INTEGRATING INTERACTIVE, EDUTAINMENT TECHNOLOGY WITH PROJECT-BASED LEARNING: A PEDAGOGICAL MODEL FOR INCLUSIVE CLASSROOMS

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ABSTRACT

The current scenario in the inclusive classroom is that the special needs learner is labelled as a learner with low capability and the content and learning environment is designed for prime learners but not for special needs learners. Thus, the special needs learners may not receive the appropriate instruction in the inclusive classroom. Therefore, the present study put forward an alternative pedagogical model that captures special needs learners' attention as well as supports their ability to collaborate with prime learners in an inclusive classroom. Specifically, three objectives formed the basis of the study namely, (i) To design an eProjBL pedagogical model incorporating interactive edutainment applications for selected primary school learners in an inclusive classroom; (ii) To investigate teachers' perceptions of the eProjBL pedagogical model in an inclusive classroom, and (iii) To explore the acquiring of the skills in using the eProjBL pedagogical model among the selected primary school learners in an inclusive classroom. The study had four phases. The first preliminary phase reviewed issues related to the challenge of special education through literature and conversations with relevant stakeholders. The second phase of the study focused upon the conceptual design and the theoretical framework together with the content to be utilised through the alternative pedagogical model being proposed. The eProjBl model was based upon the Project Based learning design blended with technology and edutainment applications. The Theoretical Framework leaned heavily upon Lev Vygotsky's theory and concept of Zone of Proximal Development (ZPD) in game design. The edutainment applications included Augmented Reality, Virtual Game-based, Game–based and Animation components. The samples for the study were selected schools and according to the approached school's ethical procedures. Data collection techniques included observations, semi-structure interviews, field notes, an engagement survey form and

evaluation rubrics. Phase three was the pilot testing stage where the instruments were validated and tested. This was followed by the actual testing in the field. The final fourth phase was the analysis and interpretation stage where the data collected were scrutinised carefully. The strengths of the eProjBl model showed that special needs' learners were able to visualise the topic being taught better, displayed self-motivation and were able to explore the concept on their own which indirectly enhanced their communication skills. The weaknesses included the time that was taken by the teachers to set up the class. Teachers' perception of the eProjBL model showed that the flow of the process of the eProjBL pedagogical model was very effective and systematic so as to be able to achieve the lesson objectives. Teachers' evaluation of four themes showed that the mean values for the prime learners' performance for Character, Teamwork, Artefact and Presentation were 3.05, 3.08, 2.98 and 2.75 respectively; while the mean values for the special needs learners were 2.43, 2.32, 2.53 and 2.59 respectively. The extent of skills acquired showed that overall the mean value for the prime learners were slightly higher than the special needs learners. The implications of the findings and suggestions for further study is also discussed.

ABSTRAK

Senario semasa di dalam kelas inklusif memaparkan pelajar keperluan khas telah dilabelkan sebagai pelajar yang rendah keupayaan dan kandungan serta persekitaran pembelajaran yang direka adalah untuk pelajar perdana tetapi tidak bagi pelajar keperluan khas. Oleh itu, pelajar keperluan khas mungkin tidak menerima pengajaran yang sesuai di dalam bilik darjah inklusif. Oleh kerana itu, kajian ini mengemukakan model pedagogi alternatif yang boleh menarik perhatian para pelajar keupayaan khas serta menyokong keupayaan mereka untuk bekerjasama dengan pelajar perdana di dalam kelas inklusif. Secara khususnya, tiga objektif asas terbentuk melalui kajian ini iaitu, (i) merangka satu model pedagogi eProjBL yang menggabungkan aplikasi interaktif inforia untuk murid sekolah rendah pilihan di dalam bilik darjah inklusif; (ii) untuk menyiasat persepsi guru mengenai model pedagogi eProjBL di dalam bilik darjah inklusif, dan (iii) untuk meneroka kemahiran yang diperloleh dengan menggunakan model pedagogi eProjBL dalam kalangan murid sekolah rendah pilihan di dalam bilik darjah inklusif. Kajian ini mempunyai empat fasa. Fasa pertama adalah mengkaji isu-isu yang berkaitan dengan cabaran Pendidikan Khas melalui kesusasteraan dan perbualan dengan pihak berkaitan. Fasa kedua kajian adalah memfokuskan kepada rekabentuk konsep dan kerangka teoritikal serta kandungan yang digunakan melalui model pedagogi alternatif yang dicadangkan. Model eProjBL adalah pembelajaran berteraskan projek yang berasaskan rekabentuk yang diadun dengan teknologi dan aplikasi inforia. Kerangka teoritikal banyak bersandarkan kepada teori Lev Vygotsky dan konsep Zone of Proximal Development (ZPD) di dalam rekabentuk inforia. Aplikasi inforia termasuk komponen augmented reality, berasaskan permainan maya, berasaskan permainan dan animasi. Sampel kajian bagi kajian ini adalah sekolah terpilih dan mengikut prosedur etika sekolah tersebut. Teknik pengumpulan data yang dijalankan seperti pemerhatian,

temubual semi-struktur, nota lapangan, borang kaji selidik perlibatan dan penilaian rubrik. Fasa tiga adalah peringkat ujian perintis bagi menguji dan mengesahkan instrumen kajian. Seterusnya, diselusuri oleh kajian sebenar di lapangan. Akhir sekali, fasa keempat ialah peringkat analisis dan tafsiran data yang terkumpul diteliti dengan berhati-hati. Kekuatan model eProjBL menunjukkan bahawa pelajar keperluan khas dapat menggambarkan topik yang diajar dengan lebih baik, memaparkan motivasi-diri dan mampu meneroka konsep dengan sendiri dan secara tidak langsung telah meningkatkan kemahiran komunikasi mereka. Kelemahannya merujuk masa yang diambil oleh guru untuk persediaan kelas. Persepsi guru terhadap eProjBL model menunjukkan bahawa aliran proses eProjBL pedagogi model adalah sangat berkesan dan sistematik supaya dapat mencapai objektif pengajaran. Penilaian guru menerusi empat tema menunjukkan bahawa nilai min bagi prestasi pelajar perdana untuk karekter, kerjasama berpasukan, artifak dan pembentangan, masing-masing adalah 3.05, 3.08, 2.98 dan 2.75; manakala nilai min bagi pelajar keperluan khas masing-masing adalah 2.43, 2.32, 2.53 dan 2.59. Tahap kemahiran yang diperoleh menunjukkan bahawa secara keseluruhannya nilai min bagi pelajar perdana adalah sedikit lebih tinggi daripada pelajar keperluan khas ini. Implikasi daripada dapatan dan cadangan-cadangan untuk kajian selanjutnya juga dibincangkan.

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LIST OF SYMBOLS AND ABBREVIATIONS

PPD	:	Education District Office (*Pejabat Pendidikan Daerah*)
MOE	:	Ministry of Education
ETD	:	Education Technology Division
MSC	:	Multimedia Super Corridor
UNICEF	:	United Nations Children's Emergency Fund
JSEAP	:	Japan Special Education As
JPNT	:	Terengganu State of Education Department (*Jabatan Pendidikan Negeri Terengganu)*
JPNM	:	Malacca State of Education Department (*Jabatan Pendidikan Negeri Melaka)*
BTPM	:	Technology Division of Malacca Education (*Bahagian Teknologi Pendidikan Melaka)*
3C	:	Connect, Content, Confidence
3M	:	Reading, Writing, Arithmetic (*Membaca, Menulis, Mengira*)
AR	:	Augmented Reality
3D	:	Three Dimension
ProjBL	:	Project-based Learning
eProjBL	:	Project-based Learning use the computer as mediated tools
ADHD	:	Attention Defisit Hyperactive Disorder
ASD	:	Autism Spectrum Disorder

LO : Learning Objects

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CHAPTER 1: INTRODUCTION

1.1 Introduction

The new paradigms of information technology encourage people to engage with technology components, such, as computers, television, mobile phones, Smartphones, Personal Digital Assistants (PDA) and other electronic mediums. This improvement and transformation of the learning environment has impacted the fields of education, especially by merging several types of constructivist learning where new approaches and techniques are applied. This practice enhances the learning process from kindergarten to university and has benefited various groups of people around the world, including, special needs learners. Every year, the usage of information technology (IT) has increasingly catered for special needs learner communities. However, the technologies are still in the primary stage and growing slowly because of limited products that support special needs learners' learning in school. The Malaysian government believes that technologies can help solve this problem and minimize the difficulties of the teaching process for these learners (Chan, 2002). One of the technologies involves multimedia elements as a learning medium. Generally, multimedia is a combination of digital media elements which help to create desktop videos, including narration and sound effects, animations and simulations which can help to enhance users' learning practice (Choo, 1994; Mayer, 2003, 2009). In Malaysia, multimedia technology grew in popularity with the launching of the Multimedia Super Corridor (MSC) project in 1996 (MDeC, 2009). Multimedia is being used progressively to provide computer-based instruction (Hwa & Norhayati, 2009). Moreover, multimedia is now integrated with the entertainment environment. Research have been conducted based on a combination of entertainment, multimedia and education (Karime et al., 2008; White, 2003). This area is often called edutainment

technology. A higher human-computer interaction is implemented to engage learners in this type of learning environments. According to White (2003), edutainment is defined as the combination of entertainment and education and a way to teach people using entertainment to enhance their engagement. He defined it as follows:

"…entertainment that also delivers educational content in an entertainment format. It consists of two equally important parts: the format (entertainment) and the message/content (education)." (White, 2003, p. 1)

The Malaysian government had also implemented the element of Project-based Learning in SMART[1] schools which is known as ProjBL (ETD, 2006; Roslan & Mokhtar, 2009; Thomas, 2000). The advantages of ProjBL are acknowledged and have since provided high-quality consequences to Malaysian education (ETD, 2006). Recognizing the fact that active learners learn better in a highly interactive environment such as interactive lectures, it "…can be a staple component within an active learning pedagogy" (Moore, Fowler, & Watson, 2007).

Within the Malaysian education system, there are innovations involving learning approaches and methods that focus on special needs learners (UNICEF, 2014). Special needs learners should also be considered as gifted learners who have different characteristics and need special attention. The categories of special needs learners can be broadly divided into learners with learning disabilities and those who have physical disabilities. Realising those special needs learners learn differently through interaction with the environment, the need for alternative pedagogical models that could maximize the output of the learning skills through technologies is necessary. Some researchers have tried to find solutions that can support special needs learners to learn with the use

[1] The Malaysian Smart School is a learning institution that has been systemically reinvented in terms of teaching-learning practices and school management in order to prepare children for the Information Age (Malaysia, 1997)

of technology (Chuanga, Leeb, Chena, & Choua, 2009; Laghos, 2010; Patton, 2012; Wah, 2010; Xu, Reid, & Steckelberg, 2002b).

This research investigates whether the animation element with edutainment adaptation in ProjBL content will demonstrate any changes in learners' engagement in special education. Does creating an animation project with edutainment adaptation help special needs learners understand the topic? What are teachers' perceptions towards this alternative pedagogical model? When used mainly as a form of entertainment, animations are mainly in the cartoons category, but in this research project, the present study was focused on the potential of an animation project with edutainment adaptation as an educational tool.

1.1.1 Special Needs Learners

Special needs learners are a minority community who needs the society's attention. Moreover, the way they gain information or knowledge is rather different from other learners. According to the Malaysia Country Report by Kassim, Othman, Guat, and Yusoff (2009), the Malaysian government categorises the child and adult disabilities as follows:

1. Visual disabilities (low vision and blindness),
2. Hearing disabilities ranging from mild hearing loss to profound deafness,
3. Speech disability,
4. Learning disabilities (Down's syndrome, autism, ADHD, intellectual disability),
5. Physical disabilities (spina bifida, cerebral palsy),
6. Mental disabilities (organic brain disorder, schizophrenia, mood disorders), and
7. Multiple disabilities.

However, according to the Malaysia Report by UNESCO (2009b), they identified three major types of special needs learners involved in special education programmes in

schools. They are the hearing impaired, the visual impaired and the learning difficulties learners. The present study is focused on special needs learners who have learning difficulties. Based on these three types, the Ministry of Education Malaysia has provided the special needs learners with three types of programme in the formal education system (MOE, 2008; UNESCO, 2009b). The programmes are as follows:

1. Special Education Schools (special schools for the hearing impaired and the visual impaired),
2. Special Education Integrated Programmes (Regular school provided a classroom for special needs learner , and
3. Inclusive Programmes (Inclusive classroom that allow special needs learners to attend the regular classroom).

The inclusive programme provides equal opportunities to special needs learners to gain the knowledge similar to other learners. However, the limited school resources, teachers and facilities in utilizing ICT in their teaching are challenges that need to be faced.

1.1.2 Project based Learning (ProjBL)

Project-based Learning (ProjBL) is a learning model from the constructivist theories and it is "a model for classroom activity that shifts away from the usual classroom practices of short, isolated, teacher-centred lessons" (ETD, 2006, p. 3). The Project-based learning also integrates collaboration in the group, is student-centred with learners applying several learning skills within the provided time frame and a time to reflect on their learning (ETD, 2006; Pearlman, 2009; Roslan & Mokhtar, 2009; UNESCO Bangkok, 2009). According to Sylvia Chard, director of the Child Study Centre at the University of Alberta, the Project-based Learning approach is an "in-depth investigation of a real-world topic worthy of children's attention and effort" (ETD, 2006, p. 10). By using the technology or medium such as a book, a journal or an article, it will help to

define the problem, search for the solution and do the evaluation. The teacher as the instructor will provide guidelines to the learner (ETD, 2006).

1.2 Problem Identification

In Malaysia, the government acknowledges the benefits and the advantages of applying the innovative educational approach of Project-based Learning by producing a handbook of Project-based Learning in the education field as a reference for all in the education sector and proposes Project-based Leaning specifically in SMART[2] schools (ETD, 2006). The Ministry of Education has implemented *"Program Pembestarian Sekolah"* or "Making Schools Smart" programme for all Malaysian schools under the Ninth Malaysian Plan (RMK-9). This programme calls for innovation in areas of teaching and learning by incorporating technology. (ETD, 2006, p. v). Moreover, in the year 2010, the sixth Prime Minister of Malaysia (Dato' Sri Haji Mohammad Najib bin Tun Haji Abdul Razak) has launched the year of innovation which encourage the people to contribute innovations in various sectors including in the field of education (Junus, 2010).

Malaysia has grown tremendously with the support of technology and this affects our daily life activities. There are a lot of facilities provided that helps us to complete our work responsibilities using a computer. However, the usage of technologies for minority communities such as special needs learners is still in the pilot stage. The question is how can special needs learners adapt technologies in their learning if they do not have

[2] According to Prime Minister's report from EPU (2006), the focus on ICT in the Malaysian education system can also be seen in the Multimedia Super Corridor(MSC) initiative. The MSC Malaysia Smart School Flagship initiative responds to the need for Malaysia to make the critical transition from an industrial economy to a knowledge-based one. The objective is to produce a technologically literate and thinking workforce, which is well able to perform in a global environment and use information-age tools and technology to improve productivity. The Ministry of Education, with Telekom Smart School Sdn. Bhd. acting as the industrial counterpart, heads the Smart School initiative. The project's implementation plan was divided into four phases; i) Pilot – 2005), iii) Making all schools smart (2005 – 2010), and iv) Consolidate and stabilize (2010 – 2020) (MDeC, 2009). According to the plan, the smart school programme was to be implemented beyond the initial 88 schools to all schools in the country between 2005 till 2010. This project benefitted from the largest allocation from the Seventh Malaysia Plan – RM 401.1 million (US$133 million).

supporting equipment or customized technologies that can maximize the usage of technology for special needs learners.

According to the Malaysian policy on ICT in education which also has a focus on special education, teaches are encouraged to implement ICT as a routine by listing out the four key elements as below (MOE, 2010b):

1. ICT tools and devices such as screen readers and 'embosses' will be part of the ICT infrastructure provided to schools for special needs learners.
2. Teachers in schools for special needs learners will be trained and sensitized to issues specifically related to the use of ICT in teaching special needs learners.
3. All teachers in schools for special needs learners will be trained in using ICT-enabled methods during their professional development.
4. Web-based digital repositories should be deployed to address the lack of availability of resources for special needs learners.

The transformation of education in Malaysia has highly benefited learners especially those in the primary schools and the special needs learners. By adapting the appropriate technology into ProjBL, it can be used as a catalyst to motivate the learners to become explorers and researchers. Learners will be able to enhance their "expression of sensitivity, fluency, flexibility, originality, and elaboration of scientific creativity" (Jang, 2009, p. 247).

This present study is a hybrid approach (ProjBL and technology integrated) and named eProjBL. The usability of eProjBL was looked at from the development of a learners' knowledge, motivation of learners to learn, improve research and problem-solving skills and applying real-life learning in school (Jang, 2009; UNESCO Bangkok, 2009).

"A good project based lesson should not ignore the curriculum" (Jurica, 2005, p. 1).

The combination between ICT and project based learning can make the learner become motivated (Hussain et al., 2004). Furthermore, animations can be one of the

motivational tools to enhance learners' awareness (Khuchinda, 2008). According to Khuchinda (2008), learners when involved in developing a module (Learning Objects - LO) for English by creating animations, were highly motivated.

The eProjBL pedagogical model approach in learning which adapts further edutainment applications as a platform is expected to help special needs learners' interaction with the teaching – learning process. Therefore, in the present study, the eProjBL with edutainment applications contributed to the construction of a learning environment that can support special needs learners. The eProjBL as an alternative pedagogical model for a special needs learners learning environment was investigated in this study.

According to previous research, animations are valuable and useful tools that can gain the attention of learners in a learning environment (Byrne, Catrambone, & Stasko, 1999; Khuchinda, 2008; Mayer & Moreno, 2002). Attention-gaining is an important initial event of instruction (Gagné, 1985). Moreover, there are five functions of animation that help in enhancing learning. These are cosmetic, attention gaining, motivation, presentation, and clarification function (Weiss, Knowlton, & Morrison, 2002). The eProjBL pedagogical model combined the interactive elements of ProjBL principles, ICT integration and edutainment applications such as animation tools to help the special needs learners carry out activities in the teaching and learning process. It is the belief of the researcher that the present study edutainment application can encourage special needs learners to sit and focus on what is being taught. Related past research has shown that animations can enhance learning (Byrne et al., 1999; Khuchinda, 2008; Mayer & Moreno, 2002). In addition to this, animations can also affect learners' creative skills and computer handling skills, as well as technical and soft skills (Jang, 2009).

1.3 Problem Statement

The learning style of special needs learners and prime (normal) learners are different (Woo & Teoh, 2007). Most past researchers have agreed that one of the special needs learners' characteristics is lack of attention to focus in the classroom (Armstrong, 1999; KDISC, 2010b; Prosser, 2006). According to KDISC (2010b), special needs learners cannot stay focused because they get easily bored and they live in their own world. At the beginning of an Inclusive Programme, the majority of the teachers face difficulties in instructing special needs learners who are registered in the prime classroom (also known as inclusive classroom). Teachers decided to locate special needs learners in the same group with other lower class learners. The study investigated the engagement and scaffolding that could occur in such a context to infuse skills such as simple computer literacy skills, collaborative and creativity skills that are so essential in the present era. According to UNICEF (2014), the number of special needs learners who registered for the inclusive programmes declined to 562 learners in year 2012 from 6,360 learners in year 2010. This is because teachers showed their lack of confidence to allow special needs learners to register for the Inclusive Programme.

According to JSEAP (2009), the Malaysia Act for Special Education started in 1997 (Education Regulation in Special Education in 1997). It is also noted that "multimedia technology" has grown by leaps and bounds with the launching of their research (Hwa & Norhayati, 2009, p. 247). The Malaysian government has produced a handbook of Project-based Learning. Moreover, it has been supported by launching of the new policy of education using ICT in 2010 (MOE, 2010b). While this may have been found successful for learners in general, nevertheless, the benefits of implementing Project-based Learning with the integration of technology in Malaysian special education and the skills that can be acquired by special needs learners are still questioned by the researcher.

There are several learning approaches that have been suggested by many researchers related to the use of ICT in the classroom (Choo, 1994; Hussain et al., 2004; Kotwal, Burns, & Montgomery, 1996; Traynor, 2003). For example, animation as a tool that enhances learning in general has been tried (Byrne et al., 1999; Höffler & Leutner, 2007; Khuchinda, 2008; Mayer, 2003, 2009).However, adapting digital content for special needs learners might face limitations if the factors of key enablers called 3C (Content, Connection, Confidence) are not properly executed (Ponter & Brown, 2007). Thus, there are limitations on the usage of Project-based learning that can be implemented in special education. Moreover, there are limitations on ICT engagement with special needs learners in their learning. The combination of the Project-based Learning approach and ICT integration with edutainment applications such as animation tools has not been tested with the special needs groups in the Malaysian learning environment. This was found by the researcher in a preliminary study (Please refer to section 4.3.1 Preliminary Study).

Thus, the focus of the present study was the alternative pedagogical e-Project Based Learning (eProjBL) model that was proposed which is actually a pedagogy that integrates Project-based Learning and edutainment applications which can offer many benefits for special needs learners such as motivation in building collaborative skills, creativity, computer literacy skills and many more in order to aid in real life problem-solving skills. The implementation of this alternative pedagogical model was tested in school to understand the learners' reaction and acceptance in the study.

1.4 Rationale of Research

The present study put forward an alternative pedagogical learning model with the integration of new technology in the inclusive classroom that engages special needs learners. It utilized a blended learning environment. The rationale of the research can be seen from three domain elements namely the learner, interactivity and content. These elements were derived from the teachers' perspective on pedagogy which related to learners' Zone of Proximal Development (please refer to section 3.2 Conceptual Framework of Research on eProjBL). These three elements can be connected with the factors of implementing the digital content called 3C; Connection, Content, and Confidence (Ponter & Brown, 2007) in the communication paradigm. The 3C are the key enablers to ensure the successful implementation of the present study in the Malaysian special education system. These three domain elements are discussed in Section 2.7 Connection, Content, and Confidence.

1.4.1 Learner

Malaysia's Government provides a policy to improve the right to education by promoting several programmes (MOE, 2008). One of the programme is called the Inclusive Programme, focusing on special needs learners who learn under the same roof with other prime learners (MOE, 2008, 2014b). Therefore, the purpose of selecting the special needs learners as the focus of the present study is to minimize the teaching pedagogy gap between the prime learners and learners with learning difficulties. In addition, the majority of teachers have the misconception that the special needs learners are slow learners. Thus, this study conducted in the blended inclusive classroom among special needs learners, aims to identify criteria and elements which will assist in further interventions for special needs learners. A design-based research approach was chosen to achieve its objective (Akker, 1999; Reeves, 2006).

1.4.2 Interactivity

Interactivity is one of elements that need to be considered when producing a technological innovation model or approach. It will help to ensure that the information is conveyed in a two-way communicative manner in the blended inclusive classroom. The rationale of choosing the interactive edutainment application as a tool is because technology can boost the learners' engagement when properly utilized. Moreover, it can improve the interaction design between the learner and the content. There are several appropriate edutainment applications adapted and tested in the present study's model such as, games, augmented reality, animations project and virtual reality.

1.4.3 Content

The Malaysian Government's intention to encourage educational transformations lead to the choosing of Project-based learning (ProjBL) as the main approach to deliver the content. The Malaysian government agrees that the Project-based Learning can improve content understanding and build-up other certain skills such as writing skills, research skills, communication skills which are needed for the building up of collaborative skills, creativity, computer literacy skills as well as other skills (ETD, 2006). Moreover, under the Education Technology Division, the Ministry of Education has also published a handbook on Project-based Learning that helps educators understand the usage of ProjBL. Pilot testing has been done by the Ministry of Education on selected SMART schools (ETD, 2006). This study will go a little further and integrate ProjBL with ICT (blended learning), to test the effect among special needs learners.

1.5 Research Objectives

The problems facing teachers of special needs learners are related to the limited technology resources available and the difficulties in teaching in an inclusive classroom because of the difference in learning styles between the prime learners and special needs learners. The present study is focused on designing and developing an edutainment technology approach for the special needs learners in the inclusive classroom. The objectives were specifically to create and to explore how the learners and teachers in the inclusive classroom perceive the technologies in their teaching and learning. The study put forward three main objectives as follows:

1. To design an eProjBL pedagogical model incorporating interactive edutainment applications in an inclusive classroom for selected primary school learners,
2. To investigate teachers' perceptions of the eProjBL pedagogical model in an inclusive classroom, and
3. To explore the skills acquired after using eProjBL in an inclusive classroom among selected primary school learners.

The three objectives above formed the basis of the study.

1.6 Research Questions

The study was conducted in inclusive classrooms where prime learners studied together with special needs learners in the same classroom where the eProjBL pedagogical model was designed and utilized. The research questions investigated were:

1. What are the strengths and weaknesses of the design of the eProjBL pedagogical model?
2. What are the teachers' perceptions of the special needs learners during the utilization of the eProjBL pedagogical model in the inclusive classroom?
3. What are the teachers' evaluations of learners' performance in using the eProjBL pedagogical model in the inclusive classroom?
4. To what extent are skills acquired in utilizing the eProjBL pedagogical model by the learners in an inclusive classroom?

1.7 Significance of Research

Transformation in Malaysian's special education will need effort, creativity and motivation from the teachers. The alternative pedagogical model put forward in this research can become a useful method rooted in constructivist learning. The present study is unique and can provide positive impact to the Malaysian education system. It also can support the transformation and provide alternative approach for the special needs learners in blended inclusive classroom. The present study was aligned with the government's policy in increasing the number of special needs learners registered in the Inclusive Programme. According to a report by MOE (2012), there are 6% special needs learners who are in the Inclusive Programme. Therefore, the Ministry of Education is planning to increase the number of special needs learners in the Inclusive Programme to 30% in 2015 (MOE, 2014b). Most higher education systems implement the inclusive programme for special needs education. This is in support of the Salamanca Statement and Framework for Action on Special Needs Education (1994) published in UNESCO (1994). Based on the requirement of MOE, there appears to be three further perceived benefits from conducting such a study as the present study which sought to find out how the special needs learners and teachers can be transformed in an effective learning environment in blended inclusive classrooms. These are as follows:

1. The learners can be encouraged to create animated learning objects which might improve skills associated with creative thinking, computer literacy, collaboration, communication, and writing and others,
2. The study uniquely provides another method or technique of teaching for the teacher to apply in the blended learning environment for both special needs learners and prime learners (Inclusive Programme), and
3. The study provides evidence that support the usage of innovative techniques which helps to improve learners' engagement and motivation.

In this manner, the present study has contributed to existing literature.

1.8 Definition of Terms

The research involved several terms that needs to be defined to avoid confusion. The definition such as Project-based learning, interactive edutainment application, special needs learners, prime learners, Attention Deficit Hyperactive Disorder (ADHD), Autism, Dyslexia, Slow learner, and inclusive classroom are defined below.

1.8.1 Project-based Learning (ProjBL)

Project-based Learning is a learning model connected with constructivist theories (please refer to section 2.2 Fundamentals of Learning Theories) on how the integration of group collaboration, student-centeredness, and having learners to apply several learning skills within the provided time frame to reflect on their learning (ETD, 2006; Pearlman, 2009; Roslan & Mokhtar, 2009; UNESCO Bangkok, 2009).

In the context of the present study, this model is the basic pedagogical model that has been adapted and tested in the study (please refer to section 1.1.2 Project based Learning (ProjBL)). The modification was made to fit in with the blended inclusive classroom.

1.8.2 Interactive Edutainment

Interactive edutainment applications are technologies such as software or tools that help the learner to enhance their interaction with the content by providing the play and learning interaction that helps to gain learners' engagement (White, 2003). There are several types of edutainment approaches such as games, augmented reality, animation project and virtual reality which were integrated in this present research.

