efficacy	
Selwyn Attitude	Strong & highly significant	Strong & highly significant	Strong & highly significant	Strong & highly significant	-	-	1- Behavioural. 2- Control. 3- usefulness and affective
Attitud e based on the new model	Strong & highly significant	Moderate & highly significant	Strong & highly significant	Strong & highly significant	Strong & highly significant	Strong & highly significant	1-Anxiety, 2- Control, 3- Behavioural, 4-Self-efficacy, 5- Affective, 6- Usefulness.

Regarding, the correlation between attitude and achievement Table 39 below demonstrates that there is a strong relationship between the attitudes of KS3 learners towards BBC Bitesize and their achievement regardless the model of attitude if Selwyn model or the current study model. It can be concluded that the positive attitude towards BBC Bitesize makes the achievement of KS3 learners satisfactory which is the case in the current study. And the negative attitude affects the achievement negatively.

Table 39: The correlation between (Selwyn attitude and the attitude on (6 factors) and KS3 learner achievement

	Selwyn attitude based on (4 factors)	Attitude based on (6 factors)
Achievement	R is strong positive & p is high significant.	R is strong positive & p is high significant.

Smart PLS software was used for computing the partial correlation between the attitude and its components after linking the attitude with achievement. Table 40 below clarifies that all Selwyn components affect positively the attitudes of KS3 learners towards BBC Bitesize in order (affective, behavioural, usefulness, and control). Also, all the new model components affect the attitude positively except (anxiety & control) because the result is not significant for both last two components. The importance of the components in the new model for attitude is in order (behavioural, control, affective, self-efficacy, usefulness, and anxiety).

Table 40: The size effect of socio-psychological on the attitudes of learners from the strongest to the weakest by using (partial correlation)

Selwyn attitude of 4 factors	The new scale attitude of 6 factors	The significance
		If T-statistics of path coefficient > 1.96 the result is significant.
1- Affective	1- Behavioural	Significant for both (affective & behavioural)
2- Behavioural	2- Control	Significant for behavioural) but not significant for control.
3- Usefulness	3- Affective	Significant for both (usefulness & affective)
4- Control	4- Self-efficacy	Significant for both (control & self-efficacy)
-	5- Usefulness	Significant for usefulness
-	6- Anxiety	Not significant for anxiety

Because the results of partial correlation between attitude and (anxiety & control) are not significant as it is Table 40 above so these two components were removed from the new model. So the new model (affective, usefulness, behavioural, and self-efficacy) was tested. Table 41 below shows that the partial correlation between the 4 factors and attitude is positive and significant. In terms of the importance of the components for attitude the first three components are in order (affective, behavioural, and usefulness) in both models (Selwyn and in the new model) but the last one in Selwyn is control component while self-efficacy component in the new model. Overall, it can be concluded that Selwyn model (affective, usefulness, control, and behavioural) and the components of the new model (affective, usefulness, behavioural and self-efficacy) affect KS3 learners *attitudes* towards Online learning (BBC Bitesize) if the *attitude* construct has been linked with the achievement construct. Additionally, the Selwyn components and the new model components should be considered by educators and teachers for designing the lessons and Curriculums.

Table 41: The socio-psychological factors in order according to their impact on the attitudes after omitting (control & anxiety) factors

Selwyn attitude model (affective, usefulness, control, and behavioural)	The attitude on 4 factors (affective, usefulness, behavioural, and self-efficacy)	The significance
		If T-statistics of path coefficient > 1.96 the result is significant.
1- Affective	1- Affective	Significant for affective in both models
2- Behavioural	2- Behavioural	Significant for behavioural in both models
3- Usefulness	3- Usefulness	Significant for usefulness in both models
4- Control	4- Self-efficacy	Significant for control in Selwyn model and self-efficacy in the new model.

Table 42 below shows that there is a strong positive relationship between the attitudes of KS3 learners and their achievement either the attitude based on Selwyn model (affective, usefulness, control, and behavioural) or on the new model (affective, usefulness, behavioural, and self-efficacy). Eventually, the most important conclusion is that the attitude of KS3 learners towards Online learning (BBC Bitesize) affects the learners' achievement to a high degree. So the attitudes of learners towards Online learning should be taken into the educators and teachers' consideration.

Table 42: The high degree of effect of attitude on achievement

	The attitude based on Selwyn model (affective, usefulness, control, and behavioural)	The attitude based on the new model (affective, usefulness, behavioural and self-efficacy)
Achievement	a strong positive correlation	a strong positive correlation

From above it can be concluded that Selwyn model (affective, usefulness, control, and behavioural) explores the attitude towards Online learning. Also, the current study suggests a new model that surveys the attitude towards Online learning. The new model consists of (affective, usefulness, behavioural, and self-efficacy). The current study has shown that the effect of anxiety and control is not significant on attitude if the attitude has been linked with achievement. Therefore, inserting the constructs of anxiety and control in the new model has shown that anxiety construct as well as control construct are not significant in terms of achievement in the current study. The results yielded by the current study and which have used the new Selwyn - based model are compatible with the results of a number of studies that have used Selwyn model. The results of the current study which has used both models will be compared with the results of previous studies. The importance of the new model is that it demonstrates that anxiety effect and control impact on achievement are insignificant and that self efficacy plays a role in the learners' achievement.

6.15 Qualitative data analysis for KS3 learners' attitudes

The data collected via semi-structured interviews as discussed in the methodology Chapter are analysed in this section. The learners were interviewed and their answers were written by the interviewer. 11 KS3 learners took part to find out their attitudes towards technology and BBC Bitesize because it is essential to understand the attitudes and the affecting socio-psychological factors that impact the learners' acceptance of technology and BBC Bitesize in their learning and achievement. The interviews took place in stages. The first stage was warming up where a kind of rapport was established between the interviewer and the interviewee with the presence of the school teacher. This included describing the research and outlining its aim and goals and how the interviewee's participation would contribute. The first question, then, was introduced in a clear, simple and direct language. When necessarily, the question was repeated in a clearer and simpler way. The interviewee was allowed a break when they needed to stop. Simplifying the questions was also a technique used by the interviewer to elicit more data about the subject under investigation. No pressure was placed on the interviewee to speak. All the interviewees expressed their embarrassment to have their voices recorded, so the data elicited were written.

The data collected were analysed by choosing qualitatively distinctive data, expressing the qualitative meaning, and clarifying the similarities and differences of the data collected. The data collected were described, explained, interpreted and represented by using words and diagrams. This section will answer the first research question "**How does BBC Bitesize affect the KS3 learners' attitudes towards Online learning methods?**" The data analysed by checking the learners' chosen answers which explore the learners' attitude if positive or negative and every learner was asked to explain their options. Below is an overview of the learners' responses to 6 socio-psychological factors: affective, usefulness, control, behavioural, anxiety, and self-efficacy. These interviews assess the attitudes of learners toward technology and BBC Bitesize in depth. The findings of the

data collected show that the majority of learners have positive attitudes towards technology and BBC Bitesize for all scales as shown in Table 43.

Table 43: The learners who have positive attitude towards BBC Bitesize and technology for every scale

Selwyn Constructs				Anxiety Ans	Self-efficacy Ses	Learners Attitude Att
Affective Aff	Usefulness Uc	Control Cc	Behavioural Bc			
The majority of learners have positive attitudes towards BBC Bitesize and technology.						

6.15.1   KS3 learners' attitude based on affective components

The affective factor was defined before as the learners' satisfaction, and appreciation of learning (Lee et al. 2010). This dimension focuses on feeling, emotions (affection) and behaviour (Gravells 2012;Gravells & Simpson 2010;Scales 2008;Wilson 2009). A key theme emerged from the interviewees was that attitudes based on affective componnets were a common phenomenon.

 By viewing the interviewees' notes it can be concluded that the majority of the learners have positive attitudes towards using Computers & Internet and they see the Computers and Internet as familiar and helpful for their School work but one of the interviewees has got another belief as follows in the Table 44 below:

Table 44: Attitudes based on affective components

The theme	Field Themes	Field-sub-themes
Attitudes based on affective components	Positive attitudes	Not frightened; know how to use it; like to use it; experienced; correct my mistakes; not fear using; comfortable using; not scary machine, easy to use; familiar; perfectly; clever machine; useful; solving problems and difficulties.
	Negative attitudes	Not useful; correcting mistakes without Computers.

- **The learners with positive attitudes**:

'I am not frightened from using Computers and Internet, I know how to use them, I like to use Computers, and I feel comfortable when I use Computers' and Internet especially BBC Bitesize' (**Learner 5**).

'I know how to use Computers and Internet so I do not fear to damage them and I can correct my mistakes, Computer is familiar for me, I like using Computers, and I am not frightened from Computer because I use it very often' (**Learner 7**).

'I do not feel scared to break Computers at all, I know how to deal with my mistakes to correct them because I am experienced, I feel comfortable when I use Computer because I use it efficiently, and I can solve problems and difficult things' (**Learner 11**).

Positive attitudes are related to the interviewees' awareness that Computers are not scary machines. Computers and Internet are familiar for the learners and they feel comfortable when they use them (please see section 6.15.7, Table 50, and Figure 56).

- **The learners with negative attitudes**:

Just one of the interviewees has got another opinion: he/she thinks negatively about Computers and Internet (please see section 6.15.7, Table 51 and Figure 57). This learner thinks that he/she is able to do the same Computers jobs as follows:

'I can solve problems by myself without technology (Computers & Internet). I can correct mistakes without Computers and I can solve difficulties without Internet' (**Learner 6**).

6.15.2   KS3 learners' attitude based on usefulness components

Perceived usefulness as defined before is related to the degree of an individual feeling and believing that using technology will contribute in improving the performance and outcome (Teo et al. 2007). Renny et al. (2013) indicate that usefulness influences attitudes toward the ease of use of something and this shapes intention to use'. A key theme emerged from the interviewees was that attitudes based on usefulness components were a common phenomenon.

The results point out that the majority of learners have positive attitudes towards using Computers and Internet for some reasons but some of the interviewees have got another opinion as follows in the Table 45 below:

Table 45: Attitudes based on usefulness components

The theme	Field Themes	Field-sub-themes
Attitudes based on usefulness components	Positive attitudes	Organise my work better; Computer can be used; improve the presentation of my school work; easier to use; effective; faster; get more opinions from the net; looks neater; more interesting; using the internet; do my homework quickly; via Computer looks in a high quality; effective machines; use Computers perfectly; Computers are useful; employing Computer imaginatively; using pictures, diagrams and tables and improving work by using different fonts and colours.
	Negative attitudes	Can do that Computer cannot do.

- **The learners with positive attitudes**:

   'Computers organise my homework in files, Computers and Internet (BBC Bitesize) are effective machines that help me to do my homework quickly, my ability to search the Internet makes my work interesting, Computers help me to almost do all my School work, and my work presentation via Computer looks in a high quality' **(Learner 5).**

'Computers organise my School work because they are useful machines, they are effective as they improve my hand writing, Computers are useful because I know how to use them imaginatively, I am a smart learner so I can invest Computers and Internet to develop my work, and I can manage and present my work better' **(Learner 8).**

'*Computers organise my School work in files, folders and sub- folders, Computers and the Internet are effective and they let me get details about any topic of my School work, Computers allow me to present my work in an interesting way by using pictures, diagrams and tables, and Computers can do more than what I can do without it, and I use different Computer programs to improve my work presentation'* **(Learner 10).**

These interviewees have positive attitudes towards Computers and Internet. These positive attitudes are related to the interviewees' realisation that Computers are useful machines that help to do homework quickly, can also help in the work presentation, and also organise School work in files, folders and sub-folders. There is a relationship between the positive attitudes of the interviewees and the realisation that Computers are useful to them in different ways (please see section 6.15.7, Table 50 and Figure 56).

- **The learners with negative attitudes**:

Some of participants have different views and they stated:

> '*There are many things I can do that Computer cannot do'* **(Learner 2).**
> '*I know how to do most things such as Computers'* **(Learner 4).**
> '*I can do myself some work that Computer can be used for'* **(Learner 6).**

For this group of interviewees, Computers do not provide a lot of help. They do not have positive attitudes towards Computers because the realisation of the usefulness of Computers is absent. They feel that they can do without Computers and that they even can do things that Computers cannot do. This indicates the relationship between usefulness and positive attitudes. When the learners feel that Computers are not useful they develop a negative attitude towards them (please see section 6.15.7, Table 51, and Figure 57).

6.15.3   KS3 learners' attitude based on control components

Perceived *control* is defined before as the people perception of their capability to carry out an action. Also, the awareness of people of how simple or complicated to perform a behaviour (Ambali 2014). The action and behaviour in this study is the learners' reaction towards using technology (Computer, Internet, and etc.....). A key theme emerged from the interviewees was that attitudes based on control components were a common phenomenon.

The majority of learners have positive attitudes towards Online learning, using Computers and Internet. Examples of the negative and positive views can be stated as follows in the Table 46 below:

Table 46: Attitudes based on control components

The theme	Field Themes	Field-sub-themes
Attitudes based on control components	Positive attitudes	Technological information are simple; easy to use; solve any technical problem; they are just machines; I am in control; using Computers for what are required at school; loading & uploading; using keyboard and mouse; got some knowledge; shortcuts.
	Negative attitudes	Some information I need to know (less knowledge); I am not in complete control when I use Computer; destroy humanity; need an experienced person nearby because some school work is hard and complex; IT teachers are useless; need an experienced person nearby because I need to gain new information.

-   **The learners with positive attitudes**:

'I can teach myself about Computers because I know how to use them in general (e.g. loading & uploading), Technological information are simple, I can make Computers do some things of what I want them to do because I know how to use keyboard and mouse' **(Learner 5).**

'I can fix some technical problems because I have some knowledge, I am in complete control when I use Computer because I know how to use it' **(Learner 7).**

'I do not need an experienced person to tell me what to do and I do not need someone to tell me the best way to use Computers because I used to use Computers and Internet a lot' **(Learner 11).**

The interviewee has a positive attitude toward Computers and Internet. This positive attitude is connected with the interviewee's knowledge of how to deal with Computer-related problems. Feeling in control has created a positive attitude. Using Computers, in this case, is not a source of apprehension. The interviewee can use Computers confidently because he/she can deal with any emerging problem (please see section 6.15.7, Table 50, and Figure 56).

- **The learners with negative attitudes**:

Some participants have got negative comments such as:

'I do not know much about Computers and technology. There is some information I need to learn' **(Learner 2).**

'I am not in complete control because when I use Computer I feel and believe that technology will destroy humanity. As I know technology separate people and prevent the friendly relationships between people. So Online learning will prevent the intimate relationship between teachers and learners' **(Learner 3)**.

'I need an experienced person with technology nearby when I use Computers and Internet for doing hard and complex School work because my experience with technology is very little' **(Learner 4)**.

Some interviewees have negative attitudes towards Computers and technology in general. The source of these negative attitudes with the three interviewees is the lack of knowledge of how to deal with Computers. Learner 3 believes that Computers and technology are destructive forces that will destroy the world. This negative perspective is created by the lack of knowledge to control Computers and to deal with related problems (please see section 6.15.7, Table 51, and Figure 57).

6.15.4 KS3 learners' attitude based on behavioural components

Behavioural intention was defined before as reflection to outcome from beliefs about performing the behaviour (Ajzen & Fishbein 2005;McLeod 2014). The behaviour here is the attitude of KS3 learners towards technology, and Online learning (BBC Bitesize). A key theme emerged from the interviewees was that attitudes based on behavioural components were a common phenomenon.

The majority of the interviewees have positive attitudes. The respondents with positive and negative attitude towards technology and Internet stated in the Table 47 below:

Table 47: Attitudes based on behavioural components

The theme	Field Themes	Field-sub-themes
Attitudes based on behavioural components	Positive attitudes	Involved in all school tasks; do not avoid using Computers; to develop my work; enhance my knowledge; no field does not need Computer; because no task can be achieved without Computers; Computers are necessary at school; Computers are unavoidable; all tasks can be solved; a lot tasks need Computers; using the internet it is my pleasure; usefulness of Computers; improve the quality of my job and enhance my job value.
	Negative attitudes	Computers can be challenging for some work; cannot be bothered using Computers; cannot use it, makes me feel board; play football rather than using Computer.

- **The learners with positive attitudes**:

'I get involved in all School tasks if Computers and Internet are used especially when BBC Bitesize is involved because that will improve my task, using the internet it is my pleasure' (**Learner 5**).

'I enjoy Computers and Internet for example BBC Bitesize, BBC Bitesize is easy to be used for study and homework, and it saves time and efforts' (**Learner 9).**

'I use Computer and Internet at School to develop my work and to save time, I use computers throughout School because this will help me to enhance my knowledge, and I will continue working with Computers in the future because no field does not needs Computer and Internet' (**Learners 11).**

The interviewees do not avoid using Computers. They believe that Computers and Internet are helpful and they develop the interviewees' work. Computers and Internet save the learners' effort and time. They want to resume using Computers because of the benefit they get from them and the help they offer. The realisation of the helpfulness of Computers enhances this behaviour of continuing to use Computers (please see section 6.15.7, Table 50, and Figure 56).

- **The learners with negative attitudes**:

But there are some learners who have negative attitude and different opinions and they commented:

'I use Computers throughout School when I am desperate to do so because I prefer to play football rather than using Computer' (**Learner 2).**

'I avoid any task at School if Computers are involved sometimes when I feel boared and because I am not interested using Computers' (**Learner 4.**

'I avoid Computers at School sometimes because using Computers for some School work is challenging' (**Learner 6).**

There is a behaviour of avoidance by these interviewees. They try to avoid using Computers and Internet and even they consider it as challenging, boring and not interesting. One of them would rather play football than use Computers. This behaviour of avoidance is created by the feeling of the interviewees that using Computers is hard and they cannot deal with it (please see section 6.15.7, Table 51, and Figure 57).

6.15.5 KS3 learners' attitude based on anxiety components

Computer anxiety was defined before as the individuals' worries, stress, phobia, and hesitation when they use Computers (Celik & Yesilyurt 2013). A key theme emerged from the interviewees was that attitudes based on anxiety components were a common phenomenon.

The majority of the learners have positive attitudes towards Computers and Internet and there some with negative views and they stated their views as follows in the Table 48 below:

Table 48: Attitudes based on anxiety components

The theme	Field Themes	Field-sub-themes
Attitudes based on anxiety components	Positive attitudes	Not get anxious/worried of using Computers; I feel calm when I use Computers; confident in my ability to use Computers; no tense or fear of working on Computers; Computers are fun to use; enjoy using Computers and searching the internet for social media and games; Computers are important and necessary in everything; feel happy and relaxed working on Computers; they are interesting machines; not feeling exhausted; comfortable; good with Computers and having experience; Computers are useful machines; no anxiety with using Computers; mistakes on Computers can be corrected; playing games and chatting with friends; Computers are easy to use; Computers are easy machines; beneficial knowledge helps in solving problems and reducing the anxiety.
	Negative attitudes	Not feel relaxed; Computers are not important for me; feel exhausted with using Computers and developing pain in my back and eyes.

- **The learners with positive attitudes**:

'I never avoid using Computers and Internet for example BBC Bitesize because I do not get anxious of using them, I feel calm when I use Computers and Internet because I used to use them, I am confident in my ability to use Computers and Internet, I do not feel tense of working on Computers and Internet because I do not fear them, I feel happy and comfortable with Computers and at ease' (**Learner 5**).

'I do not feel worried making mistakes on Computers because I am confident in my ability to correct them, I do not experience anxiety when I use Computers because Computers are fun to use, I feel happy working on Computers and Internet (BBC Bitesize) because they are interesting machine' (**Learner 9**).

'I enjoy using Computers because I can search the Internet and I can use BBC Bitesize calmly, I feel relaxed when I use Computers, I wish Computers are more important than they are now because they are necessary in everything, I am not frightened from Computers because they are not scary machines, I do not feel exhausted with using Computers because they do not consume my energy' (**Learner 11).**

For these interviewees the feeling of anxiety is absent because they are confident of their ability to use Computers and Internet. The positive attitudes which these interviewees express are based on that they do not feel anxious when dealing with Computers. They feel relaxed and happy when using Computers and they do not fear the situation when they face Computers. The interviewee who is free from anxiety has shown a positive attitude (please see section 6.15.7, Table 50, and Figure 56).

- **The learners with negative attitudes**:

    'I do not feel relaxed when I use Computers because I use them for School work mostly, I do not wish Computers are more important than they are now because I do not care about technology' (**Learner 2).**

    'I feel exhausted with using Computers and Internet sometimes because I feel with pain in my back and eyes' (**Learner 3).**

For learners 2, 3 the feeling of apprehension and anxiety prevents them from using Computers in a relaxed way. This feeling creates a negative attitude that interviewee 2 does not want Computers to be considered as important machines (please see section 6.15.7, Table 51, and Figure 57).

6.15.6   KS3 learners attitude based on self-efficacy components

Computer self-efficacy was defined before as the individuals' judgement concerning their skills to use Computers (Papastergiou 2010). A key theme emerged from the interviewees was that attitudes based on self-efficacy components were a common phenomenon.

The majority of learners have positive attitude towards Computers and Internet and some learners have negative attitudes and they stated in the Table 49 below:

Table 49: Attitudes based on self-efficacy components

The theme	Field Themes	Field-sub-themes
Attitudes based on self-efficacy components	Positive attitudes	Solving difficult problems by a little effort; skilled with Computers and Internet; a lot of information can be obtained via internet; the internet helps in achieving the learning goals; Computers and internet can be used for unexpected situations and problems; staying calm as the internet and Computers guide us to the best treatment; the internet gives the way out when I am in trouble; capable to use internet for whatever happens; with a little effort and time the problem can be sorted by Computers and Internet; several solutions for any problem through the internet; able to get information through the internet; I use internet to maintain my view; able to use Google search engine to acquire some information; via internet the right information can be obtained.
	Negative attitudes	Sometimes it is hard to find the appropriate information via internet to enhance my learning goals; no enough confidence (e.g technical problems cannot sort them easily).

- **The learners with positive attitudes**:

'*I can solve difficult problems by a little effort if use Computer and Internet because I am skilled with Computer and Internet, when someone does not agree with me I can easily find some ways by Internet to convince them because a lot of information can be obtained via Internet, easily I can achieve my learning goals if I use Computers and Internet because I can find information via Internet which supports my learning goals*' (**Learner 5).**

 '*I am confident that I can deal with unexpected problems because I can use Computer and Internet to check for the best solution, I have a good resourcefulness of technology to deal with unexpected situations, I can easily solve most problems via Computers and Internet because of my skills in technology, I stay calm when I face any difficulty because I am able to check the Internet for the best means of treatment*' (**Learner 9).**

'*often I can find several solutions for any problem because I use the Internet, often I am able to find solution if I am in trouble because I rely on Internet,*

and I am whatever happens to me able to face the situation because I am capable to search Internet for some information' (**Learner 11**).

These learners believe in their ability to do different useful things with the Computers and Internet. They can deal with unexpected problems and they stay calm. They can find information via Internet support my learning goals. They can use Internet to find several solutions for any problem. This belief in one's self to challenge difficulties and sort out problems enhanced positive attitudes and makes learners confident when using Computers and Internet Figure (please see section 6.15.7, Table 50, and Figure 56).

- **The learners with negative attitudes**:

Some learners commented negatively concerning Computers and Internet as follows:

'Sometimes it is hard for me to find the appropriate information via Internet to enhance my learning goals' (**Learner 3**).

'I should try hard enough and I consult some friends to solve some problems in my Computer because I cannot sort them by my own' (**Learner 4**).

'I should try hard enough to solve some problems I do not have enough confidence (e.g. technical problems) because I cannot sort them easily' (**Learner 6**).

Learners 3, 4, and 6 do not feel confident enough to deal with Computers. They have a low self-efficacy. They are not certain enough that the information they have about Computers are sufficient to sort out some machinery problems. Low self-efficacy is demonstrated in the learners believe that they do not have the experience and knowledge that enable them use Computers confidently (please see section 6.15.7, Table 51, and Figure 57).

6.15.7   Positive and negative attitudes derived from qualitative data analysis

The positive attitudes of learners for all scales obtained from the qualitative data analysis above are summed up in Table 50 and Figure 56 below and the negative attitudes of learners are outlined below in Table 51 and Figure 57.