1.8.3 Inclusive Classroom

In the present study, an Inclusive Classroom is a learning environment that combines prime learners and special needs learners in one classroom equipped with edutainment technologies. In the inclusive classroom, the special needs learners are those who are at the higher function (please refer to section 1.8.6 Special Needs Learners) capabilities and can participate in the blended inclusive classroom to learn as the same academic topic as prime learners. A High function special needs learner is a person who is diagnosed as capable of reading, writing and counting.

1.8.4 Prime Learners

Prime learners are pupils without any disabilities. According to Malaysia's statistics in the year 2011, the number of students enrolled is 2,859, 921 students (MOE, 2011). In Malaysia, the term prime learner is used in Malaysia's public schools to differentiate between the special needs learners and other learners. Teachers can easily categorise them in the inclusive classroom. The present study also adopted the same meaning.

1.8.5 Slow Learners

According to Eastmead (2004), slow learners are those with a lower IQ than other learners at the same age. He also stated the slow learners "…do not have a learning disability and are not mentally retarded" (p.1). Most slow learners have short attention spans. The term slow learner is not in the list of special needs learners of MOE. However, both teachers and doctors use the term slow learner for a group of learners with learning disability. A diagnostic report must be prepared by medical assistants to categorise the special needs learners in blended inclusive classrooms (Please refer to Appendix H).

1.8.6 Special Needs Learners

Special needs learners are persons with disabilities physically or intellectually who need special facilities. "As of 31st May 2009, there were 258,918 person with disabilities registered with the Department Welfare of Malaysia, which is far below the estimated 2.7 million"(Kassim et al., 2009, p. 6). In the year 2011, there were 359,203 persons registered, which is an increase of 38% since 2009 (MOE, 2011). The number of learning disabilities persons registered was 134,659 persons. Figure 1.1 shows the MOE (2014b), statistics for special needs learner with learning disabilities which is increasing year by year.

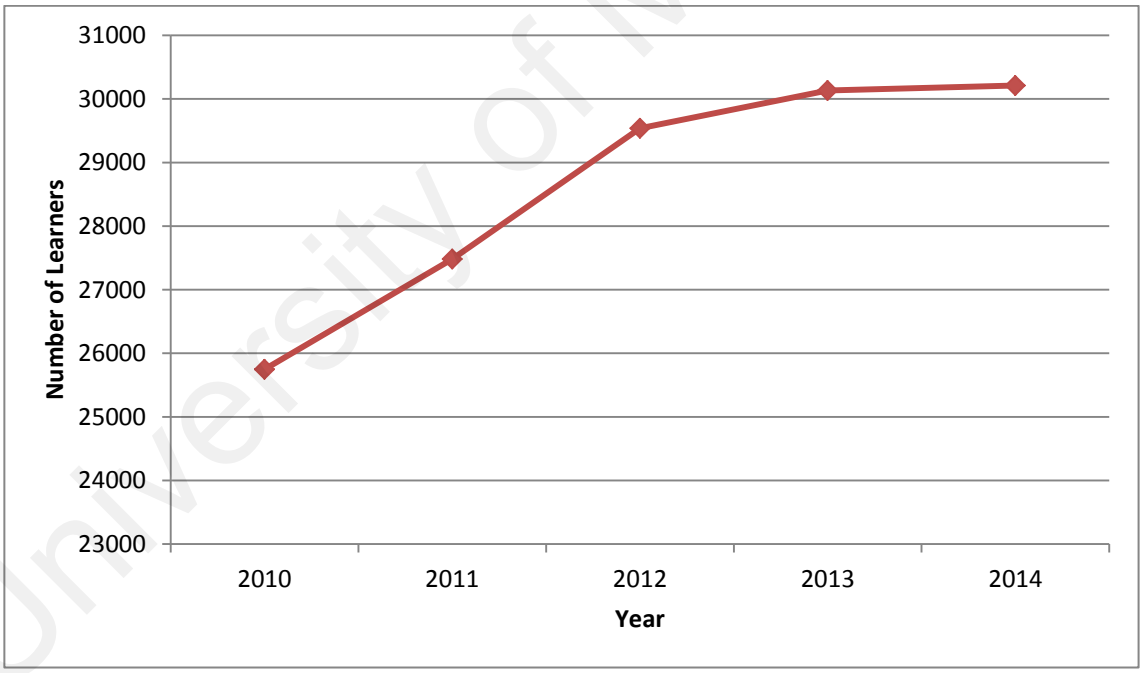

Figure 1.1: Enrolment of Students with Learning Disabilities in Primary School Year 2010 to 2014 (MOE, 2014a)

Special needs learners can be divided into two groups namely high function learners and low function learners based on their capabilities. The present study invited only the high function learners to join in the inclusive classroom because it is a regulation to enter the Inclusive Programme.

The high function learner is a person (special needs learner) who has the abilities to manage his or herself and is able to start to focus on the academic skills. Within this group a minority of them can participate in the inclusive classroom with the prime learners. The term high function learner was coined by teachers of special education for the Malaysian context. The low function learner is a person (special needs learner) who really needs much early intervention care and therapy. In the special classroom, the teacher and teacher assistant guide them and teach them on how to manage themselves.

1.8.7 Attention Deficit Hyperactive Disorder (ADHD)

The following is a definition of ADHD as reported by the American Psychiatric Association (2013a), Diagnostic and Statistical Manual of Mental Disorders (DSM-V),

"…symptoms will be divided into two categories of inattention and hyperactivity and impulsivity that include behaviours like failure to pay close attention to details, difficulty organizing tasks and activities, excessive talking, fidgeting, or an inability to remain seated in appropriate situations"(p.1).

ADHD is one type of learning disability; where the individual becomes less focused and easily gets distracted from their surrounding environment. Previous researchers have come up with alternative approaches to maintain their attention and engage them in the learning process (Woo & Teoh, 2007). It has been reported that five out of hundred new born children may have ADHD symptoms and might need educational intervention to support their learning as they grow (KDISC, 2010b).

1.8.8 Autisms

Autisms is "…a group of developmental brain disorders, collectively called autism spectrum disorder (ASD)" (American Psychiatric Association, 2013b, p. 1); based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition - Text Revision (DSM-V-TR), it defines five common disorders:

- Autistic disorder (classic autism)

- Asperger's disorder (Asperger syndrome)
- Pervasive developmental disorder not otherwise specified (PDD-NOS)
- Rett's disorder (Rett syndrome)
- Childhood disintegrative disorder (CDD).

1.8.9 Dyslexia

According to DSM-V, dyslexia is classified as a reading disorder. DSM-5 fact sheet produced by (American Psychiatric Association, 2013b) defined a dyslexia as a specific learning disorder.

"... is now a single, overall diagnosis, incorporating deficits that impact academic achievement. Rather than limiting learning disorders to diagnoses particular to reading, mathematics and written expression, the criteria describe shortcomings in general academic skills and provide detailed specifies for the areas of reading, mathematics, and written expression."

1.9 Scope of the Research

Based on the gaps in the research (please refer to section 3.2 Conceptual Framework of Research on eProjBL) learners' engagement through the eProjBL pedagogical model in the blended inclusive classroom was investigated in this study. Therefore, the learners' feedback was important to identify whether the proposed eProjBL pedagogical model can stimulate learners' engagement especially among the special needs learners. The present study also investigated the usage of eProjBL's content on prime learners of average academic ability and the high function special needs learners. The learners involved in the study had pre-knowledge to operate the computer. The blended-learning environment was applied in this study which encourages the learners to utilize the technology and increase in confidence level. The content was selected from one topic of Science Year 5 (example: concept of water cycle) to test the content from the Malaysian

primary school science curriculum. From the content point of view, the eProjBL pedagogical model was the subset of the project-based learning approach shown in Figure 1.2.

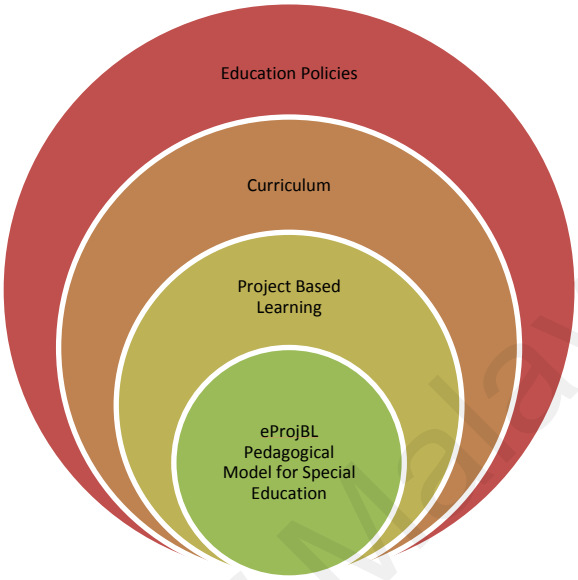

Figure 1.2: Scope of the Content in eProBL

1.10 Limitation of the Research

The sample group involved in the study was limited and small because only three primary schools and one pilot school responded to participate in the testing session when the consent letter was presented. Moreover, the selected schools were also filtered based on the minimum requirement based on the 3C key enablers during the preliminary study which further limited the choice of available schools.

1.11 Summary of the Chapter

This chapter provides an overview of the study which consists of the problem statement, the objectives, research questions, study significance, rationale and the limitation of study. There are four main research questions that were put forward involving teachers' perception in implementing the proposed pedagogical model in inclusive programmes of special education.

CHAPTER 2: LITERATURE REVIEW

2.1 Overview of the Chapter

Initially, the gap of the research was defined by conducting a critical literature review of previous research. This review included the areas of Project-based Learning, the implementation of blended learning, animation projects as the main tools to gain engagement of special needs learners, edutainment applications and the special needs learners.

This chapter also reviews one of the main approaches of constructivist learning theories called Project-based Learning (ProjBL). The Project-based Learning is one of approaches used in the constructivism model in the learning environment which combines technology with previous theories of learning such as cognitive theories and behaviourism theories. According to Liu and Chen (2010) and Raskin (2008) who researched on the evolution of constructivism, they stated that constructivism consists of how people gain knowledge and thoughts rather than remember and rehearse the amount of information. Therefore, Project-based Learning employs constructivism as a major underpinning theory. It is also one of the learning models from the constructivist theory and it is "a model for classroom activity that shifts away from the usual classroom practices of short, isolated, teacher-centred lessons" (ETD, 2006, p. 3).

Further, this chapter also focuses on blended learning which focuses on how the blended learning environment could be incorporated with the Project-based learning and where and how these approaches can be implemented in normal classrooms (Yusof & Song, 2010). According to Hisyam, Che, and Abu Bakar (2006), they defined the blended learning as a combination of face to face learning and online learning. The definition also has been supported by Yusof and Song (2010), when they conducted the

learning approach with the blended learning in the classroom where the school was provided with facilities such as the internet wireless..

In addition, the research also concluded that the additional animation project is one of the interventions that encourage learner engagement and build-up their creativity as learners complete their project. Animation is one of the elements of multimedia which is a combination of sequential images that form the movement (About.com, 2009; Byrne et al., 1999; Khuchinda, 2008; Rieber, 1990; Yusof & Song, 2010). According to Mayer's Principle the benefits of multimedia and animation include motivation and learner engagement (Mayer, 2003, 2009; Weiss et al., 2002).

Finally, the review focuses on the special need learners who will benefit from the new approach of learning that share the same facility with the prime learners. The rationale of choosing ADHD learners as a point of benchmarking is because the learners have certain characteristics that will inform the improvement of the alternative learning approach as to how the special needs learners' can be engaged. A person who has ADHD will easily get distracted and become less focused and lack attention (Armstrong, 1999; Woo & Teoh, 2007).The alternative pedagogical model in this study was suggested and tested to see whether special needs learners can benefit from the proposed alternative pedagogical model.

2.2 Fundamentals of Learning Theories

The fundamentals of constructivist learning theories were reviewed and are taken as a base for this study, in particular as to how the learner could learn by their own experience to learn a new skill such as was described by John Dewey, " learning by experience in experiential learning (Dewey, 1929, 1938). However, Liu and Chen (2010) noted the root and the beginning of constructivism was from Von Glasersfeld 1990. Dewey (1929, p. 76) who stated that "To prepare him (the learner) for the future

means to give him command of himself…" Dewey explained the school can become a good social institution that the learner experiences by doing (hands-on) when the educator creates a learning environment associated with their real-life (Dewey, 1929). Lev Vygotsky continues to refer to Dewey's work that is related to social constructivism (Vygotsky, 1962, 1978). Vygotsky highlighted the importance of the Zone of Proximal Development (ZPD) and Scaffolding as a means of influencing and motivating learners during their learning sessions (Rezaee & Azizi, 2012; Verenikina, 2003; Vygotsky, 1962, 1978). ZPD is "to identify the kinds of maturing psychological functions (and the social interactions associated with them) needed for transition from one age period to the next"(Kozulin, 2003, p. 39). Project-based learning carries similarities with problem-based learning, intentional learning and design experiments which is influence by constructivism (Thomas, 2000). Moreover, it also supported the cognitive theory of multimedia learning which discussed further.

The researcher mapped the model that connects Schell's (2008) in "The Art of Game Design" to design the edutainment element which is applied in the present study (please refer to Figure 2.1).

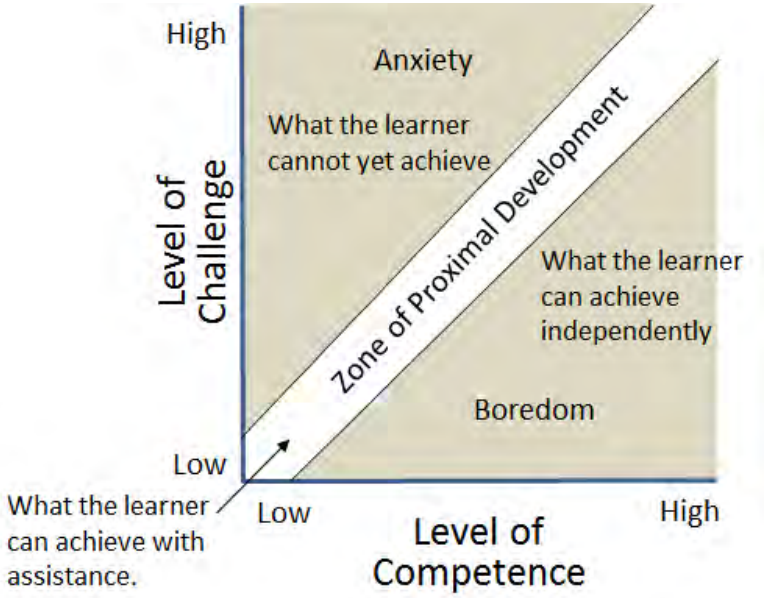

Figure 2.1: Zone of Proximal Development in the Game Design (Schell, 2008)

2.3 Cognitive Theory of Multimedia Learning

The information processing model was divided into three sections namely sensory, short-term memory and long-term memory (Atkinson & Shiffrin, 1986). Byrne et al. (1999) evaluated the animation algorithms and concluded that animation can help learning because it displays the features that one should presumably attend too. Self-explanation can increase the likelihood of a learner integrating the new information into existing knowledge structures, thus making the learner more likely to transfer the information to novel situations. Mayer and Moreno (2002) adapted this information processing model and showed how the use of animations can be explained by cognitive theory.

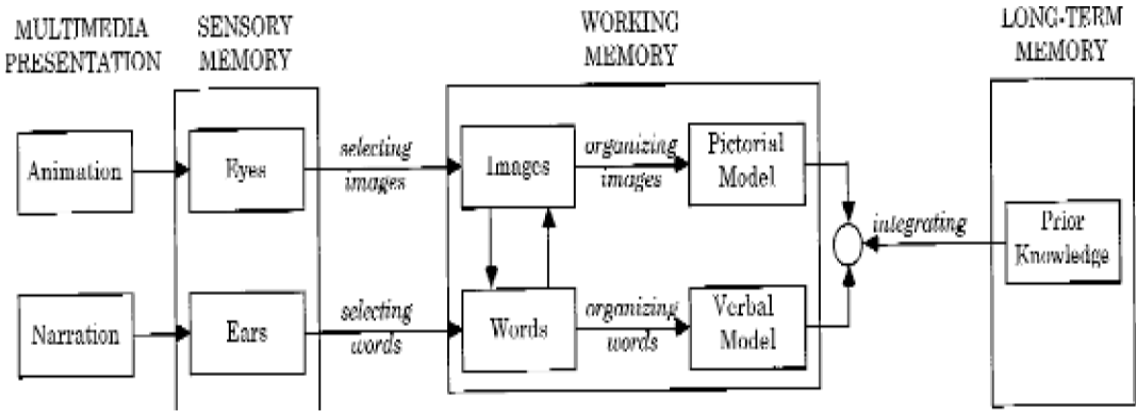

Figure 2.2: Cognitive Theory of Multimedia Learning (Mayer & Moreno, 2002)

Figure 2.2 shows the cognitive theory of multimedia learning which focuses on the utilisation of animation in the learning process. The eye sees and detects the animation element. Then, the learner will choose the image for advance handing out in the visual path, manipulate the image into cause-effect cycle and combine the pictorial model and prior knowledge. The ears will detect the narration, so the learner will choose the selected words for advance handing out in the verbal path, manipulate the words into a cause-and effect chain, and combine it with the verbal objects and prior knowledge. According to the Mayer and Moreno's (2002) theory above, the process of cognition occurs when the receiver elements were integrated with the animation and narration into the working memory through sensory organs. Therefore, the narration and animation support each other in the multimedia environment and hence encourages learning (Mayer & Moreno, 2002).

2.4 The Purposes of Animation in Enhancing Learning

According to Mayer (2003), animation is one of the elements in multimedia that can be a tool to gain the learner understanding as an intervention. Basically, the purpose of this kind of intervention requires improving the learner's motivation and creativity. Moreover, it encourages other additional skills, by doing practical and hands-on learning in their classrooms (Luther & Diakopoulos, 2007; Sun Associates, 2003;

UNESCO Bangkok, 2009). The methods and how the learners learned relates to how teachers teach them. It will need teacher's creativity to make changes and innovation of lesson to suit learners, especially special needs learners (Konshy, 2009; Zeichner, 2001). Therefore, to ensure that learning meets the objective, a teacher must know and allocate the appropriate tool to teach the learners.

In the learning environment, research has been conducted on the usability of animation in enhancing learning. When implementing Computer-based Instruction, the designing roles need to be identified. According to Weiss et al. (2002), there are five functions of animations that help in enhancing learning. These functions will now be discussed.

2.4.1.1 Cosmetic Function

"Animations can have a purely cosmetic function when it is used to make instruction attractive to learners."(Weiss et al., 2002) .The good montage and introduction will attract the learners before they go through the courseware.

2.4.1.2 Attention Gaining Function

Attention-gaining is an important initial event of instruction (Gagne, 1985), where by attention gained on each part or chapter before any lesson is very important. "The movement created by the animation is useful for capturing the learner's attention and focusing it on the salient points" (Weiss et al., 2002).

2.4.1.3 Motivation Function

Designers must exercise caution when using animations as a feedback mechanism. For example, positive feedback has been found to help the learner feel that they have completed a task correctly. (Weiss et al., 2002).

2.4.1.4 Presentation Function

Animations can help present information by defining a concept, rule, or step in a procedure. Animations also can supplement the text by providing examples of or elaborating upon a concept, procedure, or rule (Rieber, 1989). For example, in the chemical class, student can visualize changes between two chemical items. Animations help the student to understand the effect of such change.

2.4.1.5 Clarification Function

While closely related to the presentation function, the clarification function employs animation to provide a conceptual understanding without providing new information. That is, the animation clarifies relationships through visual means. (Weiss et al., 2002).

2.5 Project-based Learning and Constructivism

Stager (2012) said the term "project" is not worksheet-based or takes longer during a class period. He stated that the elements of a good project are: Purpose and Relevance; Time- Sufficient time must be provided for learners to think about, plan, execute, debug, change course, expand, and edit their projects; Complexity; Intensity; Connectedness; Access; Shareable and Novelty.

Project-based learning consists of learning strategies from constructivism which were established by the Autodesk Foundation in the 1990s. It was "founded by Joe Oakey, former Commissioner of Education in Vermont and Micronesia and former manager of Autodesk, Inc.'s Education Department. The Foundation has spread the word nationally about Project-Based Learning from 1992 until its close in 2000" (Pearlman, 2009). Moreover, Thomas (2000) also conducted a review of research related to Project-based learning. The Project-based learning also integrated collaboration in the group, student-centeredness and learner applies several learning skills at one time within a provided

time frame and also time for reflection of learning (ETD, 2006; Pearlman, 2009; Sun Associates, 2003; Thomas, 2000; UNESCO Bangkok, 2009). Project-based learning also encourages learners to understand the task. Then, they can complete the task and they will also be able to answer abstract questions (ETD, 2006). Therefore, the implementation of Project-based learning in this study was focused on providing a scaffold to lead the learners to understand the concept in selected topics.

According to Sun Associates (2003) , there are 4 classical activities of Project-based learning : ”(1) an extended time frame; (2) collaboration; (3) inquiry, investigation, and research; and finally, (4) the construction of an artefact or performance of a consequential task“ (p.1). In Malaysia, the Education Technology Division has created a diagram depicting the definition of project-based learning which covers several criteria (see Figure 2.3).

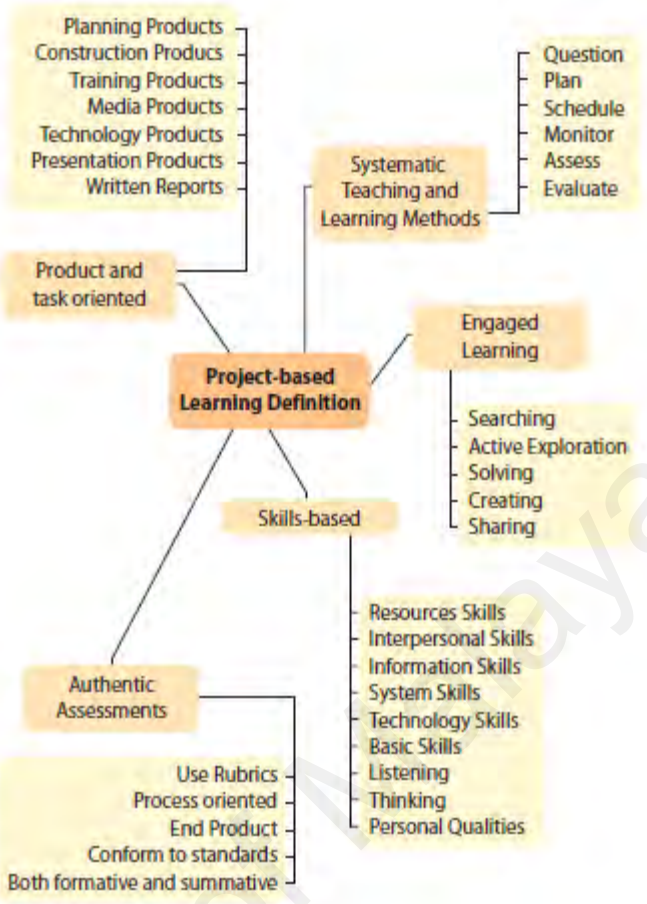

Figure 2.3: Project Based Learning at a Glance (ETD, 2006)

Based on the diagram shown in Figure 2.3 (page 29), the elements which help us to understand the criteria of Project-based learning is clear. There are five elements of Project-based learning, these are: 1) product and task oriented, 2) systematic teaching and learning method, 3) engaged learning, 4) skills-based, and 5) authentic assessment.

The constructivist theory has had a profound influence on educators to change the learning environment to become more reliable to enhance the learning process which has been recommended by previous researchers such as John Dewey, Jean Piaget, Lev Vygotsky (Liu & Chen, 2010) . The constructivist environment has been implemented in different approaches and understanding which supports the learning environment. Constructivism is a theory of learning generated from the idea that knowledge is constructed based on intellectual activity (Liu & Chen, 2010; Matsuoka et al., 2004;

Swan, 2005). The learner also becomes an active person that tries to fulfil the meaning (ATiT, 2004). According to Swan (2005), "all learning is an active process and all knowledge is unique to the individual, whether acquired from lecture and text or discovered through experience" (p.2). Therefore, the learners will be scaffolded by their experience through their journey to complete a given task.

The new knowledge is based on the merging of previous experiences and what and how one question, explores and assesses using individual skill. Therefore, a teacher can encourage their learners to become active learners who apply research skills to assess the knowledge (ATiT, 2004; Matsuoka et al., 2004). Teachers become the facilitators who provide guidelines to the learners (ETD, 2006). Hence, Project-based Learning can encourage the learner to practice hands-on in relation to a project while collaborating within the group in a given time to complete the project (Grant, 2012; Kurzel & Rath, 2007; Thomas, 2000).

"The Whole Child Blog" was identified and expressed as to how it can benefit Project-based learning for children with special abilities. According to (Markham, 2012), the children could experience mastery, identify the meaning and build constructive relationship to be caring. He also stated that an adult could become a mentor to support or to provide guidance for the child to complete the task given. In the study, the scaffold is important elements to support the direction of ZPD to complete the tasks.

2.6 Project-based Learning in Blended Learning

Seymour Papert once said, "If you can make things with computers, then you can make a lot more interesting things" (cited in Stager (2012). In previous research, several researchers found several meanings put forward for blended learning. Blended learning incorporates the face to face learning with the computer as the mediated-tools (Graham,

in press; Reay, 2001; Rooney, 2003). The computer is one of e-learning tools that provide the facilities to support learning (Graham, in press; Reay, 2001; Rooney, 2003). The combination of the computer communication and Project-based Learning creates a better impact as compared to solely face to face communication. It is beneficial to conduct the collaboration activities among the learners to encourage teamwork in the project (Kurzel & Rath, 2007; Savin-Baden, 2003).

Relationships exist between Project-based Learning and technologies. The use of both pedagogies in learning environments offer greater adaptability and flexibility than traditional classroom procedures as it enables the planning and design of tasks that benefit both learning processes and learning outcomes (CELL, 2009; Thomas, 2000). The move has been accelerated by technology with its capacity to offer learners a broad array of activities, and tasks for engaging in constructivist learning. It is anticipated that the benefits of Project-based Learning and technologies will far outweigh its drawbacks and will become an accepted practice for both online and offline learners (Savin-Baden, 2003). Multimedia Project based Learning share the significance of using the technologies to the learner to perform learner's motivation.

2.6.1 Multimedia Project based Learning (MPBL)

A preliminary study had been conducted by Hussain et al. (2004) on the Multimedia Project-based Learning (MPBL) which is one of the new methods of learning for form one learners which integrated the technologies. Hussain, et al (2004) also said "technology integration is not about technology but it is about teachers teaching using technology effectively". The MPBL model was a combination of three different learning models, namely, Project-based learning with Multimedia, Project approach, and Cooperative Learning (Hussain et al., 2004; Johnson & Johnson, 1989). These

researchers believe that "When teachers implement this approach successfully, children can become highly motivated to produce high quality work" (Hussain et al., p. 3). Therefore, the MPBL model (Figure 2.4) and conceptual framework of MPBL (Figure 2.5, page 32) was developed as below:

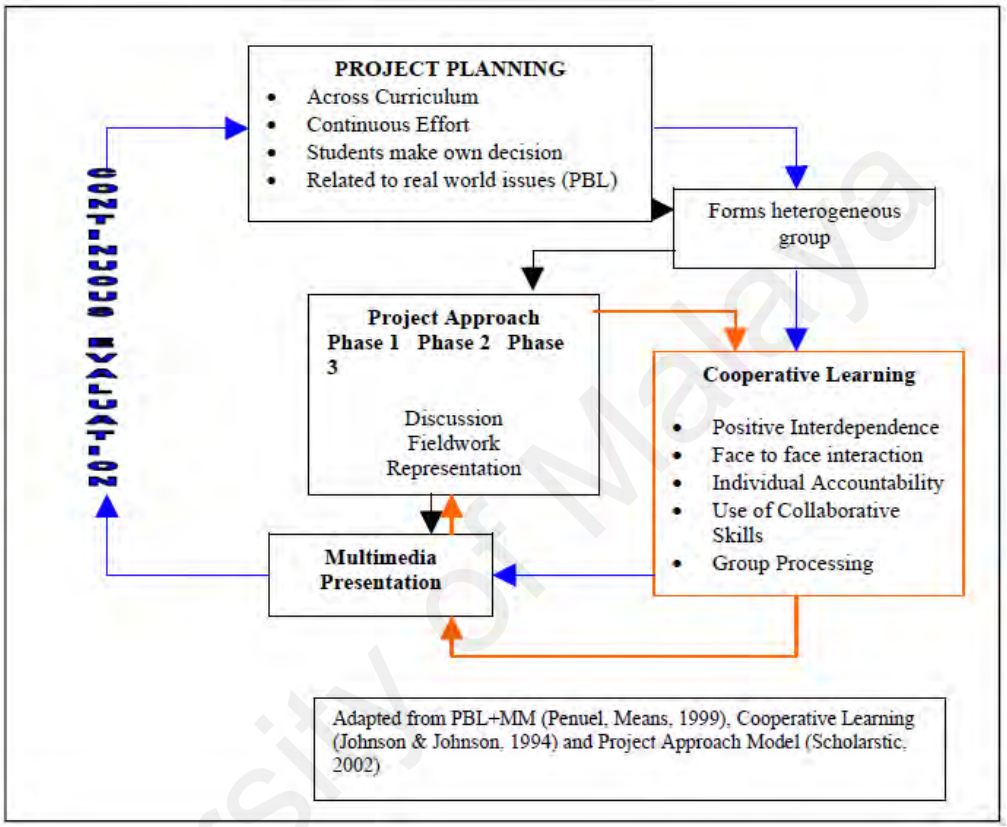

Figure 2.4: Multimedia Project Based Learning (MPBL) Model (Hussain et al., 2004)

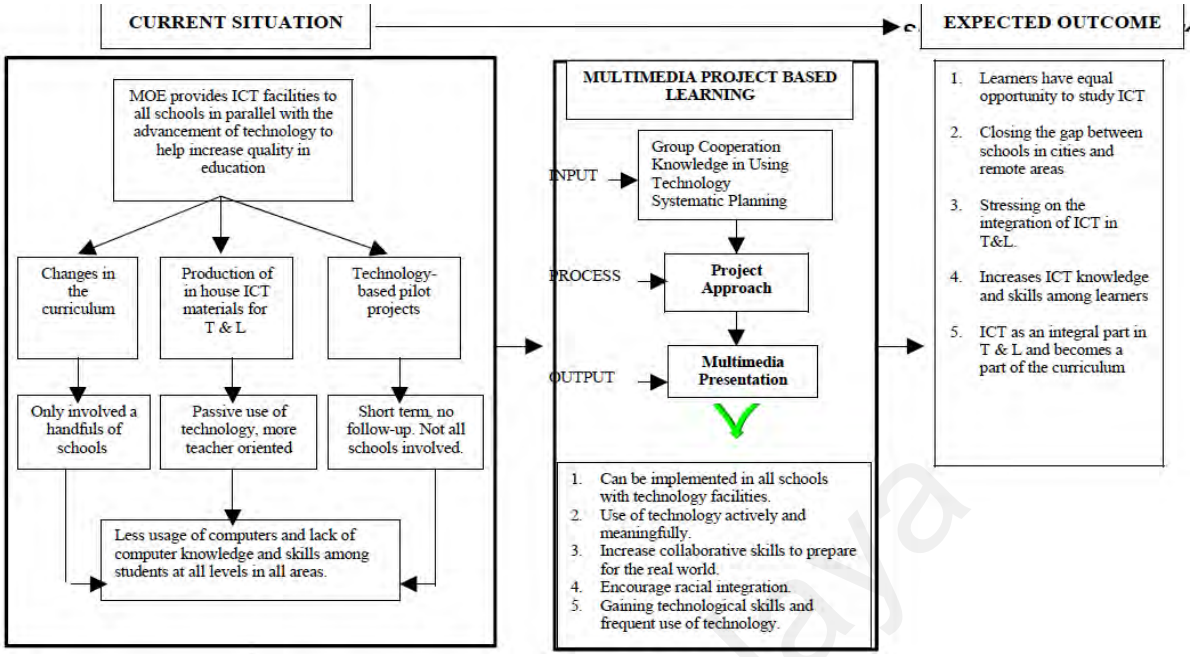

Figure 2.5: The Conceptual Framework of Research on MPBL (Hussain et al., 2004)

According to Hussain's conceptual framework as shown in Figure 2.5, the current situation involved the lack of computer usage and knowledge skills among learners and the intervention of MBPL could ensure that:

1. Learners have equal opportunity to study Information Communication Technology (ICT),
2. The gap between schools in cities and remote areas can be closed,
3. It stresses on the integration of ICT in Teaching and Learning (T&L),
4. It Increases ICT knowledge and skills among learners, and
5. ICT becomes as an integral part in T&L and become part of the curriculum.

2.6.2 Project-based Learning for Special Needs Learner

According to Kincaid and Jackson (2006), the special needs learners enjoy the freedom provided in the Project-based learning unit lessons. They also highlighted some challenges they faced prior to the start of the project namely poor attendance, low

motivation, heavy reliance on teacher instruction, and poor learner attitude. However, it was evident that the project was successful when the learners entered the classroom on time, set up their computers without delay, and quickly started working where they had left off the week before (Kincaid & Jackson, 2006). Moreover, they shared the positive impact when learners who always had a passive role in their education became the group leaders. Learners who had histories of problem behaviours and hostile personalities became caring and compassionate classmates. Learners who normally had poor academic performances were given a chance to shine under the admiration of classmates whose challenges were more severe than theirs (Kincaid & Jackson, 2006).

2.7 Connection, Content and Confidence

In the new paradigm of communication tools, the computer has become a required component in any learning environment. Computer is the electronic component that can translate the information in the internet in different forms and formats. It helps to gather the information from the web in real time. People have experienced the benefits of computers that encourage them to engage in learning, learn from it, and assess the information. The computer can support blended learning in the Project-based Learning by encouraging learners to do the technical assignment, such as, creating a simulation object (animation) in a science project (Yusof & Song, 2010). By creating the animation project, the learners are "designing, making, manipulating and animating models" (Hoban & Ferry, n.d., p. 5). However, there are some challenges that are needed to be considered before implementing the animation project for learners. According to Ponter and Brown (2007), there are three components of key enablers that needed when implementing the blended learning, such as, Connection, Content, and Confidence. Connection usually refers to the technology whether it can provide the good and high transmission broadband that can help to access information. Confidence is the focus on the learners who use this information technology and interact directly or indirectly with

the information in the internet. It needs to provide the skill and knowledge on how to handle this content or information in proper ways. Content refers to the items that improved the performance of learning when the items were created and shared. It involves the actual content or the modified content. Actual content is the original content without making any adjustment or modification. Modified content are items that were integrated together to become more informative content. These entire three components become the guideline to support the implementation of the project-based learning in the blended environment.

2.8 Special Education

Each country has different special education modules in the National Education of inclusive education (JSEAP, 2009). These modules are defined by the number of special needs learners and their capabilities in the learning environment. Therefore, the learning style of special needs learners might need to be considered together with the symptoms they display. Kotwal et al believes that using technology can help to maximize learners' attention (Kotwal et al., 1996; Traynor, 2003). These different inclusive programmes adapted by the different South East Asia countries are similar to how Malaysia promotes the inclusive program in special education.

2.8.1 The Curriculum of Special Needs Learner in Malaysia

In Malaysia, there are many Non-Government Organizations (NGOs) which provide their own curriculum to train and teach the special needs learners (Lee, Jun, & Kwak, 2006).However, Malaysian's NGO still need to get the guidelines from the government and modifications are made to suit the special needs learners. According to KDISC (2010a), the Malaysian's Government had divided the curriculum into two types: 1) National Curriculum, 2) Alternative Curriculum.

"For students under the Alternative Curriculum, those taking the National Skills Standard (Standard Kemahiran Kebangsaan) will be certified with the Certificate of Skills Malaysia, while those taking Art and Design Courses will be awarded the Certificate of School Certified (Sijil Perakuan Sekolah) and the Certificate of Special Skill."(KDISC, 2010a, para. 5)

Under the Malaysia Ministry of Education for Special Education Program *(Program Pendidikan Khas Kementerian Pendidikan Malaysia)* there are three major programs for special education (MOE, 2008):

1. Special Schools *(Sekolah Khas)* for learners with vision and hearing disabilities,
2. Special Education Integration Programme *(Program Pendidikan Khas Integrasi),* which offers programmes for learners with learning disabilities, hearing and visual impairments. The Program is "…using the withdrawal and partially inclusive approach to teach and learn"(KDISC, 2010a, para 1) for both primary and secondary schools.
3. Inclusive Programme

According to UNESCO (2009a), the definition of inclusive education varies between South East Asian countries. In Malaysia, the inclusive programme focuses on the integration of prime learners and the selected special needs learner in the same classroom (UNESCO, 2009b).

2.8.2 Learning Style of Special Needs Learners

When teachers plan to create their lesson plan for the special needs learners, for example, those with ADHD symptoms, they will first need to analyse the characteristics of ADHD. What are their differences from the non-ADHD learners? What are the solutions that overcome their special behaviour which encourage learning? According to (KDISC, 2010b), the characteristic of ADHD "is a condition that can make it hard for a person to sit still, control behaviour, and pay attention".

There are three common symptoms of ADHD learners (KDISC, 2010b):

1. inattentive type , where the person can't get focused or stay focused on a task or activity;
2. hyperactive-impulsive type , where the person is very active and often acts without thinking; and
3. Combined type, where the person is inattentive, impulsive, and too active.

The ways on how to handle these characteristics of special needs learners, require the exploration of alternative ways to improve the interaction between the content and the learner. Therefore, the static form of information exchange will not benefit special needs learners (Armstrong, 1999). Moreover, new ways of interactivity using computers with animated learning help to motivate and encourage the learner (Höffler & Leutner, 2007; Mayer & Moreno, 2002).

2.8.3 Support through Interactive Installation for Special Needs Learners

McMillan (2005) states that interactivity can occur at many different levels and degrees of engagement and that it is important to differentiate between these levels. User-to-user interaction via the internet; para-social interaction, where new forms of media are generated online; and user-to-system interactivity which is the way devices can be engaged by a user.

Consensus from literature (Amory, Naicker, Vincent, & Adams, 1999; Brooks, Camurri, Canagarajah, & Hasselblad, 2002; D. J. Brown et al., 2002; Bush, Nigel, J. Priest, & R. Coe, 2004; Cooper, Susan, & Clark, 2003; Cox et al., 2003; Egloff, 2004; Green & McNeese, 2007; Salintri, Geri, Smith, & Clovis, 2002) can be seen for the following list of key concepts for alternative interactive installation and social inclusion (Table 2.1).

Table 2.1: List of Key Concepts for Alternative Interactive Installation and Social Inclusion

Aspect	Support through interactive installation
Concentration	Interactive installation should support the users in the process of switching between interaction tasks and the surrounding important factors. Therefore, the learning environment also counts to ensure interactive installation meets the task to be completed.
Challenge	Interactive installation for users with special needs should stimulate and support the users in their own creation of scenarios and pacing. Pervasive interactive installations should help the users in keeping a balance in the creation of paths and developments in the human-machine world, but not put too much control or constraints on the pacing and challenge evolvement.
User Skills	Interactive installations for users with special needs should be very flexible and enable the users' skills to be developed in a pace set by the users.
Control	Interactive installations for users with special needs should enable the users to easily pick up the modules and interact.
Clear Goals	Interactive installations for users with special needs should support the users in forming and communicating their own intermediate goals.
Immersion	Interactive installations for users with special needs should support a seamless transition between different everyday contexts, and not only imply or require user actions that might result in a violation of normal social norms in everyday contexts.

Aspect	Support through interactive installation
Social Interaction	Interactive installations for users with special needs should support and enable possibilities for game-oriented, meaningful and purposeful social interaction within the system. Interactive installations for users with special needs should incorporate triggers and structures (e.g., quests and events, factions, guilds, or gangs) that motivate the users to communicate and interact socially.

2.9 Edutainment Technology in Science Topics

The subject of science is interesting and encourages the learner to explore new things and demonstrate interesting elements in living things. Moreover, science also relates to technology. Edutainment is an approach to immerse technology and science in teaching various topics. A definition by White (2003) reads, "edutainment as any entertainment that also delivers educational content in an entertainment format" (p.1). Edutainment is a combination of education and entertainment as a learning technology that engage their learning. There are several techniques and technologies to persuade learning such as television, storytelling computer games, interactive web 2.0, Smartphone games, and video games. According to White (2003), location-based learning involves the following Table 2.2:

Table 2.2: Type of Edutainment

Interactive & Participatory	Non-interactive & Spectator
Open-ended & Immersive (play)	Seated & Scripted (movie, play or science show)
Structured (participatory games)	Explorative
Scripted (mazes)	Scripted (aquarium, some museums)
	Free-choice (zoos, some museums)

Figure 2.6: Current reviews for Edutainment Platforms

2.9.1 Augmented Reality (AR) supports for Special Needs Learner

Augmented Reality (AR) is a variation of virtual environment also called Virtual Reality (Azuma, 1997). According to Azuma (1997), the AR applications are monitor-based (Please refer to Figure 2.7), however, with the latest technology, mobile devices are now used to operate AR technology. AR helps learners gain their attention and motivation when the normal flash card displays the three dimensional (3D) object when the camera lens focuses on to the marker on the flash card. Majority of the teachers interviewed expressed interest in the potential of using AR as part of learning tools. They saw the potential of AR as an exciting and fun teaching aid.

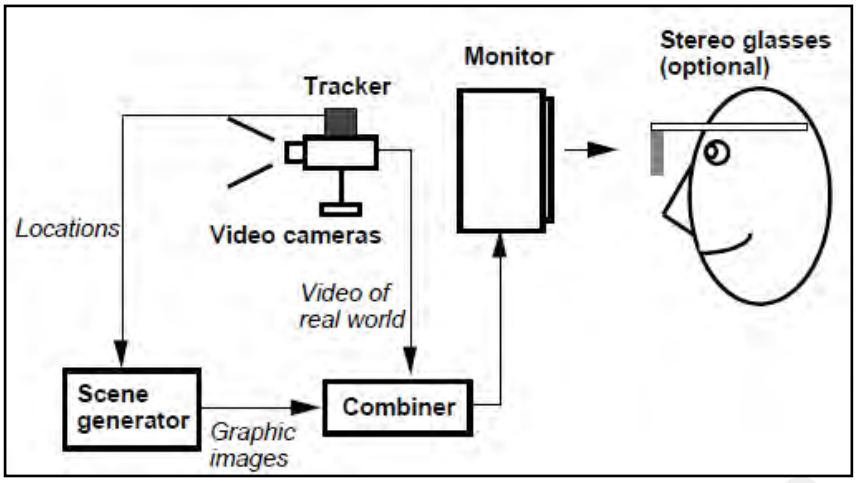

Figure 2.7: Monitor-based Augmented Reality Conceptual Diagram Azuma (1997, p. 13)

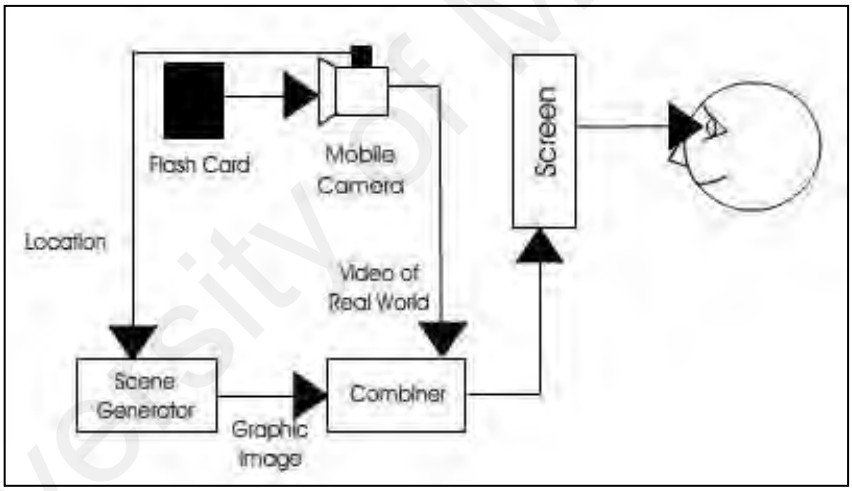

Figure 2.8: Mobile-based Augmented Reality Conceptual Diagram (modification from Azuma (1997, p. 13)

Besides augmented reality, game-based learning also can be another element to encourage the learners to capture their focus (Chuanga et al., 2009; Said, 2008; Time-scout, 2010). According to Said (2008), her study was focused on the using game-based learning to increase the interactive which was also agreed by researcher such as (Rieber, 1989, 2001)

2.9.2 Interactive Television as Edutainment Platform

A study on the interactive edutainment application on television in Portugal was first's launched by the Portugal's Government into their interactive cable television on June 17th 2001(Damasio & Quico, 2004). The application included the digital video recording (DVR) called TV Cabo. The government promotes the iTV via TV Cabo Smart Box since the end of year 2003:

"...the mix of entertainment content and other information to create a learning context - , enabling its users to know more about a given subject or to play along with the program, learning something along that process"(Damasio & Quico, 2004, p. 3).

Moreover, they had defined the conceptual model on T-Learning involving the relationship between Personal Computer (PC) and Television (please refers to Figure 2.9, page 42). One of the interactive children's programme is called "Batatoon" (please refer to Figure 2.10). The programme used television as the platform for special needs learners (such as Autism) and the prime learners to learn.

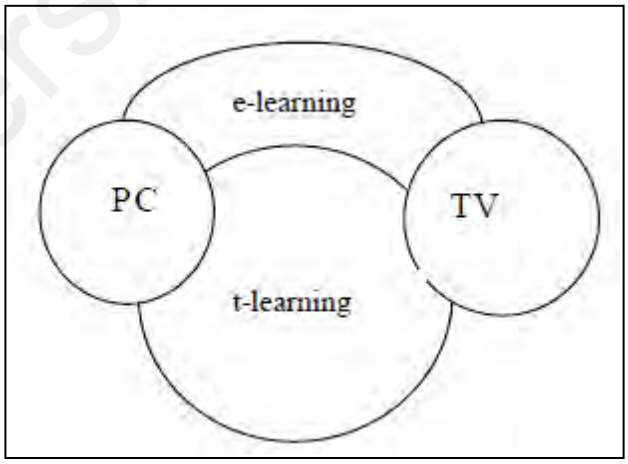

Figure 2.9: T-Learning: a convergence between the PC and Television (Damasio & Quico, 2004)

Figure 2.10: User interface for the edutainment program "Batatoon" (retrieve from (Damasio & Quico, 2004))

In Malaysia, a private television station called ASTRO, utilises an interactive edutainment television for revision of the major national examinations, such as, Primary School Assessment Exams (*Ujian Penilaian Sekolah Rendah*), Lower Secondary Examination (*Peperiksaan Tingkat 3*) and Malaysian Rating Certificate (*Sijil Penilaian Malaysia*) called Tutor TV (ASTRO, 2010). The interactive edutainment Tutor TV provides the interaction with animated characters that take on the role as a tutor. The purpose of this approach is to boost the prime learner's confidence when answering the questions. "…emphasise on interactive measures with interesting visuals and mapping to help users understand and remember facts effectively for last minute revisions" (ASTRO, 2010). Although, this platform was recommended in the preliminary study by teachers in special education, there is no evidence that Tutor TV had been implemented for the special needs learners.

Therefore, both of the examples of interactive edutainment and interactive television have helped to promote education with the purpose of sustaining learners' motivation as well as their confidence in learning.

2.9.3 Interactive Games on Edutainment in Mobile Learning (Smartphone)

Song and Yusof (2010) had conducted current reviews on mobile learning as a tool that promotes learning among learners with learning disabilities through edutainment software. Song and Yusof's devised specific technology that helps the autistic learner, namely, The Augmentative and Alternative Communication (AAC) which had been used to help the autistic learner to learn based on images and animation (Song & Yusof, 2010). With the flexibility of multimedia content, easy portability and relatively cheaper cost, plus easy content creation capabilities, there is immense potential to utilize mobile devices such as the iPod and iPhone to teach autistic learners with specialized and individualized content. Recent applications development has capitalized the potential of iPod and iPhone to support communication among autistic persons (USA Today, 28 May 2009; WDNU, 9 March 2010).

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Figure 2.11: Picture Exchange Communication System on smartphones (image taken from Proceedings of the 7th international conference on Interaction design and children, p.47)

2.9.4 Interactive Learning Object on the Web 2.0

In Malaysia, Lee Lay Wah created a module for learning via web 2.0 for the special needs learners. This module which provides a source of learning objects for teachers of special needs learners called ePKhas (Wah, 2010). The system integrates the lesson plan, multimedia learning object and short articles that are the resources for the teaching module for special needs learners.

"ePKhas is an open-access online multimedia learning objects repository to support the teaching and learning processes of special needs learners in Malaysia. ePKhas was developed based on the rationale of harnessing the power of technology to advance theory and practice of instruction in special education" (Wah, 2010, para. 1) .

2.10 Engagement: Shneiderman's Framework

Researchers are constantly trying to search for the best way to increase learners' engagement with several alternative models, guidelines or frameworks. Reich and Daccord (2009) did a research that integrated Shneiderman's Collect-Relate-Create-Donate Framework with technology. The framework was designed for learners to be implemented with the computer as the medium to gain knowledge (Luther & Diakopoulos, 2007; Reich & Daccord, 2009; Shneiderman, 2002). Shneiderman had stated and created a useful framework about the perception of learners on the usage of computers. "The old computing was about what computers could do; the new computing is about what users can do" (Shneiderman, 2002, p. 2). According to Shneiderman (2002), the framework started from collecting the information which is done in the initial stage. Then, the information was further deliberated. Then, they will proceed to create the product or presentation and finally, they will donate and share new information to other people.

Heckner and Wolff (2009) conducted a research entitled "Towards Social Information Seeking and Interaction on the Web", utilizing Shneiderman's framework which allow learners to gain information through the internet. They distributed the activities of search into a table (Please refer to Table 2.3). In addition to that, they also shared on how the social interaction took place (Please refer to Figure 2.12). Therefore, in the inclusive classroom, the learners are provided with the opportunity to capture the related information from the internet, use, create and present their work among their peers and teacher (please refer to Figure 6.1).

Table 2.3: Information and Communication-related Activities and Relationships (Heckner & Wolff, 2009)

	Collect Information	**Relate** Communications	**Create** Innovation	**Donate** Dissemination
Self	Retrieve an item from the personal collection in *Flickr*, *Connotea*, *Delicious*, etc.		Manage personal *Delicious* bookmarks; Manage scientific bibliographies on *Connotea*;	
Family and Friends	Browse a friend's collection of *Flickr* photos;	Communicate with friends on *Facebook;* create a social networking profile that reflects your personal beliefs and tastes;	Tag photos for retrieval on *Flickr*; use *a blog* to write about experiences during a year abroad;	Publish birthday photos on *Flickr*;
Colleagues	Sift through the bibliography of fellow researchers on *Connotea* or *Citeulike*;	Write a message to a fellow colleague on *Facebook*;		Use a bookmarking management software to publish job-related articles; Write about business processes in the *CorporateWiki*;
Citizens and Markets	Watch *Youtube* videos;	Rate videos on *YouTube*; Express an opinion about product on *Amazon*;	Compose a Wikipedia article; comment on articles from newspaper portals; Write a blog about public issues;	Publish a *Wikipedia* article; Share a *Youtube* video;

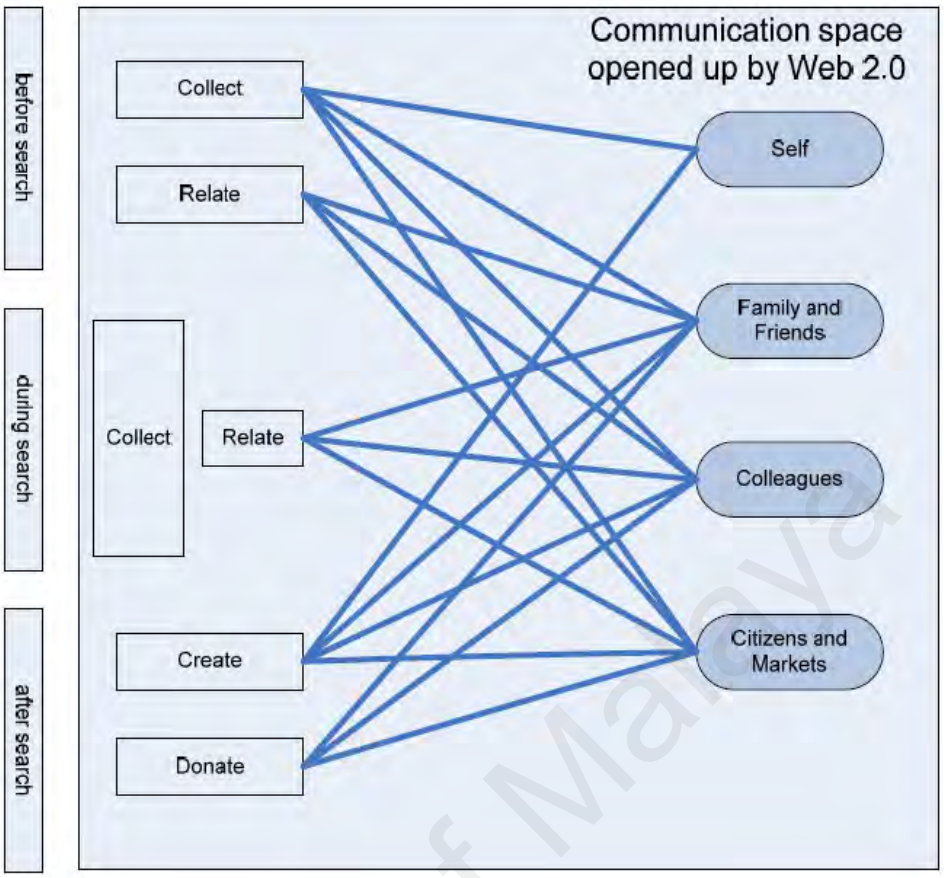


Figure 2.12 : Social Interactions during search (Heckner & Wolff, 2009)

2.11 Creativity

Creativity is the ability to create or think up a new thing and that can be applied in real life. According to Romeike (2007), creativity is something that is new, original, and very useful to the people. Creativity is the psychology that helps to encourage people to learn and create new ideas that will be useful in daily life. In school, the teachers need to play role to encourage their learners to see their ability to create new idea. "In an educational context the latter is more interesting and can be aimed for in the classroom" (Romeike, 2007, p. 2) .Moreover, he mentions that "…based on a larger knowledge in a practical and applied form as well as on the will to acquire and use that knowledge" (Romeike, 2007, p. 2) Romeike (2007) also discussed the model that drives creativity in education (Please refer to Figure 2.13).