Table 50: The summary of positive attitude of KS3 learners

Affective	Usefulness	Control	Behavioural	Anxiety	Self-efficacy
The learners appreciate technology (useful, easy to use, and good for solving problem).	The learners use technology for design, search, and improving the presentation of work (pictures & films).	The learners control technology effectively (loading, unloading, uploading & using Internet).	The learners enjoy, and love technology, and PC saves their time and efforts.	The learners feel comfortable, happy and confident in their ability to use PC and Internet without any worries at all.	The learners trust their ability to use technology and they stay calm when they use technology.
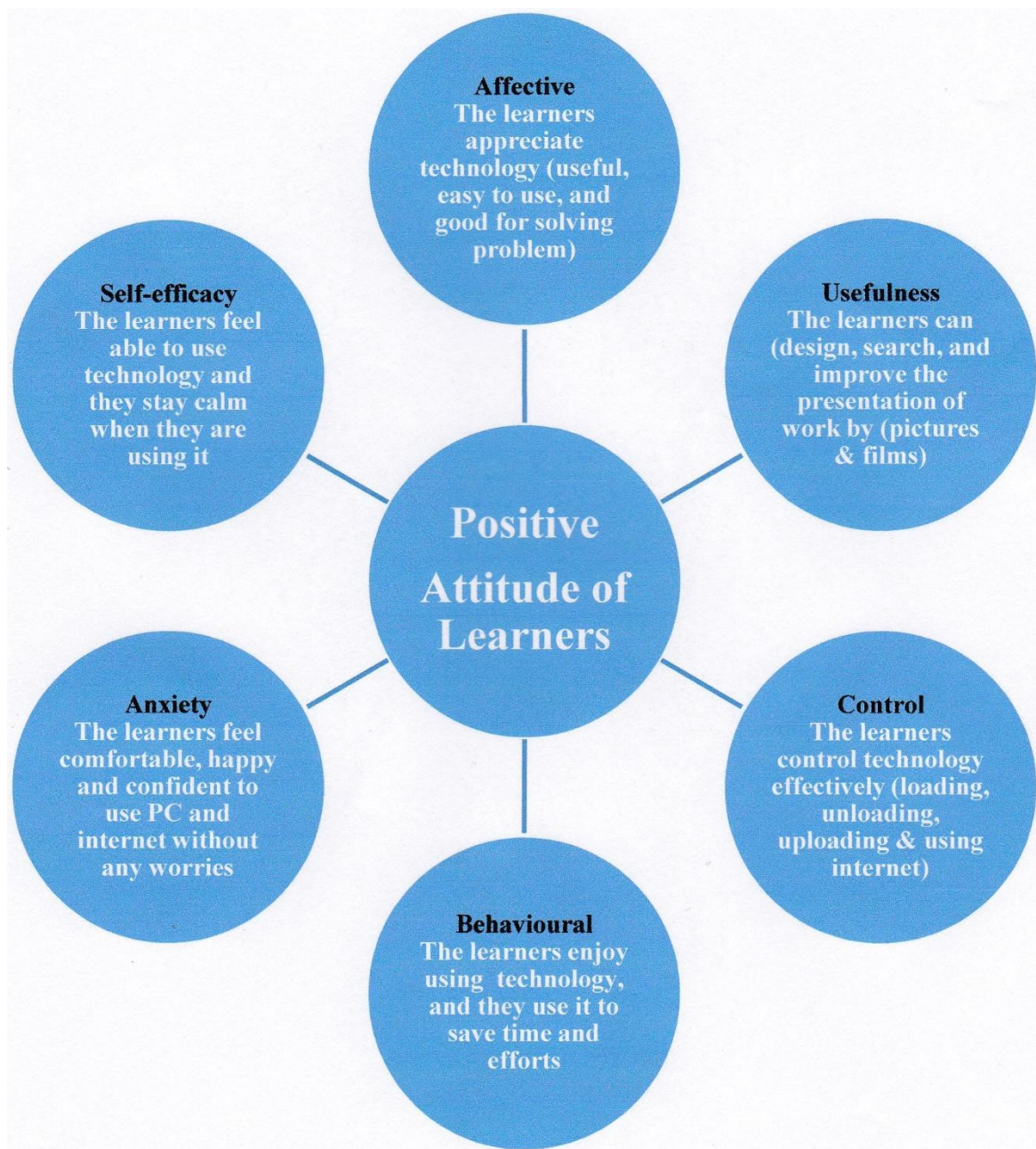
Figure 56: The KS3 learners with positive attitudes

Table 51: The summary of negative attitudes of KS3 learners

Affective	Usefulness	Control	Behavioural	Anxiety	Self-efficacy
The learners do not need Computers to solve problems or to correct mistakes.	They can do some things like PC (Writing & drawing pictures).	The learners believe that PC & Internet will invade the earth and destroy humanity, and they are not in complete Control.	The learners do not like PC and they use it just when they are directed by teachers.	The learners feel exhausted and they do not feel relaxed, and they feel in pain in their back after using PC for long time.	The learners cannot fix problems.
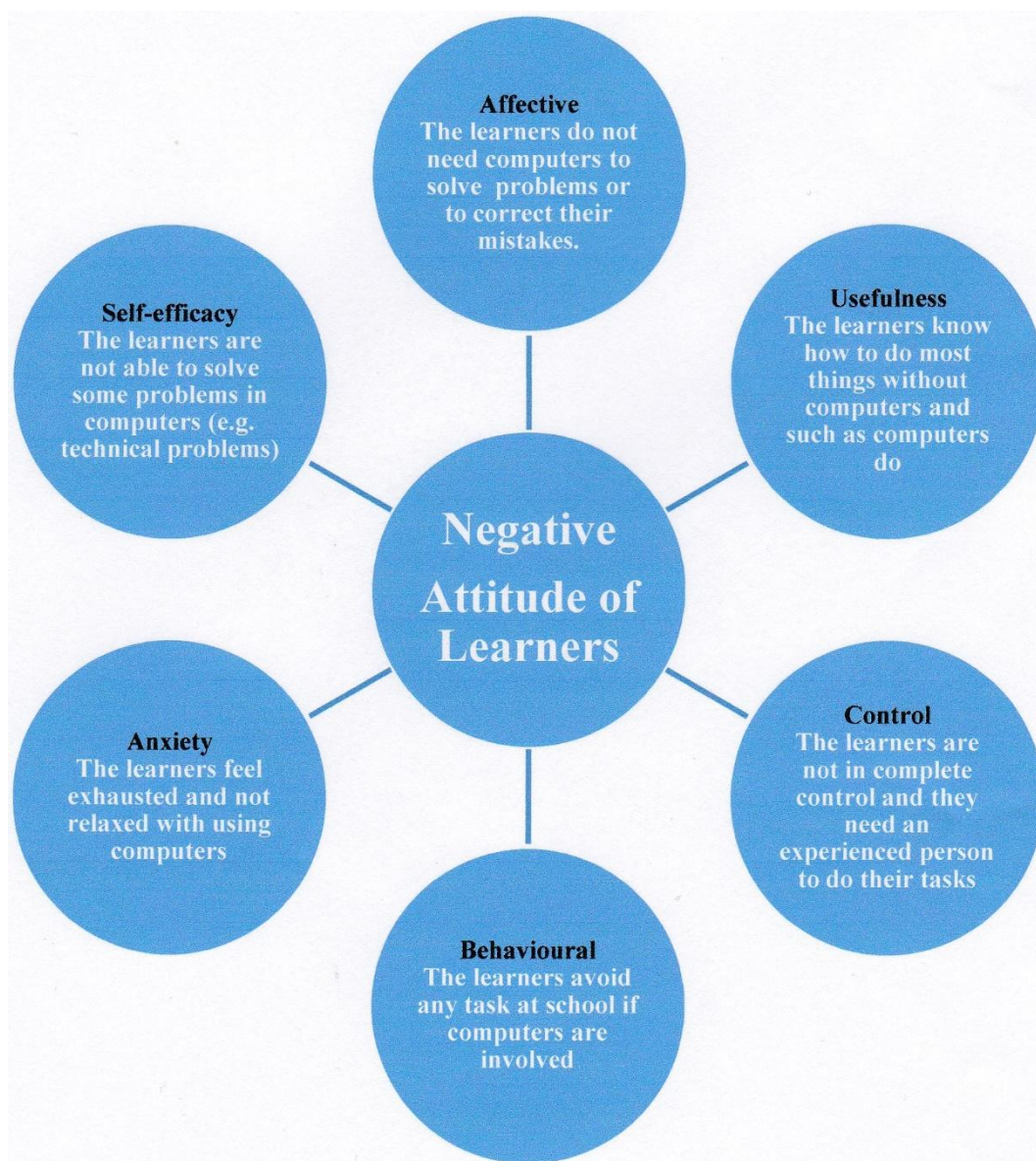
Figure 57:The KS3 learners with negative attitudes

6.16 The summary of the research findings

In the current study it was concluded that the sample distribution is not normal and the data were appropriate for statistical analysis. This research was aimed to explore the attitude of KS3 learners towards using BBC Bitesize Online in the learning process and exploring the impact of technology on KS3 learners' achievement. Semi-structured interviews and a questionnaire were used to explore the attitudes of KS3 learners. A written test was used for exploring KS3 learners' achievement.

216

6.16.1 The answer to question **one**

The answer to question one obtained through questionnaire and semi-structured interview and the answer will be displayed below. Additionally, the answer to question one regarding attitude will be linked to the effectiveness of BBC Bitesize for learning.

6.16.1.1 The answer to question **one** obtained through questionnaire

a) **The mean and the median**

The mean and the median of attitude scores of KS3 learners for using BBC Bitesize and technology are satisfactory for the full questionnaire (full model) (please see Table 28). Additionally, the mean and the median of attitude scores of learners for using technology are acceptable for (Selwyn model, affective, usefulness, control, behavioural, anxiety, and self-efficacy scale) (please see Table 28). Also 92% of KS3 learners have positive attitudes towards technology for all scales (full questionnaire) which is a satisfactory result (please see Table 29).

b) **The impact of socio-psychological on attitude by using (the correlation Spearman's rho)**

- **The study model (new model)**

The correlation (Spearman's rho) between the 5 components (affective, control, behavioural, anxiety, and self-efficacy) of the new model and the attitude is strong and highly significant. But there is a moderate and highly significant correlation between usefulness and the attitude. So the constructs of Selwyn and the new model affect the attitudes of KS3 learners towards Online learning (BBC Bitesize) positively (please see Table 30). The size effect of socio-psychological on attitude from the strongest to the weakest as follows: 1-anxiety, 2- control, 3- behavioural, 4- self-efficacy, 5- affective, 6- usefulness (please see Table 30).

- *Selwyn* **model**

The correlation between Selwyn attitude towards BBC Bitesize and its components (affective, usefulness, control, and behavioural) is strong and highly significant (please see Table 31). The size effect of socio-psychological on attitude from the strongest to weakest as follows: 1- Behavioural. 2- Control. 3- Usefulness and affective (please see Table 31).

c) The size effect of socio-psychological on the attitudes by using (partial correlation)

- **Selwyn constructs**

There is a relationship between the four constructs of Selwyn model (affective, usefulness, control, and behavioural) and the final attitudes. The affective factor has the strongest effect on the KS3 learners' attitudes towards learning via BBC Bitesize followed by behavioural, then usefulness, then control (please see Figure 49).

- **The new model (Selwyn model & anxiety & self-efficacy)**

There is a relationship between the new model six constructs (Selwyn scale & anxiety and self-efficacy) and the final attitudes towards. The behavioural factor has the strongest effect on the KS3 learners' attitude towards learning via BBC Bitesize followed by control, then affective, then self-efficacy, then usefulness, then anxiety. But the result for control and anxiety is not significant (please see Figure 51).

- **The new model after omitting two constructs (control & anxiety)**

There is a relationship between the 4 constructs (affective, usefulness, behavioural, and self-efficacy) and the KS3 learners attitudes towards BBC Bitesize. The affective factor has the strongest effect on the KS3 learners' attitude towards learning via BBC Bitesize followed by behavioural, then usefulness, then self-efficacy (please see Figure 53).

d) Comparison between Selwyn model and the new model

The first three components in terms of the effect on attitude in both models are (affective, behavioural, & usefulness) but the last one in Selwyn model is control

218

factor but is self-efficacy in the new model. Eventually, both models are valid for measuring the attitude of KS3 learners towards Online learning (BBC Bitesize) (please see Table 40, Figure 49 and Figure 53).

6.16.1.2   The answer to question **one** obtained through semi-structured interview

The majority of KS3 learners have positive attitudes towards technology and BBC Bitesize for (the new model, Selwyn model, affective, usefulness scale, control, anxiety, and self-efficacy). There is a small number of learners who have negative attitudes towards technology and BBC Bitesize for the above scales. The positive and negative attitudes can be justified as follows:

a. The justification of positive attitudes:

The positive attitudes are related to the interviewees' understanding that Computers and Internet are familiar for the learners and that they feel relaxed and happy when they use Computers and Internet (Learners 5 and 7). The interviewees realise that Computers and Internet are useful to do homework quickly, can also help in the work presentation, and also organise School work in files, folders and sub-folders (Learners 5, 8, and 10). Also, positive attitude is connected with the interviewee's knowledge and skills in technology and to deal with Computer-Related Problems (Learners 5, 7, and 9). Computers and Internet save the learners' effort and time (Learners 9, and 11). The interviewees' realisation of the helpfulness of Computers and Internet enhances the learners' behaviour for continuing to use them (Learner 11). The feeling of anxiety by the interviewees is absent because they are confident of their ability to use Computers and Internet (Learners 5, 9, and 11). The interviewee who is free from anxiety and fear has shown a positive attitude. These learners believe in their ability to do different useful things with the Computers and Internet such as (dealing with unexpected problems and they stay calm) (Learner 5, 9). This belief of interviewees in their ability to challenge difficulties and sort out problems via Computers and internet enhanced their positive attitudes and their confidence when using Computers and Interne (Learners 5, 9, and 11).

The key words intertwined and linked to the positive attitude towards Computers and Internet is as shown in Figure 58. Figure 58 below summarises the qualitative data

findings in the cuurent study. So, the links are casual and related to the positive attitude in the present study context.
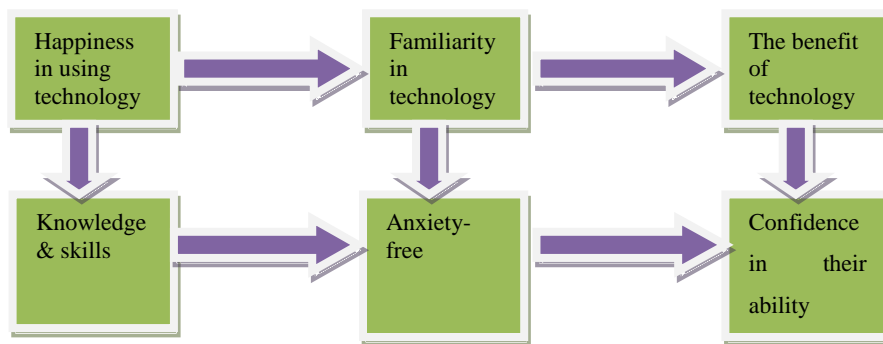
Figure 58: The key words intertwined and linked to the positive attitude in the current study

b. The justification of negative attitudes of learners

Four interviewees have got negative views and they think negatively about Computers and Internet. For this group, Computers and Internet are not helpful and the idea that they are useful is absent. They feel that they can do things with better quality without Computers (Learners 2, and 4). The reason behind the negative attitudes is the lack of experience knowledge, and skills in Computers and Internet field (Learners 2 and 4). Some believe that technology is going to destroy the human relationship between people (Learner 3). Some learners avoid using Computers and Internet because they believe technology is challenging and boring (Learner 6). The feeling of tiredness of some learners prevents them from using Computers and Internet (Learners 2 and 3). Some learners have low confidence in dealing with Computers and Internet (Learner 6). They have a low self-efficacy. The learners do not have sufficient experience and knowledge to use Computers and Internet confidently (Learner 4).

The key words intertwined and linked to the negative attitude towards Computers and Internet is as shown in Figure 59. Figure 59 below summarises the qualitative data findings in the current study. So, the links are casual and related to the negative attitude in the present study context.
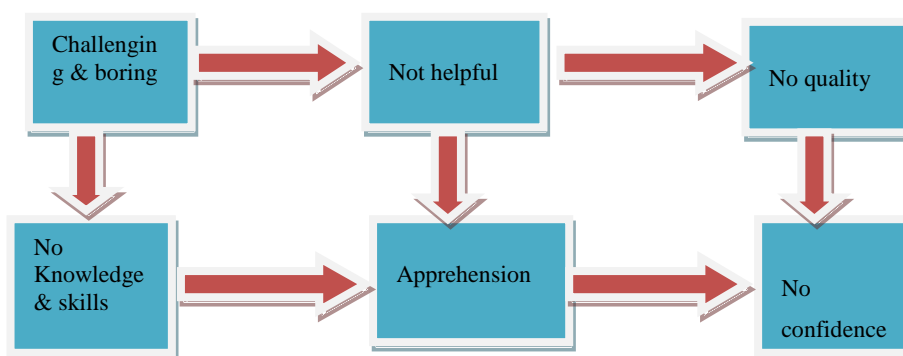
Figure 59: The key words intertwined and linked to the negative attitude in the current study

6.16.2 The link between the attitude and the effectiveness of BBC Bitesize

The results show that 92% of KS3 learners have positive attitudes towards BBC Bitesize (Online learning) for all the scales of the study model (please see Table 29). The mean scores in the questionnaire (the study model) is 75 out of 100 and the median is 78 out of 100 (please see Table 28). Additionally, the mean on Selwyn scale is 75 out of 100 and the median is 78 out of 100 (please see Table 28). The results indicate that KS3 learners have satisfactory attitudes towards BBC Bitesize (Online learning) on the study model and on Selwyn model. The findings obtained via the study model and Selwyn model are supported by the results obtained through the semi-structured interview which show that the majority of learners have positive attitudes towards BBC Bitesize (Online learning) (please see Table 43 and Table 50), because KS3 learners are happy, and they appreciate using BBC bitesize for their study. Also, they believe that BBC Bitesize is useful and helpful for learning and they think that Internet encourages them to develop positive behaviour towards technology. Additionally, they have enough knowledge and skills to deal with technology so this creates positive attitudes towards using BBC Bitesize. Furthermore, the learners do not have fear or apprehension of technology and they trust themselves that they are able to face difficulty by Computer and Internet. According to this dimension the effectiveness of BBC Bitesize is satisfactory.

6.16.3   The answer to question **two**

The answer to question two will be mentioned through the achievement of KS3 learners in the written test for evaluating the effectiveness of BBC Bitesize (Online learning) for learning.

6.16.3.1   The achievement and evaluating the BBC Bitesize effectiveness

The results show that 92% of all KS3 learners have passed the written test (please Table 33), and the mean scores in the written test is 74 out of 100 and the median is 77 out of 100 (please Table 32). The mean and median of the learners' scores are satisfactory for 121 learners. Therefore, according to the achievement dimension, it can be noticed that by using Online learning (BBC Bitesize) KS3 learners have gained acceptable level of knowledge and skills in the unite of microbes in science. The mean and median scores are a good sign for effective learning. Eventually, the effectiveness of BBC Bitesize for Online learning is satisfactory for KS3 learners in the UK.

6.16.4   The answer to question **three**

- Using **Spearman's rank correlation coefficient** as a data analysis method for exploring the relationship between the attitudes and achievement shows that there is a significant medium positive relationship between the achievement of KS3 learners and their attitudes towards BBC Bitesize (Online learning) on (the study model & Selwyn model) (please see Table 35). And there is a significant medium positive relationship between the achievement of KS3 learners and their attitudes on (affective scale, behavioural scale, and anxiety scale) (please see Table 35). Also, there is a significant moderate positive relationship between the achievement of KS3 learners and their attitude on (usefulness scale, control scale, and self-efficacy scale) (please see Table 35).

- **PLS-SEM method** of Smart-PLS software was used for an in-depth understanding of the relationship between KS3 learners' attitudes towards learning via BBC Bitesize and their achievement via using BBC Bitesize. The results show that there is a strong relationship between KS3 learners' attitudes based on Selwyn scale

towards learning via BBC Bitesize and their achievement via using BBC Bitesize (please see Figure 49). Additionally, there is a strong relationship between KS3 learners' attitudes (based on the present study model: affective, usefulness, control, behavioural, anxiety, and self-efficacy) towards learning via BBC Bitesize and their achievement via using BBC Bitesize (please see Figure 51). Finally, after omitting two of the factors (control and anxiety) because they are not significant. Also, the results show that there is a strong relationship between the KS3 learners' attitudes based on the new model (affective, usefulness, behavioural, and self-efficacy) towards learning via BBC Bitesize and their achievement via using BBC Bitesize in their learning (please see Figure 53).

- Using the **partial correlation** is useful for identifying the effect of socio-psychological components on the attitude towards BBC Bitesize after linking the attitude construct with the achievement construct. So, the findings show for the model of study that the affective factor has the strongest effect on the KS3 learners' attitude towards learning via BBC Bitesize followed by behavioural, then usefulness, then self-efficacy (please see Figure 53). Additionally, for Selwyn model there is similarity with the study model in the first three components (affective, behavioural, and usefulness) but the last one is control not self-efficacy as it is in the current study model (please see Figure 49).

6.17 Summary

This Chapter has dealt with the analysis of the data collected for this current study qualitatively and quantitatively. The quantitative data were collected via a questionnaire and a written test. The qualitative data were collected via semi-structured-interviews. SPSS programme was used for quantitative data analysis. Data were collected from KS3 121 learners by a questionnaire and a written test, and 11 KS3 learners were interviewed. The data were categorised in three themes as follows:

a. **The effect of Computers & BBC Bitesize on KS3 learners' attitudes**. Data for this theme have been collected through Selwyn questionnaire and the present study model. The attitudes were measured according to 6 constructs in the present study

model and 4 constructs for Selwyn model. Also, qualitative data have been collected through semi-structured interviews.

b. **The impact of Computers & BBC Bitesize on KS3 learners' achievement and learning effectiveness**. Data for this theme have been collected through a written test.

c. **The correlation between the learners' attitudes towards BBC Bitesize and their achievement**. Data for this theme have been collected though a questionnaire, and a written test.

The quantitative data have been collected through a questionnaire and written test. The questionnaire has been used for exploring the attitudes of KS3 learners towards BBC Bitesize (Online learning). The data were analysed using some data analysis methods through SPSS software and Smart-PLS program. The results corresponding with theme one and answer the first research question: **How does BBC Bitesize affect the KS3 learners' attitudes towards Online learning methods?** A written test as another data collection method has been used to collect data about the KS3 learners' achievement. The data obtained from the test corresponding with theme two and answer research question two: **How does BBC Bitesize (Online learning source) affect the KS3 learners' achievement?**

The qualitative data have been collected through semi-structured interviews and have been analysed by the researcher. The learners' views were described and interpreted according to the research questions 1 and theme 1. A summary of the views and perspectives has been displayed to clarify the attitudes of KS3 learners towards technology and BBC Bitesize in both secondary Schools.

Theme three was addressed and the research question three: **How do the KS3 learners' attitudes affect their achievement?** This question was answered via using data analysis methods through SPSS program and Smart-PLS program to explore the relationship between the attitude and the level of achievement. Also, the goal was to discover the most effective construct on the attitudes and achievement.

Overall, the results show that Selwyn model (affective, usefulness, control, & behavioural) is valid for surveying KS3 attitude towards BBC Bitesize (Online learning). Also, the new model (affective, usefulness, behavioural, and self-efficacy) is valid for studying the attitude. Additionally, the results denote that the socio-psychological factors affect the attitude substantially. Moreover, the attitude of learners affects the level of achievement. If the attitude was positive the level of achievement will be satisfactory and vice versa. Eventually, there is a strong relationship between KS3 learners' attitudes towards learning via BBC Bitesize and their achievement via using BBC Bitesize. The qualitative data show that the majority of KS3 learners have positive attitudes towards BBC Bitesize (Online learning) because they are happy and appreciate using BBC Bitesize and they realise the benefit of BBC Bitesize and Internet. Also, they have knowledge and skills in technology to develop a good behaviour towards BBC Bitesize. Furthermore, KS3 learners do not show any fear or they are not terrified of technology and Internet but they believe in their ability to use technology for sorting out problems and difficulties.