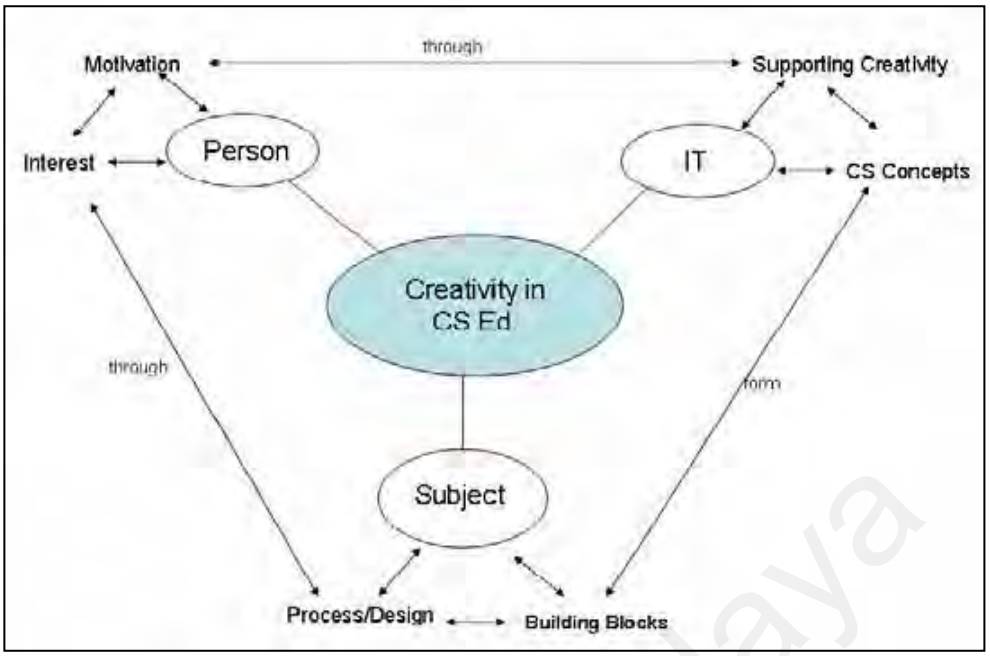


Figure 2.13: Three Drivers for Creativity in Computer Science Education

Luther and Diakopoulos (2007), noted three stage roles in the model based on several theories of engagement (Please refer to Figure 2.14)

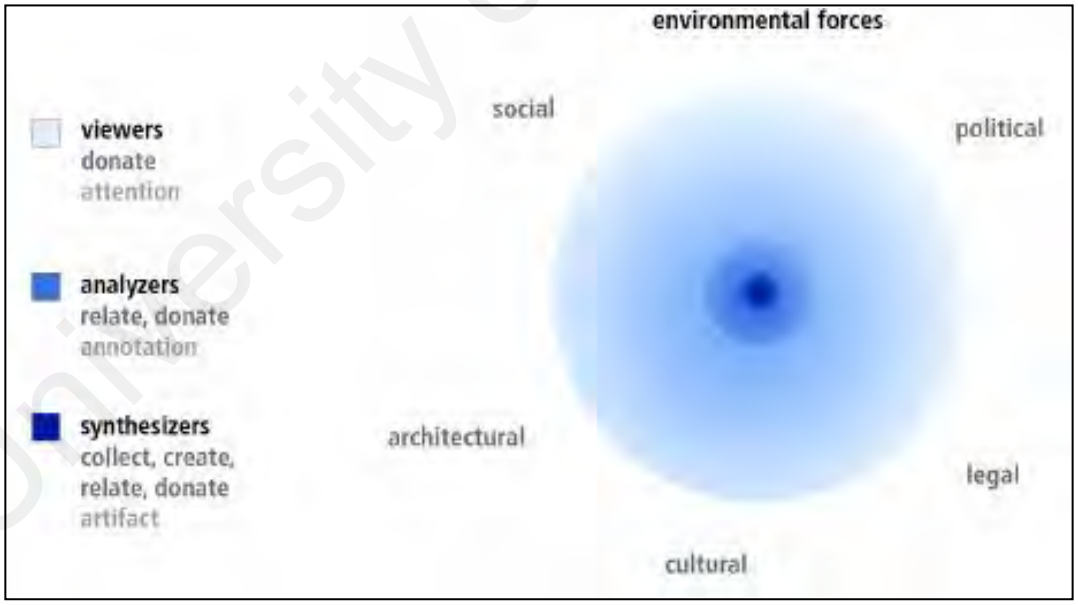


Figure 2.14: Creative roles and processes are influenced by environment forces.

Figure 2.14 shows that there are three forces of creativity namely viewers, analysers and synthesisers. The model identifies the relationship between the environment forces such as social, political, legal, cultural, and architectural which generate creativity. In the present study, the indicator for creativity was based on the synthesis of social and cultural elements among special needs learners and prime learners in the inclusive classroom. Teachers facilitated learners and gave the direction to complete their task.

2.12 Design-based Research

There are many types of research approaches that can be applied in research. However, it depends on the purpose of a study and how the objectives of the study can be achieved. The present study employed a design – based research.

There are constant debates as to know how action research can improve the teaching approach. Based on the fundamental definition on action research, there are several definitions that are related to improving the teaching approach, such as the design development of a pedagogical model. In this research, the development research is suitable to apply for improving the learning approach analysis problem, design, test, reflection document (Amiel & Reeves, 2008; Anderson & Shattuck, 2012; Reeves, 2000; The Design Base Research Collective, 2003). According to Wang and Hannafin (2005), they listed the design-based research variants and methods included in the development research proposed by Akker (1999). Akker (1999) had defined the criteria and methods of development research as below:

1. Begin with literature review, expert consultation, analysis of examples, and case studies of current practice,
2. Ensure interaction and collaboration with research participants to approximate interventions.
3. Ensure Systematic documentation, analysis, and reflection on research process and outcomes.
4. Use multiple research methods; formative evaluation as the key activity.

5. Conduct Empirical testing of interventions.
6. Principles as generated knowledge in the format of heuristic statements.

Currently, Herrington, McKenney, Reeves, and Oliver (2007) had recommended a guideline to apply the design-based research approach sample designing the research method as below (Figure 2.15, page 50):

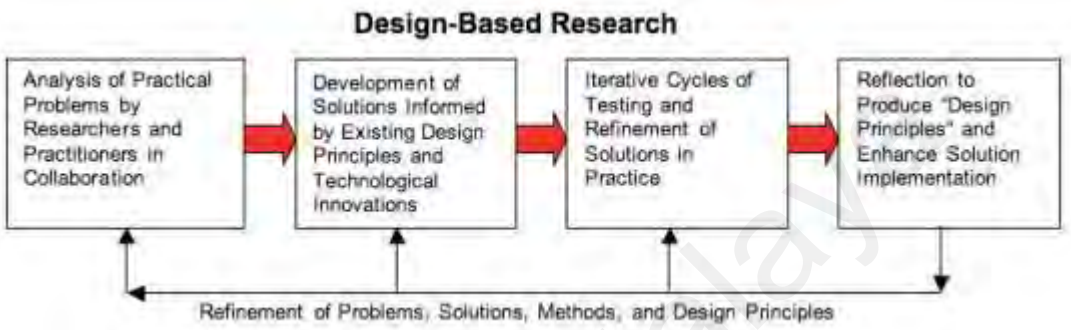


Figure 2.15: Design-based Research Approaches in Educational Technology Research (Reeves, 2006)

2.12.1 Triangulation of Multiple Data

According to (Bryman, 2004), triangulation is the technique to minimize the bias and the validate the data and the method to answer the research question. The researcher is aware and agrees with Meijer, Verloop, and Beijaard (2002) that triangulation of multiple data is a necessity. Miles and Huberman (1994) identified types of triangulation as below:

1. Triangulation by data source (data collected from different persons, or at different times, or from different places);
2. Triangulation by method (observation, interviews, documents, etc.);
3. Triangulation by researchers (comparable to interpreter reliability in quantitative methods);
4. Triangulation by theory (using different theories, for example, to explain results);
5. Triangulation by data type (e.g., combining quantitative and qualitative data).

2.13 Summary of the Chapter

This chapter reviewed literature pertinent to the study. The definition of Project-based learning and blended learning has been reviewed. The literature has shown the importance of the 3Cs (Connection, Content and Confidence) to identify learners' capabilities. As shown in the literature, special needs learners have difficulty to maintain their attention and easily get distracted. Moreover, they also have difficulty in following instruction. This affects their understanding of concepts in various topics. In the inclusive classroom, the selected learners (high function learners) are given the opportunity to join together with prime learners. The literature review also discussed how the inclusive classroom faced difficulties if the content was not appropriate with the special needs learners. Many of the teachers who teach in the inclusive classroom lack confidence to manage and teach students in inclusive classroom. Therefore, the blended learning approach adapted in the present study is a combination of technology such as the use of the internet into a classroom in real time application. Animation projects can be created to cover the syllabus or curriculum supported by edutainment applications to maintain learners' engagement. The benefits of animation projects as tools to promote learners' engagement were also highlighted. Animation can support learners' creativity, motivation and engagement. Therefore, this present study focused on the special needs learners' performance and engagement in relation to animation projects in a blended learning environment.

CHAPTER 3: CONCEPTUALISATION OF THE STUDY

3.1 Overview of Chapter

In this chapter, the conceptualisation of the study is based on the studies in the literature review presented in the second chapter. The literature sought to understand the scenario of the issue investigated and the conceptual framework will be discussed in this chapter. The conceptual framework identifies the various areas and factors that influence the blended learning environment of the eProjBL. The theoretical framework for the study will underpin the study in the constructivist paradigm. The scope of the study is explained within the context of Malaysia's perspective.

3.2 Conceptual Framework of Research on eProjBL

The eProjBL pedagogical model utilized the project-based learning approach in a blended learning environment with a combined usage of online content and face to face learning in the classroom. The eProjBL pedagogical model was implemented in a blended learning environment as explained by Friesen (2012); Graham (in press); Hisham et al. (2006). "Blended learning as the integrated combination of traditional learning with web-based online approaches, the combination of media and tools deployed in an e-learning environment and the combination of a number of pedagogical approaches, irrespective of the learning technology used in each case" (Hisham et al., 2006, p. 11).

The present study was conceptualized to investigate an alternative solution for improving the way of teaching and learning in special education. Moreover, the eProjBL engaged edutainment elements in order to utilize the learners' capabilities to maintain their attention and enhance their creative skill. ICT was utilized for special needs learners by utilizing an animation project in their lesson and supported by

edutainment elements as guidance before they could complete their task. According to Vygotsky (1978) on play and learning "…play creates a zone of proximal development of the child. In play, a child always behaves beyond his average age, above his daily behaviour; in play it is as though he were a head taller than himself". Figure 3.1 (page 53) shows that there are three components highlighted based on Vygotsky's Zone of Proximal Development (ZPD) and the elements of interactivity act as a scaffold to connect between learners and the lessons taught by teachers (Vygotsky, 1962, 1978). The components shown were identified as the variables to be investigated in connection with the alternative pedagogical model eProjBL put forward to enhance the learner's engagement.

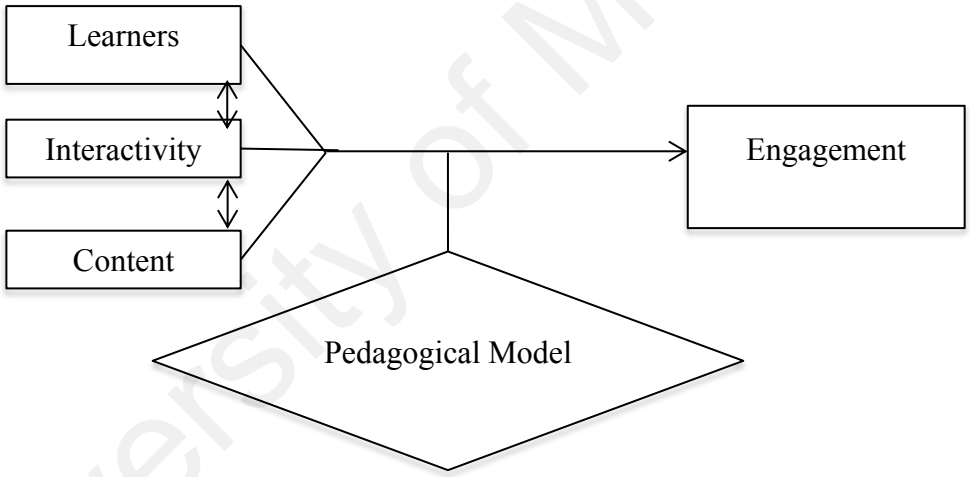


Figure 3.1: Fundamental Framework of Pedagogical

The fundamental framework of this research consisted of both the independent variables and dependent variables. Both of these were taken into consideration when the eProjBL pedagogical model was designed. The independent variables included learners (special needs learners and the prime learners), Interactivity, and Content. The dependent variable was focused on the learners' engagement. The eProjBL pedagogical model was put forward as an approach that was tested for its impact among the special needs learners as compared to the prime learners. In other words, the eProjBL

pedagogical model can be looked upon as the tool to operate interactions between special needs learners and the content (curriculum).

From the literature, the gaps identified from the three components are highlighted in Figure 3.1. According to Krajcik et al. (1994), the three components promoted the project-based science (Table 3.1) that utilized the laboratory experience to learners without disabilities to explore the real-world when they carry out the project activities. Without any modification, can the project-based science benefit be also appropriate to the special needs learners as well? Can it be implemented in the inclusive classroom without any modification?

Table 3.1: ProjBL research on Content, Interactivity and Learner

Author	Content	Interactivity	Learner
(Krajcik et al., 1994)	"Using technology in project based science makes the environment more authentic to learners, because the computer provides access to data and information, expands interaction and collaboration with others via networks, promotes laboratory investigation, and emulates tools experts use to produce artefacts."	Computer-based	Normal primary classroom
(Brown & Campione, 1996)	"Technology has, among its touted benefits, The value of making the knowledge construction process explicit, thereby helping learners to become aware of that process" cite in (Thomas, 2000)	Computer-based	Normal classroom

Author	Content	Interactivity	Learner
(Savin-Baden, 2003)	Project-based Learning and technologies will far outweigh its drawbacks and will become an accepted practice for both online and offline learners.	Computer-based	Normal classroom
(Hussain et al., 2004)	One of new method of learning for Form One students which integrated the technologies	Computer-based	Normal secondary classroom
Belland, Ertmer, and D.Simons (2006)	The learners with special need were enjoyed the freedom the ProjBL unit lessons. They also highlighted some challenges they faced before even beginning the project were poor attendance, low motivation, heavy reliance on teacher instruction, and poor learner attitude	Non-computer - based	Special classroom
(ChanLin, 2008)	Learners conducted research (through guided research process), interacted with peers, teachers and the community (through personal interviews and visits), and displayed their understanding of knowledge through the presentation of web-pages	Non-computer - based	Normal secondary classroom
(Markham, 2012)	The children could experience mastery, identify the meaning and build the constructive relationship to a caring. He also stated that the adult could become a mentor to support as guidance.	Non-computer-based	Special classroom

Thus, the benefit of eProjBL that promotes the alternative pedagogical model in the present study was identified. According to previous research, the ProjBL is the learning strategy that allows the learner to gain knowledge experimentally. However, adapting the elements of the eProjBL pedagogical model in the inclusive classroom needs to have an alternative approach to ensure that the learners can engage with the lesson (futher explanation in section 4.3.1 Preliminary Study). Therefore, the teachers' perception on learners' capabilities and the learning environment needs to be investigated to know the capability of the proposed alternative pedagogical model. What are their perceptions? Does the alternative pedagogical model require new skills for the special needs learners? What are the design principles of alternative pedagogical model?

In the context of Malaysian education, the three gaps identified before the implementation of the eProjBL pedagogical model in the blended inclusive classroom is based on the three indicators (learner, interactivity and content) were (Please refer Figure 3.2, page 57):

1. *Misperception on learners' capabilities.* Special needs learners who were categorised as high function learners could participate in the inclusive classroom together with prime learners. Unfortunately, the teachers place these learners in the same classroom with the poorer prime learners. Teachers' misperception of the learner's capabilities led us to investigate of the learner's engagement when the alternative pedagogical model was tested.

2. *Lack of play and learning approaches.* The special needs learners in the inclusive classroom could not focus and lose attention because the appropriate play and learning approaches were not utilized. Teachers preferred to use the conventional teaching method for both special needs learners and prime learners.

3. *Inappropriate content for inclusive classroom.* Most of the content was designed for the prime learners in the inclusive classroom. Based on the objective of national curriculum, the learners need to understand certain concept in science. This scenario was not beneficial to the special needs learners. Special needs learners lacked attention and engagement when the same content was not aligned with their interest.

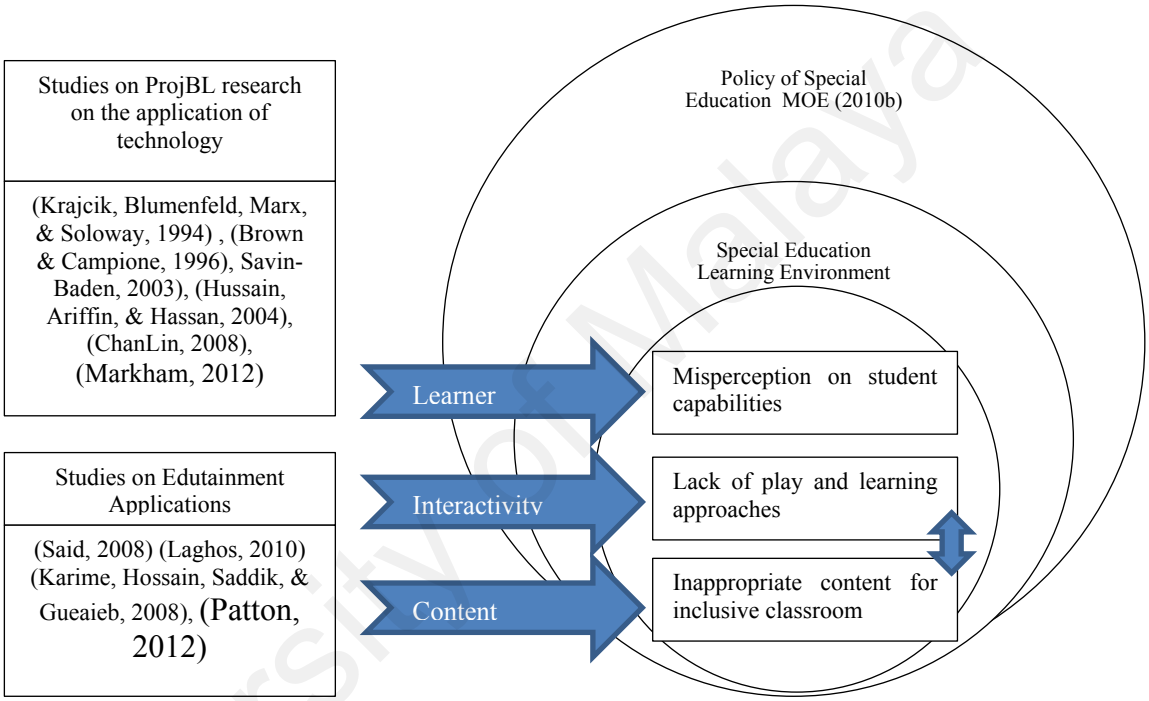


Figure 3.2: Defining the Gap of the Study based on Learner, Interactivity, and Content from the Previous Literature

The main activities of ProjBL were highlighted based on previous literature to identify the gaps (please refer to section 4.3.1 Preliminary Study) in order to improve the design principles for special needs learners. To develop the alternative pedagogical, the criteria and the design principles were identified through the development phase. Based on Table 3.2 , all the activities of ProjBL highlighted in the previous literature indicate different perspectives. Most of them specified that the learners' needs must be complemented by working in a group to build the artefact with the teacher as their guidance. In the context of special education, the activities of PROJBL were modified.

In addition, edutainment elements work as a scaffold in the project to maintain the learners' attention from getting.

Table 3.2: The Central Meaning of ProjBL

Author	Criteria
(Thomas, 2000)	The central teaching strategy; learners encounter and learn the central concepts of the discipline via the project. ProjBL projects are focused on questions or problems that "drive" learners to encounter (and struggle with) the central concepts and principles of a discipline. Projects involve learners in a constructive investigation. Projects are student-driven to some significant degree. Projects are realistic, not school-like.
(Sun Associates, 2003)	One activity which addresses different learner learning styles and which does not assume that all learners can demonstrate their knowledge in a single, standard, way.(1) an extended time frame; (2) collaboration; (3) inquiry, investigation, and research; and finally, (4) the construction of an artefact or performance of a consequential task.
(ETD, 2006)	Long-term, interdisciplinary, student-centred, and integrated with real-world issues and practice 1. Product and task oriented 2. Systematic Teaching and Learning Methods. 3. Engaged Learning 4. Skills-based 5. Authentic Assessments
(Xu, Reid, & Steckelberg, 2002a)	Students designing, planning, and carrying out an extended project that produces a publicly-exhibited output such as a product, publication, or presentation

The impact of edutainment elements for the teaching method in the literature was identified. The uniqueness of the study was explored when edutainment was integrated as a scaffold to maintain learners' attention during the lesson period. The review was done to describe the ability of edutainment elements in special education (please refer to Table 3.3). Moreover, the benefits of the game elements for special needs learners to engage in learning in the classroom were also identified (Obikwelu, Read, & Sim, 2013; Puentedura, 2012; Said, 2008). However, in the Malaysian context, teachers' confidence

is one enabler by adapting the technology. This enabler was referred to by Ponter and Brown (2007) as the key enabler which relates to adapted technology in the community, specifically for the teaching and learning environment. Therefore, the rationale to get teachers' feedback is the main focus to ensure the alternative pedagogical model could be more practical and effective for special needs learners. Therefore, the alternative pedagogical model proposed was to find a solution that suits the Malaysian culture of teaching and learning.

Table 3.3: Previous Research on Edutainment Approaches

Author	Summary
(Karime et al., 2008)	Edutainment systems for children 1-4 year give the benefit impact to visualize the content. The lesson more fun. The abilities to transform the narrative activities into visualization content which improving the student's cognitive skill.
(Said, 2008)	The designing application that utilized the game-based learning for mild ADHD learner. The application that allowed the students to maintain their engagement and help to not lose their attention.
(Laghos, 2010)	The game is recommended for classroom and homework use and its purpose are to help educate the learners in a fun and visually attractive way (p 80). Transformation the homework to adapted meaning in their learning.
(Wirawan, Muhammad, Saifudin, Ibrahim, & R, 2013)	Develop and adapting the game approach for Children Computer Interaction (CCI) in Indonesia. The development of edutainment games that consisting with three components of developments, such as cognitive, physical and social

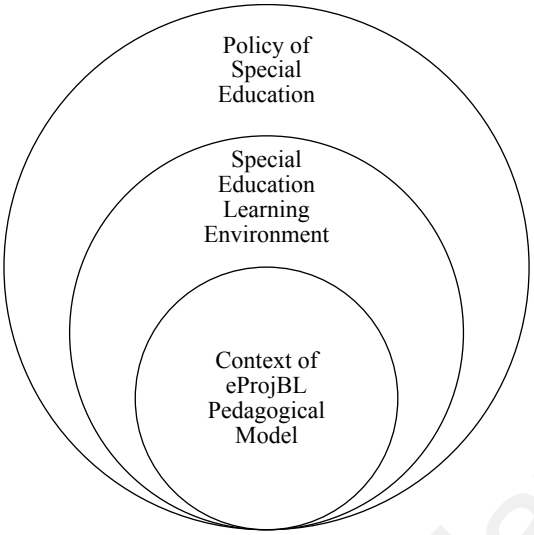


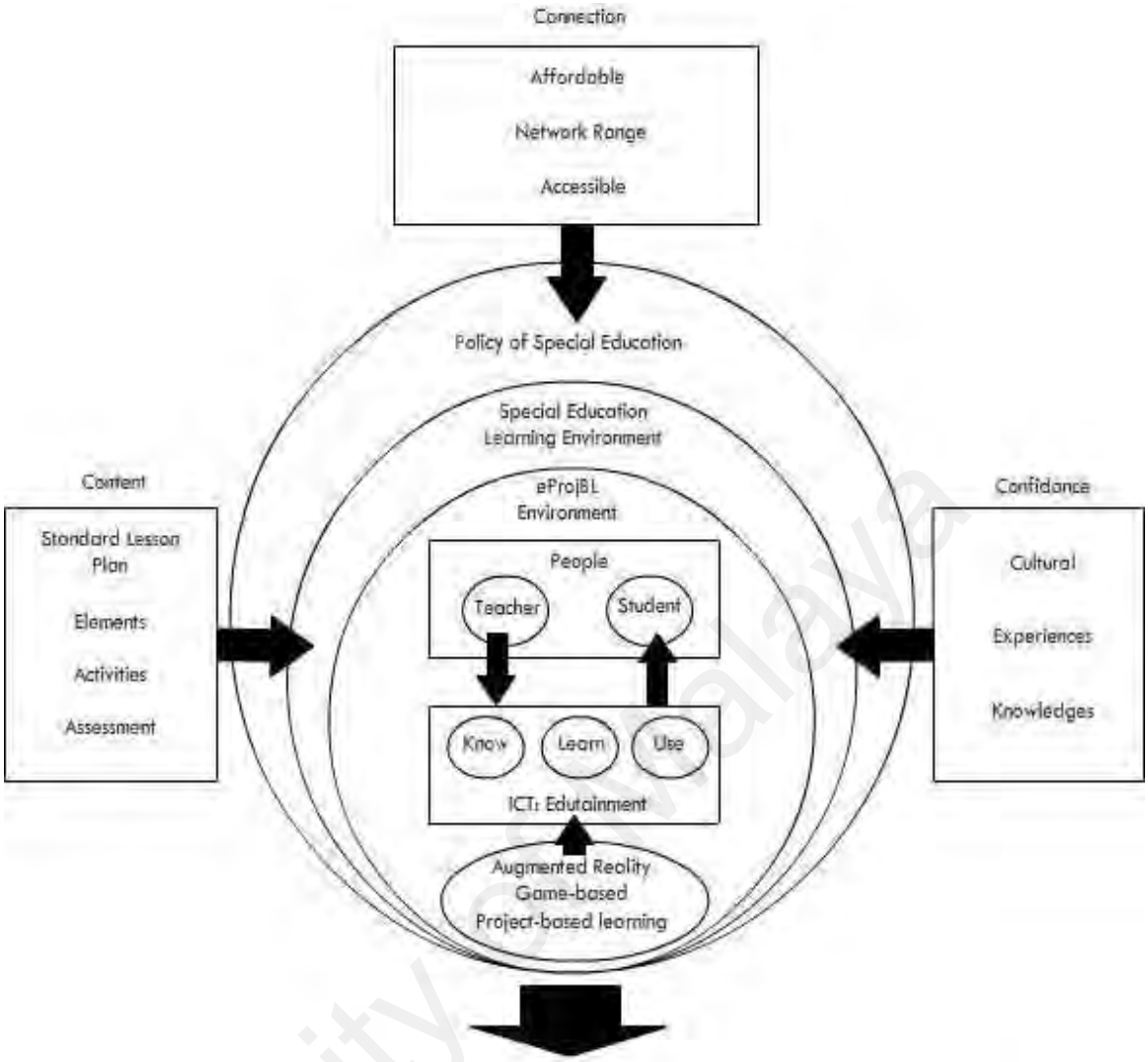
Figure 3.3: The main context of the study

In the present study, the conceptualization was narrowed-down to the Malaysian policy of ICT in education, where the study aimed to find an alternative pedagogical model that infuses blended technology for special education. It was aimed to map Malaysia's policy as a main context for this research (please refer Figure 3.3).

Based on Figure 3.4, the conceptual framework of the study consisted of three strategies that connect several factors which influence the learning environment in special education. Based on Malaysia's policy and the key factors of 3C, the model was created based on content which consists of the standards, elements, tasks and assessment need to be taken into consideration when applying the blended learning environment. The connectivity on network and internet was defined as connection. The connection also related to ICT facilities and infrastructure as well as accessibility that emerged in the connection strategies. The culture was identified as that influences the confidence of people to handle the blended learning environment. Moreover, the experience and knowledge that they acquire enhances their confidence to implement ICT as the medium of their teaching. The preliminary study also revealed three keywords that can depict the experience with activities integrating ICT among special

learners namely Know, Learn and Use. Know is defined as the initial stage the people only know about what ICT is. Then, they learn how to operate it. Finally, they will use it among their learners by teaching them or use the ICT in the classroom. These experiences can influence learning based on the sharing of knowledge and experience among teacher and learners.

The study integrated the elements of edutainment to engage learners and tested to investigate the learner's capabilities and learning envornment. The indicator for learner's performance was subjective through the teacher's observation. Therefore, the engagement among the special needs learners was investigated according to teachers' feedback. There are three major objectives of the study to investigate the learner's capabilities and learning environment which blend with the current senario (please refer Figure 3.4). The Learning environment was dependent on the key enablers (Connection, Content and Confidance) that are indicators to ensure the appropriateness and suitablility of the implementation of eProjBL pedagogical model.



- To design an eProjBL pedagogical model incorporating interactive edutainment applications for selected primary school learners in an inclusive classroom,
- To investigate teachers' perceptions of the eProjBL pedagogical model in an inclusive classroom, and
- To explore the acquiring of the skills in using the eProjBL pedagogical model among the selected primary school learners in an inclusive classroom.

Figure 3.4: Conceptual Framework of Research on eProBL

3.3 Theoretical Framework

In Chapter Two, the literature focused on constructivism and the benefits of Project-based Learning (ProjBL) as a conceptual learning model (ETD, 2006; High Tech, 2011; Hussain, Ariffin, & Hassan, 2009; Jurica, 2005; Kurzel & Rath, 2007; Sun Associates, 2003; UNESCO Bangkok, 2009). Furthermore, the cognitive theory of information processing was used for multimedia learning recommended by Mayer (2009). The theoretical framework was derived from the Social Constructivism paradigm as suggested by Vygotsky (1962). Lev Vygotsky believed that each learner has their own zone of proximal development (Vygotsky, 1962). Scaffolding is needed to engage learners to learn (Verenikina, 2003).For example, animations benefits learning and this is supported by the cognitive theory of multimedia learning (Mayer, 2003, 2009; Mayer & Moreno, 2002). Furthermore, Said (2008) discussed the fact that games also can capture learners attention. The combination of games elements and animations project as scaffold is important.Obikwelu et al. (2013, p. 60) identified Scaffolding is "…the guidance required in bridging the gap between what a child knows and what he is supposed to know. For this to take place, scaffolds (learning stimulators) are used". Both prime learners and special needs learners face the same challenges in sustaining their interest when learning a specific topic. ProjBL which was established by AutoDesk Foundation in early the 1990s cited by Pearlman (2009) is a learning strategy to capture the learner's engagement (CELL, 2009; ETD, 2006). In Malaysia, ProjBL is a relatively new learning strategy that was piloted in smart schools supported by a handbook of ProjBL for Malaysian perspective.

Based on Figure 3.5, psychological tools are necessary in scaffolding (as explained by Vygotsky's Zone of Proximal Development – ZPD); therefore eProjBL activities

included the animation project which was blended with edutainment elements as a scaffold. Moreover, the scaffolding by teacher, peer, and edutainment elements (in the form of game based) could most probably secure learners' engagement. Therefore, the study examines their perceptions and what skills can be infused according to learners' capability and learning environment. The model was mapped based on Schell (2008) "The Art of Game Design" to design the edutainment element which was applied in the study in maintaining the learners' attention.

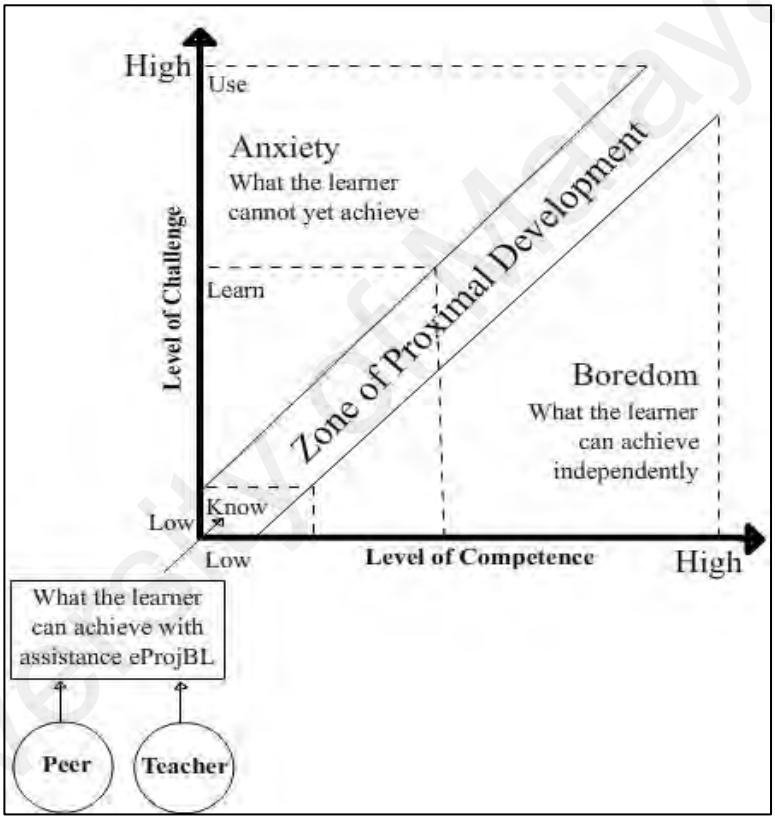


Figure 3.5: Design of eProjBL Pedagogical Model adapted based upon the Zone of Proximal Development in the Game Design (Schell, 2008)

In the present study (Please refer to Figure 3.6, the main focus was to explore the significant value of implementing the alternative pedagogical model approach that supports the learners' capability and teaching environment. In addition, the benefit of multimedia learning was adapted by Mayer and Moreno (2002) which highlighted the animation as an useful aid to support capabilities of engagement among special needs learners. The edutainment design strategy was organized which was labelled as Know-Learn-Use (KLU) strategy as the main stages to construct the edutainment elements in the alternative pedagogical model in the present study. The strategy was mapped in sync with the idea of ZPD (Figure 3.5) that related the capabilities of learners to maintain the learners' engagement. This is a learning phase strategy in adapting the technologies or devices to the student, teacher, and other stakeholders. This phase was adapted and was tested to identify the scenario of learners' adaptation to technologies for learners. Each phase followed the KLU stages which challenged the learners to know what the new technologies are and how they can learn to use it and how they share their knowledge with other learners.

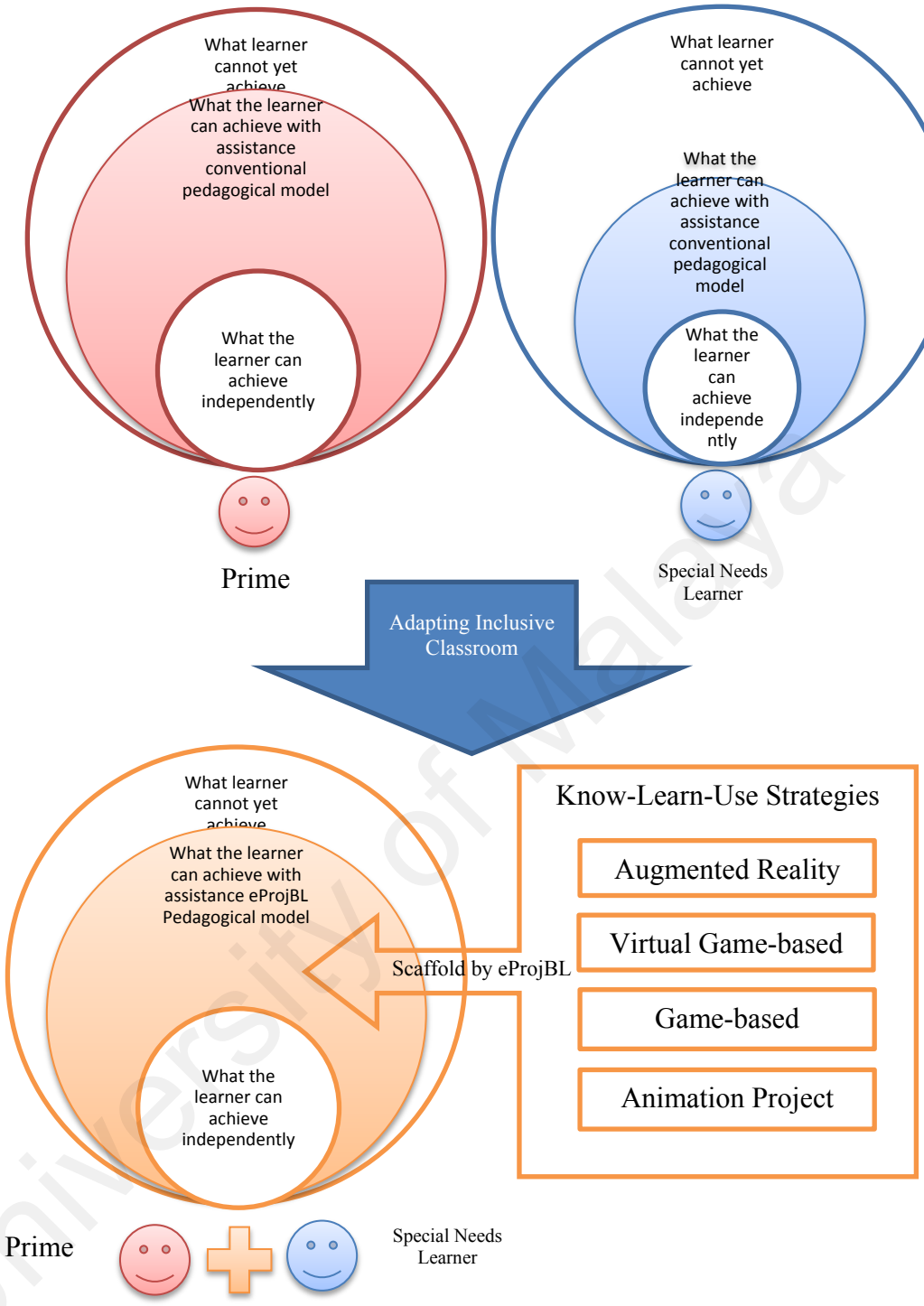


Figure 3.6: Learner's Capabilities and Teaching Environment of eProjBL Pedagogical Model by Zone of Proximal Development (Adapted Schell's Game Design)

3.4 Summary of the Chapter

Chapter Three presents the conceptual framework in the research which is based on the review of literature discussed in Chapter Two. Based on the literature, we identified the research gaps as follows (learner, interactivity and content). The theoretical framework put forward the social constructivist paradigm of Vygotsky, in particular where the alternative pedagogical model can be a scaffold along the Zone of proximal Development of each special needs learner. The next chapter discusses the overall design-based research methodology in greater detail.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Overview of Chapter

This present study utilized a design-based research which consisted of four phases. The purpose of the present study was to design an alternative pedagogical model that utilized the edutainment technologies for the inclusive classroom. Data from multiple sources were collected and triangulated to answer the research questions (Bryman, 2004). This section covers the research design, the techniques of data collection, the hardware and software involved and data analysis of the study.

4.2 Research Design: Design-based Research

The rationale of choosing a design-based research as the main research design was adapted from Akker (1999). This study was designed to explore the perception and acceptance of the eProjBL pedagogical model for the special needs learners in the blended inclusive classroom (Please refer to Table 4.1).

Table 4.1: Summary of Research Mapping on eProjBL

Objectives	Research Questions	Instruments	Sources/ Evidences	Data Analysis
1. To design an eProjBL pedagogical model incorporating interactive edutainment applications in an inclusive classroom for selected primary school learners	What are the strengths and weaknesses of the design of the eProjBL pedagogical model?	• Document Review, • Literature Review,	• Journal • Online database • Books.	Qualitative Analysis
		• Interview (Informal Conversation)	• Subject Matter Expert (SME) • Teachers • Assistant Officer Unit (Division of Special Education)	

2. To investigate teachers' perceptions of the eProjBL pedagogical model in an inclusive classroom	What are the teachers' perceptions of the special needs learners during the utilization of the eProjBL pedagogical model in the inclusive classroom?	• Observation • Interview • Open-ended Question	• Teachers • Video Recording	
3. To explore the skills acquired after using eProjBL in an inclusive classroom among selected primary schools learners.	What are the teachers' evaluations of learners' performance in using the eProjBL pedagogical model in the inclusive classroom?	• Engagement Survey Form (refer Kember, D, et. al. ,2005) • Observation • Rubric Evaluation Form	• Observer • Teacher	Descriptive Quantitative Analysis
	To what extent are skills acquired in utilizing the eProjBL pedagogical model by the learners in an inclusive classroom?	• Engagement Survey Form (refer Kember, D, et. al. ,2005) • Open-ended Question	• Teacher (Observer) • Video Recording • Screen Recording • Learners' Group Project	

Table 4.1 also shows the connection between the objectives and the research questions.

The current research carried out is based on the design based approach of Akker et al. The design-based study consists of four phases adapted from previous researchers (Akker, 1999; Amiel & Reeves, 2008; Herrington et al., 2007). As shown in Figure 4.1, the diagram shows the summarized research phases involved in mapping the overall process of the study.

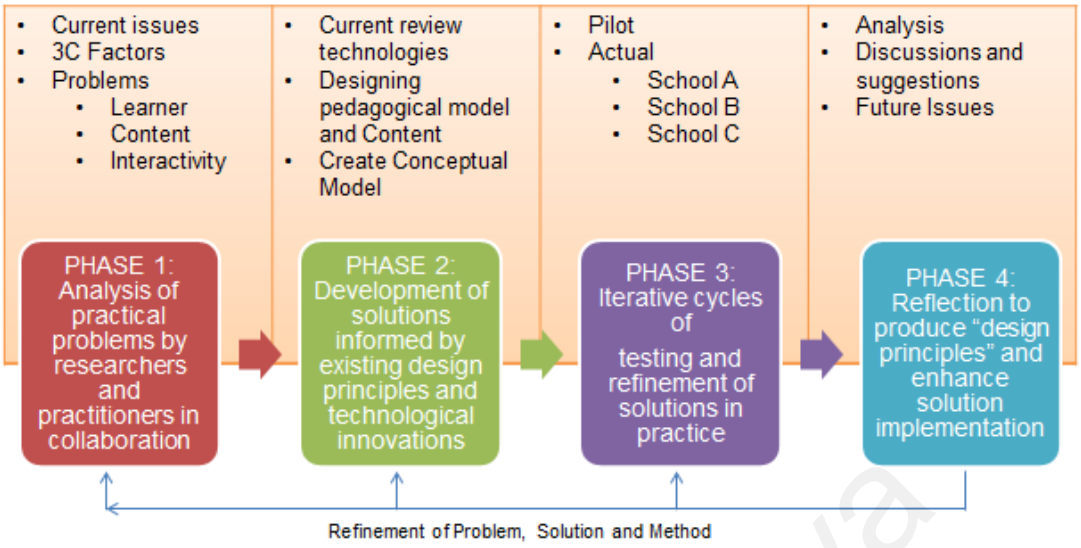


Figure 4.1: Research Phases on eProjBL using Design-based Research

4.3 Phase 1: Analysis of Practical Problems by Researchers and Practitioners in Collaboration

The first phase was the preliminary study. The purpose of this preliminary study was to investigate the current issues and analyse the problems through document reviews, and informal conversations among several stakeholders. The three key enablers are namely Connection, Content, Confidence, (3C) were suggested by Ponter and Brown (2007) which could help to identify the scenario in Malaysia's Educational context. Based upon the preliminary study, the study's problem statement was refined and put forward. In addition, permission was obtained from the Ministry of Education and the study was passed by the ethics' committee. The number of schools to be involved in the study was proposed to get their approval and permission to conduct the study in their schools. Each selected school was coded in the study for further action.

4.3.1 Preliminary Study

In the first phase of this design-based research, the understanding of current issues faced by educators in Malaysia especially in the special education environment was looked into and discussed in Chapter Three. Based on Ponter and Brown (2007), the 3C

factors become the key enablers to capture the appropriate scenario blended with technologies. Firstly, the researcher described in-depth the process as to how the special education classroom teaching and learning should be conducted. Through the document review in year 2010, percentage of learners with learning disabilities in primary schools in Malaysia was 0.74 % (Special needs learners with learning disabilities = 21,310 learners and number of primary learners in Malaysia = 2,897,871 learners) with sources from JSEAP (2010); MOE (2010a). The number of learning disabilities increased 35.5 % from year 2006 to 2010. According to Figure 1.1, the number of learning disabilities continued to increase from 2010 to 2014.

According to MOE (2008), In the inclusive programmes, the special needs learners of high function will combined with prime learners in the prime classroom to learn the national curriculum and might be able to sit for the primary school evaluation test (UPSR). "These integrated programmes give room towards inclusive education where able special education learners may be placed and study in normal education classes." NISE (2007, p. 56). However, using the same conventional teaching method in the prime classroom might not be beneficial for special needs learners (high function learner). Moreover, the special needs learners are usually grouped together with normal or prime learners in the lower achieving classes in the schools. The main factor that needs to be overcome in the inclusive programmes is the lack of motivation among special needs learner in the inclusive classroom, commonly associated with ADHD.

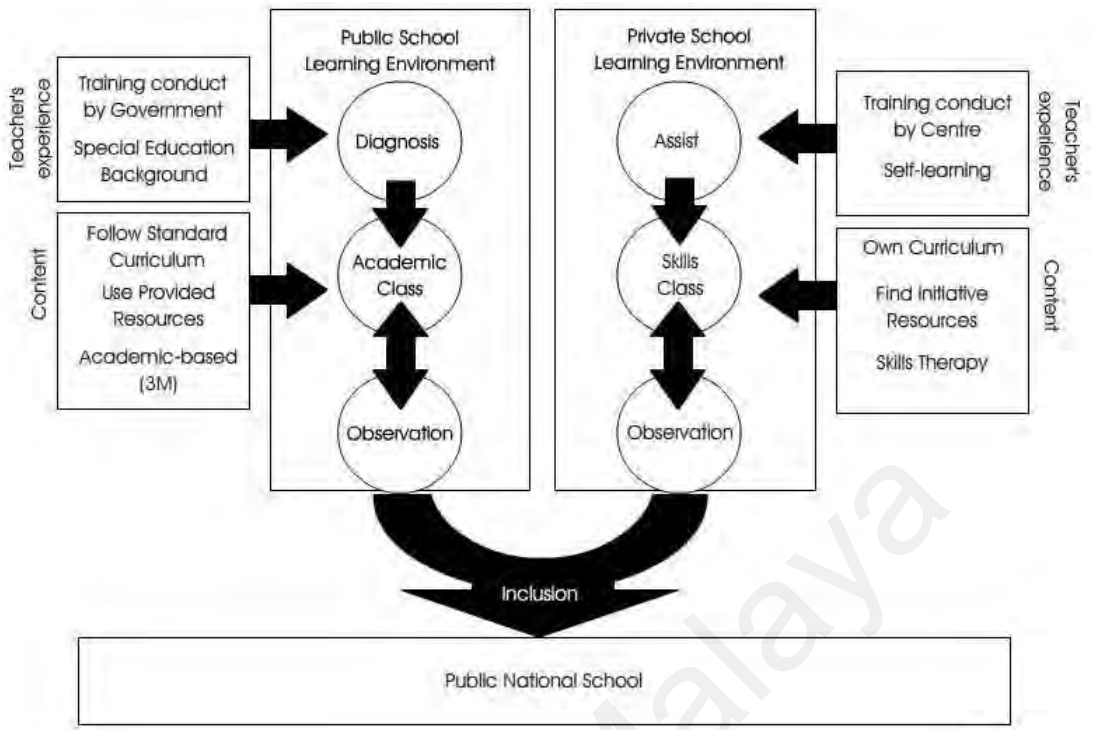


Figure 4.2: Scenario of Schools involved in Special Education School in Malaysia

Figure 4.2 identifies the relationship between private and public schools based upon teachers' experiences in handling special needs learners, the process of teaching learning experiences, content and other resources with respect to the inclusive classroom. The relationship can be visualized as the flow of the teaching methods and process that are implemented in the two different types of school management. In the national public school, learners are required to sit for a standard test developed for the remedial classroom and their performance is observed and measured by teachers. Based on their performance in this test, learners are diagnosed a week before they are separated. According to the special education coordinator, the main objective for the separation into the various academic classes is to ensure that the special needs students will learn the 3M-*menulis, membaca dan mengira* (Writing, Reading, and Counting) concepts. Observations will be conducted for every learning session by teachers until the student can achieve the minimum requirement for them to be included into the

national curriculum. For private schools, they start by assisting the new special needs learner in several types of skills therapy classes within the first two weeks. Then, the student's interest and capability will observed by the teacher. After that, the coordinator will assist them to join any selected therapy skills class suitable for the student. The skills therapy class include drawing classes, ICT classes, and other therapy classes.

Studies on teaching methods have been conducted in both private and public schools to understand how their learning environments affect the inclusive programmes. In addition, five pertinent issues commonly found are:

1. The lack of teacher's experience to utilise ICT as their teaching tool in the class;
2. Lack of software related to special education which may be difficult to handle or operate for the special needs learner;
3. The software is not related to special education or it could not be customized;
4. Lack of ICT hardware facilities for special education; therefore most teachers still use the manual approach in their teaching, and
5. Limited time to teach special needs teachers how to use ICT and related lesson plans that they need to cover in the class.

In the document and literature review, the limitation on the usage of ICT identified in the inclusive classroom were influenced by the three elements namely learner, content, and interactivity. These elements can help map the problems that arise in an inclusive classroom. These elements were central when constructing the pedagogical model to maintain the learners' engagement in the present study. These three elements will now be discussed in turn.

4.3.1.1 Learner

Special needs learners who have different learning capabilities depending on how their teachers organised activities for their learning. As a result, one of the important elements investigated in the present study is the alignment with government policy on teaching and learning for special education teachers in the inclusive classroom (Please

refer to section Malaysian policy on ICT in education). Based on Figure 4.2, the current scenario in the inclusive classroom, according to teachers is that the special needs learner was labelled as a learner with low capability. However, the content and learning environment was designed for prime learners but not for special needs learners. Therefore, the special needs learners lack the attention they need in the classroom.

In the present study, when constructing the alternative pedagogical model, the related teachers were questioned as to what could be the characteristics needed in the designing of an alternative pedagogical model? A simple review of teacher perception was conducted on whether the edutainment elements could become a medium to help the special needs learner to engage with the learning in the classroom.

4.3.1.2 Interactivity

Interactivity was suggested in the present study to align the ICT policy of MOE in the utilisation the ICT facilities for special education[3] (MOE, 2010b). The collection of the informal conversations with educators and policymakers were investigated to identify the background of the education policy, school facilities, and teachers' capabilities that align with the suggested alternative pedagogical model to ascertain whether the model can be implemented or not. The majority of interviewees expressed the need of an alternative pedagogical model that could increase or maintain the special needs learner's attention. The in-depth information was collected from people in various positions to determine how the policy could be implemented in the current situation in special education (Please refer to Appendix M).

[3] ICT tools and devices such as screen readers and 'embosses' will be part of the ICT infrastructure provided to schools for the students with special needs. Teachers in schools for the students with special needs will be trained and sensitized to issues specially-related to the use of ICT in teaching student with special needs. All teachers' in schools for the students with special needs will be provided with ICT-enabled methods during training and their source of professional development. Web based digital repositories should be deployed to address the lack of availability of resources for students with special needs.

4.3.1.3 Content

Based on Figure 4.2, Majority of the interviewees explained that the content was provided by the Ministry of Education (MOE) for public schools. In the private schools, they used their own lessons which combined the guidelines from other resources and MOE. Based on Figure 4.2, the conceptualized flow of content for both public and the private school is explained. In private schools, they were focused more on the learners' abilities and capabilities that suite their interest. However, in the public schools, the learners need to be aligned with the academic objectives. Learner's capabilities to achieve three important academic skills (read, write, and count) called 3M (*membaca, menulis, mengira*) are the targets. In the inclusive classroom, the majority of teachers prefer to use the conventional teaching approaches in their classroom. The alternative inclusive classroom would blend several edutainment applications which could act as scaffolds for the learner. The teachers responded positively and hoped that the alternative approach might be useful in the inclusive classroom.

The main issue focused on was, how to increase the special needs learners' attention in the inclusive classroom. The investigation in the present study was highlighted according to these three variables (Learner, Content, and Interactivity) which described further. The teachers responded that the majority of special needs learners (ADHD) had lack of attention in the inclusive classroom. Therefore, the ADHD criteria were selected as a benchmark when designing the alternative pedagogical model for the inclusive classroom. Most of the selected teachers responded that learners with ADHD are challenged most in maintaining their attention in class. ADHD symptoms and characteristics were described by Kiwanis Disability Information and Support Centre (KDISC). They had classified the type of ADHD symptoms as three types (KDISC, 2010b):

1. Inattentive type: the person cannot focus or stay focused on a task or activity;
2. Hyperactive-impulsive type: the person is very active and often acts without thinking; and
3. Combined type: the person is inattentive, impulsive, and too active.

Observations in several centres and public schools were conducted to investigate the characteristic of learners to be identified in the first phase. Moreover, the researcher participated in several workshops in order to understand in-depth what the current issues and cases were from the Malaysian perspective. One of the workshops was conducted by University Malaya Centre of Addiction Sciences (UMCAS). A number of experts in the various aspects of special needs learner participated in the workshop. The workshop arranged a group discussion on the definition of ADHD and how to assist these learners to learn through both medication and special attention in learning approaches. In conclusion, the participants agreed that they need to find an alternative approach to capture learner's attention for special needs learners. The majority of them identified that "attention" is the key element to solve in special education. This identified key element was noted seriously and then the researcher proceeded to create the appropriate environment for the inclusive classroom with the eProjBL pedagogical modal. Then, the study continued into the second phase which focused on the conceptual design and alternative design principle. In the third phase, the testing session was conducted to test the alternative design principle for the eProjBL pedagogical model.

4.4 Phase 2: Development of Solutions based on Existing Design Principle and Technological Innovations.

In the second phase, the conceptual framework and proposed theoretical framework of the study were constructed. Suitable and relevant information from the literature review on technologies were added into the designing of the eProjBL pedagogical model. Then, the content of the model was constructed by following the current curriculum of Malaysia. The topic from science year 5 (Water cycle) was chosen (please refer to Appendix G). The topic was suggested by teachers during the preliminary study in the first phase. The rationale to choose this topic was to ensure the learners' understanding to visualize the process of the water cycle. Many learners' especially special needs learners in the inclusive classrooms have difficulty to remember and understand this concept in science. Therefore, the idea was to test the learners' capabilities whether the alternative pedagogical model could capture the learners' attention during science period. The selected schools and the learner participants were defined according to the acceptance of each school's ethical procedures. The data collection techniques to collect relevant data of learners' engagement were prepared and as for the evaluation of the learners' tasks, rubrics were prepared.

4.4.1 Design and Development of eProjBL Content

The design and development was executed in the second phase in this design-based research. The construction of the eProjBL pedagogical model adapted and adopted Project-based Learning with the integration of technology in a blended learning environment (Hisham et al., 2006; Yusof & Song, 2010).

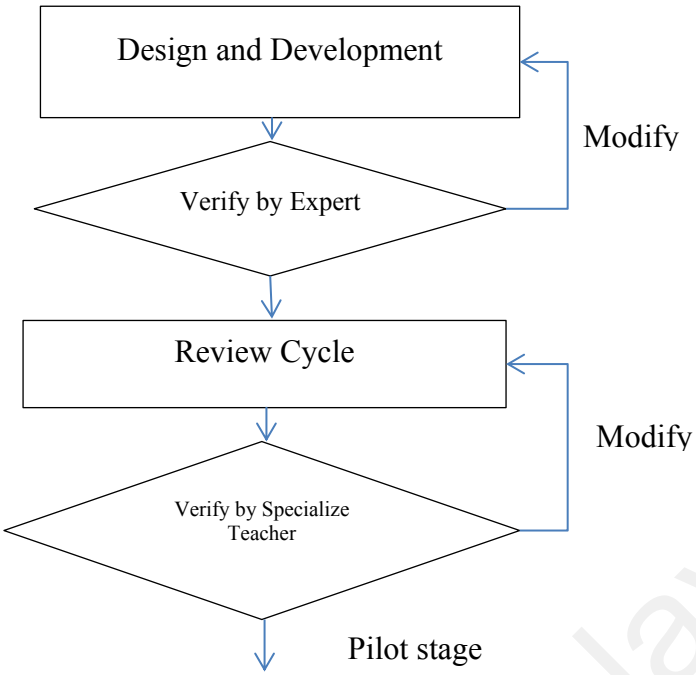


Figure 4.3: The Workflow of the Design and Development for eProjBL Content

The main purpose of the eProjBL Pedagogical model was to maintain learners' engagement as they learn the topic of the water concept in science using the edutainment approach. In the context of the present study, the teacher specialist, programmer, and medical expert collaborated to ensure that the sample prototype of eProjBL content was reliable and relevant (please refer to Appendix G). The sample eProjBL content was created and was reviewed by teachers and expert in the first stage. Moreover, the improvement of the content continued during the initial workshop (please refer Appendix H). The diagram above (Figure 4.3) shows the flow chart of the design and development of the content until the third phase of this design based research.