Chapter 7

Discussion Chapter

7.1 Introduction

The previouse Chapter was focused on the primary data analysis and the findings. Selwyn model and the present study model are proven to be valid and suitable for measuring attitudes towards BBC Bitesize. The attitudes of the study learners are positive and their achievement is satisfactory. In the current discussion Chapter, the analysis findings (Chapter 6) will be compared to the literature review theoretical findings (Chapter 2). In this Chapter data analysis will be undertaken according to the themes and research questions of the current study. There are three themes and three research questions in this study: learners' attitudes towards the implementation of BBC Bitesize in their learning, the impact of Computer & BBC Bitesize on KS3 learners' achievemnet and their learning effectiveness, and the relationship between KS3 learners' attitudes towards BBC Bitesize and their achievement via using BBC Bitesize. These are the themes on which data discussion will be based and build the structure for this Chapter.

The current study approaches attitude as a combination of 6 componants: affective, usefulness, control, behavioural intentions, anxiety, and self-efficacy. They all construct attitude and contribute to its structure. Discussion of the KS3 learners' attitudes will start with analysing each component of the attitude first, and then defining the attitudes as a whole. The results obtained from qualitative analysis of the data will be compared with the results yielded quantitatively. Moreover, the relationship between the attitude and its components and the size effect of every component on attitude will be discussed. Furthermore, in the last part of this section the similarities and the differences between the results of this work and the results obtained by other research studies will be discussed to show what has been contributed by this study.

7.2 The effect of Computers & BBC Bitesize on KS3 learners' attitudes

This section discusses the answer to first research question - **How does BBC Bitesize affect the KS3 learners' attitudes towards Online learning methods?**

It can be concluded from the quantitative data (section 6.9.1) that the mean and the median scores of attitude towards Computers & BBC Bitesize are satisfactory (please see Table 28). An acceptable percentage of learners have positive attitudes towards Computers and BBC Bitesize (section 6.9.2) (Please see Table 29). These findings are also supported by the results which were obtained through qualitative data in (section 6.15) as the majority of KS3 learners have positive attitudes towards Computers & Internet for learning. Both quantitative and qualitative data analysis findings are consistent and supporting each other.

7.2.1 Comparing the findings of the current study with other studies results

In this study, an attitude was approached as having 6 constructs: affective, perceived usefulness, perceived control, behavioural, anxiety, and self-efficacy. These components were considered in data analysis and they will be used in data finding discussion. Therefore, the final picture of KS3 learners' attitudes toward Computer and Online learning BBC Bitesize will be depicted in –depth and as more-detailed.

By using the Likert scale, quantitative data analysis showed that the mean scores of KS3 learners' attitude towards Computers & BBC Bitesize were satisfactory (141.64 out of 188 or 75 out of 100) and the median was (146 out of 188 or 78 out of 100) (please see Table 28 in section 6.9.1). 92% of KS3 learners had positive attitudes towards Computers and BBC Bitesize, which was acceptable (please see Table 29 in section 6.9.2). The results obtained qualitatively showed that the majority of KS3 learners had positive attitudes towards Computer & Internet and especially toward BBC Bitesize as Online learning (section 6.15). Both quantitative and qualitative data analysis findings are consistent.

These findings are consistent with the study of Abedalaziz et al. (2013). The positive attitude in the current study could be attributed to the availability and accessibility to BBC Bitesize for KS3 learners in the UK. BBC Bitsize is well-known by learners in the UK (BBC Bitesize 2012). Additionally, BBC Bitesize is a famous Online learning website and 60% of KS3 learners in the UK use BBC Bitesize to revise for their exams because the facts and concepts of the subjects are delivered in explicit and clear methods (Reida & Pruijsenb 2015). BBC Bitesize benefitted the study learners in behaviours that may have created their attitudes in a positive direction. Therefore, using BBC Bitesize and Internet by KS3 learner would be linked to the accomplishment of their School tasks. All these reasons make BBC Bitesize very attractive for KS3 learners in the UK. However, it is worth mentioning that there are similarities and the differences between the current study and Abedalaziz et al. (2013). The participants are KS3 in the current study but postgraduate in Abedalaziz et al. study. The model used in the current study is CAS (Computer Attitudes Scale) which is composed by Selwyn and two extra constructs (anxiety & self-efficacy) were added while just CAS model was used in Abedalaziz et al. (2013). Mixed research methods (qualitative & quantitative) and two data collection methods (questionnaire & semi-structured interview) were used in the current study but quantitative data were collected by a questionnaire in Abedalaziz et al. study. The results of attitude study were positive in both studies but measuring the attitude was based on CAS (4 constructs) which are (affective, usefulness, control, and behavioural) in Abedalaziz et al. study but two more constructs (anxiety and self-efficacy) were added to CAS model in the current study. The two studies findings are consistent in terms of the positive attitudes of the two studies learners where CAS was used. Learners in both studies expressed positive attitudes towards the use of Computer as a learning tool.

 Quantitative data analysis showed that the mean scores of KS3 learners' attitudes towards Computers & BBC Bitesize was satisfactory (66 out of 88 or 75 out of 100) and the median was (69 out of 88 or 78 out of 100) (please see Table 28 in section 6.9.1). 91% of KS3 learners had positive attitudes towards Computers and BBC Bitesize which was an acceptable percentage (please see Table 29 in section 6.9.2). Additionally, the results obtained qualitatively supported the quantitative results. The majority of KS3 learners had positive attitudes towards Computer & Internet (BBC Bitesize) (section 6.15). From these

results it can be concluded that there is a similarity between the findings obtained through Selwyn model and the results in the current study model. CAS was the skeleton of the current study model therefore, CAS or Selwyn model was used for measuring the attitudes of KS3 toward Computer & Internet (Online learning BBC Bitesize). The findings of the attitude study in the current study compared favourably with the results of the attitude study in Abedalaziz et al. (2013) study. The study of Abedalaziz aimed to study the significant differences of learners' attitude by gender, age, field of study, and ethnicity while the present study aimed to study the attitude for all KS3 learners regardless the gender and ethnicity but all participants in the same age and the level of study. Furthermore, the attitude toward Online learning BBC Bitesize was linked with the learners' achievement which is absent in Abedalaziz et al. (2013) study. However, the current study proves that Selwyn's Computer Attitude Scale (CAS) is significantly valid (please section 6.5) and all constructs are reliable (please section 6.4) and this result is consistent with (Larbi-Apau and Moseley 2012).

The qualitative results support the quantitative findings and the majority of KS3 learners had positive attitudes on all constructs of Selwyn scale and on anxiety and self-efficacy as well, as follows:

At the Affective level, KS3 learners' attitudes are positive. The mean scores of KS3 learners' attitudes on affective was satisfactory and positive (20.047 out of 24 or 83.53/100), and the median was acceptable and positive (19 out of 24 or 79 out of 100) (please see section 6.9.1, Table 28). The results in the current study are compatible with the results in Abedalaziz et al. (2013) study. In Abedalaziz et al. (2013) the mean scores of learners' attitudes on affective are positive as they are in the current study. The mean scores of attitude on affective were the highest in the current study but were the third in Abedalaziz et al. (2013). The sample of participants in Abedalaziz et al. (2013) was postgraduate learners' from four educational Master degree programs in Malaya not KS3 learner in the UK as it is in the current study. As far as Affective level of an attitude is concerned, the present study results support the study results of Abedalaziz et al. (2013), though the study context was different.

93% of KS3 learners had positive attitudes on affective construct which was acceptable and 7% of KS3 learners had negative attitudes (please see section 6.9.2, Table 29). The qualitative data showed that the majority of KS3 learners had positive attitudes towards BBC Bitesize. The learners' attitudes were related to the interviewees' awareness that Computers were not scary machines and KS3 learners felt comfortable when they used Computers and Internet. Therefore, the learners did not have apprehension to use BBC Bitesize for example (Learners 5, 7 and 11). But learner 6 believed that he could sort out all his mistakes, and problems without Computers and Internet (please see section 6.15.1). Additionally, the results showed that there was a strong and significant correlation between the affective construct and the attitude and it was the fifth contributor of Computer & Internet attitude on the current study scale (6 factors) (please see section 6.9.3, Table 30). The affective level was the third contributor of Computers & Internet attitude on Selwyn scale (please See section 6.9.4, Table 31). These results are consistent with Larbi-Apau & Moseley (2012) study. In Larbi-Apau & Moseley's study the attitude was measured by Selwyn scale and the affective component was the first contributor on the attitude. In Larbi-Apau & Moseley study the data were collected by questionnaire from learners in different academic teaching disciplines in three state traditional Universities in Ghana not in the UK Schools as it is in the current study. Therefore, affective factor is essential in determining the attitudes of the learners towards the use of BBC Bitesize as a learning tool.

From the results it can be concluded that KS3 learners have sufficient satisfaction towards learning Science via BBC Bitesize and they appreciate using it because most learners welcome using Internet in their studies (Becta 2008). Therefore, KS3 learners like to study through Online learning BBC Bitesize.

At the **Usefulness** level, **KS3 learners have positive attitude**. The mean scores of KS3 learners' attitudes on usefulness were satisfactory and positive (14.438 out of 20 or 72.19/100), and the median was acceptable and positive (15 out of 20 or 75 out of 100) (please see section 6.9.1, Table 28).

The results in the current study agreed with the results in Abedalaziz et al. (2013) study. In Abedalaziz et al. (2013) the mean scores of learners' attitudes on usefulness were

230

positive as they are in the current study. The mean scores of attitude on usefulness were the fifth in the current study but were the highest in Abedalaziz et al. (2013).

91% of KS3 learners had positive attitudes on usefulness construct which was acceptable and 9% of KS3 learners had negative attitudes (please see section 6.9.2, Table 29). And the qualitative data analysis showed that the majority of KS3 learners had positive attitudes towards BBC Bitesize. KS3 learners wanted to use BBC Bitesize because they thought that it was useful and it made a difference to their understanding and it had a positive impact on their learning. They also thought that Computers and Internet helped them to organise their learning and School work in a better way by using pictures, diagrams and tables. The learners work more productively and quickly by Computers and Internet (learners 5, 8, and 10).

But some learners believed that the usefulness of Computers and Internet was not present (Learners 1, 2, and 4). KS3 learners explained their positive acceptance in section (6.15.2). Furthermore, the results showed that there was a moderate and significant correlation between the usefulness construct and the attitude and usefulness was the sixth contributor of Computer & Internet attitude on the current study scale (6 factors) (please see section 6.9.3, Table 30). Correlation was strong and significant on Selwyn scale and it was the third contributor of Computer & Internet attitude (please see section 6.9.4, Table 31). These results are consistent with Larbi-Apau & Moseley's (2012) study. In Larbi-Apau & Moseley study the attitude was measured by Selwyn scale and usefulness was the second contributor on the attitude. The data were collected by a questionnaire in Larbi-Apau & Moseley study but by questionnaire and semi-structured interview in the present study. However, KS3 learners had the intention to use BBC Bitesize and they believed that using BBC Bitesize would improve their performance. The reason behind that was that there were different methods to support KS3 learners and the topics in all subjects could be delivered from different angles (Pachler & Cook 2009). This reflects the benefit of BBC Bitesize for KS3 learners. Usefulness is, therefore, a factor that determines the learners' attitudes.

At the perceived **Control** level, **KS3 learners' attitudes are positive**. The mean scores of KS3 learners' attitudes on control were satisfactory and positive (17.584 out of 24 or

75/100), and the median was acceptable and positive (18 out of 24 or 75 out of 100) (please see section 6.9.1, Table 28).

The results in the current study met the results in Abedalaziz et al. (2013) study. In Abedalaziz et al. (2013) the mean scores of learners' attitudes on control were positive as they were in the current study. The mean scores of attitude on control were the fourth in the current study but were the second in Abedalaziz et al. (2013).

93% of KS3 learners had positive attitudes on control construct which was acceptable and 7% of KS3 learners had negative attitudes (please see section 6.9.2, Table 29). The qualitative data showed that the majority of KS3 learners had positive attitudes towards BBC Bitesize. KS3 learners felt in control when they used Computers and Internet because the interviewees' knowledge enabled them to deal with Computer-Related Problems and they knew good ways about how to deal with Computers and Internet and they could deal with any emerging problem (Learners 5, 7 and 11).

But some learners had negative attitudes and the negative perspective was based on the deficiency in knowledge and experiences to control Computers and Internet (Learners 2, 3, and 4) (please See section 6.15.3). Moreover, the results showed that there was a strong and significant correlation between the control construct and the attitude and the control was the third contributor of Computer & Internet attitude on the current study scale (6 factors) (please see section 6.9.3, Table 30). Also, correlation was strong and significant on Selwyn scale and it was the second contributor of Computer & Internet attitude (please see section 6.9.4, Table 31).

These results are consistent with Larbi-Apau & Moseley (2012) study. In Larbi-Apau & Moseley's (2012) study the attitude was measured by Selwyn scale and the control was the second contributor on the attitude. The data were collected by a questionnaire in Larbi-Apau & Moseley (2012) study while data were collected by a questionnaire and semi-structred interview in the current study. The participents in Larbi-Apau & Moseley (2012) were learners in different academic teaching disciplines not KS3 as it is the case in the current study. Overall, KS3 learners believed that it was easy to use BBC Bitesize by them because they had adequate skills and knowledge to use BBC Bitesize. The easiness of

BBC Bitesize stemmed from the BBC staff awareness of the value of Online learning since this web has started. So the BBC has provided the School learners with a rich instructive material (Mouromtsev and d'Aquin 2016). Therefore, knowing how to control the Computer is an important factor in shaping the learner's attitudes towards the use of Computer and BBC Bitesize as a learning tool.

At the **Behavioural** intention level, KS3 learners' **attitudes** are positive. The mean scores of KS3 learners' attitudes on behavioural were satisfactory and positive (14 out of 20 or 70/100), and the median was (15 out of 20 or 75 out of 100), which is satisfactory and positive (please see section 6.9.1, Table 28).

The results in the current study meet the results in Abedalaziz et al. (2013) study. In Abedalaziz et al. (2013) the mean scores of learners' attitudes on behavioural were positive as it was the case in the current study. The mean scores of attitude on behavioural were the sixth in the current study but were the fourth in Abedalaziz et al. (2013).

Quantitative data analysis showed that 85% of KS3 learners had positive attitudes on behavioural construct which was acceptable and 15% of learners had negative attitudes (please see section 6.9.2, Table 29). Additionally, the qualitative data show that the majority of KS3 learners have positive attitudes towards BBC Bitesize. The learners did not avoid using Computers and Internet especially when BBC Bitesize was involved. They did not avoid BBC Bitesize in School because it was easy to be used. The learners believed that Computers and Internet were helpful to enhance their knowledge; rather they improved the interviewees' work at School. Computers and Internet saved the learners' effort and time. They wanted to resume using Computers because of the benefit they got from them and the help they offered. The realisation of the helpfulness of Computers enhanced this behaviour of continuing to use Computers (Learners 5, 9, and 11) in section (6.15.4). However, some learners had negative attitudes and the negative perspective was created by the learners' belief that the School tasks were challenging and their interest in technology was absent, rather they preferred football to technology (Learners 2, 4 and 6) in section (6.15.4). Alongside, the results showed that there was a strong and significant correlation between the behavioural construct and the attitude and the behavioural was the second contributor of Computer & Internet attitude on the current study scale (6 factors)

(please see section 6.9.3, Table 30). The correlation was strong and significant on Selwyn scale and the behavioural was the first contributor of Computer & Internet attitude (please see section 6.9.4, Table 31). These results are consistent with Larbi-Apau & Moseley (2012) study. In Larbi-Apau & Moseley (2012) study the attitude was measured by Selwyn scale (4 factors) and the behavioural was the third contributor on the attitude. Eventually, KS3 learners presented positive behaviour towards BBC Bitesize. This behaviour was based on KS3 learners' beliefs and philosophy which accepted Online learning BBC Bitesize for learning Science. The availability of Internet and increasing the access to Internet by learners contributed to getting the benefit of the education across the world and instructional sources. Using the Internet very often made the learners familiar with it and with technology (Abedalaziz et al. 2013). The availability of BBC Bitesize any time and the capability of learners to study autonomously without teachers were the advantages of BBC Bitesize (Paget 2012). This creates a positive behaviour of learner towards technology. Hence, behaviour intention is an important factor in determining the learners' attitudes towards the use of BBC Bitesize as a learning tool.

At the **Anxiety** level, the mean scores of KS3 learners' **attitudes** on *anxiety* were (46.8 out of 60 or 78 out of 100 and the median is (49 out of 60 or 82 out of 100), which was acceptable and positive (please see section 6.9.1, Table 28). Quantitative data analysis showed that 94% of KS3 learners had positive attitudes on anxiety construct which was acceptable (please see section 6.9.2, Table 29). That means 94% of KS3 learners in the current study did not fear using Online learning BBC Bitesize. 6% of KS3 learners were scared and worried from using Computer and BBC Bitesize. Additionally, the qualitative data showed that the majority of KS3 learners had positive attitudes towards BBC Bitesize. KS3 learners were free of anxiety when they were working with Computers and Internet BBC Bitesize. This is evident through (Learns 5, 9, and 11) in section (6.15.5). KS3 learners did not avoid using Computers and Internet for example BBC Bitesize, and they did not feel anxious when they were using Computer and BBC Bitesize because they were confident and they could correct their mistakes. Less anxiety encouraged them to use Computers and Internet (BBC Bitesize) calmly and enjoy them. They also felt content, comfortable and happy when using Computers & Internet (BBC Bitesize).

However, some learners felt anxious and not happy when they used Computers because they were desperate to use them for School work and they felt exhausted from Computers and developed pain in their backs and eyes. In general, they did not care about technology (Learner 2 and 3) in (section 6.15.5). Additionally, the results showed that there was a strong significant correlation between the anxiety construct and the attitude and anxiety was the first contributor of Computer & Internet attitude on the current study scale (6 factors) (please see section 6.9.3, Table 30). This result means that the high level of anxiety makes the learners' attitudes towards Online learning BBC Bitesize negative. Also, the low level of anxiety increases the possibility of attitudes to be positive. In fact, BBC Bitesize offers free source for learning because it is a free website (Bernal- Merino 2015). So, the absence of KS3 learners' stress, phobia, and worries can be due to the possibility of getting free resources. So, using BBC Bitesize for learning does not create any financial problems for learners and their parents. Additionally, teachers and parents encourage the learners to use BBC Bitesize (Ibid.). This encouragement helps in creating the learner motivation towards BBC Bitesize to be used comfortably and easily. However, the result in the current study is consistent with Adebowale et al. (2009) study. Adebowale et al. (2009) study aimed to find out the learners attitude towards Computer and Computer anxiety in secondary School in Nigeria. The results showed that Computer anxiety plays a significantly negative role in shaping the learners' attitudes as it is in the current study (Adebowale et al. 2009). The main differences between this study and the current study are that Adebowale's study has not studied most factors which have been studied in the current study. The attitude was studied towards Computer only not towards Internet and Online learning which is the case in the current study. Two questionnaires were used for collecting quantitative data about attitude in Adebowale's study but it was a questionnaire for collecting quantitative data and semi-structured interview for qualitative data in the current study. Also, Huang and Hsu (2006) study was conducted on University learners in Taiwan. Huang and Hsu study results were consistent with the current study. The results showed that there was negative correlation between anxiety and positive attitudes and that is the case in the current study (Huang and Hsu 2006). That means the apprehension of using BBC Bitesize will affect the attitude negatively. However, the anxiety factor is an obstacle in creating positive attitudes towards the Computer, Internet and Online learning BBC Bitesize. Overall, Huang and Hsu study was conducted on University learners by using a scale consists of two socio-psychological factors (anxiety & self-efficacy) but the

current study was conducted on secondary School learners and the scale of attitude is based on 6 socio-psychological factors two of them are (anxiety & self-efficacy). Thus, anxiety is a factor that affects attitudes in a negative way i.e. the existence of anxiety of the Computer makes the learners' attitudes negative towards using the Computer and BBC Bitesize. Learners with anxiety and comprehension were found to express negative attitudes towards using Computers.

At the **Self-efficacy** level, the mean scores of KS3 learners' **attitudes** on **self-efficacy** were satisfactory (29.716 out of 40 or 74.29 out of 100 and the median was acceptable (29 out of 40 or 73 out of 100) (please see section 6.9.1, Table 28). Quantitative data analysis showed that 94% of KS3 learners had positive attitudes on self-efficacy construct which was acceptable and 6% of learners had negative attitude (please see section 6.9.2, Table 29). Additionally, the results showed that there was a strong significant relationship between self-efficacy and attitude towards Online learning BBC Bitesize (please see section 6.9.3, Table 30). Qualitative data analysis showed that the majority of KS3 learners had positive attitudes towards BBC Bitesize. KS3 learners' attitudes were positive. This was evident through (Learners 5, 9, and 11) in (section 6.15.6). KS3 learners were confident that they could always manage to solve difficult problems by using Computers and Internet because they were skilled in technology. They were capable to use Internet to find information to get what they wanted if someone confounded them. They were also confident that they could deal with unexpected and unforeseen situations. They could get their learning goals by using Computers and Internet because they could get the right information to support their study. The KS3 learners' high self-efficacy was expressed when they felt confident that they could solve unforeseen problems via Internet to find the resolution while staying calm. They could handle whatever happened without losing control or calmness when they were using Computers and Internet due to their skills. Finally, the results showed that the majority of KS3 learners had positive attitude on self-efficacy construct. But some learners had negative attitude on this construct because they did not trust internet and they suffered too much surfing Internet to find the suitable information to improve their learning, rather they needed somebody to fix and sort out their technical problems (Learners 3, 4, and 6) (please see section 6.15.6). The current study results are consistent with those of Huang and Hsu (2006) study. Huang and Hsu study shows that there is a correlation between Computer self-efficacy and positive

236

attitude and as it is in the current study. That means KS3 learners have the confidence and believe that they have skills and knowledge to use Computers and Internet so this belief contributes in creating the positive attitude towards Online learning BBC Bitesize. BBC website delivers good Online sources (Reida & Pruijsenb 2015). BBC Bitesize starts from simple KS1 to difficult GCSE (BBC 2012). BBC Bitesize provides helpful guidance for all stages in the National Curriculum (Chivers & Shoolbred 2007). These characteristics of BBC Bitesize create the confidence of learners and reinforce their self-efficacy for grasping skills and knowledge. The learners in the current study are at secondary School but they are University learners in Huang and Hsu (2006). Furthermore, the current study results are consistent with those of Simsek's study (2011). The study investigated the Computer self-efficacy of learners and teachers in elementary and secondary Schools. The results showed that Computer self-efficacy score for the overall sample was relatively high and learners had higher self-efficacy scores than their teachers (Simsek 2011). The current study shows that the mean and median scores of self-efficacy attitude towards Computer and Internet (BBC Bitesize) are satisfactory and acceptable. In the current study the attitude has been studied against 6 factors but in Simsek's study the attitude has been studied on two factors (anxiety & self-efficacy). Also, Simsek has not studied the impact of Computers and Internet attitude on achievement as it is the case in the current study. Therefore, self-efficacy is an important predictor of the learners' attitudes towards Online learning and BBC Bitesize as a learning tool. Learners with high self-efficacy have expressed positive attitudes towards Online learning.

7.3 The impact of Computers & BBC Bitesize on KS3 learners' achievement

KS3 learners' achievement via using BBC Bitesize in their learning will be discussed through answering the current study research question "**How does BBC Bitesize (Online learning source) affect the KS3 learners' achievement?".**
 The mean scores of achievement for 121 KS3 learners are 73 out of 100 and the median scores were 77 out of 100 (please see section 6.10.1, Table 32). The results in the current study denoted that the scores of the learners in the test were acceptable. Also, 92% of KS3

learners passed the test. On the other hand 8% of the learners did not pass because they did not answer 50% of the test questions (please see section 6.10.2, Table 33). Moreover, the percentage of successful learners in the test was satisfactory. There can be a number of reasons why the results of unsuccessful learners were not in line with the vast majority of learners.