Table 4.2: List of Specialised Teachers from Each School

School	Type of school	Teacher Code #	Age & Gender (M/F)	Job description
A	**SK 05 (rural school in Eastern of Peninsular of Malaysia)**	SK05-04	35 F	Person who teaches the learners science and ICT
B	**SK 03 (rural smart school in Southern of Peninsular of Malaysia)**	SK03-02	29 F	Person who teaches the learners science and ICT
		SK03-03	33 M	Teacher Assistant
C	**SK 09 (urban school in Central of Peninsular of Malaysia)**	SK09-01	50 F	Person who teaches the learners science and ICT
		SK09-02	32 F	Teacher Assistant

Table 4.2 shows the list of teacher specialists involved in the development of the eProjBL Content. A specialised teacher is a selected teacher who have related experience and knowledge on Special Education and Science topic. In the context of the conventional inclusive classroom, the special needs learner faces difficulties in maintaining his /her attention and lack of engagement. Therefore, the alternative inclusive classroom proposed in this study provided the facilities that support these learners in gaining new experiences through the edutainment components. In addition, blending with the playful learning environment was also suggested to maintain learners' motivation.

4.4.2 Framework of the eProjBL Pedagogical Model

The framework for the present study (Figure 4.4) was created based on literature review of several previous researches (Hisham et al., 2006; Hussain et al., 2009; Sun Associates, 2003; Thomas, 2000; UNESCO Bangkok, 2009; Yusof & Song, 2010). As a first step in the framework of eProjBL pedagogical model, each participating teacher was briefed on the activities to be carried out among the learners. The teacher divided the learners into small groups and instructed them to complete the animation project. The learners were scaffolded by the edutainment application, and, through the use of the animation tool were able to construct their own knowledge as they understand the concept of 'water cycle'. At the end of the lesson, the learners' presented their project in front of the teacher and peers. The teacher acted as the main assessor and marks were based on the learner's presentation at the end in addition to the observations made by the teacher during the lesson in the classroom

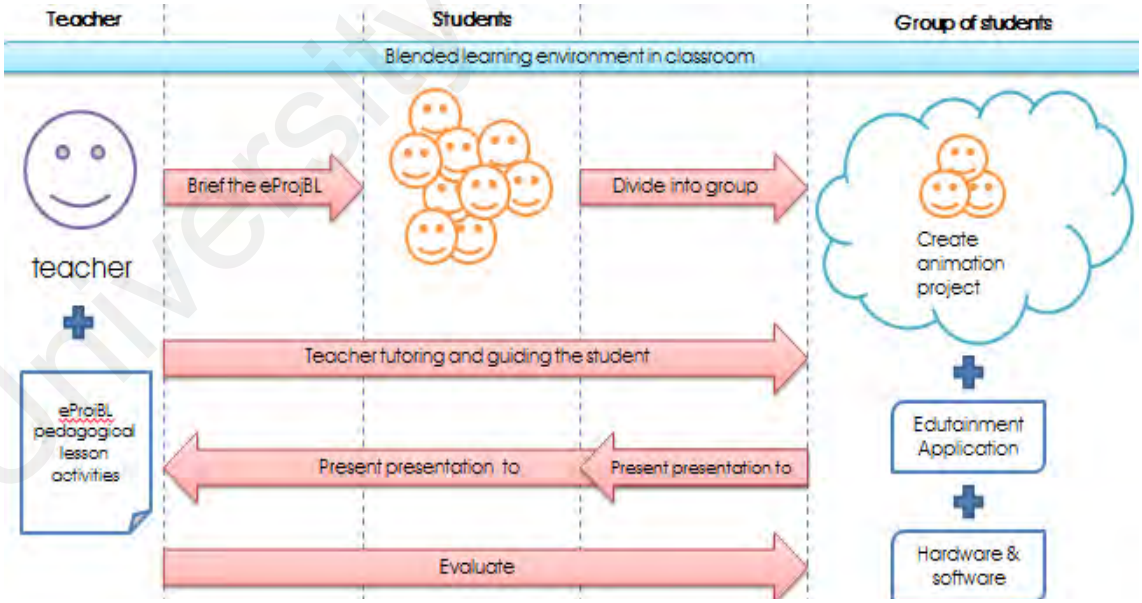


Figure 4.4: Modified Framework of eProjBL Pedagogical Model (Yusof & Song, 2010)

In the inclusive classroom where the study was conducted, the prime learners were paired together with special needs learners to complete the task given according to the component of the eProjBL content as given in Table 4.3 (Please refer Appendix G)

Furthermore, the Know-Learn-Use (KLU) strategy was applied when developing the edutainment content in this pedagogical model. The KLU strategy was suggested to maintain the learner's level of competence in the Zone of Proximal Development (ZPD) when the level of challenge increased (It was discussed further in the CHAPTER 3, please refer Figure 3.5). The pedagogical model is expected to not only benefit the learners but also the teachers to use technologies in their teaching and learning.

Table 4.3: Components of eProjBL Content

Day	Theme	Task	Edutainment Approaches	Strategies Stage
Day1	INDUCTION / INTRODUCTION	Search and collect information	Augmented reality	KNOW
Day2	LESSON DEVELOPMENT	Step 1: exploring and internalising the concept Step 2: exploring and building schema of the concept	Virtual Game-based	LEARN
Day3	LESSON ASSESSMENT	Assessing understanding	Game-based	LEARN
Day4	GROUP PROJECT	Synthesizing – creating with technology	Animation project	USE
Day5	PRESENTATION/ EVALUATION	Synthesizing and externalising the concept		USE

Table 4.3 shows the arrangement components of eProjBL with KLU strategies within one week lesson period. Each level of strategies consists of different edutainment approaches based on availability and relevancy. Each edutainment approach can support as a scaffold to maintain the ZPD of eProjBL (Please refer to Figure 3.5).

4.4.3 Edutainment Application Development

The alternative pedagogical was proposed to integrate the edutainment element as tools to maintain the learners' engagement especially in the inclusive classroom. In the preliminary study, the criteria of the design principles were identified by choosing the lack of attention symptoms as a benchmark to design the edutainment applications. There are four elements of edutainment applied to gain the special needs learners' attention and engage them in the learning of the selected science concept – the water cycle (Please refer Appendix G). The edutainment elements are now further discussed.

4.4.3.1 Augmented Reality

The augmented reality (AR) was adapted in the beginning of the lesson to help the learners recognize the elements of water. The teacher needed to follow the procedure from the lesson plan. The learners were given the four different flash cards called markers (Please refer Figure 4.5). The computer detected the marker and translates it into a three dimensional object (3D). The object then appeared on the screen monitor. The equipment needed were a computer, a web-cam and an AR program using Flash.

Figure 4.5: The Flash Card Marker for Augmented Reality

The learners explored by themselves after the teacher gave the instruction on how to operate and execute the assignment. The learners knew that there are three different forms of water and the learners drew the picture of these three forms of water in the worksheet (Please refer Appendix G).

4.4.3.2 Virtual Game-based

Using the technology of Kinect (motion camera), the learners also explored the virtual environment using their body gestures to move around. The benefit of this technology is to help the special needs learners identify their positioning of their body-part. While they were waiting for their turn to use Kinect, the teacher gave them a worksheet to fill up the name of each water form they observed on the screen projector. The equipment included a set of Kinect (motion camera), a projector, a screen projector and a computer as the controller (Figure 4.6).

Figure 4.6: The Virtual game-based learning activity using the Kinect

4.4.3.3 Game-based

The teachers explored the online game which is related to the topic of water cycle and instruct the learners to play with it. While there were playing, the teacher distributed a worksheet (Appendix G: (Activity Work Sheets: D1A2 Worksheet)) to complete a water cycle model by drawing links to connect the three water forms.

Figure 4.7: The Drag n Drop Game using FLASH

4.4.3.4 Animation Project

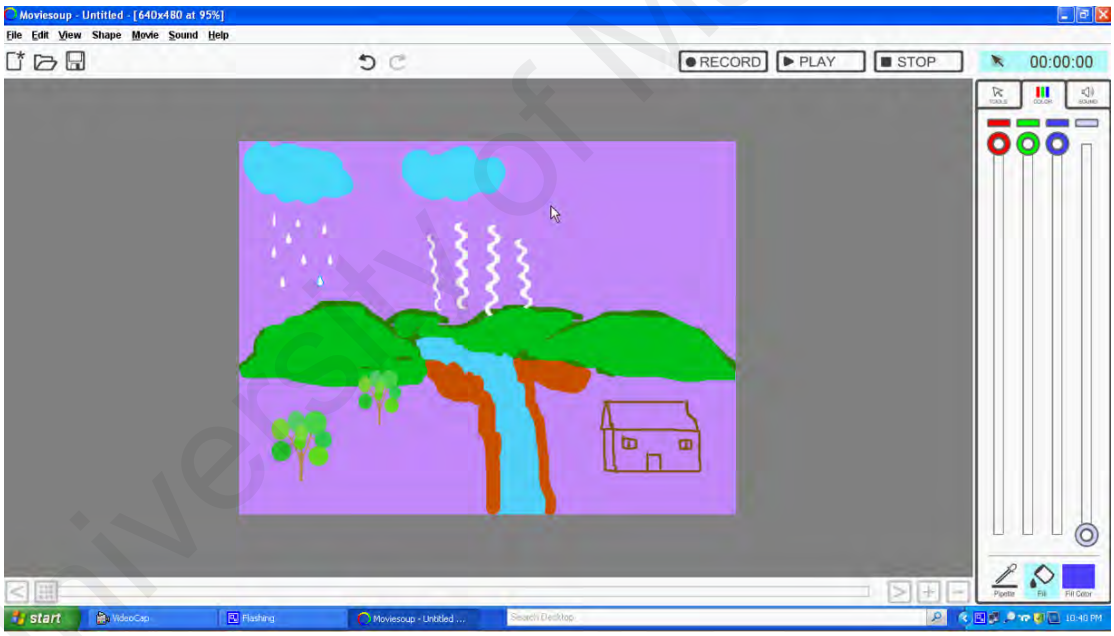


Figure 4.8: Create Water Cycle Model Using Animation Tool

The animation project activity was created to allow the learners to use the online animation tool to build the water cycle model and animate it. In the end, the learners presented their project in the classroom among their peers.

4.5 Phase 3: The Iterative Cycles of Testing and Refinement of Solution of Practice

In this phase, the pilot testing was conducted to validate the instrument and the reliability. Before the pilot session began, the teachers were given a pre-study workshop to help them to understand the process of teaching and learning using the eProjBL pedagogical model (Please refer Appendix H). The pilot study included the suggested intervention. Then, the feedback from the pilot study was recorded carefully. The details of the pilot study are given below:

1. Participation: number of learners (n=12) consisting six prime learners and six special needs learners. The number of learners was identified according to ratio of teacher and special needs learners (1:6) based upon Malaysia's Special Education)
2. Procedure: Content and technologies application
3. Data Collection Technique: observation, semi-structure interviews, field notes, engagement form and evaluation form.
4. Refinement: Procedures and instrument methods

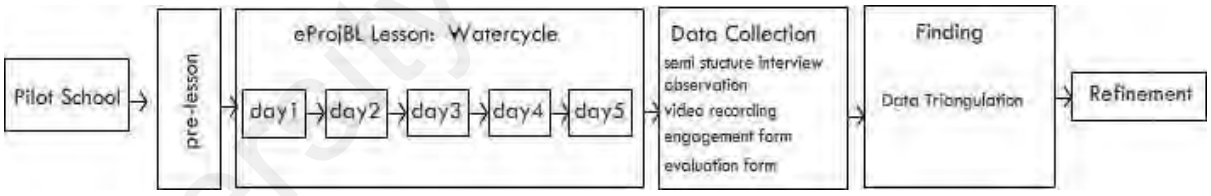


Figure 4.9: The Pilot Testing Procedure

The implementation of the intervention and modification that followed upon the procedures, data collecting techniques and the preparing of the actual testing were:

1. School: three schools (two rural schools and one urban school)
2. Participation: number of learners (n=12) consisting six prime learners and six special needs learners. Ratio of teacher and learners suggested by MOE was 1: 6.
3. Procedure: Content and technologies implication in the Inclusive Programme set-up.
4. Data Collection Technique: observation, pre-post open-ended questions, field notes, engagement form and evaluation form.

5. Data Analysis: Qualitative, quantitative descriptive analysis, triangulation data and triangulation method.

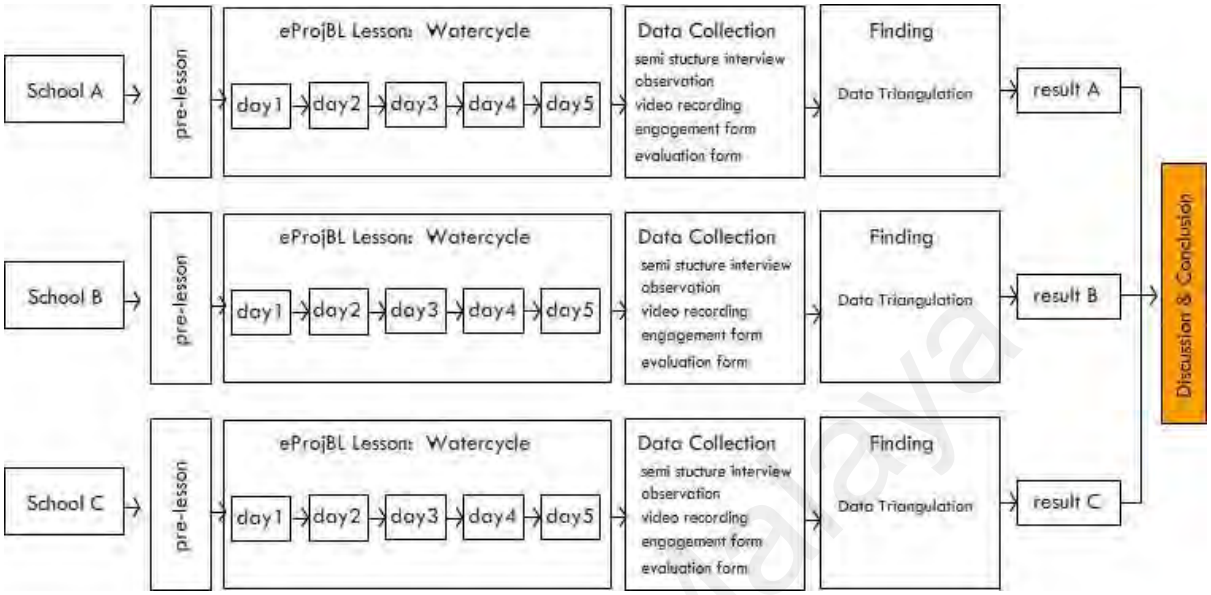


Figure 4.10: The Actual Testing Procedure

4.5.1 Research of Actual Testing Procedure

The procedure of data collection in this design-based research was in phase three. In this phase, three different schools were involved to compare and to triangulate the data for the proposed alternative pedagogical model.

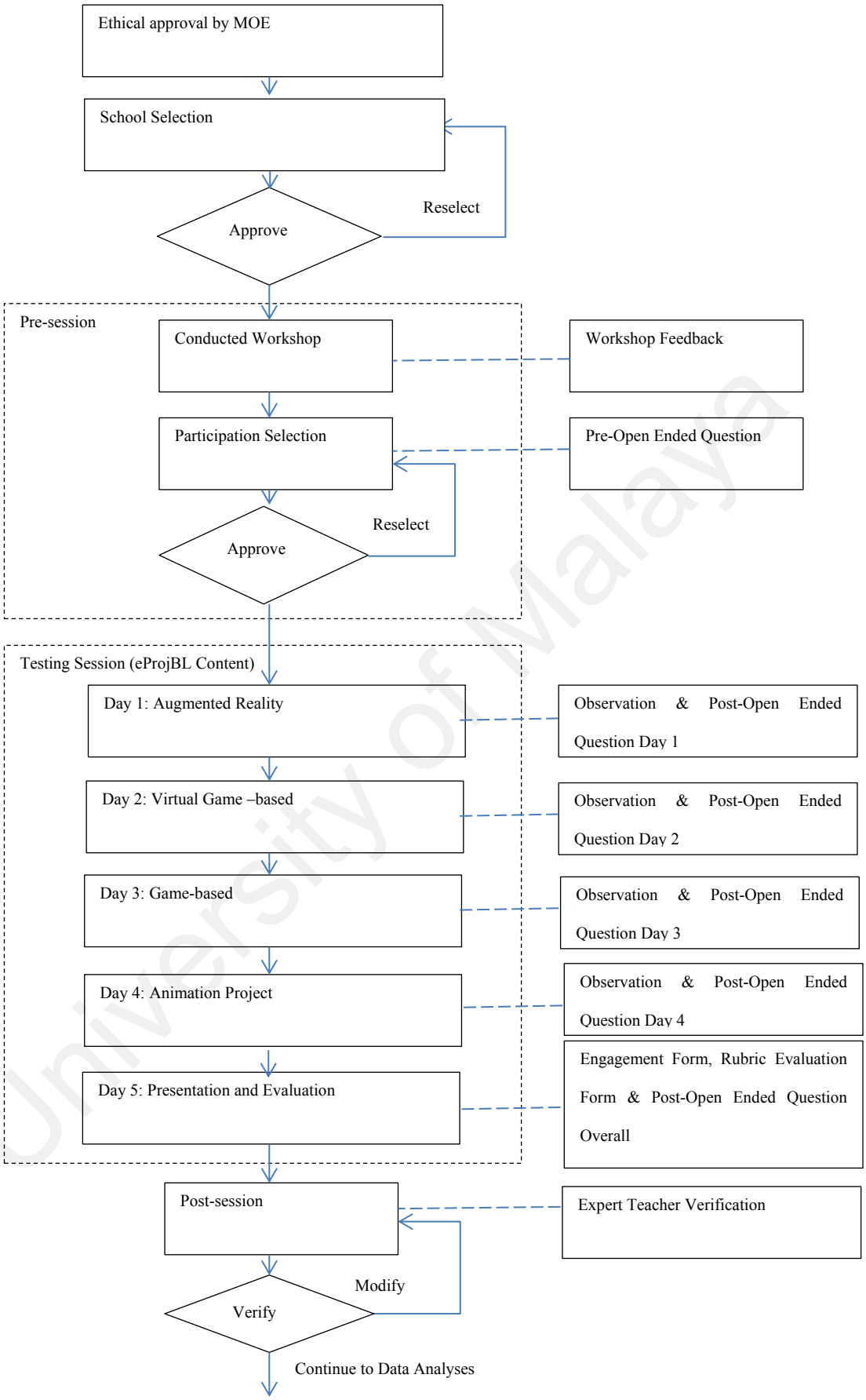


Figure 4.11: The Workflow Procedure of Module Testing for Each School

The chart above (Figure 4.11) shows the procedure in the single school for data collection. In each school, the researcher conducted a pre-session workshop with the teachers. The workshop was conducted to brief the teachers about the alternative pedagogical model and the eProjBL content to be implemented in the classroom during the testing session. Moreover, the participants were given the consent letter for ethical purposes before they participate in the actual testing session. This briefing and workshop session for the teachers was carried out one or two weeks before the actual testing (actual study).

The actual testing for the proposed alternative proposed model was conducted during the five school days of the week. In each school the study involved 12 or 13 students (special needs learners and prime learners) combined in classroom and two teachers. Each student was provided a computer in the laboratory. Four different edutainment sessions were implemented in the actual testing session. At the end of each lesson the open-ended question completed by the learners was collected. Furthermore, at the end of the last lesson, the learners needed to do a presentation. The teachers evaluated by completing in the engagement form with the help of the rubrics. The engagement form is to measure teachers' perception on the learners' capabilities. Moreover, it also measures feedback on teaching and learning using the eProjBL pedagogical model. The data from the video recorder, screen capturing tool and pictures were also used as the evidence to triangulate the data. All these data were verified by the teachers.

4.5.2 Data Collection Instruments

An overview of the data collection is described in the research design section discussed above. The study combined several methods of data collection for data triangulation for reliable results. The open-ended questions obtained from the pre-sessions and post sessions were collected to obtain teachers' perceptions; the

Engagement Survey Form to obtain teachers' observations related to learners' engagement and task performance based on prepared rubrics. The validity and reliability was tested through the pilot study as shown below.

Table 4.4: The Validity and Reliability of Instrument

Instrument	Validity	Reliability
Engagement Survey form (Please refer to Appendix F)	Reviewed by experts (Please refer to Table 4.2)	• Adaption from Kember and Leung (2009); Yusof & Song (2010) • Reviewed by experienced Teachers • Approval from experts • Cronbach Alpha
Rubric Evaluation Form (Please refer to Appendix E)	Reviewed by experts (Please refer to Table 4.2)	• Adaption from 4Teacher.org (2008); Yusof & Song (2010) • Reviewed by experienced Teachers • Cronbach Alpha
Pre-Post Open-ended Questions (Please refer to Appendix D)	Reviewed by experts (Please refer to Table 4.2)	• Approval from experts

4.5.2.1 Engagement Survey Form

According to Kember and Leung (2009), the learner's experience become the focus elements in a learning environment. The purpose of the engagement survey form was to identify the teachers' perspectives of the learners' capabilities and learning environment in the classroom. In the study, the engagement form was distributed among teachers who were chosen as observers (not a person who teaches in the inclusive classroom) for each selected school during the testing session. The observer has to capture and describe the engagement from their observations in the inclusive classroom from the testing session.

> *"Learning environment refers to the social, psychological and pedagogical contexts in which learning occurs and which affect student (learner) achievement and attitudes."(Fraser, 1998, p. 3)*

The engagement survey form (please refer to Appendix F) was modified and tested for its validity and reliability prior to its use in the actual study. For example, (please refer Table 4.5), the statements were adapted and modified before it was piloted.

Table 4.5: Example of Engagement Survey Form Item Modification

Original Item from Kember and Leung (2009, p. 27)	Modified and Validated by Teacher
I have developed my ability to make judgements about alternative perspectives.	The student has developed his/her ability to make judgments about alternative perspectives.

The scale one to five in the engagement survey form was prepared to identify and measure the criteria as below:

Table 4.6: Criteria of Scale for Engagement Survey Form

Scale	Criteria
1	Strongly Disagree
2	Disagree
3	only to be Used if a Definite Answer is not Possible
4	Agree
5	Strongly Agree

Table 4.7 shows the criteria of engagement for learners' capability and learners' learning environment for the inclusive classroom. The criteria put forward by Kember and Leung (2009) was adapted to the present study to capture the evidance related to learner's engagement.

Table 4.7: Criteria of Engagement based on Kember and Leung (2009)

Learner's Capability	Learning Environment
• Critical thinking • Creative thinking • Self-managed learning • Adaptability • Problem solving • Communication skills • Interpersonal skills and group work • Computer literacy	• Active learning • Teaching for understanding • Feedback to assist learning • Assessment • Relationship between teachers and students • Workload • Relationship with other students • Cooperative learning • Coherence of curriculum

4.5.2.2 Rubric Evaluation Form

In the study, the teachers used the rubric evaluation form (Appendix E, page 202) to evaluate the learners' performance when the learners executed the tasks given. The rubric evaluation form was adapted from 4Teacher.org (2008). It is a website that provides sample evaluation of project-based learning activities. Then, the validation of the rubric evaluation form was done in the pilot session and reliability was determined. The rubric helped to capture the learner's performance while they executed their project or task (ETD, 2006; Hussain et al., 2009; Jurica, 2005; Kurzel & Rath, 2007; Stager, 2012; Sun Associates, 2003). Teachers also wrote their marks formatively during the whole session. The criteria of the rubric evaluation form are shown in Appendix E.

4.5.2.3 Pre-Post Open ended Question

The purpose of the pre-open ended questions is to gather the information regarding the teachers' background prior-knowledge. The open ended question in the post session was used to collect teachers' feedback related to the eProjBL pedagogical model after they experienced the teaching-learning process in the testing session (Please refer to

Appendix D). The questions were created based on the preliminary study to collect evidence to align the 3C key enablers to the eProjBL pedagogical model during testing and implementation. For example,

Table 4.8: Pre Open ended Question Validation by Expert

Questions created based on the 3C key enabler	**Validated by teachers during pilot testing**
What is the teaching and learning you used in the classroom?	What is the teaching method you used in the classroom?

The purpose of the study was to elicit the feedback from both teachers and learners on the alternative pedagogical model which was utilised. The open-ended questions were prepared to get individual feedback from both teachers and learners. A pre-open-ended question form was distributed to collect the evidence on teachers' prior knowledge (Appendix D Open-ended Question - teacher) before they became involved in the testing session. Then, on each day, the post-open ended question form was given to capture their perceptions on the effectiveness on edutainment elements. At the end of the session an open ended question form (Appendix D Open-ended Question - teacher) was also distributed to the learners to elicit feedback. As a whole, the feedback was evidence for the whole process of teaching and learning in the inclusive classroom for the present study.

4.5.2.4 Observation

The learner's concentration and engagement were observed based upon the task given by teacher. The field notes on each school and teacher also added to the understanding of the overall scenario in the school and the classroom during the actual testing for further discussion. The screen captures were records of evidence to triangulate the learners' engagement. (Figure 4.6) shows a sample of a screen capture

that has recorded the learner activities in a computer monitor. Moreover, the web-cam was also used to capture the learners' movements during the session.

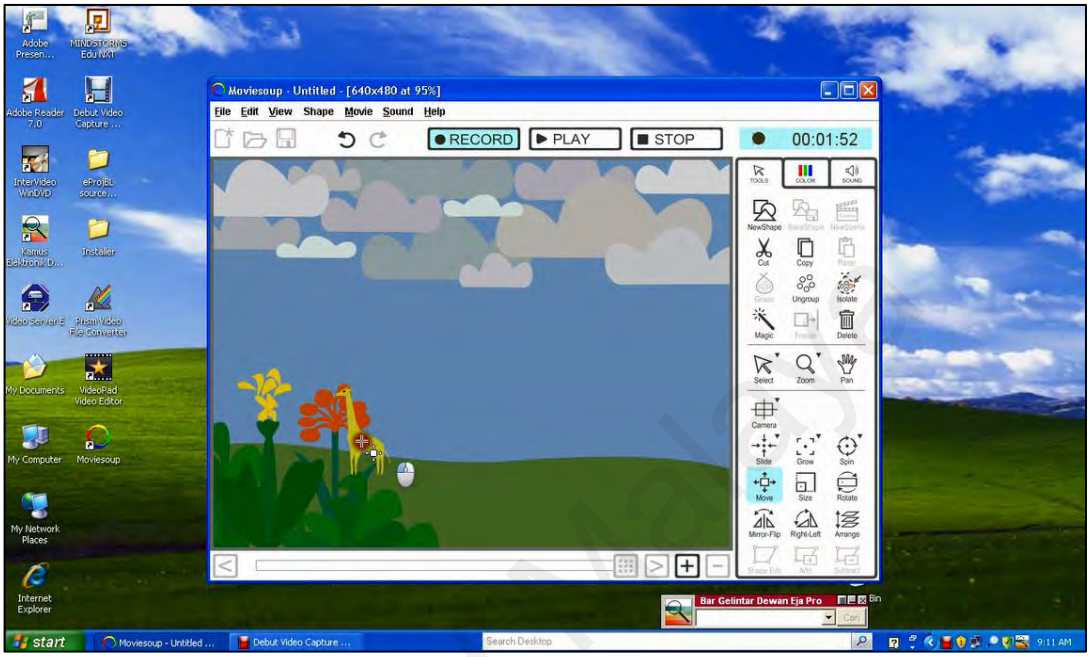


Figure 4.12: Sample of Screen Capture by Debut Video Capture Application

According to Figure 4.14, the visualization of triangulation data was identified. The study is highlighted three selected instruments have been validate through the pilot study and the refinement has been made.

4.5.3 Participant Selection

The procedure to identify and select the sample started in the first phase of the study. During the Document and Literature Review phase, it was evident that Malaysian National Education basically had two types of school namely rural and urban school.

The sampling was purposive sampling. Purposive sampling is the selection of learners according to certain criteria such as 1) primary school 2) type of learners (high function or low function) 3) basic knowledge of the teacher. The selected schools and the number of learner subjects were selected after the permission from the schools were obtained (please refer to section 6.5 Ethical Issues). Many schools were approached but did not successfully obtain permission. Each school had to have at least one learner with

ADHD identified which diagnosed (supported by a medical report). The other special needs learners have to be diagnosed by the teacher specialists who teach them. Then the prime learners were selected. All selected learners were required to have a fundamental knowledge on computer literacy because the scope of this study focused on the 'Inclusive Program' which was one of three major programmes conducted by the Ministry of Education. The rationale of these selection criteria was because the cohort of selected learners was refered by Hobart (2014) and Turner (2013) as Gen-Z (Generation Z). The charcteristic of Generation Z was "…describes this generation of youth, who were born from the mid-90's to the present, as being native speakers to the digital language of the internet, computers, video games, and multimedia platforms" (p.30). The learners have the capabilities to experience the usage of ICT facilities since the internet had been introduced.

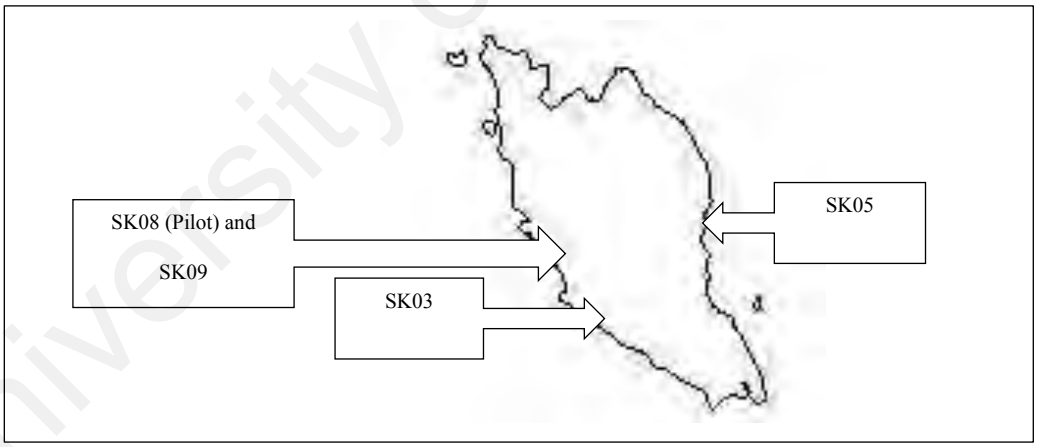


Figure 4.13 : Geographic of Selected Schools for Testing Session in Peninsular of Malaysia

In each of the selected schools involved in the actual study, one class was specially formed into an inclusive classroom called a testing class. Each testing class had equal number of prime learners and special needs learners with at least two teachers as is required by the MOE standards (Table 4.2). The collaboration between both special

needs learners and the prime learners in the testing session helped to answer the research questions on the eProBL pedagogical model.

Table 4.9: List of Learners Who Participated in the Testing Session in the Pilot School

Code #	Gender	Age	Type of Learner
SK08-S1	female	11	Prime
SK08-S2	male	11	Prime
SK08-S3	female	11	Prime
SK08-S4	female	11	Prime
SK08-S5	male	11	Prime
SK08-S6	female	11	Prime
SK08-S7	male	12	Special (Dyslexia)
SK08-S8	male	8	Special (ADHD)
SK08-S9	female	12	Special (Dyslexia)
SK08-S10	male	13	Special (Autism)
SK08-S11	male	13	Special (Autism)
SK08-S12	female	14	Special (Dyslexia)

Table 4.10: List of Learners Who Participated in the Testing Session in the Actual Study Schools

Code #	Gender	Age	Type of Learner
SK05-S1	Female	11	Prime
SK05-S2	Male	11	Prime
SK05-S3	Male	11	Prime
SK05-S4	Female	11	Prime
SK05-S5	Female	11	Prime
SK05-S6	Male	11	Prime
SK05-S7	Male	8	Other
SK05-S8	Male	10	Other
SK05-S9	Male	9	ADHD
SK05-S10	Female	15	Slow
SK05-S11	Male	11	Other
SK05-S12	Male	14	Dyslexia

Code #	Gender	Age	Type of Learner
SK05-S13	Male	12	ADHD
SK03-S1	Male	11	Prime
SK03-S2	Male	11	Prime
SK03-S3	Male	11	Prime Learner
SK03-S4	Female	11	Prime Learner
SK03-S5	Female	11	Prime Learner
SK03-S6	Female	11	Prime Learner
SK03-S7	Male	12	ADHD Learner
SK03-S8	Male	13	Autism Learner
SK03-S9	Male	13	Slow Learner
SK03-S10	Male	13	Slow Learner
SK03-S11	Male	13	Slow Learner
SK03-S12	Male	12	Slow Learner
SK03-S13	Male	13	Slow Learner
SK09-S1	Male	10	Prime Learner
SK09-S2	Female	10	Prime Learner
SK09-S3	Female	10	Prime Learner
SK09-S4	Female	10	Prime Learner
SK09-S5	Female	10	Prime Learner
SK09-S6	Female	10	Prime Learner
SK09-S7	Female	9	ADHD Learner
SK09-S8	Female	9	Autism Learner
SK09-S9	Male	12	Slow Learner
SK09-S10	Male	8	Slow Learner
SK09-S11	Male	9	Other
SK09-S12	Male	10	Slow Learner

4.5.4 Hardware and Software

Both hardware materials or equipment and software were needed to operate the testing of the eProjBL pedagogical model in the actual classroom. Therefore, the list of equipment can be the guideline or checklist for the organisation of the eProjBL pedagogical model (sees Appendix G).

4.5.4.1 Hardware

The hardware required for the blended learning in the classroom were mini notebooks, wireless router, switch, network cable, and LCD Projector (Liquid Crystal Display). The classroom environment in each of the selected three schools was 'transformed' to support the communication tools and web-based information enabler factor called Connect, for the application of blended learning environment in the school computer laboratory. The arrangement of the school laboratory was organised by the researcher and the school technician (Please refer Appendix G). The facilities became the tools which helped the learners to in the lessons to solve their tasks. The changed learning environment was to encourage the learners as well as to enhance the confidence of the teachers and the learners in relation to the technologies.

4.5.4.2 Software

In the classroom, the learners were required to design, create and present the animation project. The learners collaborated and used the edutainment application to construct their understanding of the concept being learnt. Therefore, they needed to have the appropriate software that can support their activities. The list of common software involved is listed below:

1. Online animation tool (Movie Soup-http://www.fluxtime.com/fto.php)
2. Microsoft Office 2007
3. Browser (e.g. IE, Firefox)
4. Social Network Site

4.6 Phase 4: Reflection to Refine Design Principle and Enhance Solution Implementation.

In the last phase, analysis was conducted to refine the design principle of the eProjBL pedagogical model. The data from the three schools were triangulated within each school as well as between the three schools to conclude the overall findings. According to Bryman (2004) "…triangulation becomes a device for enhancing the credibility and persuasiveness of a research account" (p.4). The three main data sources were collected from the engagement forms from teachers who played the role as observers, teachers' evaluation rubrics from teachers who teach in the inclusive classroom and open-ended questions from teachers who answered the questions at the end of each session (please refer to Figure 4.14).

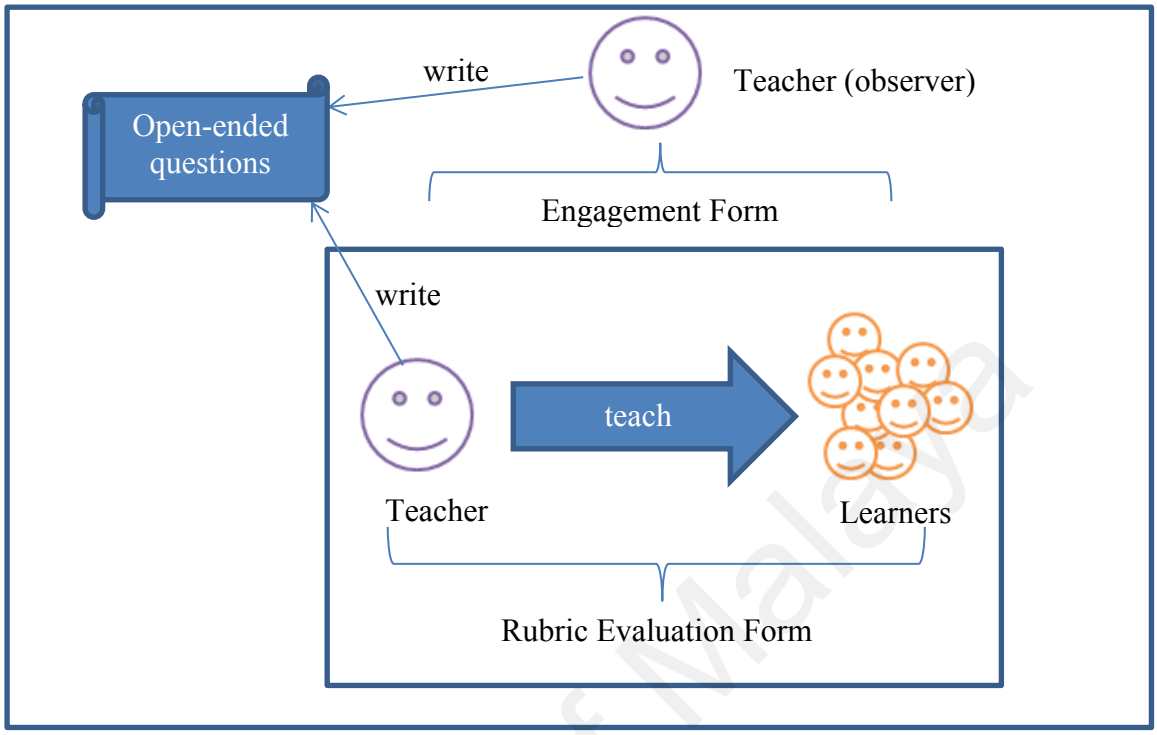


Figure 4.14: Visualization of Data Triangulation

Table 4.11, indicates the predetermined domains, themes and sub themes from literature review identified in the preliminary phase, used in the data analysis of the present study of special needs learners in the inclusive classroom.

The study used data triangulation and visualisation diagrams (please refer to Appendix L) to analyse data from learner's engagement form which consist of two major themes such as learner's capabilities and learning environment. The evaluation data using rubric evaluation forms was collected to capture the learners' performance in the classroom according to the teachers' perspective. The analysis was simple descriptive quantitative analysis. Nevertheless, qualitative analysis was carried out on the video recordings, screen captures, informal conversations and pre-post questions. Overall, the data from the various sources were analysed descriptively and triangulated.

Table 4.11: Variables and Criteria of Data Analysis

Domain	Theme	Sub-Theme
Learners' Engagement	Learner's Capabilities	Critical thinking Creative thinking Self-managed learning Adaptability Problem Solving Communication skills Interpersonal skills and group work Computer literacy
	Learning Environment	Active learning Teaching for understanding Feedback to assist learning Assessment Relationship between teachers and students Workload Relationship with other students Cooperative learning Coherence of curriculum
Learners' Performance	Character	Time Management Problem Solving Attitude Focus on the task Preparedness Pride
	Teamwork	Workload Contributions Monitors Group Effectiveness Working with Others
	Artefact	Sources Attractiveness Requirements Content Organization Oral Presentation Quality of Work
	Presentation	Pitch Comprehension Enthusiasm Props Stay on Topic Posture and Eye Contact Volume

4.6.1.1 Analysis of Teachers' Feedback

The analysis of teacher feedback was based on the pre and post open ended questions, interviews among teachers and informal communications. The qualitative analysis was to capture the themes. The process of teachers' feedback continued until the final theme was verified by the teachers during the iterative cycles of testing. In the preliminary study, the set of questions was prepared to capture the learners' capabilities in terms of motivation, creativity, computer literacy and problem solving skills. All these skills are aligned with the handbook of project based learning by ETD (2006) and the scope of the present study.

4.6.1.2 Analysis of Learners' Engagement Domain

The themes of learners' engagement had been identified from the preliminary study which was highlighted by Kember and Leung (2009). Moreover, the themes were verified by teachers who were involved in the preliminary study. The analysis was simple descriptive quantitative analysis (please refer to Figure 4.15). In Step Four of the simple descriptive analysis, the SPSS application was used to evaluate data from learners' engagement domain according to the mean value on each sub-theme. For example, (please refer Table 4.12), there are two statements (code C1 and C2) on critical thinking that were triangulated to capture the mean value of critical thinking among special needs learners and prime learners. The mean value of critical thinking on overall learners was also collected. In the discussion, the overall mean and means for each statement is discussed further.

Table 4.12: List of Sub-Theme Engagement for Learner's Capabilities

Code#	Capabilities	Statement
C1	Critical thinking	1. The student has developed his/her ability to make judgments about alternative perspectives.
C2	Critical thinking	2. The student becomes more willing to consider different points of view.
C3	Creative thinking	3. The student has been encouraged to use their own initiative.
C4	Creative thinking	4. The student has been challenged to come up with new ideas.
C5	Self-managed learning	5. The student feels that he/she can take responsibility for their own learning. .
C6	Self-managed learning	6. The student has become more confident of their own ability to pursue further learning.
C7	Adaptability	7. During their time at previous class, the student has learnt how to be more adaptable.
C8	Adaptability	8. The student has become more willing to change their views and accept new ideas.
C9	Problem solving	9. The student has improved their own ability to use knowledge to solve problems in their field of study
C10	Problem solving	10. The student able to bring information and different ideas together to solve problems.
C11	Communication skills	11. The student has developed their ability to communicate effectively with member's group. .
C12	Communication skills	12. In their time at previous class, the student has improved their ability to convey ideas.
C13	Interpersonal skills and group work	13. The student has learnt to become an effective team or group member.
C14	Interpersonal skills and group work	14. The student feels confident in dealing with a wide range of people.
C15	Computer literacy	15. The student feels confident in using computer applications when necessary.
C16	Computer literacy	16. The student has learnt more about using computers for presenting information.

There are two themes that were covered in the learners' engagement domain such as learners' capabilities (Please refer to Table 4.12) and learning environment (Please refer to Table 4.13). Furthermore, the data were analysed according to the themes and sub-themes.

Table 4.13: List of Sub-Themes Engagement for Learning Environment

Code#	Learning Environment	Statement
T1	Active learning	17. The student wants a variety of teaching methods.
T2	Active learning	18. Students are given the chance to participate in classes.
T3	Teaching for understanding	19. The teacher tries hard to help the student understand the course material.
T4	Teaching for understanding	20. The lesson plan helps students understand the content.
T5	Feedback to assist learning	21. When the student has difficulty with learning materials, they find the explanation provided by the teacher is useful.
T6	Feedback to assist learning	22. There is sufficient feedback on activities and assignments to ensure that the student learn from the work they do.
T7	Assessment	23. Class uses a variety of assessment methods.
T8	Assessment	24. To do well in assessment in this class the student need to have good analytical skills.
T9	Assessment	25. The assessment tested their understanding of key concepts in this class.
T10	Relationship between teachers and students	26. The communication between teacher and students is good.
T11	Relationship between teachers and students	27. The student finds teacher helpful when asked questions.
T12	Workload	28. The student manages to complete the requirements of the class activity without feeling unduly stressed.
T13	Workload	29. The amount of work there are expected to do is quite reasonable.
T14	Relationship with other students	30. The student feels a strong sense of belonging to their class group.
T15	Relationship with other students	31. The student frequently works together with others in their classes.
T16	Cooperative learning	32. The student has frequently discussed ideas from activities with other student out-of-class.
T17	Cooperative learning	33. The student has found that discussing course material with other students outside class has helped them to reach a better understanding of the material.
T18	Coherence of curriculum	34. The student can see how activities fitted together with their subject.
T19	Coherence of curriculum	35. The subject of study for their major was well integrated.

Based on Figure 4.15, the analytical steps were developed according to Kember and Leung (2009) which covered the combination of items as countable value by utilising the mean value. Descriptive quantitative analysis is the appropriate method to justify the value of mean which could be discussed further to answer the research questions. The rational of the implemented descriptive analysis was to quantify the feedback according the teachers observation in the blended inclusive classroom. Moreover, the data was also triangulated with the observation data such as video recording, 'monitor screen' recording and images for the discussion.

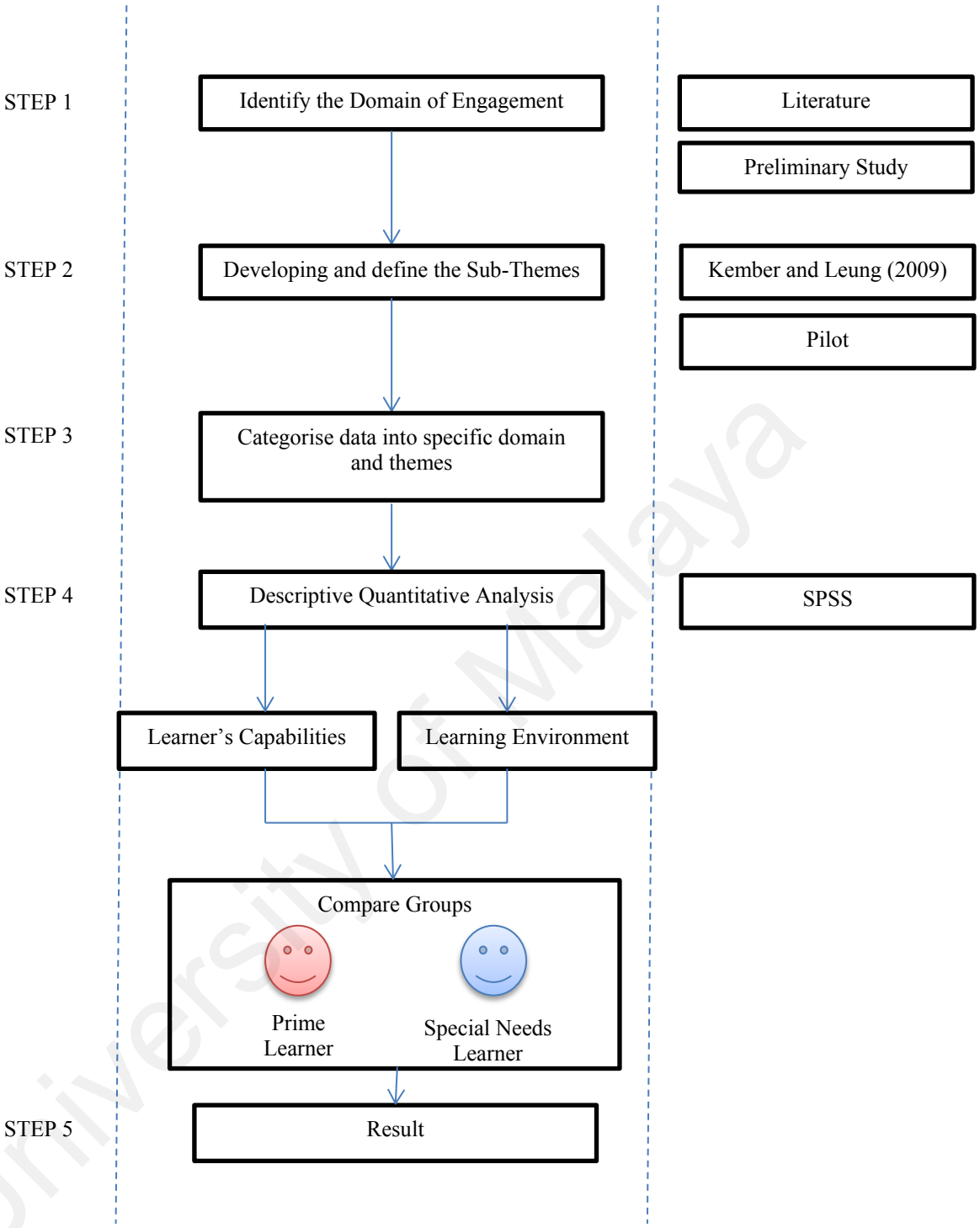


Figure 4.15: Steps of Analysis for Learner's Engagement

4.6.1.3 Analysis of Domain Learners' Performance

The rationale of analysing the learners' performance was to identify the learners' capabilities. Moreover, the analysis could explain how the eProjBL content integrates with the themes such as character, teamwork, artefact and presentation. The individual performance data was collected to understand the pattern of learners' performance for both the special needs learners and prime learners in the inclusive classroom. Therefore, their marks were compared and the details on each theme were discussed further in Chapter 5. The score for each sub-theme was collected and compared with both groups (Please refer to Figure 4.16).

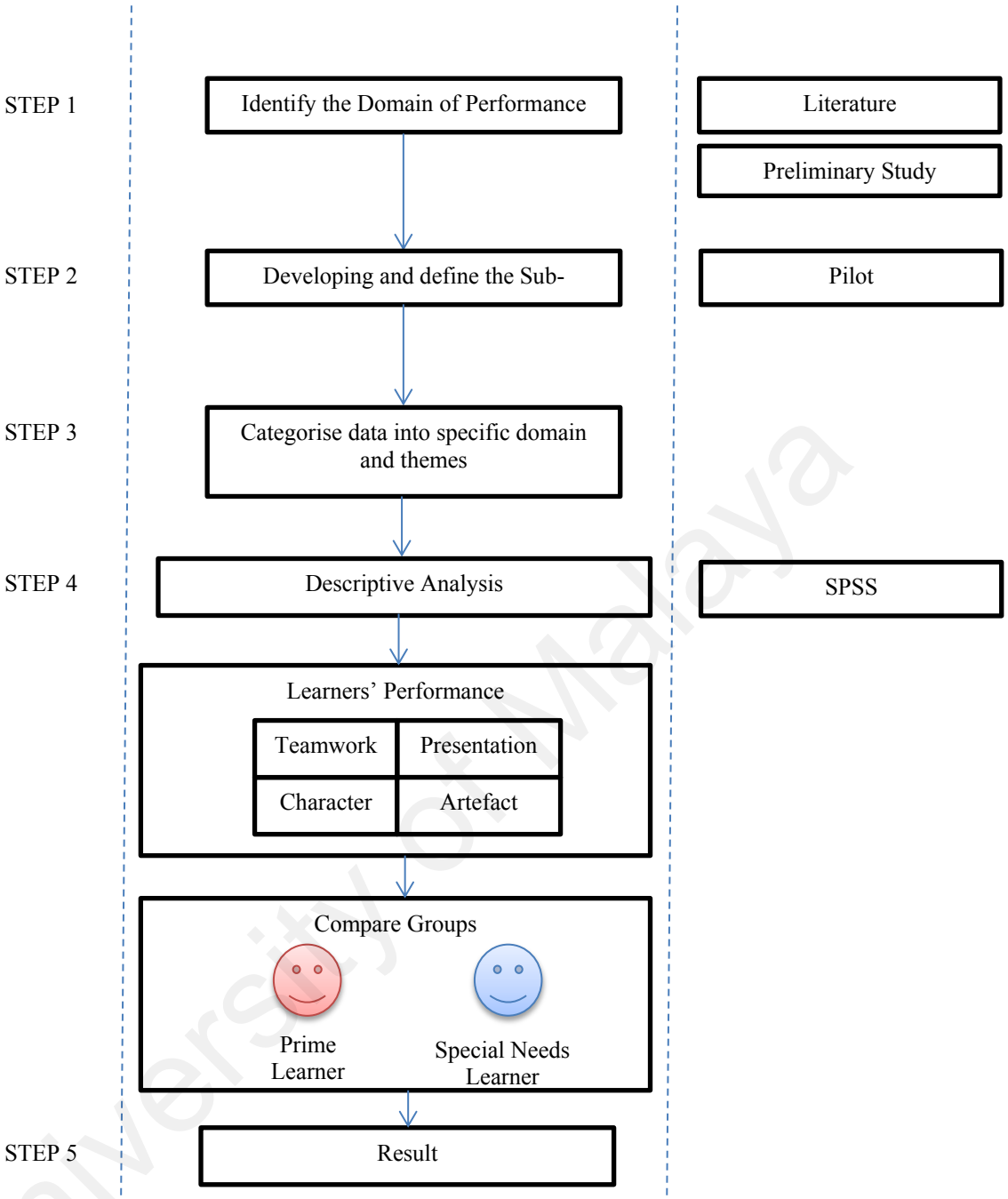


Figure 4.16: Steps of Analysis for Learner's Performance

4.7 Summary of the Chapter

Chapter Four covered the research methodology applied in the study. The literature review in Chapter Two was conducted to identify relevant analytical approaches for this study. There were four phases to this study with data collected from multiple instruments. The data analysis was overall a quantitative descriptive approach combined with complementary qualitative data. Finally, the hardware and software were also highlighted.

CHAPTER 5: FINDINGS AND DISCUSSION

5.1 Overview of Chapter

Chapter Five consists of the overview of the findings and the discussion of the present study which was conducted in three primary schools. Two were rural school and one urban school in Malaysia. The selected schools were chosen by purposive sampling. Several data collection techniques were used to collect data namely, informal conversations and interviews, pre-post open-ended questions for teachers, post-questions for learners, observations, engagement forms and evaluation rubrics. There were four phases to this design-based study starting with information gathering and identifying the problems. Then, the conceptual framework of study was constructed which included the edutainment technologies and design principles that was adapted in the study. The theoretical framework also was identified to explain the underpinning theory that was used to support the flow of the whole study. In this chapter the findings are discussed.

This study was conducted based on the eProjBL activities for the blended learning environment in the inclusive classroom which consist of special needs learners and prime learners. The study was to design the eProjBL pedagogical model using the edutainment applications and to investigate teachers' feedback as to how primary special learners react to the eProjBL pedagogical model using the edutainment elements in the inclusive classroom. The study also covered the learners' performance and learners' engagement with the eProjBL pedagogical model. Therefore, there were five research questions put forward for the study. This chapter discusses the results of the statistical and qualitative analysis of the data that have been collected.

5.2 General Issues

Before examining the research questions, there are some issues related on the 3C key enablers which were realized as the research was conducted. These issues are now discussed in turn.

5.2.1 Diagnosis issues

It was noted that the majority of learners were not diagnosed properly as the teachers complained that the learners were identified into categories which did not meet their symptoms. For example, a learner was classified as ADHD by the teacher because of his/her lack of attention. However, the learners were grouped into the category of "learning disabilities" or "slow learner" by the medical officer before the learner enters the special classroom or inclusive classroom in the first registration as a special needs learner (please refer to Appendix I on type of diagnosis form) . The teachers conducted their own diagnosis to categorise the learners into either as a high function or low function learners. The teacher categorises them based on the skills of reading, writing and arithmetic which are called 3M (*Membaca, Menulis, Mengira*). Finally, the high function learners who managed to reach the 3M joined the inclusive classroom. It is important that, in an inclusive classroom, every special needs learner has their own learning experience in order to "compete" with the prime learners when they enter the normal classroom. This issue is an important part of the 3C key enablers that affect the transformation of the inclusive classroom into a digital content environment (digital community) in special education.