As far as the opinions and views about the role of the Internet in the learners' achievement are concerned, researchers are divided into teams. The first team considers that Computer, Internet and instructional technologies in general can support and improve learners' achievement (Hattie and Anderman 2013). Also, they believe that using the current technologies help in creating a flexible and interactive structure for instruction (Ibid.). In fact, technology has driven the change in the learning methods and how learning can take place genuinely and cognitively (Keengwee 2015). Learners in these days are engaged in the current technologies and they expect to have the right to use the information and to be in touch with the world around them (Ibid.).The second team is of researchers could not find any difference in achievement when using technologies in the learning process. This team thinks that the performance and achievement of learners cannot be enhanced by investing the current technologies in the classrooms (OECD 2015). This team believes that there is more possibility that using Computers can lead to lower achievement (Ibid.). The results of learners in the current study will be discussed in the light of the two points of views above.

The results in the current study are compatible with those Delen and Bulut's study (2011). Delen and Bulut's study showed that the ICT usage has a positive impact on learners' Maths and Science performance and achievement (Delen and Bulut 2011). This result is associated with the current study. The participants in Delen and Bulut study and in the current study belong to secondary School and the difference in the age and the level of study is very little. But the main differences are that the current study has focused on linking the achievement of learners with their attitudes towards Online learning BBC Bitesize but this aspect is missing in Delen and Bulut's study. Also, Delen and Bulut's study has not focused on the role of Online learning on achievement which is the case in the current study.

The current study results support to a high degree Heppen et al's. (2015) study. Heppen et al's study has been implemented on middle grade School learners as it is in the current study. Algebra subject has been learnt through an Online course. The result showed that Online Algebra courses had a positive impact on the learners' achievement at the end of course and this result agrees with that of the current study. However, in the current study the learners have studied Science Online not Algebra. Also, the effect of Online course on the learners' achievement in Algebra subject has been studied in isolation of attitudes while both constructs attitude and achievement have been studied in the current study.

Additionally, the results of the current study are consistent to some degree with Kalelioglu's study (2015). Kalelioglu's study aimed to discover the importance of teaching code.org site (Online teaching) on thinking skills for problem solving and achievement. The results revealed that code.org site did not have an effect on the thinking skill towards problem solving but the learners' performances on the code.org site were much higher than their normal classroom activities. The sample in Kalelioglu's study is 32 primary School learners attending a Computer course not secondary School learners studying Science Online as it is in the current study.

Moreover, the results of the current study are consistent to some degree with Wenglinsky's study (2006). Wenglinsky studied the effect of Computers on the level of achievement of 4th and 8th graders learners in mathematics, Science, and reading. The study suggested that the best boost to learner achievement may be when Computer cultivates the learners' Computer skills (Wenglinsky 2006). The current study has surveyed the effect of Computers and Internet through Online courses on achievement not just Computers as it was in Wenglinsky study. Also, the attitude was not studied in Wenglinsky study for the effectiveness to be assessed.

In fact a lot of studies support the current study and use Online courses for learning. For example, it was noticed that Online coursework improved the test scores of learners (Meyer 2014). Also, Online courses were effective for learning because the learners could get richer portfolios by merging sound and images (Lou et al. 2013). Moreover, a plethora of studies revealed that by using Online learning the learners' achievement is better than the learners' achievement by using other traditional learning methods (Higgins 2013;Lim et al. 2008).

However, there are some reasons behind the success of using Online learning BBC Bitesize for KS3 learners:

a. BBC Bitesize is available anytime (Paget 2012) and is accessible for any learner anywhere (BBC Bitesize 2012). In general, Online learning is more flexible than other learning methods, and in this model of learning times and places do not need to be arranged for learners (Hillman and Corkery 2010). The learners use BBC Bitesize as an Online learning source (Reida & Pruijsenb 2015) and BBC Bitesize has developed a number of Online learning courses (BBC 2012).

b. The Internet stimulates the sense of enquiring and interest within the learners (Younie et al. 2014). Also, the Internet improves the cognitive skills and the brain function of the learners (Savage & McGoun 2013). Alongside, BBC Bitesize provides knowledge and explanations On-screen (Paget 2012). However, the best learning occurs when the learners use the knowledge gained in the Computer lab (Dickinson and Repman 2015).

c. BBC Bitesize site has useful guidance (Chivers & Shoolbred 2007), and it is a helpful site for revising (Beveridge 2012;Dickinson & Benson 2015;Doyle 2008).

d. The topics in BBC Bitesize are broken up into 'Revision Bites', including subject information, and 'Test Bites', which test learners' knowledge of the subject (Reida & Pruijsenb 2015). Breaking down the information and skills to small and simple information for learners makes them easier to be understood and this agrees with the Behaviourist theories (Ashman 2014).

Nevertheless, there are some studies results which are not consistent with those of the current study. Some studies results reveal that the availability of Internet for learners in classroom makes the learners engaged in activities not related to their course. For example Bellur et al. (2015) study has been conducted on University learners enrolled for basic communication course. The aim of Bellur's study is to discover the effect of technology-based multitasking behaviours in and outside classrooms on learners' achievement. Multiple tasks mean (texting, reading, and using social media). The results showed that during University class, females are more likely to use Facebook, email, and

texting. Males are more likely to use Online videos. Overall, the data collected showed that multitasking during class had a negative influence on college GPA (Grade Point Average) and the academic performance of learners. Bellur's study results do not agree with the current study results. In addition, Bellur's study conducted on University learners not on School learners as it is in the current study and the subject was communication technology in Bellur's study not Science as in the current study. Overall, Bellur's study indicates that having access to Internet is not always a positive factor for achievement but sometimes it can be negative. Moreover, a UNESCO report confirms that the availability of technology and Internet have added nothing to the School learners and did not improve the learners' scores in their test in USA. In Peru; the current technologies had no positive effect on the learners' achievement in mathematics and language (UNESCO 2015). Furthermore, the report of OECD from (the Organisation for Economic Co-operation and Development) confirms that no any progress on the learners' achievement has been noticed for reading, mathematics or Science in 70 countries by using the current technologies because the learners' scores in the test were not disappointing (OECD 2015).

But, there are some reasons behind the failure of using Online learning BBC Bitesize for KS3 learners:

    a.   There are negative features of Online learning related to engagement (McQuiggan 2007) so it is not understandable why many Online learning users abstain from Online learning after their first practice (Pei-Chen et al. 2008).

    b.   There are restrictions related with the use of Online learning such as social separation, deficiency of faith in peer advice and understanding, and technological problems and difficulties (Song et al. 2004). Additionally, the merely use of the Internet does not make teaching effective but the skilled teachers should design a creative teaching plan and constructing chances for the learners to use the Internet successfully (Martin and Loomis 2013).

    c.   There are religious factors and social values of the family that prevent the learners from using the Internet because there are some films that should not be seen and

in this case the feeling of hatred will be created towards Internet as an educational medium. Eventually, a big barrier will emerge between the learners and the Internet (Livingstone 2013).

d. There are some difficulties related to the nature of Online learning and BBC Bitesize itself such as: there is no way that the teacher can be asked questions by learners, the speed of activities may not suit all levels of learners, and the program is designed in a way that the learners cannot skip bits they already know so they follow the series of information (Paget 2012).

Regardless positive or negative achievement of learners via Online learning there are two facts that should not be ignored:

a. England's Schools Minister Nick Gibb said: the need of learners should be considered by determining how technology can match the good teaching and an accurate Curriculum subsequently, every learner can accomplish their potential (OECD 2015).
b. Maybe there are questionable expectations, but adopting the current technologies in the classroom is an irreversible process (OECD 2015).

Consequently, the study learners achieved in an acceptable way through using Online learning. However, some learners did not achieve and this was reduced to different factors that were discussed in previous studies.

7.4 The effectiveness of BBC Bitesize

The definition of effectiveness as gaining Knowledge, skills or attitudes (Brown & Green 2015; Miller 2015; Stinggins 2008; Bloom 1956; Gravells & Simpson 2010; Moody and Sindre 2003) is adopted in the current study. The mean scores of KS3 learners on attitude construct were 75 out of 100 for Selwyn model and the current study model (please see section 6.9.1, Table 28) and on achievement construct were 73 out of 100 (please see section 6.10.1, Table 32). This means that most of KS3 learners had positive attitudes towards Online learning BBC Bitesize and most of them passed the test. Therefore, the

effectiveness will be discussed through two dimensions (attitude & achievement) of KS3 learners.

This section will discuss the effectiveness of Online learning BBC Bitesize according to the following points:

A. The effectiveness through learners' attitudes.
B. The effectiveness through learners' achievement.

7.4.1 The effectiveness through learners' attitudes

KS3 learners in the current study expressed a predominantly positive attitude towards learning through using Computers and BBC Bitesize (please see Table 28 and Table 29). Selwyn (1997) points out that his scales can be used for measuring the attitudes of learners and the outcome of attitude can be used for identifying the effectiveness of instruction after the course. Selwyn has used his scale on the learners whose age group is 16-19 years old (year level 12-14) not on KS3 learners which is the case in the current study. Selwyn tried his scale for measuring the attitudes towards Computers not towards Internet (Online learning BBC Bitesize) as well. The current study model is Selwyn scale plus two scales (anxiety & self-efficacy).

The results of Larbi-Apau & Moseley study (2012) are consistent with the current study results. The results showed that the attitude of participants was satisfactory in both studies. The participants had effective and professional performances in both studies. The main differences between Larbi-Apau & Moseley study and the current study are: a) Selwyn scale and (Selwyn & anxiety & self-efficacy) model were used in the current study for measuring the attitude and the effectiveness and both models were valid and reliable but Selwyn model was used in Larbi-Apau & Moseley study, and b) the current study was conducted on KS3 learners not on University learners which is the case in Larbi-Apau & Moseley study.

The results of Abedalaziz et al. (2013) are consistent with the results in the current study. The results of attitude on the current study model support Abedalaziz et al. study results. Both studies show that attitudes are positive towards Computers in Abedalaziz et al. (2013)

243

and toward Online learning BBC Bitesize in the current study. The main differences are: Abedalaziz et al. used Selwyn scales as it is in the current study but the current study has used two extra constructs (anxiety & self-efficacy). Additionally, Abedalaziz et al. study was conducted on postgraduate learners not on KS3 learners as it is in the current study. Moreover, the two models used in the current study are Selwyn model and the current study model (Selwyn & anxiety & self-efficacy) for measuring the attitude towards Online learning BBC Bitesize but Abedalaziz et al. study used Selwyn model for measuring the attitude towards Computers.

The current study results support Teo's results in his study (2008). Teo's results revealed that the participants demonstrated positive attitudes towards Computers, also in the current study the participants' showed positive attitudes towards Online learning BBC Bitesize. Both studies used Computer Attitude Scale (CAS) (Selwyn model). The current study used extra model which consists of Selwyn model & anxiety & self-efficacy. Additionally, Teo's study was conducted on pre-service teachers not on KS3 learners as it is in the current study.

From the above discussion, it can be found that the positive attitude towards Online learning BBC Bitesize is a good indicator for the effectiveness of Computers & Internet in teaching and learning. Eventually, the positive attitude means that KS3 learners deal with Internet-Oriented Information for better performances and effective learning.

7.4.2 The effectiveness through learners' achievement

This part will focus on discussing effectiveness of Online learning in learning and the degree of similarities and differences of the results of the current study and those of other studies. The current study findings showed that the mean scores of achievement for 121 KS3 learners were 73 out of 100 and the median scores were 77 out of 100 which was acceptable (please see Table 32). Quantitative data analysis showed that 92% of KS3 learners answered 50% or more of the test questions (please see Table 33) which means that Online learning affected learners' achievement positively.

The present study results support Ersoy & Akbulut (2014) study results. Ersoy & Akbulut study results show that using Computers, Software, Websites and Search Engines, affects

the learners' achievement in Math positively. The current study uses the Internet and Internet enabled application – BBC Bitesize which is accessed through a School Computer by a KS3 learner. BBC Bitesize as educational source affects the learners' achievement in Science positively. The current study was conducted on KS3 learners not on pre-service mathematics teachers as it is in Ersoy & Akbulut study. Ersoy & Akbulut study concludes that Wolfram Alpha (Semantic Search Engine) is effective for learning Math but the current study found that BBC Bitesize was effective for learning Science.

Additionally, the current study results support Jaffar (2012) study results. Jaffar results show that YouTube on Internet is an effective tool and educational source for studying a human anatomy module. Also, YouTube video films reinforce the instruction and self-learning in classroom if the videos are suitable for the course objectives. Jaffer study highlights an important point when it comes to educational sources development – it is not any Computer but specific sources in their case video that have a positive result. In the current study the results are focusing on one particular source which has been developed by BBC animators and educators. Moreover, the present study found that BBC Bitesize was an effective educational source for Science. Jaffar examined the effectiveness of YouTube channel for studying the human anatomy module by undergraduate medical learners but the current study examined the effectiveness of BBC Bitesize for studying Science subject by KS3 learners.

The current study results are consistent with the results of Hussain et al. (2010) study. Hussain et al. study results indicate that the performance of learners who use technology is better than those who do not use technology. Also, the results reveal that teaching through technology improves the learners' achievement. Overall, Hussain et al. results and the current study results reveal that using technology affects the learners' achievement positively. The role of technology has been focused in enhancing the achievement of learners in both studies, but Hussain et al. study has surveyed the effect of technology on the achievement in English but the current study has surveyed the effect of Online learning on achievement in Science. Hussain et al. study has used Computer technology but the current study has used Computers and Internet (BBC Bitesiz). The learning effectiveness has been identified by the learners' achievement in Hussain et al. study but it has been identified through two constructs: achievement and attitudes in the current study.

However, the current study provides evidence against the findings of other studies which claim that technologies and Online learning have no positive effect on learning such as OECD (2015), and Skarupova et al. (2015). The current study results contrast with the results of a global research which was conducted by OECD (the Organisation for Economic Co-operation and Development). OECD conducted a study in 70 countries and the results were published in 2015. The results of the global research showed that the achievement of learners who used tablets and Computers very often was worse than those who use them moderately. Also, no tangible evidence was found that technologies improved School learners' achievement in Science, reading, or mathematics. There are some differences between OECD study and the current study: a) OECD study was conducted in 70 countries around the world and was not specified for the School learners in the UK as it is the case in the current study, b) OECD research studied the influence of the current technologies in general on achievement but it did not focus on Online learning which is the case in the current study, and c) OECD research focused on the effect of technologies on School learners achievement but it ignored the learners' attitudes towards technologies, and studying the degree of accepting technologies in the learning process by learners is missing in OECD study which was the foundation stone in the current study.

Skarupova et al. (2015) study was conducted for studying the impact of the Excessive Internet Use (EIU) on 1000 learners' behaviour at School, aged 9–16 in 25 Europe countries. The results revealed that the Excessive Internet Use increased the possibility of behavioural and School problems, depression, and anxiety. These results indicate that teachers foresee negative consequences at School (Skarupova et al. 2015). Skarupova et al. focused on the effect of Internet on School learners' behaviour not on learners' attitude and achievement as it is in the current study. Additionally the current study results showed that the implication of using the Internet in learning process (Online learning) was positive on learners' achievement but Skarupova et al. study results showed that using Internet excessively causes psychological complications, which makes the teachers expect negative consequences. Therefore, the learners' achievement would be affected in addition to health problems.

The data in the current study did not show that Computers and Internet can have no or negative on learners learning. However, when it comes to teaching activities design and

KS3 learning the study suggests that BBC Bitesize as a source of information for learning has a positive impact and, therefore should be encouraged in the teaching activities in the classroom and as autonomous learning activity. The study suggests that a well-constructed learning source such as BBC Bitesize has a positive impact, but just putting learners in front of Computers and giving them access to the Internet alone is not sufficient for learning to take place. However, the current study has also found that learners with positive attitudes are more likely to have satisfactory achievement in their assessed learning activity task – which is discussed in the next section in more detail. This, however, suggests that Computers could be introduced also for play activities which develop a positive attitude to Computers and in the long run influence a positive attainment with learning tasks such as BBC Bitesize. Therefore, the use of Online learning website, BBC Bitesize, was effective and supported the learners' performance and achievement. However, there are some cases in the current study, which showed that using BBC Bitesize did not help the learners to achieve and perform well. This can be a background for future studies.

7.5 The correlation between the learners' attitudes towards BBC Bitesize and their achievement

This section will discuss how the current study answers the third research question "**How do the KS3 learners' *attitudes* affect their *achievement*?**" The primary data collected during the current study will be compared with other relevant studies. The relationship between the two constructs, attitude and achievement, was not discussed especially for KS3 learners in the UK. The current study explores the association between the two constructs as follows:

a. The relationship between Selwyn attitude and achievement

The results of the current study denote that there is a medium significant relationship between Selwyn attitude (4 constructs together) and achievement (please see Table 35 and Figure 44). This means that teachers who would like to improve their learners' achievement should focus on improving their attitudes towards the use of Computers and Internet such as BBC Bitesize. Making the teaching activities engaging and introducing the general use of Computers as a positive tool for learning can also have positive effect when the learners are engage in meaningful activities such as studying Online.

The result above partially supports Barkatsas et al. (2009) result. Barkatsas et al. study results show that there is a relationship between high achievements in Mathematics with a strongly positive attitude to learning Mathematics with technology as it is the case in the current study, but in the current study the degree of the effect of Selwyn attitude on achievement is medium. Moreover, the attitude scale in Barkatsas el al. is based on different components to Selwyn components. Also, the scores of learners in Mathematics have been collected from the Schools teachers not by the researcher as it is in the current study. Additionally, the subject of the study was Mathematics in Barkatsas el al. (2009) but it is Science in the current study. Therefore, there is a relationship between the learners' attitudes and their achievement using Online learning tool, BBC Bitesize. Positive attitudes towards the Online website leads to a better achievement.

b. The relationship between the current study model attitude and achievement

The current study has identified that there is a medium significant relationship between the overall attitude (6 constructs together) and achievement (please see Table 35 and Figure 45).

This result partially agrees with Kalelioglu's study (2015). Kalelioglu's result indicates that the learners' performance on the code.org site (Online learning) is high also; the learners' performance on Online learning is satisfactory in the current study. Additionally, Kalelioglu's result shows that the learners have a positive attitude towards programming through code.org site while KS3 learners in the current study show an acceptable attitude towards learning Science through BBC Bitesize. The main differences between Kalelioglu's study and the current study are:

a) Kalelioglu's study has studied the two constructs of achievement and attitude but the link between the attitudes with the achievement has not been examined.

b) Kalelioglu's study was conducted in a primary School not secondary School as it is the case in the current study.

c) The subject of study in Kalelioglu's study is Computer Science but it is Biology in the current study.

Additionally, the results of current study agree partially with the results of Cepni et al. study (2006). Cepni et al. study results show that Online learning could improve the learners' achievement but it did not change learners' attitudes towards Science lessons. The main differences between the two studies are:

a) Cepni et al. study has not linked the attitude with the achievement as it is the case in the current study.

b) Cepni et al. study was conducted on Science teachers and learners but the current study was exclusively for KS3 learners.

Moreover, the findings of the current study consist of part of Kareem's study results (2015) and contrasted with another part of the results. Kareem's study results show that there is a significant impact of the instruction method (Computer-Assisted Instruction) on learners'

achievement in Biology and this result is compatible with the result in the current study which shows that the impact of Online learning BBC Bitesize on achievement in Science is satisfactory. But, there is no significant impact of attitude on learners' achievement in Biology in Kareem's study which is different to the current study result. The differences between Kareem's study and the current study are:

a) The learners in Kareem's study are older than the learners in the current study.
b) The instruction method used in Kareem is Computer-Assisted Instruction not Online method as it is in the current study.

c. The relationship between affective, behavioural, and anxiety components and achievement

The current study shows that there is a medium significant relationship between affective attitude, behavioural attitude and anxiety attitude and achievement (please see Table 35).

Regarding affective component, KS3 learners' satisfaction and appreciation towards Computers and Internet affect their achievement positively so this helps them to have better achievement in Science subject. And this will encourage KS3 teachers focus on using Computers and Internet in their teaching and their lessons plans. The result of the current study above for affective component is consistent with Barkatsas et al. (2009). In Barkatsas el al. study the correlation between achievement and affective engagement is strong but it is medium in the current study. So, there is a relationship between affective factors such as liking and preferring as well as feeling comfortable and the learners' achievement and performance after using Online learning website such as BBC Bitesize.

Concerning, behavioural component, this means that KS3 learners beliefs and philosophy accept and welcome using Computers and Internet for learning Science. And they realise the beneficial use of technologies in their learning and this enhances their behaviour for continuing to use Computers and Internet for learning Science via BBC Bitesize. Therefore, this will perform for better achievement. Eventually, gaining this behaviour by KS3 learners will help their teachers to take the current technologies in their consideration when they write their lessons plans. The result of current study above for behavioural attitude is consistent with Barkatsas el al. (2009). In Barkatsas el al. study the correlation

between achievement and behavioural engagement is strong but it is medium in the current study. Therefore, there is a relationship between the behaviour of the learners and their acceptance of using an Online website and their achievement when using this website. Learners who are keener and more prepared to use the website achieve better in the subject they have studied via the Online website.

For anxiety component, KS3 learners do not have any feeling of fear, tension, hesitation, or anxiousness when they use Computers and Internet. Therefore, they are confident of their skills to use BBC Bitesize for learning Science. This means that the teaching environments does not need to worry about anxiety factor towards the use of technologies. Eventually, KS3 learners can carry out their learning goals without any pressure related to using technologies therefore; anxiety scale is low because the mean scores of learners attitude on anxiety is (78 out of 100 and the median is 82 out of 100) and KS3 learners' achievement is satisfactory (the mean of scores is 73 out of 100 and the median is 77 out of 100) in the current study. The correlation between achievement and anxiety is medium. The overall results are similar to the results of study by Chien's study (2008). The current study results show that KS3 learners' attitude on anxiety construct is low and the learners' achievement is satisfactory so this result is similar to Chien's results because the results in Chien show that learners with high level of Computer anxiety gain low level of achievement and vice-versa. The major difference is that the current study surveyed anxiety attitude for KS3 learners while Chien's study has reviewed several studies for others about Computer anxiety for different [level of ages, level of studies (Schools & Higher education), and gender]. The current study has examined the correlation between anxiety and the learners' achievement but within the context of the components of the attitude which is absent in Chien's study. Additionally, Chien's study has examined Computers anxiety but Internet anxiety has not been studied while Internet anxiety has been examined in the current study. Overall, Chien's study recommends that the learners with high level of Computer anxiety and with low level of achievement to attend training courses include Computer-Related Activities designed for reducing anxiety and theses training courses will be recommended in the current study (Chien 2008). There is a negative correlation between Computer anxiety and the learners' achievement. The presence of anxiety in the learners affects negatively their achievement and performance.

d. The relationship between usefulness, control, and self-efficacy components and achievement

For usefulness component, KS3 learners realise that Computers and Internet are useful machines in their learning. KS3 learners' realisation of the usefulness of technology affects their achievement to some degree. Eventually, the KS3 learners' belief of the effect of technology on achievement is essential but it is moderate (please see Table 35). The belief of KS3 learners of the usefulness of technology is helpful, but this does not help to a high degree because KS3 learners must deal with Science concepts and facts as well, and these concepts and facts affect learners' achievement positively or negatively.

Joo et al. (2012) study results are consistent with the current study results. Both studies results show that there is significant correlation between the learners' achievement and usefulness at the alpha level of .05. Eventually, both studies linked the learners' achievement with usefulness component. But Joo et al. study was conducted on adult trainees in a large company not on KS3 learners at School as it is in the current study. Also, Joo et al. have studied the component of usefulness as socio-psychological factor of learning flow not as a part of attitude as it is in the current study. Moreover, the scores of learners in Joo et al. study have been collected from the database of learning management system but in the current study a written test has been implemented by the researcher. Therefore, the learners' feeling that Online learning website can be useful to them and help them in their learning process, is a positive factor in the learners' achievement when using this website. Their belief in the usefulness of the website leads to a positive achievement.

For control component, KS3 learners have enough skills and knowledge to use technologies especially Computers and Internet for Online learning BBC Bitesize. But, there is a moderate effect of control attitude on achievement (please see Table 35), because KS3 learners should have knowledge and skills to deal with technologies but also, they should know how to deal with Science-related problems. However, Raines defines control component as 'an internal locus of control means that individuals believe they are in control of events that affect themselves' (Raines 2012). But the results of current study negate Chalak and Nasri study (2015) results. The current study results showed that there is a significant moderate correlation between KS3 learners' achievement and their control

252

attitudes for all learners (please see Table 35). But in Chalak and Nasri study there is no significant relationship between learners achievement and control for (males and females), and for all different groups of age (Chalak and Nasri 2015). The main differences between the current study and Chalak & Nasri study are:

The current study has been conducted on particular age of learners (13-14) years old not for adult learners as it is in Chalak and Nasri study. Also, the orientation of learners towards learning Online was measured in Chalak and Nasri study on just one socio-psychological factor (control) while the attitude in the current study was measured on 6 socio-psychological factors and control component is one of them. The current study has used a written test for measuring the learners' achievement while the grades of learners were collected from the institute. Chalak and Nasri have studied the orientation of learners towards learning English Online not Science as it is in the current study. The current study has examined the correlation between attitude and achievement regardless of learners' age and gender while they are considered in Chalak and Nasri study. Therefore, feeling in control of any unexpected conditions while using the BBC Bitesize is an important factor in the learners achievement when used BBC Bitesize.

For self-efficacy component, KS3 learners believe in their capability to do different useful things with technologies. The current study shows that the effect of self-efficacy attitude on achievement is moderate (please see Table 35). So the moderate impact of self-efficacy attitude on achievement can be attributed to some factors related to the content of Science, the topic, or the learning environments. Therefore, self-efficacy, which is about the learners' belief in their capability to do things with an Online learning website, plays role in the learners' achievement when used BBC Bitesize.

The current study results support Joo et al. (2012) study results. Joo et al. study results showed that there is a significant correlation between the learners' achievement and self-efficacy at the alpha level of .05 (Joo, Lim, & Kim 2012). The similarity between the current study and Joo et al. (2012) study is that both studies have linked the achievement and self-efficacy. But Joo et al. study was conducted on adult trainees in a large company not on KS3 learners at School as it is in the current study. Also, Joo et al. have studied the component of self-efficacy as socio-psychological factor of learning flow not as a part of

attitude as it is in the current study. Furthermore, the scores of learners in the current study have been collected by a written test which has been implemented by the researcher but in Joo et al. study the scores have been collected from the database of learning management system.

7.6 Summary

The data collected by the current study show that KS3 learners' attitudes towards the use of an Online website as a learning tool, BBC Bitesize, in their learning are positive. The study concludes that KS3 learners have positive affective components, perceived usefulness, perceived control behavioural intents, negative anxiety, and positive self-efficacy. These components are interrelated with each other and they shape an overall attitude. These attitude components, affective components, perceived usefulness, perceived control, behavioural intention, negative anxiety, and self-efficacy, are all predictors of an attitude. They affect the learners' attitudes and shape them.

The current study supports the results of Kareem's study (2015, Kalelioglu's study (2015), and Barkatsas et al's. study (2009) which conclude that the attitudes towards the use of an Online learning website are positive, the Internet and an Online learning tool such as BBC Bitesize is linked to satisfactory level of achievement in their learning. Practically, positive attitudes reflect one step towards accepting the Online learning website as partners in the learning process. The current study supports the view that learners are ready to incorporate the Online website in their learning using Behaviourist and Cognitive pedagogic foundations of a tool such as BBC Bitesize. Because learners like to engage with BBC Bitesize, and they think it is useful, and they show less anxiety when dealing with it and they believe they can manage it.

The KS3 learners' achievement using BBC Bitesize was also recorded as satisfactory and acceptable. The positive achievement results are also a motivating issue which increases the effectiveness, efficacy, and value of Computers & Internet by KS3 learners. The results of the current study contribute to the wider debate on the effectiveness of

Computers and Internet in educational settings, and offer new evidence focusing on a specific tool that is BBC Bitesize as a positive contribution to their learning process.

Chapter 8

Conclusions Chapter

8.1 Introduction

In the previous Chapter data interpretation and discussion have been performed in order to discover the similarities and the differences between the current study and the studies reviewed in the literature review. The other purpose of the previous Chapter was to identify the contribution of the present study to both knowledge and practice.

This Chapter highlights the contributions to knowledge and practice made by this research and it starts with section 8.2 to elucidate how CAS (Computer Attitude Scale) of Selwyn (1997) was used for exploring the attitudes of KS3 learners towards Computer and BBC Bitesize. Also, how CAS was developed to include two other factors (anxiety & self-efficacy) for exploring the attitudes towards Online learning BBC Bitesize will be explained. The study findings have demonstrated that BBC Bitesize has led to enhancing the KS3 learners' attitudes towards learning Science via the Computer. Most of the learners had positive attitudes towards using BBC Bitesize in learning Science for KS3

Moreover, the validity, and suitability of Selwyn model and the new model of the study for measuring the attitude will be clarified. Therefore, the first theme - the role of BBC Bitesize in affecting KS3 learners' attitudes towards Online learning methods - will be covered in Section 8.2. The findings show that the use of BBC Bitesize has raised the achievement of the KS3 learners in Science.   The second theme is the impact of BBC Bitesize in enhancing KS3 learners' achievement and it will be covered in section 8.3.

Section 8.4 considers the third theme - the relationship between the attitudes towards Computers and BBC Bitesize and achievement. The findings of the study have shown that there is a link between the KS3 learners' attitudes towards the use of the BBC Bitesize in learning Science and their level of achievement in Science. Section 8.5 explains the

relationship between using BBC Bitesize and the mechanism of learning theories in the light of the present study findings. Section 8.6 explains the research limitations during the application of this case study. The last section 8.7 will be generic and will include future research, recommendations, and suggestions in the light of the current research circumstances, conditions and findings.

Overall, this Chapter concentrates on the contributions to knowledge and to the practical implication of the findings for the classroom and the expectations of changes in classroom by understanding the attitudes, achievement, and what changes are expected in classrooms in the light of understanding the effectiveness of Computers, BBC Bitesize or Online learning.

8.2 The effect of Computers & BBC Bitesize on KS3 learners' attitudes

This theme will be explained through the data analysis findings, and the significance of the findings will be understood more deeply. Moreover, the usefulness of findings for researchers and practitioners will be discussed. CAS (Computer Attitude Scale) has been designed by Selwyn (1997) and has been used by many researchers, for example, Teo (2008) and Abedalaziz et al. (2013) and also has been used in the current study. CAS consists of 4 socio-psychological components (affective, usefulness, control, and behavioural). CAS has been used for the first time by Selwyn (1997) to measure Computer attitudes of 16-19 years old learners and the effectiveness of learning via Computer. The current study shows that KS3 learners have positive attitudes towards BBC Bitesize Online learning on Selwyn model. Also, the attitudes are positive according to the current study model (Selwyn model & anxiety & self-efficacy).

The positive attitudes of the KS3 learners are attributed to:

On the affective construct, the happiness and joyfulness of KS3 learners to use BBC Bitesize Online learning, the affinity between the learners and Computers and Internet, as

well as the satisfaction and appreciation of using Computers and BBC Bitesize which will strengthen the learners' attitudes towards Online learning and technology in general.

On the usefulness construct, the awareness of the value of Computers and BBC Bitesize for learning, the learners finding Computers and Internet easy to be used and their ability to utilize them confidently enhance positive attitudes towards Computers and BBC Bitesize.

On the control construct, the learners have knowledge and skills in Computers and Internet, so they do not face any difficulties when they use Computers and Internet. This leads to positive learners' attitudes towards BBC Bitesize.

On the behavioural construct, KS3 learners' positive intention and beliefs to do different tasks with the Computers and Internet lead to positive attitudes towards BBC Bitesize.

On the anxiety construct, learners who feel more anxious than others will demonstrate negative attitudes. Low levels of anxiety about technology leads to positive attitudes.
The study results show that KS3 learners do not have apprehension and anxiety when using Computers and BBC Bitesize.

On the self-efficacy construct, the learners' belief and confidence that they can perform the tasks required from them by Computers and the Internet contribute to the creation of positive attitudes towards Computers and Internet. This is the case in the current study.

Furthermore, the results show that the main effect on learners' attitude towards BBC Bitesize Online learning is anxiety, followed by behavioural, control, self-efficacy, affective, and then usefulness. Subsequently, educators, teachers, and researchers should focus on anxiety as an affecting factor on the learners' acceptance to use technology in their learning especially those learners who have negative attitudes. Also, they should encourage KS3 learners' behavioural intentions to use technology in a proper way especially those who dislike Computers and Internet.

However, developing KS3 learners' knowledge and skills in technology will enhance the easiness of using BBC Bitesize exclusively and Online learning in general because

knowledge and skills help in increasing the learners' confidence, improve the learners' appreciation of technology, and the usefulness of BBC Bitesize Online learning will be realised.

According to the positive attitudes of KS3 learners, it can be concluded that BBC Bitesize is an effective tool for Online learning. It is effective in the sense that the learners have captured attitude as effectiveness is defined in terms of capturing attitude.

Overall, Selwyn model and the present study model are valid, reliable, and suitable for measuring the attitudes of KS3 learners towards BBC Bitesize Online learning. So, Selwyn model (affective, usefulness, control, and behavioural) is valid and appropriate for studying the attitudes towards Online learning for future studies. Also, the current study suggests a new model for studying the attitudes towards Online learning for future studies. The new model consists of (affective, usefulness, control behavioural, anxiety, and self-efficacy).

8.2.1 Contribution to knowledge

The current study answers the call for further work by Selwyn (1997), Teo (2008), Larbi-Apau & Moseley (2012), and Abedalaziz et al. (2013). The findings contributed are:
The current study has used Selwyn model and the new model for Computers and Online learning not just for Computers as it is in the studies mentioned above for different age group sample and in different contexts, but also for the areas that have not been covered by previous studies. The present study has also responded to Dajani (2014) who calls for studying the learners' atitudes in a more in-depth approach. This has been achieved by studying the attitudes qualitatively and quantitatively. Moreover, Heafner (2014) and Hartshorne (2012) have called researchers for a great deal more research on attitudes. So, the present study is a base for future studies in Online learning field.

According to the empirical study conducted in the present research, the new insight is that the attitudes of the learners who are going to study Online should be surveyed based on a socio-psychological approach by researchers. The current study is expected by the researcher to be the background of future studies which can use a new scale for measuring

learners' attitude using socio-psychological factors to investigate more about attitudes, since the components of attitudes are confirmed as: affective, usefulness, behavioural and self-efficacy. This amends the original four components from Selwyn's model. Additionally, researchers can avoid the two components (control and anxiety) because they are not significant in the study of attitudes.

Moreover, it was explored that the new model is valid for measuring the learners' attitudes towards Online learning which is the area of research in the current study. Selwyn's model was used before for learners who are 16-19 years old and for adult learners, but currently the amended Selwyn model was used for first time for KS3 (13-14) years old. Eventually, the present study has bridged the gap of previous research by using socio-psychological factors for exploring the attitude towards BBC Bitesize Online learning. Also, the current research is the first research on KS3 in the UK for studying the attitudes towards BBC Bitesize as socio-psychological components. Furthermore, the effectiveness of BBC Bitesize for learning was probed according to the attitude of learners towards BBC Bitesize Online learning for the first time. Overall, the new scale (affective, usefulness, behavioural, and self-efficacy) is the amended scale of Selwyn's model and also it is suggested to be used in the future studies of attitudes as shown in Figure 60.
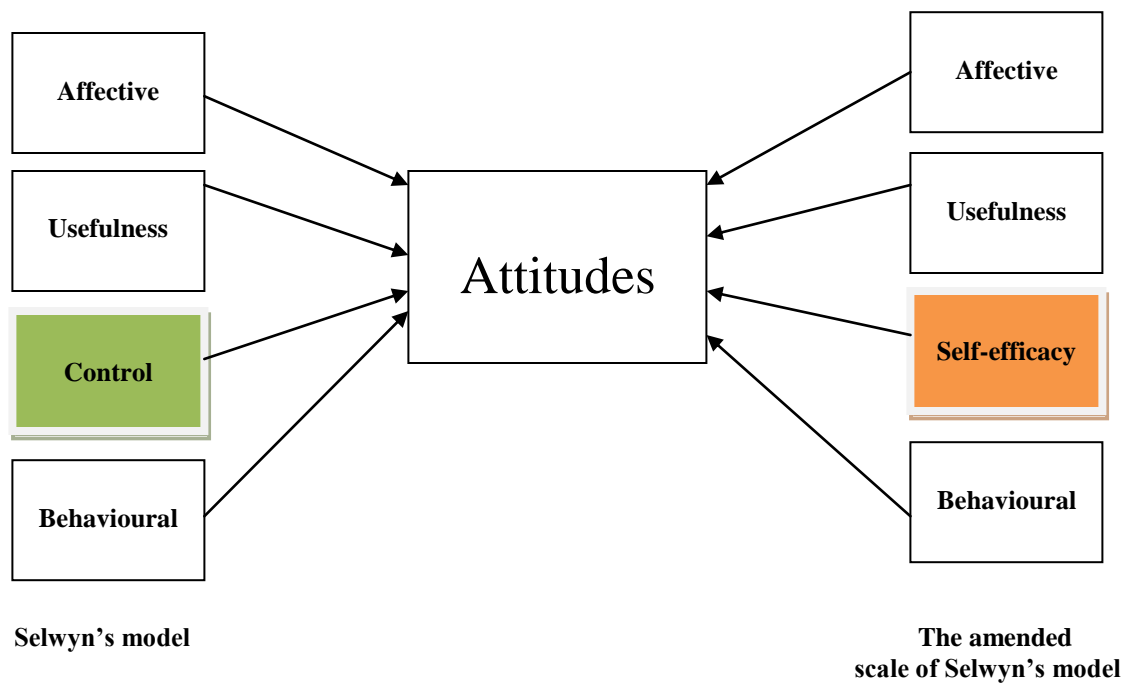
Figure 60: The difference between Selwyn's scale and the amended scale of Selwyn's model

8.2.2 Contribution to practice

Sharma (2015) believes that the implementation of technology in education is still a complex and challenging process. Studying attitudes and identifying them can help teachers and researchers understand this process. Studying the learners' attitudes can raise awareness of the obstacles that hinder the success of the implementation of technology in education. The current study has shed light on the learners' attitudes in an attempt to understand these obstacles and help mitigate their negative influence.

Ermolayev et al. (2014) define the relationship between education and technology as 'antagonism'. In this case the study of learners' attitudes supports in understanding the core of this relationship. The current study is one step towards discovering whether this is the reality of the relationship between education and technology especially Online learning which is the area of contribution of the present study. The aim is to improve the teaching/learning process in Online learning.

The current study suggests that understanding the learners' attitudes towards Computer & Online will improve the learners' achievement and performance via technology. It has been found by a few studies that there is a correlation between attitudes and performance and there is a considerable influence on Computer use and Technology-Based Performance (Jegede & Owolabi 2005;Jegede et al. 2007;Larbi-Apau & Moseley 2012).

The questionnaire and semi-structured interviews used in the present study have elicited data about BBC Bitesize website and the learners' attitudes towards using it in their learning. This is the first time where this website is used in this way. The learners have learned a course in Science through BBC Bitesize and their attitudes were measured in accordance. In this case, the learners will answer from their recent experience with the website and will be able to answer from a very recent experience rather than depending on memory.

The Internet will likely increase the learner's learning through Online learning tools such as BBC Bitesize. By identifying and resolving the negative attitudes of learners towards

Computers and Internet, the teachers can take responsibility towards the learners who have negative attitudes by preparing special activities for improving the attitudes and skills of the learners for learning Online. Therefore, developing the learners' attitudes will help them in gaining experience in using (Computer and Internet) and this will encourage the learners to extract new information from different Websites by themselves.

However, School teachers, educational staff, and Curriculum designers are suggested to start conducting initial assessment of learners by using interviews and a questionnaire on the learners' attitudes towards Computers and the Internet. This will help in understanding the attitudes of learners and classifying them into three fields positive, negative, and neutral. In particular, the current study is based on questionnaire components and interviews. Initial assessment will help teachers understand the learners' needs and the gaps they have in their dealing with technology.

8.2.3 Future studies

The current study framework was efficient for measuring the effectiveness of Computers and Internet and a particular Online learning tool - BBC Bitesize. The current study has answered a number of questions in terms of the role of Computers and the Internet in KS3 education. But, it has also raised a number of other issues, which can be explored in future studies such as follows:

First, the new model is proven to be valid and appropriate for measuring the attitudes in the present study, and they could be used in different contexts – surveying different generations of learners e.g. KS1, KS2 as well as KS3 learners in Schools in other cities and countries. Since measuring learners' attitudes is important for successful application of Computers and the Internet, it is vital to find out learners' attitudes, suspicions and how they can be positively promoted.

Ermolayev et al. (2014) describe the relationship between education and technology as antagonism, so there is a need to survey not only the learners' attitudes but also the teachers' attitudes which also influence the teaching/learning process in Online learning area.

Since the study of Computers has started, different forms of technology have grown dramatically in the UK – devices such as smart phones, smart watch and other forms of wearable technologies increase the Online and mobile connectivity of learners to potential infinite number of Online learning source. The effects of all these different technologies could be explored using the current survey adjusted to the relevant tool and age groups of learners. Also, the gender factor can be added to future studies to compare the attitudes between females and males and explore the relationship between attitudes and gender.

Gender can be a likely factor that can play a role in shaping the learners' attitudes towards the use of technology in learning. A number of studies on the learners' attitudes towards the use of technology in education have concluded that gender plays a role (Abedalaziz et al. 2013;Gokhale and Machina 2014;Harb and Abu Bakar 2014). Alongside, international comparisons between countries with high use of technologies and those with low use of technologies should be explored – the ultimate aim of all educational processes is to understand how to best prepare learners for the modern 24/7 Internet culture.

The current study focused on the learners' attitude, but it has not paid much attention to KS3 teachers' attitudes. As it was identified, the learners' attitude is important, but if their teachers are not prepared for this change, it is unlikely that they are able to inspire the use of Computers by the learners. So, it is central that teachers' attitudes are addressed as teachers are a crucial part of the learning/teaching process especially at KS3, where learners are still relying on teachers to direct their learning and they have an important role in improving the learning of their learners and because the teacher is the centre of excellent learning skills in the School, the University, and Online (Elspeth and Lenarcic 2015). In addition, effective Online teacher needs to build an honest and authentic connection with their learners (Gleason Whitney 2017).

8.3 The impact of Computers & BBC Bitesize on KS3 learners' achievement

The present study area of investigation is Online learning and, in particular, the use of BBC Bitesite in teaching Science and how this website affects the learners' achievement after

they have received a course of Science through the BBC Bitesize. It has been demonstrated that BBC Bitesize has affected the learners' achievement.

The present study has showed that the scores of KS3 learners who studied the topic of Microbes – the subject is Science via BBC Bitesize Online learning are acceptable and satisfactory. And the results suggest that most of KS3 learners have passed the test after finishing the course of Science via BBC Bitesize.

According to the results, it can be concluded that BBC Bitesize is effective as an Online learning method. The KS3 learners have learned about Microbes through the BBC Bitesize. The teacher investigated the learners' knowledge of Microbes through warming up and brainstorming where the activation of the learners' schemata about the topic took place. The teacher found out that the learners' knowledge about the topic was limited.

The reason behind the flexibility of BBC Bitesize is that it can be accessed anytime and anywhere. BBC Bitesize improves KS3 learners' knowledge and the topic information can be seen On-screen, BBC Bitesize is provided with guidance for helping the learners to go through the information of the topic, the information is broken up into small bits to make it easy for learners.

The written test is valid, reliable, and suitable for measuring the KS3 learners' achievement and the effectiveness of BBC Bitesize Online learning.

The present study investigated the effectiveness of BBC Bitesize for learning. According to Stinggins (2008), Bloom (1956), Gravells & Simpson (2010), Moody and Sindre (2003) the effectiveness can be measured through the attitudes and achievement of KS3 learners. The current study demonstrates that BBC Bitesize is an effective website for learning.

8.3.1 Contribution to knowledge

Rogers et al. (2009) have recommended the need for researching the learners' achievement in Online learning area. Wang (2014) also has called for investigating the learners' achievement in Online learning on a regular basis to recognise the weaknesses and strengths of the Online learning tool. Bryan and Wang (2013) have recommended in their research

that the study of the Online learning achievement can help in creating teaching approaches that raise the Online learners' achievement by benefitting from the gaps in the current learners' achievement and bridging them in the future approaches to teaching and learning Online (Bryan and Wang 2013). The current study has taken the recommendations of the studies above as a background and covered the areas that have been in need to be addressed in Online learning.

The current study has endeavoured to find out the effect of BBC Bitesize on KS3 learners achievement in Science course in the UK. The results showed that the mean of scores of KS3 learners' in the written test is acceptable. Additionally, the percentage of KS3 learners who passed the test is satisfactory. These results mean that the effectiveness of BBC Bitesize as an Online website method for learning is acceptable.

Sabzian and Gilakjani (2013), Cheung and Slavin, Ersoy and Akbulut, (2014), Neuhauser's study (2010), and Delen and Bulut (2011) have explored that technologies support the learners' achievement. The results obtained in the above studies were similar to the results of the current study but the main difference between these studies and the current study is that the context, age of participants, the type of technology, and the subject of study are different to the current study. Therefore, the current study sheds a spot of light on the importance of an educational website (BBC Bitesize) as a source of information for teaching/learning and its role in enhancing the achievement in the UK. Therefore, it is expected that Online courses including studying by BBC Bitesize help learners in achieving good outcomes. This insight can help researchers to conduct more research which includes comparison between the scores of the learners Online learning and other models of learning.

Moreover, it is expected that the current study will open the door for more research to study the Online learning for high School learners in the UK. Also, this study sheds some light on BBC Bitesize as a source of information for learning and it can be studied in different contexts and settings for progressing one step in Online learning research and in measuring the effectiveness of BBC Bitesize as a learning tool. Additionally, the effectiveness of BBC Bitesize for learning can be compared with that of other learning websites.

In the light of the presentation above it can be added to the literature that the BBC Bitesize (Online learning website) has impact on KS3 learners' achievement as shown in Figure 61.
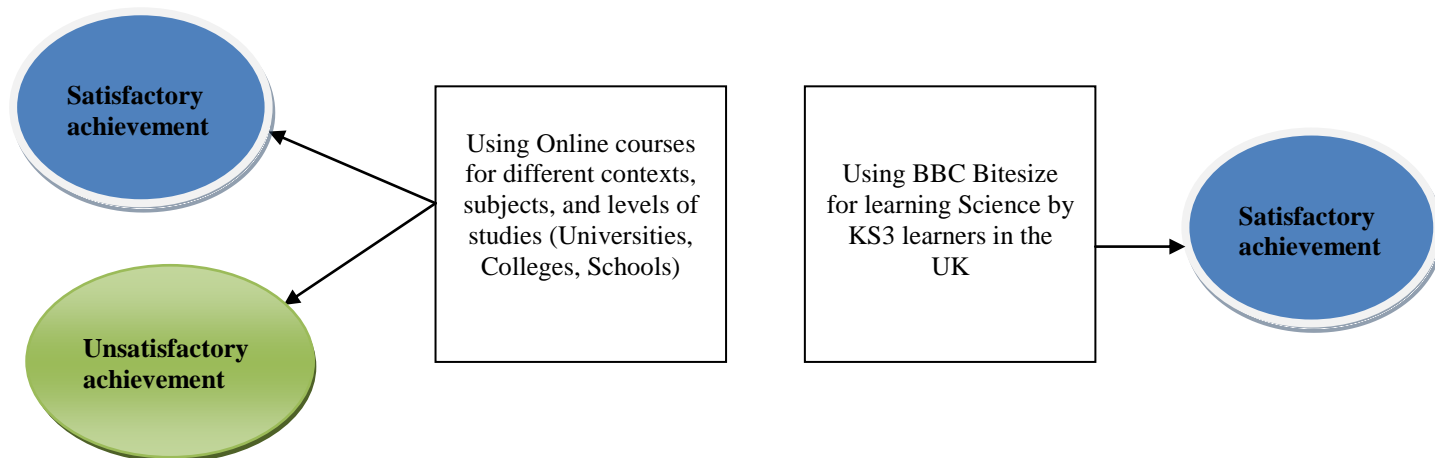
Figure 61: The relationship between the Online courses and contexts

8.3.2 Contribution to practice

The current study contributes to the practice by understanding the effects of Computers and Internet on KS3 learners' achievement which was measured via a written test. In fact, realising the role of Computers and Internet role in improving the achievement and attaining the goals of Science course will create the motivation for teachers and learners to use Computers and Internet for boosting the high thinking skills which improve the learners' scores in their course. Brosche and Feavel (2011) have pointed out that Online programmes are effective and they provide learners with access to education.

The current study has followed the steps of Brosche and Feavel (2011) and surveyed the effectiveness of Online learning BBC Bitesize which provides the learners with access to education.

Additionally, the teachers and educational staff can design the course of Science by focusing on the importance of Computers and Internet for teaching and learning, increasing the awareness of learners in the usefulness of technology, and linking better achievement with better knowledge in technology especially Computers and Internet. Attitudes are one component of effectiveness components of which are achievement and skills. Therefore, Computers and BBC Bitesize can be effective in teaching/learning process.

8.3.3 Future studies

The major aim for the future studies can be comparing two groups of KS3 learners one of them studied by BBC Bitesize and another one studied by traditional way or by using another kind of technology (iPad, iPhone, other types of technology, and other learning websites) instead of Computers and BBC Bitesize which have been used in the current study to find out the significant differences between the two types of teaching/learning methods. Future studies should concentrate on the long-term influence of Computers and Internet in learning: Does the effect of Online learning last for a long time? Does Online learning enable acquiring long-life skills and knowledge?

What is more needed is conducting a study with different contexts, different settings, different levels of studies, different groups of age, and different groups of gender. Additionally, different technologies can be used. Online test can be designed for measuring the learners' achievement instead of written test that has been used in the current study.

8.4 The correlation between the learners' attitudes and their achievement

In the current study the attitude and achievement constructs are studied together using partial correlation analysis and Spearman correlation, and a positive link is found suggesting that positive attitude has a positive impact on achievement. Subsequently, there is a relationship between KS3 learners' achievement and their attitudes towards Computer & BBC Bitesize.

On the affective construct, KS3 learners have satisfaction towards BBC Bitesize so this will be reflected on KS3 learners' achievement. If KS3 learners have an acceptable level of appreciation towards BBC Bitesize, an acceptable level of achievement is expected as it is in the current study. And if there is a low level of satisfaction, a low level of achievement is expected.

On the behavioural construct, KS3 learners in the present study showed that they believe in BBC Bitesize and they can make an action by using Computers and Internet in a proper way for learning. Eventually, KS3 learners' behaviour enhances their level of achievement.

On the anxiety construct, during the current study KS3 learners were not anxious of using Computers and Internet (BBC Bitesize) for learning. But, because the effect of anxiety on attitudes was not significant, this factor has been excluded from the current study model.

On the control construct, in the current study KS3 learners showed that they have skills and knowledge to use Computers and Internet, so they did not find any difficulty in using Computers and BBC Bitesize. However, because the effect of control on attitudes was not significant in the current study model, this factor has been expelled. But, the control construct was significant in Selwyn's model.

On the usefulness construct, KS3 learners realize the benefit of BBC Bitesize for learning which is the case in the current study. The realization of the value of Computers and Internet for learning performs for better achievement and vice versa.

On the self-efficacy construct, in the current study KS3 learners showed that they think they have the ability and capability to use Computers and Internet, so this belief supports them to use BBC Bitesize in a skilful way. This helps in improving the learners' achievement.

8.4.1 Contribution to knowledge

The area of contribution to knowledge is Online learning and how it affects learners' attitudes and achievement in Science. The current study has demonstrated that there is a correlation between the learners' attitudes towards BBC Bitesize and their achievement after they have received a course through BBC Bitesize.

Huang's (2008), Lou et al. (2013), and Hairston and Nafukho (2015) studies have concluded that there is a link between attitudes towards technology and achievement. These studies have recommended that more investigation takes place about the link between attitudes and achievement. The present study includes surveying the attitudes on (Selwyn's scale and the current study scale), achievement and the correlation between them.

After linking the achievement and attitudes together (on Selwyn's model and on the current study model), it was found that the contribution to knowledge of the current study is that there is a link between achievement and attitudes and they affect each other. So, the shared influence between achievement and attitude has been measured statistically. But, the difference between the components of attitudes on Selwyn's model and those of the current study model is one component (control in Selwyn's model and self-efficacy in the present study) as shown below in Figure 62 and Figure 63.
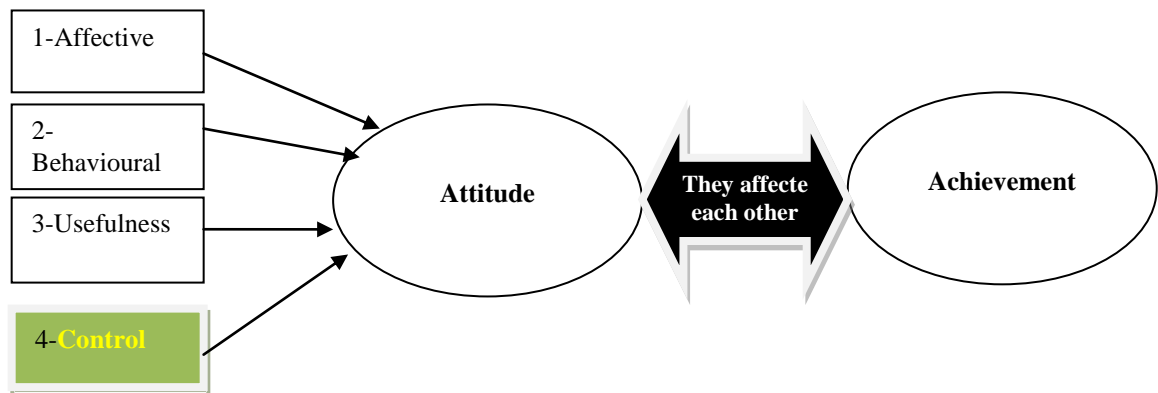
Figure 62: The influence of Selwyn model constructs on attitude, also the relationship between attitude and achievement
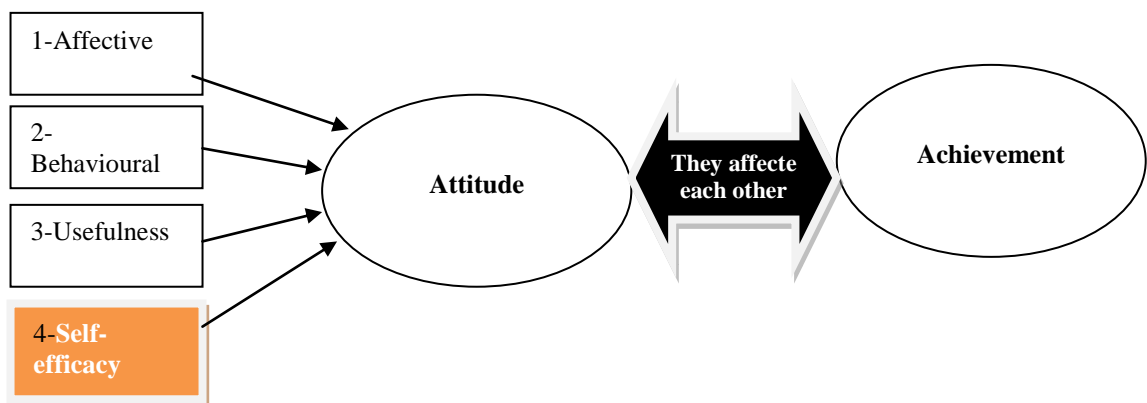
Figure 63: The influence of the amended scale of Selwyn's model on attitude, also the relationship between attitude and achievement

The other contribution to knowledge is that studying achievement and attitudes and surveying the link between them will contribute to understanding the effectiveness of BBC Bitesize for learning by realising the role of the two constructs of attitude and achievement.

8.4.2 Contribution to practice

A questionnaire was used not only to track the learners' views about BBC Bitesize and what they think about it. It was also used to find out how using the BBC Bitesize website affected the learners' attitudes and made them more positive. The written test measured the learners' achievement by the support of the website. Both a questionnaire and a written test were used to measure the effectiveness.

The current study demonstrated that there is a strong positive link between the learners' attitudes and achievement. Additionally, it has been concluded that the learners' attitudes and achievement affect each other positively and negatively so the teachers and educational staff are required to be subjected to training in ICT to update their knowledge and skills in technology and to understand how technology can be exploited for learning. The learners also are supposed to be trained in ICT as their learning requires skills and knowledge in ICT for better achievement. Also, the learners should be trained for improving their attitudes towards technology. Based on this discussion, it can be concluded that improving the learners' attitudes towards Computers and BBC Bitesize will result in an improved achievement in the topic under investigation.

Overall, surveying the relationship between achievement and attitudes will contribute to understanding the effectiveness of BBC Bitesize for learning, and it can be used in the best way to be beneficial for learners in high Schools.

8.4.3 Future studies

The aim for the future studies is supposed to focus on surveying the KS3 learners' attitudes towards using BBC Bitesize and their achievement via using BBC Bitesize in different subjects such as (Maths, English, Geography, History, and Modern languages). Also, the

attitudes, achievement and the link between them can be studied for different samples (different Key Stages) in Schools. Additionally, other educational websites can be studied and experimented for KS3 learners and for different Key Stages in Schools. A deeper socio-psychological approach to examine the link between attitudes and achievement in the field of Computer and technology will provide a richer insight about how they affect each other.

8.5   Using BBC Bitesize and the mechanism of learning theories

Learning is all about behaviour and how it changes through a stimuli-response mechanism (Gould 2012). The contribution the present study has made to the mechanism of learning is represented in a number of aspects which will be discussed in the following section.

The first contribution is that the mixing between the learning approaches (Behaviourist, Cognitivist, and Constructivist) to learning in one lesson in order to meet the different needs of the learners and cope with the different areas that need to be covered in the lesson. As far as the Behaviourist school of learning is concerned, the present study has used the concept of learning as a stimulus and response to that stimulus as explained in Chapter 2, Section 2.3.1. The topics, the pictures and the explanation of the pictures are all representatives of stimulus to stimulate learning. To explore the responses of the learners, a formative assessment was undertaken during the lesson; also a written test was conducted in the end of lesson. The correct answers were given positive feedback and the wrong answers were given negative feedback. However, this gave an idea about whether learning took place. By Behaviourist background it is meant that the Computer presents a stimulus for learning and rewards the correct response. Recapping information and providing reinforcement is a Behaviourist issue. Some educators point out that Behaviourist approach makes learners passive recipients of information. However, Skinner agreed with Thorndike's theory that learners are not passive but active learners whose behaviour is created and maintained by rewards or punishment (consequences) (Gray & Macblain 2012). BBC Bitesize provides the learners with the stimulus which can be a question, video film, or a photo and then the learners respond and then they receive feedback from the BBC Bitesize web site. The

sections of the lesson are designed as (Revision, Activity and Test) as explained in Chapter 2, Section 2.2. The design reflects the Behaviourist perspective in the sense that the learners can take the test as many times as they want and they can receive the feedback by clicking on Test and then on Check Score. The main point in the Behaviourist theory of learning is that they do not focus on what is inside the learner. Rather they stress the importance of the stimulus-response process.

There were a number of activities that indicated the use of Constructivist principles in the lesson of the study: the use of brainstorming at the beginning of the lesson to activate the learners' schemata and encourage them build the new knowledge based on an already existing knowledge, the use of problem-solving activities which encouraged the learners to analyse and critically think; the use of the principle of the learners trying to make sense from the environment through using different skills as explained in Chapter 2, Section 2.3.3. The Constructivist theory also explains how the interaction between the learners and the Computer led to learning. Learners learned through the interaction with the Computer. This interaction is, however, controlled by the learners in the sense that they could stop the Computer whenever they wanted, made it repeat the information, and they could focus on the points they want to understand in-depth.

In other words, the contribution of the present study to the learning theory field is that all learning theories need to be involved in understanding how learning takes place. Every theory covers and justifies an area of the learning process. Learners need a stimulus to start the process of learning. They also need reinforcement to examine whether what they have learned is accurate or not. Knowing whether what they have learned is accurate is another stimulus to move to another learning stage and so on. Learning is stimulus-based. Because Behaviourist does not afford to explain how learning takes place, the integration of the Cognitivist and Constructionist theories was essential which explained how learning took place.

It is an essential question to ask how BBC Bitesize works in teaching KS3 learners. In fact, BBC Bitesize can be integrated in the classroom for working on (Cognitive background, Behaviourist background, and Constructivist background). By Cognitive background it is meant that Online learning involves a number of cognitive processes by the learners to solve

problems and understand information. It also involves retrieving and using skills and knowledge as explained in Chapter 2, Section 2.3.2. By Constructivist background the learners use their already existing knowledge to understand the new knowledge. By Behaviourist background the learners use the processes of stimulus-response, feedback process, and reinforcement (rewards or punishment).

8.6 The research limitations

There are some restrictions accompanied this research and can be mentioned as follows:

a- There were limits on accessing the Schools. Only two Schools allowed the researcher to carry out the study. The time spent for searching for Schools around 7-9 months.

b- Time was so tight and both Schools gave a limited time to the researcher to carry out the study. The Schools' administrations were very keen to make the School program not affected by the current study.

c- The practical study was conducted through stages because the learners were subjected to their own course at School.

d- The number of the learners should have been more but the access to Schools was limited. Also, the number of the learners is limited because not many parents gave consent to their children to participate in the study.

e. It took a long time for the ethical approval to be given by University.

8.7 Recommendations & Suggestions

Nowadays focusing on using technology in education is a paramount. The present study focuses on using Computers and BBC Bitesize too. And this study recommends some points and also it is expected that these points are supposed to be taken into educationalist and Schools staff account for effective learning such as:

a- Experimenting Selwyn model and the current study model in different contexts for measuring the attitude of learners and comparing the two models through the findings.

b- Surveying the attitudes of learners towards different kinds of technology regularly and this can be useful for finding out the best way for utilizing technology for teaching and learning.

c- Surveying the attitudes of teachers towards technology is important as the teacher has a fundamental function in classroom and it is expected that teachers' attitude affects learners' attitude.

d- When attitudes towards technology are studied, attitudes towards Science should also be studied because the negative attitude of learners towards technology maybe reflection of negative attitude towards Science.

e- Treating the negative affecting factors on the learners and teachers by increasing the awareness of learners and teachers in technology.

f- Updating the learners' and teachers' information in technology by delivering training courses in technology, and their role in enhancing the teaching/learning process.

g- Surveying the attitudes of teachers & learners towards Online courses and studying its effectiveness in improving learners achievement in different contexts.

h- Explaining the importance of technology and software in education for learners and teachers to make them in control of their technology.

i- Improving the teaching and learning methods in traditional classrooms by integrating technology in classrooms to be part of every lesson.

8.8 Final conclusion

In this concluding Chapter, the main results and recommendations are presented. The aim of this study is to measure the effectiveness of BBC Bitesize for learning Science. This study has explored that BBC Bitesize is effective and can make a difference in teaching and learning Science in the high Schools in the UK.

The findings show that KS3 learners have significant and positive attitudes towards BBC Bitsize (Onlin learning). Alongside, the results show that KS3 learners have made a significant achievement via using BBC Bitesize. The implementation of BBC Bitesize Online courses will be accompanied with some expected changes in the teaching/learning methods such as the role of teachers and learners in teaching/learning process, and the structure of the classroom. Moreover, the results have demonstrated that Online learning (BBC Bitesize) is welcomed by KS3 learners and this reinforces the learners' confidence helping them to learn at their own pace.

The study has also shown that some of the KS3 learners have difficulties during using BBC Bitesize. These problems have emerged in KS3 learners' interviews. The learners' views were analysed and interpreted. The restrictions, limitations, and the problems of the current research were described and discussed. Suggestions and further research are proposed. In the end, the results reveal that BBC Bitesize is effective and efficient and the present study will pass the data analysis methods to be used in other context, conditions, and circumstances. Also, this study sheds the light on implementing the Online courses for teaching/learning Science to KS3 learners in the high Schools in the UK.

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Appendices

Appendix 1   The ethical approval

University of
Salford
MANCHESTER

College of Arts & Social Sciences
Room 626 Maxwell Building
The Crescent
Salford, M5 4WT
Tel: 0161 295 5876

01 May 2012

Ghassan Al-Khatib
University of Salford

Dear Ghassan

Re: Ethical Approval Application

I am pleased to inform you that based on the information provided, the Research Ethics
Panel have no objections on ethical grounds to your project.

Yours sincerely

Deborah Woodman
On Behalf of CASS Research Ethics Panel

Appendix 2   A letter from the supervisor to Schools

Ms. K. August   28th February 2011

The Principal of Manchester Academy School.

Moss Lane East, Manchester M14 4PX.

Dear Ms. August,

Re: Research project as part of PhD studies.

I am writing on behalf of my PhD student, Mr Ghassan Alkhatib, to ask your permission for him to engage in some research with pupils at your school, Manchester Academy. He is a PhD student in the Information Systems Research Centre at the University of Salford. As part of his research he is investigating e-learning, and its impact on children, and he would appreciate your help in order to carry out some empirical work with children in the school setting.

Title of the research:

The Relationship between Effectiveness and Attitudes towards learning Science Online: A Comparative study between Autonomy & Computer assisted Instruction (A field study in Manchester Academy School for Year 10 and 11 by Using BBC Bitesize teaching material from the Web Site).

Aims of the research:

The research project involves an experiment with two methods of teaching/learning processes, for learning in Science modules. The experiment is planned for pupils in years 10 and 11,
The study's goal is to find the factors that contribute to positive or negative attitudes towards the use of computers in Education, such as computer anxiety, self efficacy, and perceived ease of use and perceive usefulness, as contributory factors that affect the acceptance or rejection of computers by learners.
The study aims to measure the attitudes of learners in Years 10 and 11 towards using computers in high school, by measuring the effectiveness of one of the BBC Bitesize modules

school, by measuring the effectiveness of one of the BBC Bitesize modules as a website learning tool. Two types of learning methods are planned to be investigated: self-learning using the computer module (Autonomy) and computer-based instruction, with teacher support, and comparing the results of these learning methods.

The matter of ethics:

The anonymity and privacy of those pupils who participate in the research process will be respected. Personal information concerning research participants will be kept confidential. The researcher will inform the participants of their rights under any copyright or data protection laws (STATEMENT OF ETHICAL PRACTICE FOR THE BRITISH SOCIOLOGICAL ASSOCIATION MARCH 2002 (Appendix updated May 2004). The researcher has applied to Research Governance and Ethics Committee in Salford University for Ethical Approval to confirm that the research follows the rules of ethics.

The researcher:
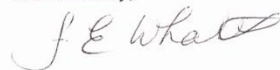
Ghassan Alkhatib is a trained teacher, with CRB approval. He is committed to following and respecting the rules in place within your school, and he is willing to ensure that the research plan will fit the school's programmes of study, so that there will be the minimum of disruption to the participants' (students, teachers) time, or organisation of the school schedule. The work in your school will be co-ordinated with the principal and other relevant staff, as required. He is prepared to undertake any training, meetings and other requirements necessary to meet the rules and conditions in your school.

The results of the research:

The findings of the research project will be provided for the School, as it is anticipated that the findings will be of benefit to inform pedagogical direction of the school.

Thank you very much in anticipation of your approval for involvement in this research.

Yours sincerely,

J E What

Dr Janice Whatley (Lecturer)

University of Salford
Salford Business School
The Crescent
Salford M5 4WT

Appendix 3   CRB (Criminal Record Bureau)

Enhanced Disclosure
Page 1 of 2

disclosure

Disclosure Number   001329239928

Date of Issue: 12 JULY 2011

Applicant Personal Details

Surname: ALKHATIB

Forename(s):   GHASSAN

Other Names: NONE DECLARED

Date of Birth: 28 OCTOBER 1959

Place of Birth: LATAKIA

Gender: MALE

Employment Details

Position applied for:
RESEARCHER

Name of Employer:
UNIVERSITY OF SALFORD

Countersignatory Details

Registered Person/Body:
UNIVERSITY OF SALFORD

Countersignatory:
JULIE EVANS

Police Records of Convictions, Cautions, Reprimands and Warnings

NONE RECORDED

Information from the list held under Section 142 of the Education Act 2002

NONE RECORDED

ISA Children's Barred List information

NONE RECORDED

ISA Vulnerable Adults' Barred List information

NONE RECORDED

Other relevant information disclosed at the Chief Police Officer(s) discretion

NONE RECORDED

Enhanced Disclosure
This document is an Enhanced Criminal Record Certificate within the meaning of sections 113B and 116 of the Police Act 1997.

THIS DISCLOSURE IS NOT EVIDENCE OF IDENTITY

CRB   PO Box 165, Liverpool, L69 3JD Helpline: 0870 90 90 844

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Use of Disclosure information

The information contained in this Disclosure is confidential and all recipients must keep it secure and protect it from loss or unauthorised access. This Disclosure must only be used in accordance with the Criminal Record Bureau's (CRB) Code of Practice and any other guidance issued by the CRB. Particular attention must be given to the guidance on the fair use of the information in respect of those whose Disclosure reveals a conviction or similar information. The CRB will monitor the compliance of Registered Bodies with this Code of Practice and other guidance.

This Disclosure is issued in accordance with Part V of the Police Act 1997, which creates a number of offences. These offences include forgery or alteration of Disclosures, obtaining Disclosures under false pretences, and using a Disclosure issued to another person as if it was one's own.

This Disclosure is not evidence of the identity of the bearer, nor does it establish a person's entitlement to work in the UK.

Disclosure content

The personal details contained in this Disclosure are those supplied by or on behalf of the person to whom the Disclosure relates at the time the application was made and that appear to match any conviction or other details linked to that identity.

The information contained in this Disclosure is derived from police records, and from records held of those who are unsuitable to work with children and/or vulnerable adults, where indicated. The police records are those held on the Police National Computer (PNC) that contains details of Convictions, Cautions, Reprimands and Warnings in England and Wales, and most of the relevant convictions in Scotland and Northern Ireland may also be included. The CRB reserves the right to add new data sources. For the most up to date list of data sources which are searched by the CRB please visit the CRB website.

The Other Relevant Information is disclosed at the discretion of Chief Police Officers or those of an equivalent level in other policing agencies, who have been approached by the CRB, with due regard to the position sought by the person to whom the Disclosure relates.

Disclosure accuracy

The CRB is not responsible for the accuracy of police records, or records of those who are deemed unsuitable to work with children and/or vulnerable adults.

If the person to whom the Disclosure relates is aware of any inaccuracy in the information contained in the Disclosure, he or she should contact the Countersignatory immediately, in order to prevent an inappropriate decision being made on their suitability. This Countersignatory will advise how to dispute that information, and if requested arrange for it to be referred to the CRB on their behalf. The information should be disputed within 3 months of the date of issue of the Disclosure.

The CRB will seek to resolve the matter with the source of the record and the person to whom the Disclosure relates. In some circumstances it may only be possible to resolve a dispute using fingerprints, for which consent of the person to whom the Disclosure relates will be required.

If the CRB upholds the dispute a new Disclosure will be issued free-of-charge. Details of the CRB's disputes and complaints procedure can be found on the CRB's website.

Contact us

Post:	Criminal Records Bureau	Telephone:	Disputes Line:	0870 90 90 778
	PO Box 165		Welsh line:	0870 90 90 223
	Liverpool		Minicom:	0870 90 90 344
	L69 3JD		General Information:	0870 90 90 811

Web: www.crb.gov.uk
Email: CustomerServices@crb.gsi.gov.uk

If you find this Disclosure and are not able to return it to the person to whom it relates, please return it to the CRB at the address above or hand it in at the nearest police station.

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End of Details

Appendix 4   An e-mail from BBC Bitesize

Subject: Comments on BBC Bitesize

From: GCSE Bitesize (gcsebitesize@bbc.co.uk)

To: gassanalkhatib@yahoo.co.uk;

Date: Wednesday, 5 December 2012, 16:02

Dear Mr Alkhatib,

Thank you for contacting us.

We've looked into your request on the effectiveness of our online content. Unfortunately no specific research has been done with regard to Bitesize KS3 Science. I can however direct you to our research portal, where reports of this kind are published.

http://www.bbc.co.uk/learning/overview/research.shtml

I'm sorry we could not help more specifically with your research, but thank you for contacting us.

Franco

BBC Bitesize

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http://www.bbc.co.uk
This e-mail (and any attachments) is confidential and may contain personal views which are not the views of the BBC unless specifically stated.
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Do not use, copy or disclose the information in any way nor act in reliance on it and notify the sender immediately.
Please note that the BBC monitors e-mails sent or received.
Further communication will signify your consent to this.

313

Appendix 5   The lesson (Disease unit) from BBC Bitesize

Disease

Introduction

This Revision Bite covers:

- **Microbes**
- **Microbes - useful or not?**
- **Spreading microbes**

Microbes

Many living things are so small that they can only be seen through a microscope. These living things are called **microorganisms** or **microbes**. There are three main types of microbe:

- **Fungi, bacteria and viruses**

Fungi
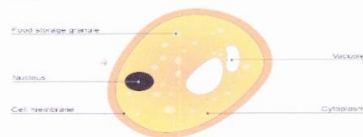
Mushrooms and toadstools are fungi, but these are made of lots of cells, so they are not microbes. Yeasts are single-celled fungi, so they are microbes. Fungi are usually the biggest type of microbe. If there is just one of them, we call it a fungus.

Bacteria
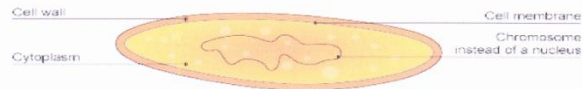
Bacteria are usually smaller than fungi. If there is just one of them, we call it a **bacterium**. Bacteria have many different shapes. Some have 'tails' (called flagella) that let them swim.

Viruses

1

314
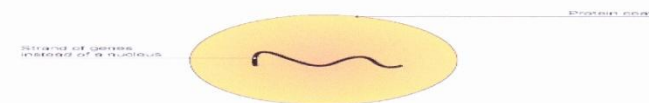
Viruses are the smallest type of microbe. As a virus can only reproduce inside a cell, some people are not convinced that viruses are really living things.

Differences between fungi, bacteria and viruses

The table shows some of the similarities and differences between the three types of microbe.

Feature	Fungi	Bacteria	Viruses
Cell membrane	✓	✓	✗
Cell wall	✓ (hard)	✓ (soft)	✗ (protein coat)
Cell nucleus	✓	✗ (circle)	✗ (strand)

Microbes - useful or not?

People often use the word germ instead of microbe, so you might think that microbes are all harmful. But some are useful to us.

Useful microbes

Yeast cells are useful to bakers and brewers. Yeast cells can change sugar into carbon dioxide gas and alcohol. This is useful to bakers because the gas helps the bread rise, and it is useful to brewers because it adds the alcohol needed for their drinks.

Bacteria are also useful to us. For example, certain bacteria cause the changes needed in milk to make yogurt and cheese out of it.

Harmful microbes

Many microbes can cause diseases. For example here are some diseases caused by fungi:

- athlete's foot
- thrush

Here are some diseases caused by bacteria:

- tuberculosis, TB (affects the lungs)
- salmonella (causes food poisoning)
- whooping cough (affects the lungs)

Here are some diseases caused by viruses:

- chicken pox (affects skin and nerves)

2

- common cold
- influenza, flu
- measles (affects skin and lungs)
- mumps (affects salivary glands)
- rubella, German measles

Microbes cause disease when they are able to reproduce in the body. They produce harmful substances called **toxins**, and damage tissues and organs. We say that someone who has harmful disease-causing microbes in them is infected.

Spreading microbes

Many harmful microbes can pass from one person to another. Diseases caused by such microbes are said to be infectious diseases. Here are some ways that harmful microbes can be spread:

- in air
- through contact with animals
- through contaminated food
- through touch
- in water

Air

Droplets containing microbes fly into the air when people sneeze or cough. The microbes they contain get into other people if breathed in. Chicken pox, colds, flu, measles and tuberculosis are spread like this.

Animals

Animals may carry harmful microbes. The microbes can get into a person who is scratched or bitten by such an animal. **Malaria** is a tropical disease spread by a tiny fly called a mosquito.

Food

Food can have harmful microbes in and on it. The microbes get into the body when the food is eaten, causing food poisoning. Thorough cooking kills most microbes, but they can survive under-cooking. Careless handling of food increases the risk from harmful microbes.

Touch

Microbes can be passed from one person to another when people touch each other, or when they touch something an infected person has handled. Athlete's foot is spread like this. Bacteria on the skin can be killed by antiseptics, and bacteria on surfaces can be killed by disinfectants. Washing your hands reduces the chance of spreading microbes.

Water

Water can have harmful microbes in it. The microbes get into the body when the water is swallowed. **Cholera** is a disease caused by a bacterium that spreads like this. Thorough boiling or adding chlorine to the water can reduce the chance of spreading microbes in this way.

3

Appendix 6   The instruction sheets for learners (sample of handout for participants')

1
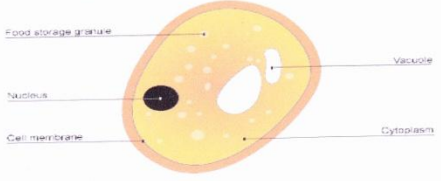
Instructions for students

Please study the topic of Disease-Microbes from the BBC Bitsize website by using the link bellow:

http://www.bbc.co.uk/bitesize/ks3/science/organisms_behaviour_health/disease/revision/1/

The teacher is there (around you) to clarify, explain and ease every difficult point for you eventually every learner will to get feedback from the teacher.
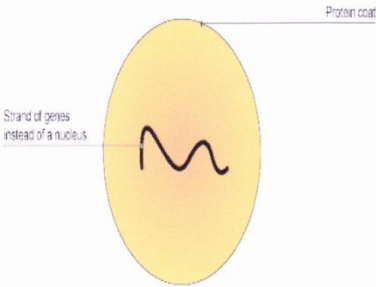
Please Tick (√) on the left column of the table when you are sure that you have understood every point.

Please study the following information on the computer	(Ask yourself the following questions)	Time	Please √
• Read about Living things from BBC website • The following diagram is Fungi please study all its parts of the diagram.	Define Living things?	1 minute	
	Can you name the diagram?	1 minute	
Food storage granule Nucleus Cell membrane Vacuole Cytoplasm	Can you identify all the parts of the diagram?	1 minute	
	Can you repeat drawing the Fungi diagram in this box?	2 minutes	

317

• The following diagram is Viruses please try to study all its parts of the diagram. Cell wall Cell membrane Chromosome instead of a nucleus Cytoplasm	Can you name the diagram?	1 minute	
	Can you identify all the parts of the diagram?	1 minutes	
	Can you repeat drawing the Bactria diagram in this box?	2 minutes	
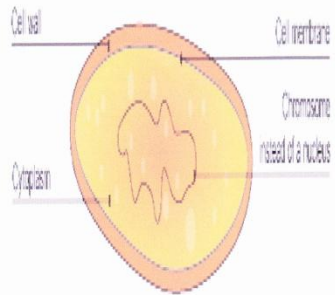
Please study the following information on the computer	(Ask yourself the following questions)	Time	Please √
	• Can you name the diagram?	1 minute	
	• Can you identify all the parts of the diagram?	1 minutes	
	• Can you repeat drawing the Viruses diagram in this box?	2 minutes	

Protein coat

Strand of genes instead of a nucleus

Please study the following information on the computer	(Ask yourself the following questions)	Time	Please √
• Look at the three types of Microbes	Name the three types of Microbes?	2 minute	
• Read about Microorganisms from BBC website	Define Microorganisms?	1 minute	
• Read about Mushrooms and find out if they are Microbes?	Can you clarify if Mushrooms are Microbes and why?	1 minute	
• Read about Yeast and find out if they are Microbes?	Clarify if Yeast is Microbe and why?	1 minute	
• Find out the biggest and the smallest microbes.	Can you divide microbes according to their size? And mention examples.	1 minute	
• Find out if the Bacteria have one shape or many different shapes.	Can you predict the number of Bactria shapes?	1 minute	
• Find out if some Bacteria have 'tails'.	Can you demonstrate if some Bactria have tails?	1 minute	
• Read about **bacterium in the website?** Bacteria are usually smaller than fungi. If there is just one of the Bacteria, we call it a **bacterium**.	Define Bacterium?	1 minute	
• Find out in which Microbes have Cell membrane.	Compare between the cell membrane in all type of Microbes?	1 minute	
• Find out which Microbes have Cell wall and mention the nature of this wall.	Compare between the cell wall in all type of Microbes?	1 minute	
• Find out which Microbes have Cell nucleus.	Compare between the Cell nucleuses in all type of Microbes?	1 minute	
• Look at the three diagrams of Fungi, Bactria and Viruses and compare between the three types of Microbes (differences and similarities) in terms of Cell membrane, Cell wall and Cell nucleus.	Can you compare between the three types of Microbes in terms of Cell membrane, Cell wall and Cell nucleus?	2 minutes	
• There are Useful and Harmful microbes.	Can you classify the microbes in two types?	1 minute	

Please study the following information on the computer	(Ask yourself the following questions)	Time	Please √
• Yeast cells are useful to bakers because Yeast helps the bread rise.	**Can you classify Yeast cell as useful Microbe?**	**1 minute**	
• Certain bacteria cause the changes needed in milk to make yogurt and cheese out of it.	**Can you demonstrate how yogurt can be made?**	**1 minute**	
• Some fungi cause athlete's foot	**Can you diagnose the causes of the following illnesses:** **-Athlete's foot.**	**1 minute**	
• Some fungi cause thrush.	**Can you diagnose the causes of the following illnesses:** **-Thrush.**	**1 minute**	
• Some bacteria cause diseases like: -tuberculosis, TB (affects the lungs)	**Can you diagnose the causes of the following illnesses:** -Tuberculosis	**1 minute**	
• Some bacteria cause diseases like: -Salmonella (causes food poisoning).	**Can you diagnose the causes of the following illnesses:** -Salmonella	**1 minute**	
• Some bacteria cause diseases like: -whooping cough (affects the lungs)	**Can you diagnose the causes of the following illnesses:** -Whooping cough.	**1 minute**	
Spreading microbes Harmful microbes can be spread in different ways (please read about that from the computer).	Can mention the ways of spreading harmful microbes?	**1 minute**	
Please read from the PC how Chicken pox, colds, flu, measles and tuberculosis transfer from one person to another.	Explain how Chicken pox, colds, flu, measles and tuberculosis transfer from one person to another?	2 minute	

Please study the following information on the computer	(Ask yourself the following questions)	Time	Please √
Please read from the PC **about Malaria** and how it can spread.	Explain the role of animals in spreading some harmful microbes (for example **Malaria)?**	2 minute	
Please read from the PC about the role of food in spreading some harmful microbes.	Explain the role of food in spreading some harmful microbes?	2 minute	
Please read from the PC about the role of touch in spreading some harmful microbes for example Athlete's foot.	Explain the role of touch in spreading some harmful microbes?	2 minute	
Please read from the PC about the role of water in spreading some harmful microbes for example **Cholera.**	Explain the role of water in spreading some harmful microbes?	2 minute	
• **Advise**: (Activity) Not all microbes are useful but there are a lot of harmful microbes which cause very dangerous illnesses so you must confront the harmful microbes to protect yourselves from any disease by following a good hygienic system by washing your hands before and after eating and washing your food to eat clean food.	**Can you mention the personal hygienic rules and beliefs you practise in your daily life to protect yourselves from any disease?**	1 minute	

• **Activities (Mock test)** • **Can you design a table which contains two columns first one for useful fungi and another one for harmful fungi?** • **Can you design a table which contains two columns the first one is for useful Bactria and another one is for harmful Bactria?** • **Can you draw the diagram of Fungi, Bactria and Viruses by heart?**	**10 minutes**	

1
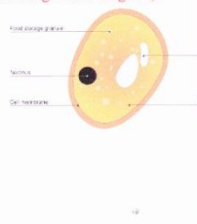
Lesson Plan   **Course : Science**   **Teacher/researcher: Ghassan Alkhatib**

Topic: Disease/ Microbes

Date:		Time:		No on register:	DDA/Additional Learning Support Requirements
Room:	ICT lab	Duration:	1 hour	No Present:	What are the specific requirements of the learners on this course? The learners who are in special needs have been identified and their needs have been covered.
Safeguarding and Risk Assessment: Room is checked for suitable light. Chairs and tables are set and comfortable. Making sure the room is quite and no noise hinders the communication (Wilson 2009). Computers have been tested for the learner safety and to make sure are working in very good quality.		Every Child/Every Learner Matters: Detail how the activities planned in the scheme link to the themes. Be healthy: Stay safe and secure to be able to read and achieve the goals of lesson. Make a positive and quite environment to let the learner able to interact with the computer and teacher (Wilson 2009).			Personal Learning and Thinking Skills and Independent learner: The learner will learn independently and the teacher will help when the learner face any difficulty. Reflective Learners: the learners will find out the degree of gaining information by the post-test.
Resources: http://www.bbc.co.uk/schools/ks3bitesize/science/organisms_behaviour_health/disease/revise2.shtml -Hand out include information for students t and include the instruction.		Equality and Diversity Equality: all learners should be respected and subjected to the same conditions of experiment. Diversity: from the beginning we believe that there are differences between the learners in term of hobbies, attitudes, potentials, present attainment and interests. The diversity is about valuing and respecting the differences in learners, regardless of ability and/ or circumstances or any other individual characteristics they may have (Gravells A. 2012).			Links to Functional/Basic Skills for Life: ICT skills

Session Aims :	**Learning outcomes:**
- In the end of lesson the learners will know the following: - Recognise the Disease/Microbes by providing the learners with knowledge (Cognitive Domain) (to understand the scientific ideas and facts), skills (Psychomotor Domain) and some Values (Affective Domain). - After completing the programme (unit) successfully the researcher will be ready to conduct the following: - Testing the learners by written test (Summative Test) can be called (Summative test) to find out the level of achievement cross the studied unit. - Testing the attitudes of learners towards Technology in learning Microbes unite by questionnaire. - Testing the attitudes of some learners towards using technology in learning Microbes unite by Interview. - Testing the attitudes of some teachers towards using technology in teaching/learning process by Interview.	In the end of lesson the Learners will be able to: -Cognitive domain (knowledge): -Understand the differences between the three types of microbes. -Understand the differences between the useful and harmful of microbes with examples. -Understand some examples of microbes cause some illness. - Understand the ways of spreading harmful microbes? - Psychomotor domain (skills): - To be able to recognises between the three diagrams of microbes. - To be able to confronts the harmful microbes.

3

Time	Tutor Activity	Student Activity	Differentiation/extension activities	Assessment
	Pre-teaching (warming up) What is "Living things"? Can you define Microbes? Can you mention the three types of Microbes?	The learners will answer the questions orally or by writing.	Less experience learners in the topic (Microbes) are given extra chance for interaction with the teacher and with learners who have got knowledge with the topic.	Initial assessment: To make link between the learners experience and the new knowledge. To assess the learners needs.
	This is a diagram of Fungi (Please Study the component of Fungi in the diagram).	The learners will know (The component of Fungi).	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	-Name the following diagram This reflects the Cognitive domain (the level of knowledge) Bloom's Taxonomy. -Identify the all parts of fungi in the diagram? Cognitive domain (the level of knowledge) -Repeat drawing the Fungi diagram? (Psychomotor Domain according to Bloom)
	This is a diagram of Bactria (Please Study the component of Bactria in the diagram).	The learners will know (The component of Bactria).	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	-Name the following diagram (Cognitive domain (the level of knowledge) -Identify the all parts of Bactria in the diagram? (Cognitive domain (the level of knowledge) -Repeat drawing the Bactria diagram? (Psychomotor Domain according to Bloom)

326

4

Time	Teacher Activity	Student Activity	Differentiation/extension activities	Assessment
	This is a diagram of Viruses (Please Study the component of Viruses in the diagram).	The learners will know (The component of Viruses).	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	-Name the following diagram (Cognitive domain (the level of knowledge) -Identify the all parts of Viruses in the diagram? (Cognitive domain (the level of knowledge) -Repeat drawing the Viruses diagram? (Psychomotor Domain according to Bloom)
	Comparison between the three types of Microbes in terms of Cell membrane, Cell wall and Cell nucleus?	The learners will know how to compare between the three types of Microbes.	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	Can you compare between the three types of Microbes in terms of Cell membrane, Cell wall and Cell nucleus? (Cognitive domain (the level of evaluation).
	Bacteria are usually smaller than fungi. If there is just one of them, we call it a bacterium.	The learners will know that Bacteria are usually smaller than fungi.	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	Define Bacterium? (Cognitive domain (the level of knowledge)
	Yeasts are single-celled fungi, so they are microbes. Mushrooms and toadstools are fungi, but these are made of lots of cells, so they are not microbes.	The learners will know how to compare between Yeast and Mushrooms.	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	-Can you clarify if Mushrooms are Microbes and why? (Cognitive domain (the level of comprehension) -Can you clarify if Yeast is Microbe and why? (Cognitive domain (the level of comprehension)

327

5

Time	Teacher Activity	Student Activity	Differentiation/extension activities	Assessment
	Fungi are usually the biggest type of microbe. If there is just one of them, we call it a fungus. Viruses are the smallest type of microbes.	The learners will know the smallest microbe.	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	-Mention the biggest and the smallest microbes? (Cognitive domain (the level of comprehension)
	There are useful microbes such as Yeast. And there are harmful microbes such as certain bacteria, Fungi and Viruses.	The learners will know the harmful and useful microbes.	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	Can you classify the microbes in two types? (Cognitive domain (the level of analysis)
	Yeast cells are useful to bakers because Yeast helps the bread rise. Certain bacteria cause the changes needed in milk to make yogurt and cheese out of it.	The learners will know how bread and yogurt can be made.	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	-Can you classify Yeast cell as a useful Microbe? (Cognitive domain (the level of application) -Demonstrate how yogurt can be made? (Cognitive domain (the level of application)
	Some fungi cause athlete's foot Some fungi cause thrush.	The learners will know the cause of Athlete's foot.	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	-Can you diagnose the causes of the following illnesses: 1-Athlete's foot. 2-Thrush. (Cognitive domain (the level of analysis)

6

Ti me	Teacher Activity	Student activity	Differentiation/ext ension Activities	Assessment
	Some bacteria cause diseases like: a-Tuberculosis, TB (affects the lungs). b- Salmonella (causes food poisoning). c- Whooping cough (affects the lungs).	The learners will know the cause of the following illnesses: -Tuberculosis -Salmonella -Whooping cough.	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	-Can you diagnose the causes of the following illnesses: -Tuberculosis -Salmonella -Whooping cough. (Cognitive domain (the level of analysis)
	Not all microbes are useful but there are a lot of harmful microbes which cause very dangerous illnesses so you must confront the harmful microbes to protect yourselves from any disease by following a good hygienic system by washing your hands before and after eating and washing your food to eat clean food.	The learners will know the role of hygienic system in protecting us.	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	-Can you mention the personal hygienic rules and believe you practise in your daily life to protect yourselves from any disease? (Affective domain (the level of characterise).

329

7

Ti me	Teacher Activities	Students Activities	Differentiation/ extension Activities	Assessment
	Harmful microbes can be spread: • in air • through contact with animals • through contaminated food • through touch • in water	The learners will know through reading the information from the BBC Bitsize that, harmful microbes can be spread in different ways.	The teacher will have more discussion with slow learners and with those who need more explanation.	Can mention the ways of spreading harmful microbes?
	Chicken pox, colds, flu, measles and tuberculosis are spread through the air. Please read about that from the computer.	The learners will read from the PC how Chicken pox, colds, flu, measles and tuberculosis transfer from one person to another.	More discussion between the teacher and slow learners and more examples.	Explain how Chicken pox, colds, flu, measles and tuberculosis transfer from one person to another?
	Please read from the PC about Malaria and how it can spread.	The learners will read from PC how Malaria can spread.	More Interaction with the learners who have got less experience i.e. using more pictures and examples.	Explain the role of animals in spreading some harmful microbes (for example Malaria)?
	Please read from the PC about the role of food in spreading some harmful microbes.	The learners will read from PC the role of food in spreading harmful microbes..	More discussion between the teacher and slow learners and more examples.	Explain the role of food in spreading some harmful microbes?
	Please read from the PC about the role of touch in spreading some harmful microbes for example Athlete's foot.	The learner will read from the PC about the role of touch in spreading some harmful microbes for example Athlete's foot.	More discussion between the teacher and slow learners and more examples.	Explain the role of touch in spreading some harmful microbes?
	Please read from the PC about the role of water in spreading some harmful microbes for example Cholera.	The learner will read from the PC about the role of water in spreading some harmful microbes for example Cholera.	More discussion between the teacher and slow learners and more examples.	Explain the role of water in spreading some harmful microbes?

8

Mock test -Can you design a table which contains two columns first one for useful fungi and another one for harmful fungi?	The learners will answer the questions by writing.	More Interaction with the learners who have got less experience	Cognitive domain (the level of Synthesis).
-Can you design a table which contains two columns first one for useful Bactria and another one for harmful Bactria?			Cognitive domain (the level of Synthesis).
-Can you draw the diagram of Fungi, Bactria and Viruses by heart?			Cognitive domain (the level of Synthesis).

Appendix 8   The test papers (for experiment).
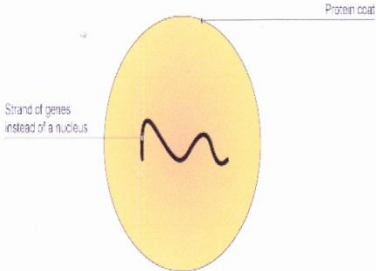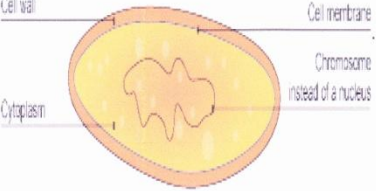
Test
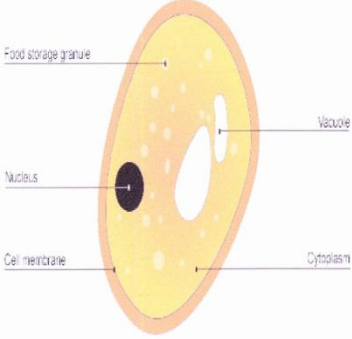
1. Your number: ....
2. Your age: ....
3- Class: ....
4- Your School name: ....

The Questions

First Question:

Please answer the following questions and put $(\sqrt{})$ in the suitable place

Which type of microbe is shown in the diagram?	A Fungus	A Bacterium	A Virus
Protein coat Strand of genes instead of a nucleus			
Cell wall — Cell membrane Chromosome instead of a nucleus Cytoplasm			

2

333

What type of microbes is shown in the diagram	A **Fungus**	A **Bacterium**	A **Virus**

Food storage granule

Vacuole

Nucleus

Cell membrane   Cytoplasm

Second Question:

Please answer the following questions and put $(\sqrt{})$ in the suitable place

Feature	A Fungus	A Bacterium	A Virus
1-What type of microbe is the smallest?			
2- What type of microbe causes tuberculosis (TB)?			
3- What type of microbe causes athlete's foot?			
4- What type of microbe causes influenza (flu)?			
5- What type of microbe causes the changes needed in milk to make yogurt and cheese out of it?			
6- What type of microbe causes thrush?			
7- What type of microbe causes Chicken pox?			
8- What type of microbe causes Mumps (affects salivary glands)?			

4

Third Question:

Please answer the following questions and put (√) in the suitable place

Features	True	False
1- There are so small living things, They can be seen through a microscope		
2-There are some living things called microorganisms or microbes		
3- Mushrooms are fungi, but these are made of lots of cells, so they are microbes.		
4- Yeasts are fungi, but they are made of single of cell, so they are not microbes.		
5- Fungi are usually the biggest type of microbe.		
6- Bacteria are usually smaller than fungi.		
7- Bacteria have many different shapes.		
8-Some Bacteria have 'tails' (called flagella) that let them swim.		
9- Cell membrane is available in fungi and Bacteria but is not available in Viruses.		
10- Measles (affects skin and lungs) is caused by Bacteria.		
11- Rubella, German measles are caused by viruses.		
12-Chicken pox, colds, flu and measles are spread from a person to another via animals.		
13- **Malaria** is a tropical disease spread by air.		
14- Cooking the food well kills most microbes.		
15- Athlete's foot is spread through the people via touch.		
16- **Cholera** is caused by a bacterium which gets into the body when the water is swallowed.		

Thank you

5

336

1

A Questionnaire for KS3 learners

Please put below your number instead of your name.

1. Your number: ....

2. Age: .... years old

3. Class: ....

4- Your School name: ....

Dear Participant

We are going to ask you some questions about what you think of using a computer and BBC Bitesize.

The target of this survey is to collect information about individual's attitudes towards using BBC Bitesize & computer in learning and teaching process.

Please be truthful in what you say about your feelings, and answer with the first thing you think of.

I would be very grateful to you if you can answer the questions bellow.

Thank you.

The researcher Ghassan Alkhatib

PhD researcher in E-learning

1

The Questions

Please read the questions bellow and tick in the appropriate box

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
1- When I use BBC Bitesize I am afraid that I cannot access it.					
2- Idon't like to use BBC Bitesize for fear of making mistakes I can't correct.					
3- I don't feel frightened about using BBC Bitesize.					
4- BBC Bitesize makes me feel uncomfortable					
5- Using BBC Bitesize does not scare me at all					
6- I don't like to use BBC Bitesize in case I look stupid if I cannot use it properly.					
7- BBC Bitesize helps me understand my school lessons better.					
8- BBC Bitesize makes me work more effectively on my school work.					
9- BBC Bitesize can allow me to do more interesting and imaginative work.					
10- I can understand the school lessons without the help of BBC Bitesize.					
11- BBC Bitesize can improve the presentation of the school lessons.					
12- I can use BBC Bitesize probably by myself without guiding.					
13- I can surf the BBC Bitesize easily.					

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
14- If I get problems using the BBC Bitesize, I can usually solve them somehow.					
15- I do not think I am in a complete control when I use BBC Bitesize.					
16- I need an experienced person nearby when I use BBC Bitesize.					
17- I do not need someone to tell me the best way to use BBC Bitesize.					
18- I would avoid doing a task if I knew it involved working with BBC Bitesize.					
19- Whenever possible, I avoid coming into contact with BBC Bitesize in school or at home.					
20- I only use BBC Bitesize when I am told to.					
21- I will use BBC Bitesize whenever I can throughout school.					
22- I advise my colleagues to avoid using BBC Bitesize whenever possible.					
23- I feel anxious whenever I am using BBC Bitesize.					
24- I wish that I could be as calm as others when they are using BBC Bitesize.					
25- I am confident in my ability to use a BBC Bitesize.					
26- I feel tense whenever I am using BBC Bitesize.					
27- I worry about making mistakes on the computer when I use BBC Bitesize.					
28- I experience anxiety whenever I sit in front of a computer to use BBC Bitesize.					
29- I enjoy studying by BBC Bitesize.					

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
30- I would like to continue studying by BBC Bitesize in the next academic years.					
31- I feel relaxed when I am studying by BBC Bitesize.					
32- I wish that BBC Bitesize was not as important as it is.					
33- I am frightened by BBC Bitsize and internet.					
34- I feel happy when I am working on a computer to study by BBC Bitesize.					
35- I feel exhausted whenever I am studying via BBC Bitesize.					
36- I feel comfortable with BBC Bitesize.					
37- I feel at ease with BBC Bitesize.					
38- I can always manage to solve difficult problems if I use BBC Bitesize.					
39- If someone does not agree with me, I can find the answers via BBC Bitesize.					
40- It is easy for me to accomplish my learning goals if I use BBC Bitesize.					
41- I am confident that BBC Bitesize helps me to deal with unexpected events.					
42- My skills in using BBC Bitesize and computers allow me to handle unexpected situations.					
43- BBC Bitesize let me solve most problems if I put in some effort.					
44- When I use BBC Bitesize I can rely on my ability to solve the difficulties I face.					
45- When I am confronted with some quizzes, I can find several solutions through BBC Bitesize.					
46- If I am in trouble, I can usually think of a solution via BBC Bitesize.					
47- I can usually deal with BBC Bitesize activities easily.					

1

An Interview for Students

1. The student number: ....

2. Age: .... years old

3. Class: ....

4- School Name: ....

Dear Participant

Thank you for your time and effort

We are going to ask you some questions about what you think of using a computer.

The target of this interview is to collect information about individual's attitudes towards using computer in the learning and teaching process.

Please be truthful in what you say about your feelings, and answer with the first answer you think of.

Thank you very much for your assistance.

The researcher Ghassan Alkhatib

PhD course in E-learning (Salford University)

1

2

The Questions

Please read the questions bellow and tick (√) in the appropriate box and mention why?

1- When I use a computer

    a- I am afraid that I might damage it in some way. ☐

    b- I am moderately afraid that I might damage it in some way. ☐

    c- I am not afraid that I might damage it in some way. ☐

    Why? ------------------------

2- When I use a computer

    a- I do not like to use it, I fear of making mistakes I cannot correct. ☐

    b- To some degree I do not like to use it, I fear of making mistakes I cannot correct.

    c- I do like to use it and I do not fear making mistakes. ☐

    Why? ------------------ ☐

3- When I use a computer

    a- I do not feel frightened at all. ☐

    b- I feel frightened a bit. ☐

    c- I feel frightened too much. ☐

    Why? ------------------

2

342

4- Computers make me feel

    a- Uncomfortable. ☐

    b- Moderately Comfortable. ☐

    c- Comfortable. ☐

    Why? -------------------

5- Using a computer

    a- Does not scare me at all. ☐

    b- Scares me a bit. ☐

    c- Scares me too much. ☐

    Why? -------------------

6- Using a computer

    a- I do not like to us it in case I look stupid too much. ☐

    b- I do not like to us it in case I look stupid a bit. ☐

    c- I like to use it because I feel I look clever. ☐

    Why? -------------------

7- Computer helps me

   a- To organise my work better. ☐

   b- To organise my work to some extent. ☐

   c- Does not organise my work at all. ☐

Why? ------------------

8- Computers let me work

   a- More effectively on my school work. ☐

   b- Effectively a bit on my school work. ☐

   c- Less effectively on my school work. ☐

   Why? -------------------

9- Computers can allow me to do

   a- More interesting and imaginative work. ☐

   b- Interesting and imaginative work to some degree. ☐

   c- Less interesting and less imaginative work. ☐

   Why? -------------------

10- I can do myself

    a- Most things that a computer can be used for. [ ]

    b- Some things that a computer can be used for. [ ]

    c- Very little things that a computer can be used for. [ ]

    Why? --------------------

11- Computers

    a- **Can i**mprove the presentation of my School work too much. [ ]

    b- Can improve the presentation of my School work a bit. [ ]

    c- Cannot improve the presentation of my School work. [ ]

    Why? --------------------

12- I could probably teach myself

    a- Most of the things about computers that I need to know. [ ]

    b- Some of the things about computers that I need to know. [ ]

    c- A little bit of the things about computers that I need to know. [ ]

    Why? --------------------

13- I can make the computer

a- Do what I want it to do. ☐

b- Do some things of what I want it to do. ☐

c- Do too little things of what I want it to do. ☐

Why? -------------------

14- If I get problems using the computers

a- I can usually solve them completely. ☐

b- I can solve them moderately. ☐

c- I cannot usually solve them. ☐

Why? -------------------

15- I think

a- I am in complete control when I use a computer. ☐

b- I am moderately in control when I use computer. ☐

c- I am not in complete control when I use a computer. ☐

Why? -------------------

16- I need

    a- An experienced person nearby when I use a computer all the time.   ☐

    b- An experienced person nearby when I use a computer sometimes.   ☐

    c- Computer at School but I do not need an experienced person nearby at all. ☐

    Why? ------------------

17- I need

    a- Someone to tell me the best way to use a computer all the time.   ☐

    b- Someone to tell me the best way to use a computer sometimes.   ☐

    c- Computer at school but I do not need anyone to tell me the best way to use it at all. ☐

    Why? ------------------

18- I would avoid doing a task at school

    a- All the time if I knew it involved working with computers. ☐

    b- Sometimes If I knew it involved working with computers. ☐

    c- If I knew it is not involved working with computers. ☐

    Why? ------------------

19-I avoid coming into contact with computers in school.

a- All the time. ☐

b- Sometimes. ☐

c- Never. ☐

Why? -------------------

20- I use computers at school

a- Always because it is my desire. ☐

b- Moderately and sometimes. ☐

c- Only when I am told to. ☐

Why? -------------------

21-I will use computers

a- Whenever I can throughout school. ☐

b- Sometimes throughout school. ☐

c- When I am desperate to do so at school. ☐

Why? -------------------

22-I would like to continue working with computers in the future.

A- Most likely. ☐

B- To some extent. ☐

C- Never. ☐

Why? ------------------

23-I try to avoid using computers.

a- Whenever possible. ☐

b- Sometimes. ☐

c- Never. ☐

Why? ------------------

24- I feel anxious of the computer

a- Whenever I use it. ☐

b- . Sometimes when I use it. ☐

c- Whenever I am away of it ☐

Why? ------------------

25- When I and other students are using computers

a- I wish that I could be as calm as others. ☐

b- I feel calm like others sometimes and worried sometimes. ☐

c- I feel as calm as others all the time. ☐

Why? ------------------

26- When I use a computer.

a- I am confident in my ability to use computer. ☐

b- I am confident moderately in my ability to use computer. ☐

c- I am not confident in my ability to use computer. ☐

Why? --------------------

27- Whenever working on a computer.

a- I feel tense. ☐

b- I feel tense a little bit. ☐

c- I do not feel tense. ☐

Why? --------------------

28- I feel

a- Worried making mistakes on the computer. ☐

b- Worried a bit of making mistakes on the computer. ☐

c- Not worried making mistakes on the computer. ☐

Why? --------------------

29- When I sit in front of a computer

a- I experience anxiety. ☐

b- I experience anxiety a bit. ☐

c- I do not experience anxiety. ☐

Why? --------------------

30- Working with computers.

a- Lets me enjoy. ☐

b- Lets me enjoy a bit. ☐

c- Does not let me enjoy. ☐

Why? --------------------

31-When I am working on a computer.

a- I feel relaxed. ☐

b- I feel a bit relaxed. ☐

c- I do not feel relaxed at all. ☐

Why? -------------------

32- I wish that computers

a- Were not as important as they are. ☐

b- Were a bit as less important as they are. ☐

c- Will be as more important as they are. ☐

Why? -------------------

33- I am

a- Frightened from computers. ☐

b- Frightened a bit from computers. ☐

c- Not frightened from computers. ☐

Why? -------------------

34- When I am working on a computer.

a- I feel happy. ☐

b- I feel a bit happy. ☐

c- I do not feel happy. ☐

Why? -------------------

35- Whenever I am working on a computer.

a- I feel exhausted. ☐

b-I feel a bit exhausted. ☐

c- I do not feel exhausted. ☐

Why? -------------------

36- With Computers

a- I feel comfortable. ☐

b- I feel comfortable moderately. ☐

c- I do not feel comfortable at all. ☐

Why? ----------------------------------

37- With computers

a-I feel at ease. ☐

b-I feel at ease moderately. ☐

c- I do not feel at ease. ☐

Why? -------------------

38- I can always manage to solve difficult problems in the computer

a- If I try hard enough. ☐

b-If I try moderate effort. ☐

c-If I try a little effort. ☐

Why? -------------------

39- If someone of my colleagues doesn't agree with me, I can use the internet to find some ways to convince him/her.

a. Hardly
b. Moderately
c. Easily

Why?.........................

40- By technology it is easy to accomplish my learning.

a. Hardly
b. Moderately
c. Easily

Why?.........................

41- I am confident that if I have a computer and internet

a. I could deal with difficult homework.
b. I could deal with difficult homework moderately.
c. I could not deal with difficult homework.

Why?.........................

42- My technological skills help me to search the internet to answer unexpected questions.

a. Hardly
b. Moderately
c. Easily

Why?.........................

14

43- Via computer I can solve most problems if I put in enough effort.

   a. Hardly
   b. Moderately
   c. Easily

Why?.........................

44- I can

   a. Remain calm when facing machinery problems because I can rely on my ability to cope.
   b. Remain moderate calm when facing machinery problems because I can rely on my moderate ability to cope.
   c. Not remain calm when facing machinery problems because I can rely on my ability to cope.

Why?.........................

45- When I am confronted with a technical problem, I can usually find several solutions.

   a. Often.
   b. Sometimes.
   c. Never.

Why?.........................

46- If I am in trouble, I can usually think of a solution through the internet.

   a. Often.
   b. Sometimes.
   c. Never.

Why?.........................

14

15

47- I can usually deal with my learning problems if I have a computer and internet.

a. Very well. ☐
b. Fairly. ☐
c. Very little. ☐

Why?.........................

Good Luck and all the best.

Appendix 11   Check lists and proofs that the case study was carried out
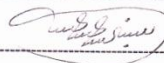
Check List

Teacher Name: Mr, Mrs, Miss:	Qualification: Master In ICT	School Name: Alnoor
Venue: Burnage High School	Date: 16.02.2013	The Lesson name: Microbes (The Experiment for PhD research

The questions	Yes	No
1-Did the researcher conduct the PhD experiment in your school?	✓	
2- Did the researcher apply a Post-test after the lesson to measure the level of achievement?	✓	
3- Did the researcher apply a questionnaire to measure the learners' attitudes?	✓	
4- Did the researcher conduct an interview to measure the learners' attitudes?	✓	
5- Was the environment of learning positive and quite to let the learner able to interact with the computer and the teacher?	✓	
6-Was the venue suitable and free of noise during the experiment?	✓	
7- During the experiment, was there any negative effect on the participants' health, safety and security?		✓
8-Did the researcher check the suitability of the room light?	✓	
9- Did the researcher check the chairs and tables if they are set and comfortable?	✓	
10-Did the learners use the computer and BBC Bitsize to study the experiment lesson?	✓	
11- Did the researcher/teacher interfere to clarify and ease the difficult pointes the learners faced?	✓	
12-Did the researcher deliver helpful handouts and instruction sheets?	✓	
13- Was the researcher/teacher helpful and supportive?	✓	
14-Were the learners happy with the program?	✓	
15-Was the interaction between the learners and the researcher constructive?	✓	
15-Was the interaction between the learners and the learning program positive?	✓	
16-Did the learners get advice and guidance from the researcher?	✓	
17- Were the participants subjected to the KS3 Science of British Curriculums?	✓	

Any comments or recommendations:

Print your Name: _TAYSSIR AL BALKHI_   Signature ------------------------

356

Subject:	Dear Ghassan please find the check list attached
From:	Tayssir Al Balkhi (taisser2002@hotmail.com)
To:	gassanalkhatib@yahoo.co.uk;
Date:	Friday, 8 March 2013, 22:15

Dear Ghassan,

Please find the check list file attached.
And I give my permission to use it in your thesis.
I wish you all the best and good luck in your PHd.

Best regards
Tayssir Al Balkhi

Check List for Ghassan Alkhatib (PhD Researcher at Salford University)

Title: Mr, Mrs, Ms or Miss: Mrs.	Teacher name: Nazim Rashid	Position: Curriculum Area Leader of Business and ICT	School Name: Manchester Academy

The questions	Yes	No
1-Did the researcher conduct the PhD experiment in your school?	Yes	
2- Did the researcher apply a Post-test after the lesson to measure the level of achievement?	Yes	
3- Did the researcher apply a questionnaire to measure the learners' attitudes?	Yes	
4- Did the researcher conduct an interview to measure the learners' attitudes?	Yes	
5- Was the environment of learning positive and quite to let the learner able to interact with the lesson, computer and the teacher?	Yes	
6-Was the venue suitable and free of noise during the experiment?	Yes	
7- During the experiment, was there any negative effect on the participants' health, safety and security?		No
8-Was the room light suitable for the experiment?	Yes	
9-Were the chairs and tables set and comfortable?	Yes	
10-Did the learners use the computer and BBC Bitsize to study the experiment lesson (Microbes)?	Yes	
11- Did the researcher/teacher interfere to clarify and ease the difficult pointes the learners faced?	Yes	
12-Did the researcher deliver helpful handouts and instruction sheets?	Yes	
13- Was the researcher/teacher helpful and supportive?	Yes	
14-Were the learners happy during the experiment?	Yes	
15-Was the interaction between the learners and the researcher constructive?	Yes	
15-Was the interaction between the learners and the learning program positive?	Yes	
16-Did the learners get advice and guidance from the researcher?	Yes	
17- Were the participants subjected to the KS3 Science of British Curriculums?	Yes	
Any comments or recommendations:		

Print your Name: -----Nazim Rashid ------------------------------- Signature ----------------Nazim Rashid--------
-----Date----20th February 2013

358

Subject:	Check List
From:	Nazim Rashid (Nazim.Rashid@manchester-academy.org)
To:	gassanalkhatib@yahoo.co.uk;
Date:	Friday, 22 February 2013, 19:58

Hi

I have attached the completed document. Hope it is ok?

Regards

Nazim Rashid

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A subsidiary of The United Church Schools Foundation, a company limited by guarantee registered in England and Wales No. 00018582. Charity No. 313999

Check List

Teacher Name: ~~Mr,~~ ~~Mrs, Miss~~: Munzer Tawil	Qualification: Master In English	School Name: Alnoor
Venue: Burnage High School	Date: 16 / 02 / 2013	The Lesson name: Microbes (The Experiment for PhD research

The questions	Yes	No
1-Did the researcher conduct the PhD experiment in your school?	✓	
2- Did the researcher apply a Post-test after the lesson to measure the level of achievement?	✓	
3- Did the researcher apply a questionnaire to measure the learners' attitudes?	✓	
4- Did the researcher conduct an interview to measure the learners' attitudes?	✓	
5- Was the environment of learning positive and quite to let the learner able to interact with the computer and the teacher?	✓	
6-Was the venue suitable and free of noise during the experiment?	✓	
7- During the experiment, was there any negative effect on the participants' health, safety and security?		✓
8-Did the researcher check the suitability of the room light?	✓	
9- Did the researcher check the chairs and tables if they are set and comfortable?	✓	
10-Did the learners use the computer and BBC Bitsize to study the experiment lesson?	✓	
11- Did the researcher/teacher interfere to clarify and ease the difficult pointes the learners faced?	✓	
12-Did the researcher deliver helpful handouts and instruction sheets?	✓	
13- Was the researcher/teacher helpful and supportive?	✓	
14-Were the learners happy with the program?	✓	
15-Was the interaction between the learners and the researcher constructive?	✓	
15-Was the interaction between the learners and the learning program positive?	✓	
16-Did the learners get advice and guidance from the researcher?	✓	
17- Were the participants subjected to the KS3 Science of British Curriculums?	✓	

Any comments or recommendations:

Print your Name: Munzer Tawil   Signature

Subject:	check list
From:	Munzer Tawil (munzertawil@yahoo.co.uk)
To:	gassanalkhatib@yahoo.co.uk;
Date:	Friday, 8 March 2013, 14:16

Hi Gassan
Attached is the check list which you can use in your thesis.
Best wishes
Munzer

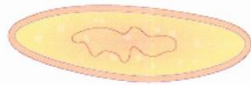Appendix 12   A model of test from BBC Bitesize

Disease – Test

http://www.bbc.co.uk/bitesize/ks3/science/organisms_behaviour_health/disease/quiz/q46363343/

What type of microbe is the smallest?

○ fungus

○ bacterium

○ virus

2.

Which type of microbe is shown in the diagram?

○ fungus

○ bacterium

○ virus

3.

What causes tuberculosis (TB)?

○ a fungus

○ a bacterium

○ a virus

4.

What causes athlete's foot?

- ○ a fungus

- ○ a bacterium

- ○ a virus

5.

What causes influenza (flu)?

- ○ a fungus

- ○ a bacterium

- ○ a virus

6.

Which statement about microbes is correct?

- ○ they are all harmful

- ○ they are all useful

- ○ some are harmful and some are useful

7.

How can infectious diseases spread?

- ○ the disease passes from person to person

- ○ the antibiotic passes from person to person

- ○ the harmful microbe passes from person to person

8.

Which type of cell can engulf bacteria or make antibodies?

- ○ white blood cell

○ red blood cell

○ platelets

9.

Immunisation can involve:

○ injecting harmful microbes

○ injecting dead microbes

○ injecting antibodies

Appendix 13   Lesson plans for Science unit in the context

Teacher:	[signature]	Class:	7cm/Sc2	No. In class:	21	Class Data Sheet?	Y
Subject:	Science	Set:	M	SEN:	1	Seating plan?	Y
		Date:	2/12/11	G and T:	n/a	Copy of resources?	Y

Title: Vertebrates

Learning Objectives:
- To learn about the vertebrate groups.

Outcome:
Describe what a vertebrate is. L4
Identify the 5 vertebrate groups L5
Describe some features of the vertebrate groups and identify some animals that belong in those groups.L5/6

PLTS:

independent enquirers	effective participants
team workers	creative thinkers
self-managers	reflective learners

X-ray Round the room task.
Think, pair and share.
Identifying groups of weird creatures

Student Activity:	Time:	Teacher activity:	Resources:	Literacy / Keywords:
• Entry: Letter code for keywords from previous lesson.	5	• Meet and greet. • Discuss how living organisms can be grouped.	Traffic Light cards Worksheet Posters PPT	Key words and images will be emphasised throughout the lesson to facilitate understanding.
• Group living organisms into 2 groups.	5	• Check baseline assessment. Discuss L.O, meaning of vertebrate and invertebrate.		
• Starter – Traffic Light – do you know what vertebrate is?				
• Think Pair & Share	2	• Discuss name of vertebrates.		
• Traffic Lights – pupils to say whether organism is a vertebrate or invertebrate.	5	• Check understanding of the term vertebrate through the PPT X-ray activity.		
• Traffic Light Check on progress.	2	• Review L.O		
• Pupils to go around the room and extract information on name of the 5 groups, examples and characteristics.	10	• Levelled task on board for pupils to follow.		
• Traffic Light check on progress.				

Differentiation:
2 versions of questions on worksheet provided for pupils to answer from looking at the pictures on the board. One worksheet requires just understanding of vertebrates/invertebreates

SFLA instructions:
n/a
I will support Omeid, Yusuf and Chakib when needed.

Activity	Time	Teaching notes	AfL
• Pupils to look at weird animals on board and decide whether it is a vertebrate or invertebrate.	15	• Review L.O – Discuss 'what, why and how' they have progressed. • Differentiated questions for back and front table. Support Omeid, Yusuf, Chakib and Ayub, in addition to moving around the class room to support others.	and name of groups. The other worksheet asks the pupils to explain their answer to a greater detail.
			AfL strategies used:
• Traffic Light check on progress.	5	• Review L.O – Question pupils on 'what, why and how' they have progressed. - Discuss L.O and do traffic light check.	Traffic Lights to check progress wrt to L.O. Answering Qs.
Plenary Pupils to write down 2 things they have learned this lesson.	10		

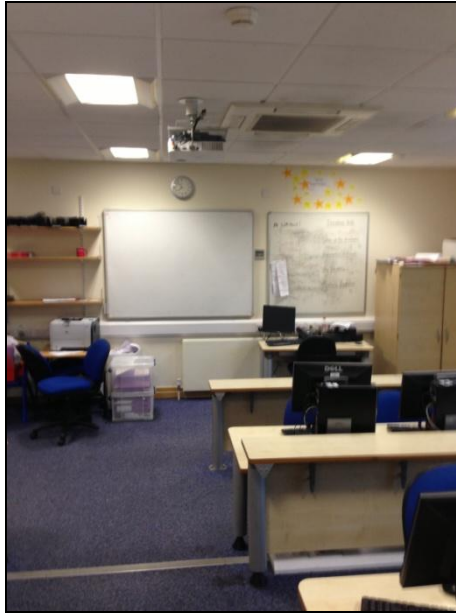Appendix 14   Photos from both Schools (Manchester Academy & AL-Noor)

Figure 64 the first photo from Manchester Academy labarotoray

Figure 65 the second photo from Manchester Academy Labarotoray

Figure 66 the third photo from Manchester Academy labarotoray

Figure 67 the fourth ohoto from Manchester Academy labarotory

Figure 68 the first photo from Burnage Media Arts College – AL-Noor School

Figure 69 the second photo from Burnage Media Arts College – AL-Noor School

Figure 70 the third photo from Burnage Media Arts College – AL-Noor School

Figure 71 the fourth photo from Burnage Media Arts College – AL-Noor School

Figure 72 the fifth photo from Burnage Media Arts College – AL-Noor School