5.2.2 Connection, Content, Confidence (3C) Key Enablers

Repeated responses by the participating teachers were related to the facilities which were provided for the special needs learner. Mostly, the facilities were provided for prime learners. However, most of the special needs learners were not able to utilise the computer lab equipment. Hence, the teachers used these computers for management purposes. The teachers had no confidence to allow the special needs learners to utilise the computers. Many a time this situation led to a decrease in the level of confidence to use ICT in their classroom. Hence, teachers preferred to use the conventional pedagogy that minimised the usage of ICT in their classroom. They also admitted that because the number of learners was too big, they could not focus more on helping the learners that needed more assistance in the classroom.

As stated earlier the three key enablers namely Connection, Content, Confidence (3C) as suggested by Ponter and Brown (2007) can be the basis to describe the scenario in Malaysia's Educational context. Therefore, the context of schools and teachers' prior knowledge would be the indicators whether the inclusive classroom is suitable to be implemented among special needs learners. In relation to this, the level of confidence could be one of the factors to ensure the learners' capabilities and learning environment could lead to positive outcome.

School A (SK05) is one of the rural school located in the east coast of Peninsula Malaysia which is in the state of Terengganu. In School A (SK05), data was collected from teachers before the study began. From teachers' feedback on their prior knowledge, they admitted their limitation of knowledge to utilize the ICT for teaching and learning. The teachers' verbatim answers below support this:

Teacher (SK05-T3): "Kemudahan terhad untuk pelajar pendidikan khas. (Facilities were limited for the learner of special education)".

Teacher (SK05-T4): "Tiada kemudahan dan tiada pengalaman" (no facilities and no experience)".

The teachers also explained the learning tools that they utilised in their classroom were provided by their school management. The content was the standard national curriculum which focuses upon three major learning objectives called 3M (membaca, menulis dan mengira – reading, writing and arithmetic). The statement below shows one of the teacher's feedback on teaching methods:

Teacher (SK05-T4):"Menggunakan bahan yang disediakan oleh pihak sekolah untuk pelajari 3M." (Using resources provided by the school to learn 3M)

In the context of School B (SK03), the school was also a rural school located in the southern part of peninsular of Malaysia (Malacca). The open-ended questions were distributed among teachers prior to the study. The results showed that the teachers have the ability to utilize the technology such as computer in their teaching approach. They explained:

Teacher (SK03-T2): "Menggunakan bahan bantu belajar, menggunakan flash card dan bahan maujud" (Using teaching helper tools, using flash card and existing sources)

Teacher (SK03-T3): Student oriented (School activities such as traditional dancing and singing)

Additionally, the teachers explained further that they were exploring and searching more content through the internet to find supporting resources for the learners.

Teacher (SK03-T2): "Melalui penggunaan komputer dan sumber internet untuk mengaitkan tajuk yang hendak diajar. Kebiasaanya saya akan menggunakan video dan 'PowerPoint' untuk menarik minat murid dan membuatkan suasana P&P lebih menarik" (Using of the computer and internet resources to relate topics to be taught. Normally I would use the video and 'PowerPoint' to attract learners and make the T & L environment more attractive).

In the context of School C (SK09), the open-ended questions were distributed among teachers in the Federal Territory of Putrajaya which was an urban school. The school was provided with good ICT facilities. The teachers shared their experiences integrating

ICT in their classroom. The teachers explained the usage of the PowerPoint application and video as their teaching tools.

Teacher (SK09-T2): "Penggunaan PowerPoint untuk tayangan cerita bergambar, audio untuk respon murid, nyanyian dan pergerakan." (Use of PowerPoint to show image story, learners' audio response, singing and movement.)

From these three schools, it was found that School A (SK05) had difficulty to utilize the blended inclusive class because the teachers had limited prior knowledge and experience in utilising ICT facilities in their classroom. Moreover, according to them, the lack of facilities in their school demotivated them to not use the ICT facilities. However, School B (SK03) and School C (SK09) shared the same type of experiences about utilization of ICT facilities in the classroom. The results are also supported by observations on the context of schools and the teacher's prior knowledge, Table 5.1 (page 114) shows the summary of comparison for these three schools mapped into the 3C key enablers (Content, Confidence, and Connection) enablers.

Table 5.1: Summary for the three different schools' context mapped into the 3C (Content, Confidence, Connection) enablers

SCHOOL	Content	Confidence	Connection
A	Conventional tool provided by school	Lack of experiences to utilize the ICT Facilities.	Lack of facilities for special needs learners
B	Teacher helper tools such as PowerPoint, video from the internet to support learning	Basic knowledge to utilize the ICT Facilities.	Lack of facilities for special needs learners
C	Using PowerPoint which provided by school	Limited experiences to utilize the ICT	Enough facilities for special needs learners

Although teachers' experiences varied in different teaching and learning environments, the majority of them showed interest to learn and experience the alternative pedagogical which they felt was beneficial to them. To substantiate this feedback was collected on the edutainment approach after each session.

The issues discussed above were the situation which faced the inclusive classroom at the start of the study. Next, the findings of the study in answer to the research questions will be discussed.

5.3 Demographic Characteristics of the Participants

The demographic data shows the criteria for both prime learners and special needs learners who were involved in the inclusive classroom investigation. The age of the participants were all below 12 years old and were chosen purposively by teachers from special education to test the eProjBL pedagogical model. During the selection of the participants, the teachers of special education in each school were involved in selecting only the high function special needs learners. The teachers were qualified to diagnose and select the special needs learners because they had experience in doing the formative observation. A total of 38 learners (18 prime learners and 20 special needs learners) from the three schools participated in the testing session of the eProjBL pedagogical model which involved 37% (N=24) male and 63% female (N=14) (Figure 5.1).

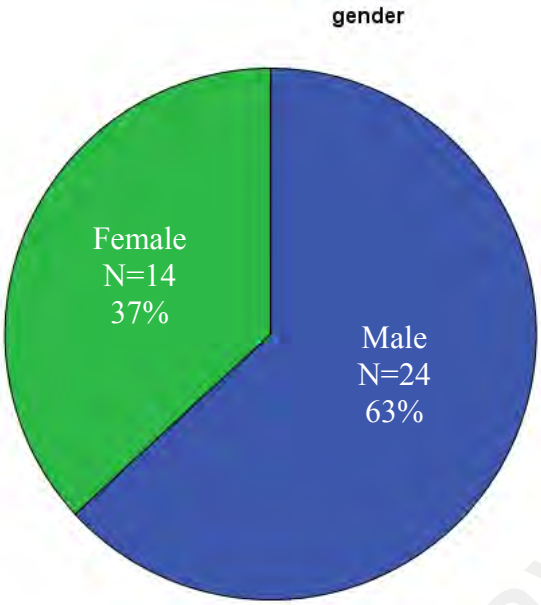


Figure 5.1: Frequency and Percentage of Gender of learners who involved the eProjBL Activities in Inclusive Classroom.

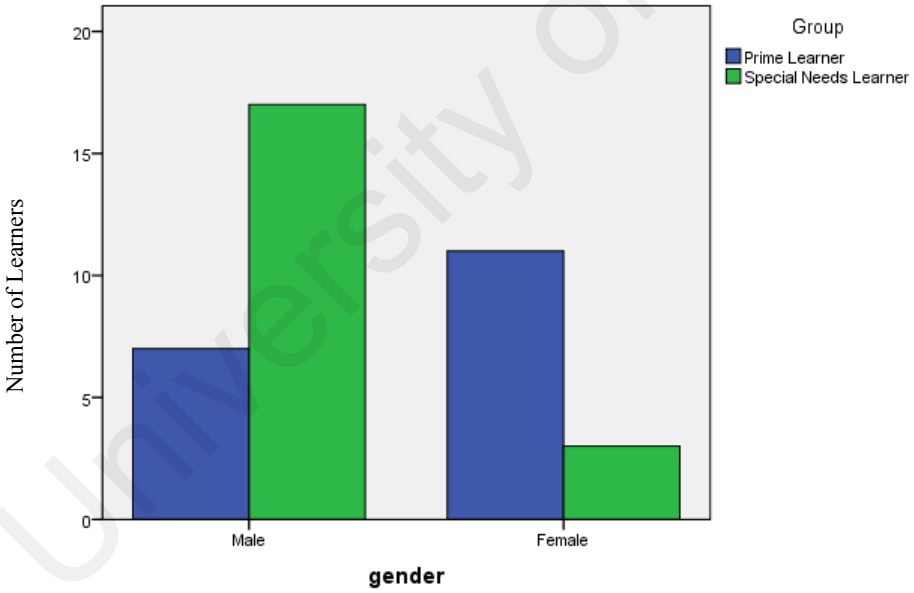


Figure 5.2: Demographic of Learners involved in the eProjBL Activities in the Inclusive Classroom.

Figure 5.2 was shows that the majority of the special needs learner participants were males compared to the prime learners where the majority of the selected learners were females. Most of the teachers explained that generally the gender proportion shown is

normal as the number of male special needs learners is higher than female special needs learners in schools.

5.4 Strengths and Weaknesses of the eProjBL Pedagogical Model

The first research question addressed the issue of design of the model investigated in the present study. A preliminary investigation to design the eProjBL pedagogical model through the literature and current technologies was conducted in the second phase of the design-based research stages (please refer to Figure 4.1). The problem on learner, content and interactivity (in the preliminary study) were identified through several informal conversations conducted with stakeholders such as teachers in special education in private and public schools (please refer to Appendix M). Moreover, the officers were also interviewed in various related sectors such as Department Special Education, Division of Education Technology, and Ministry of Education. This preliminary investigation explored the implementation process in special education conducted by the Ministry of Education. During the preliminary investigation, learner, content and interactivity factors were identified to be considered when designing the eProjBL pedagogical model lesson plans.

From the conversations with the various participants, three important factors emerged and were taken into account in the design of the proposed model.

(a) ***Time***

The duration of the lesson implemented was found suitable for use in an inclusive classroom. Moreover, it is important to ensure that the duration was enough to achieve the goal and objective of the lessons. Furthermore, if the time was systematically organized, the teacher can cover the syllabus adequately without any delay.

(b) ***Content***

Content is the important element which defines a lesson plan as suitable and can be implemented utilising the eProjBL pedagogical model. In the present research, in-depth discussions were conducted with sciences' teachers who had the experience in teaching science content to produce the eProjBL lesson plans (Please refer Figure 4.3). Moreover, the workflow of the eProjBL pedagogical model was created to help improved teachers' understanding of eProjBL (Please refer to section 4.4.2 Framework of the eProjBL Pedagogical Model for details of the eProjBL pedagogical model framework). The learners were given the task to create the water cycle animation presentation using the animation online tool. Moreover, the learner experiences the edutainment applications which act as a scaffolding throughout any single lesson. The purpose of using animation as a tool was to encourage and motivate the learners to be creative and engage with the task. This idea is supported by Jang (2009) when he mentioned that animations improve learner creativity and computer handling. In addition to that, it also encourages learner's engagement in the curriculum.

(c) ***Facilities***

For a blended learning environment, the inclusive classroom needs to have certain equipment or facilities that support learning using the eProjBL pedagogical model. Therefore, additional equipment such as wireless devices, internet connection, power supply, a projector, and netbooks were arranged in the classroom. The technician helped to organize the facilities including the internet connection in the inclusive classroom to assist the blended learning. Details of the Framework for the eProjBL Pedagogical Model has already been discussed in Sections 4.4.2 and 4.4.3 (page 95-103).

The criteria for the edutainment applications were identified by exploring two major components namely, learners' abilities, and technologies adaptation. Based on the literature review and as cited in Table 2.1, the key concepts of these components were

identified and discussed further. Through the preliminary study, several participants in related sectors and stakeholders provided feedbacks on the edutainment applications which could be applied in the teaching and learning environment. These participants also stated that the special needs learner lacked focused attention related to engagement which was much needed in an inclusive classroom[4]. Reviews of past studies on edutainment were conducted to identify the elements of edutainment which could be potentially implemented in the inclusive classroom. The elements were sorted and listed and reviewed by experts for verification before proceeding further into the development and construction phase of eProjBL content.

5.4.1 Strengths and Weaknesses of the Edutainment Applications in the eProjBL Pedagogical Model

Based on the open-ended questions administered to the teachers in the three different schools, the teachers' feedback is summarised in Table 5.2. The teachers' feedback was elicited from each session after they completed the lessons. The next section discusses this in greater detail.

[4] The seminar participation on Introduction to the Concept of Attention Deficit Hyperactivity Disorder (ADHD), 21st October 2011, Wisma R&D University of Malaya.

Table 5.2: Strengths and Weaknesses of the Edutainment Applications in the eProjBL Pedagogical Model

Session	Strengths	Weaknesses
Day 1: Augmented Reality	Computer literacy. Discipline independently. Communication skill.	Language barrier web searching. Equipment preparation.
Day 2: Virtual Game-based	Body therapy. Encourage learners to be committed to complete the task Increase understanding and recall.	Need time to setup.
Day 3: Game-based	Interest learning during playing. Repetition but not feel bored. Variety games related with topic online.	Limited guidance resources for teacher.
Day 4: Animation Project	Easily to understand the concept. Creative and Innovative. Committed to finishing the task even if the duration to complete it is longer.	Faced difficulty in handling the software without experience. Time constraint for preparation.

(a) ***Strengths of the Edutainment Activities in the eProjBL Pedagogical Model***

Teachers in School A (SK05) were interested in implementing the alternative model in their classroom after they experienced the testing session during the study. There were some criteria that helped the learners to improve certain skills especially for special needs learners. The teachers in School B (SK03) explained that the pedagogical model helped the learners to understand the concepts easily. Additionally, teachers in School B (SK03) explained that the learners were able to visualize the topic that had been taught.

Teacher (SK03-T2): "Mudah untuk digunakan dan murid cepat paham dan sesuai untuk digunakan untuk membuat projek animasi bagi murid-murid."(Easy to use and learners could understand and suitable to apply for carrying out the animation project by the group of learners)."

In School A (SK09), the learners benefited from the model. The teachers explained that the learners displayed self-motivation when the task was given and tried to complete it and competed with others especially among the special needs learners with the aid of the facilities, such as, ICT equipment and internet. To cite a teacher in School

C (SK09) who agreed that ICT helped increased the learner's capabilities to understand the topic effectively. Moreover, teachers observed that the learners were motivated to complete their task although they faced problems during the lesson.

Teacher (SK09-T3): "Murid-murid cuba untuk menyelesaikan sesuatu masalah dengan menggunakan idea atau dapatan hasil dari pembelajaran" (Learners tried to solve the problem using idea or outcome from learning.)

One of the teachers (SK09-T2) explained her perspective that the strengths of edutainment activities was that the learners explored their own skills in search for information. Learners also showed their abilities to understand the task given. Subsequently, they used their own creativity to finish the project. Another teacher (SK09-T3) highlighted that the edutainment activities in the eProjBL pedagogical model increased the learners' capabilities to create and enhance communication skills. The learners also managed to maintain their attention for the duration of the class.

Teacher (SK09-T3): Murid amat berminat dan tidak menunjukkan bosan walaupun waktu pembelajaran yang panjang." (Learners are very interested and do not show boredom even though the learning duration is long).

(b) ***Weaknesses of the Edutainment Activities in the eProjBL Pedagogical Model***

The participating teachers also highlighted some issues and improvement that needed to be done. The teachers in School A (SK05) gave comments such as time constraint to set-up the equipment and lack of knowledge and experience to handle the software, and hardware.

Teacher (SK05-T3): "pengambilan masa untuk memulakan permainan tersebut." (It takes times to start up the game application)

For example, teachers in School B (SK03) also showed their concerns during the testing session related to preparedness before the activity session. The testing session needed to be organised carefully. Moreover, some activities needed more time if any technical problems occurred during the lesson period. Additionally, a teacher in School C (SK09) explained that the learners were facing the language barrier as information in

the internet was mostly in English and most of the learners especially special needs learners preferred to use their mother tongue or their own dialect. The teachers responded to this problem by translating information although it involved time and effort.

Teacher (SK09-T3): "Memerlukan masa untuk membuat persediaan.Guru perlu membuat rondaan pada setiap murid untuk memastikan semua murid dapat membuka laman yang sama" (Need time for preparation, teacher monitoring every learner to ensure they open the same website).

5.4.2 Recommendation on Edutainment Approach Implementation

Overall, each edutainment approach provided its own learning outcome that fulfilled the eProjBL pedagogical model. Level of acceptance from teachers' perspectives showed that the animation project was the most wanted in the inclusive classroom. Table 5.3 shows the level of acceptance for the edutainment approaches that were utilised through the eProjBL pedagogical model. In other words, the teachers ranked the edutainment approaches according to the perceived benefits in the inclusive classroom. The rank was obtained through open-ended questions administered at every session (please refer to Figure 4.11)

Table 5.3: Level of Acceptance for Edutainment Approaches through the eProjBL Pedagogical Model

Rank of Acceptance	Session
1	Animation Project
2	Game-based
3	Augmented Reality
4	Virtual Game-based

5.5 Teachers' Perceptions of the special needs learners during the utilization of the eProjBL pedagogical model in the classroom

In answering the second research question, the data was collected through open-ended questions and informal conversations which were triangulated during each teaching-learning session. The data were collected in three different schools to ensure that feedbacks on the pedagogical model was collected from different Malaysian Contexts. The teachers' feedback was focused on the capability of the pedagogical model to suit to the inclusive classroom especially for the special needs learners. The teachers generally highlighted how edutainment approaches played a role in the eProjBL content to be learnt.

After executing the testing session (actual study) among special needs learners, the teachers explained that the eProjBL pedagogical model supported the special needs learner's learning when the learners pay attention and focused on completing their task. The special needs learners spent time searching solution on their own. Additionally, they requested to extend the time duration on creating the animation project. Teacher (SK03-T2) noted that "Learners are now more creative in solving problems". The teachers identified the learner's individual task as an appropriate activity that encouraged the learners to apply their problem solving skill.

The teachers highlighted the ability of the eProjBL pedagogical model that supports special needs learners in understanding a specific concept or topic. The special needs learners experienced the flow of the ZPD provided within the activities planned in the eProjBL pedagogical model based on certain levels of challenge. Each challenge of the eProjBL activities embedded in the edutainment approaches appeared to construct accumulatively the level of competence into each special needs learner.

5.5.1 Workflow of the eProjBL Pedagogical Model

Overall, the teachers' feedbacks on the edutainment technologies in the eProjBL pedagogical model showed benefits to the learners. For example, this was reflected on the teachers' feedbacks in School A (SK05) where the activity was deemed very helpful for the learners to understand the science concept. Teachers in School B (SK03) also commented that the use of edutainment encouraged the special needs learners to focus on the topic. The pedagogical model also benefited both the teachers and learners. The teachers in School C also agreed that the flow of the process of the eProjBL pedagogical model was very effective and systematic so as to be able to achieve the lesson objectives.

Teachers from School A (SK05) said that the activities are very useful. Teachers from School B (SK03) began to understand that the computer had become a medium of interaction between the learners and content. Teachers acted as guides to assist the learners maintain the engagement with the topic that they taught.

Teacher (SK03-T2): "Murid akan berpusatkan kepada komputer sebagai medium perantara diantara guru dan murid. Guru akan membimbing murid untuk melaksanakan aktiviti yang dirancang." (Learner will computer centre as middle medium between learners and teachers. Teacher will guide learners to implement the planned activities.)

The continued usage of the pedagogical model for all the activities even after the study, received positive feedbacks as all the teachers expressed the need for this pedagogical to be implemented in the future because it helped motivate the learners and they were more creative. The teachers from School C (SK09) felt that the activities increased the learners' attention and motivated them to use computers as the medium of interactivity. Moreover, teachers from School B (SK03) explained why they preferred to continue as below:

Teacher (SK03-T2): "Saya akan menggunakan 3 daripada 4 aktiviti edutaiment iaitu Augmented Reality, game-based learning dan animation projek sebagai proses

pengajaran dan pembelajaran di dalam kelas. ketiga-tiga aktiviti ini mudah untuk digunakan dan memerlukan masa yang sedikit untuk proses set-up peralatan. selain itu, murid-murid akan cepat tertarik dan mempunyai perasaan untuk mencuba dalam aktiviti tersebut." (I will use three out of four edutainment activities such as Augmented Reality, Game-based, and animation project as teaching and learning process in classroom. All these activities were easy to use and required less time to setup equipment process. Moreover, learners will quickly attract and feel to try the activities.)

Teachers in School A (SK05) said the animation project session helped the learners engaged with the content and worked collaboratively with other learners. The learners also compete with each other to complete the task. Teachers in School B (SK03) chose the animation project and the game-based learning session, the reason being:

Teacher (SK03-T2): "kerana di bahagian ini, murid diberi kebebasan untuk mereka sendiri projek berdasarkan tajuk yang telah dipelajari. Mereka lebih banyak menghabiskan masa untuk terus fokus dalam menyiapkan projek. selain itu, murid dapat menghasilkan satu projek yang kreatif dan ..."(On this part, the learner was independent to create their own project based on the title that they have learned. They spend their time to complete the project. Moreover, the learner creates the creative project and ...)

Teachers in School C (SK09) also preferred edutainment applications for Day 4; because:

Teacher (SK09-T3): "Pada hari ke 4 murid-murid dapat menunjukkan kebolehan dan menghasilkan suatu kitar air mengikut kreativiti kumpulan masing-masing."(In the fourth day, the learners could show their talent and created water cycle model using their own creativity)."

5.5.2 Problem-Solving Skills of Learners during eProjBL

The teachers in School A (SK05) explained that the learners kept trying hard to find the solution when they faced difficulties during the lessons. The teachers said:

Teacher (SK05-T3): "Murid akan terus mencuba untuk melakukan terbaik untuk projek mereka, seterusnya murid tersebut akan lebih kreatif dan mencuba untuk mencari idea bagi menyelesaikan setiap tugas yang diberikan" (Learners were trying to do their best to finish their project. Moreover, the learner becomes more creative in trying to find the idea to solve every given task).

The comments from teachers in School B (SK03) include:

Teacher SK03-T2: "Murid-murid kini lebih berfikiran kreatif dalam menyelesaikan masalah. selain itu, penggunaan movie soup dapat menarik minat murid-murid untuk terus fokus dan menyiapkan tugasan yang berbentuk animasi. selain itu, murid-murid dapat mencurahkan dapatan yang dipelajari dalam bentuk lukisan kejadian. selain itu, penggunaan aplikasi permainan juga dapat menarik minat murid untuk terus mencuba sehingga berjaya " (Learners are now more creative in solving problems. In addition, the use of movie soup to attract the learners to stay focused and complete tasks in the form of animation. Besides, the learners learned to explain findings in the form of painting the scene. In addition, the use of gaming applications also encouraged learners to keep trying until successful)"

Teacher SK03-T3: "Membantu kerana murid diberi peluang untuk menghasilkan kreativiti mereka sendiri."(Benefits learners as they are given the opportunity to demonstrate their own creativity)."

The teachers in School C (SK09) responded that problem solving skills of the learners emerged as they were given guidelines to complete their task in the eProjBL pedagogical model. Moreover, there were some learners who managed to solve the problem on their own when completing the task. The teachers in School A (SK05) said the learners frequently demonstrated their problem solving skills, but with guidance from teachers. However, the teachers in School B (SK03) commented the learners applied problem solving skills occasionally as needed. In School C (SK09), the teachers identified the learner's individual task as an appropriate activity that encouraged the learners to apply their problem solving skill.

Table 5.4 shows that performance for both types of learners obtained the mean value below of 3.0 of 4.0. However, the learners' engagement shows the overall mean at above 3.0 of 5.0 which supports the teachers' feedback that some learners could finish the task given.

Table 5.4: Problem-Solving Skill between Special Need Learners and Prime Learners

Domain	Prime Learner			Special Needs Learner			Inclusive Learner		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Learner's Engagement	4.19	4.00	.30	3.10	3.00	.93	3.62	4.00	.89
Learner's Performance	2.83	3.00	.71	2.50	2.00	.76	2.66	2.50	.75

5.5.3 Enhancement of Learners' Motivation through Edutainment Experiences

The study used the observational data to capture the learners' motivation in the blended learning environment among learners in the inclusive classroom. Data was also collected through the Engagement Survey Form. Table 5.5 shows that for 'focus on task' the special needs learners only had a mean value of 2.40, whereas they scored 3.70 for self-managing learning compared to a mean score of 3.06 and 4.25 respectively for the prime learners.

Table 5.5: Motivation between Special Need Learners and Prime Learners

Domain	Motivation	Prime Learner			Special Needs Learner			Inclusive Learner		
		Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Learner's Engagement	Self-managed learning	**4.25**	4.00	.43	**3.70**	4.00	.73	3.96	4.00	.66
Learner's Performance	Focus on the task	**3.06**	3.00	.87	**2.40**	2.00	.75	2.71	2.00	.87

Moreover, the teachers shared their feedback on learners' motivation that;

Teacher SK08-02: "*Yes, it is different from conventional teaching. Graphics and picture motivate students and easy to understand. Student like pictures"*

The visualization mechanism and hands-on approach helped the learners to focus on their task. Teachers explained that the learners maintained their attention to complete the task although the duration of each session was long. The learners stayed in focus to complete the task given and completed each project. Then, they presented to their peers and for evaluation.

The pedagogical model was acting as a scaffold along the learners ZPD as it engaged the learners till the completion of the task. The tasks were aligned systematically based upon the KLU strategies in the eProjBL pedagogical model.

The learners' attention was focused because of the different kind of teaching environment brought about by the eProjBL model. The learners' focus improved and was more careful in trying to complete the task. One of the teachers answered:

Teacher (SK09-02): "Ya kerana pengajaran dalam bentuk bermain adalah menjadi satu kelebihan bagi murid-murid untuk terus belajar. mereka juga lebih aktif dan bersemangat ketika proses P&P berlangsung" (Yes because the instruction in the form of play is to be an advantage for the learners to continue to learn. They are also more active and enthusiastic during the process when teaching and learning takes place.)

Teachers of School A (SK05) agreed that the activity improved the level of competence of learners and they were motivated to complete the task creatively. In the game-based session, the teacher said:

Teacher (SK05-T4): "Pelajar leka dan memberi respon yang berminat terhadap game yang diberikan."(Learners are engrossed and are interested in the given game.)

Moreover, the teacher explained that learners' capabilities appear to stay in focus during the execution of the task given especially the animation project task.

Teacher (SK05-T4): "Ya. Ianya memberi pelajar lebih teliti dan fokus dalam melakukan aktiviti tersebut. (Animation Project)" (Yes, it influences the learners to be more thorough and focused during the activities)"

In School B (SK03), the majority of teachers agreed that all elements of edutainment were beneficial to the prime learners and especially to the special needs learners. The

learners share the information with others and tried to complete the task given together. Teacher explained:

Teacher SK03-T2: "Ya. murid lebih banyak menumpukan perhatian dalam menyiapkan tugasan yang diberikan. mereka juga akan bekerjasama dengan rakan untuk menyaipkan tugasan yang diberikan". (Yes, learners pay attention when carrying out the assignment. They also collaborate with their peers to complete the assignment).

During the process of creating the animation, the teachers also said the learners were motivated to complete the task. Teachers in School C (SK09) also found similar findings with School B (SK03), in that the learners started sharing and helping each other to complete the task given.

Teacher SK09-T3: "Ya, dapat meningkatkan motivasi murid kerana mereka telah menunjukkan sikap bekerjasama dan bertolak ansur di antara rakan mereka. Murid-murid cuba menggunakan masa dengan sebaiknya untuk menghasilkan kerja yang diberi dan mereka juga saling bekerjasama dalam kumpulan."(Yes, it enhances learner's motivation because they showed their cooperation and compromised among themselves. Learners tried to utilise the time given to execute the task and they cooperate as a team).

5.5.4 Edutainment Activities support Learners' Creativity

Creativity is subjective to determine. Through the observation, teachers explained that the learners engaged and showed their creativity when they executed the activities. The eProjBL pedagogical activities were encouraging the learners to draw or construct their own water cycle model based on what they had learnt in the lesson session, as cited by this teacher (refer to Table 5.6);

Teacher (SK08-02): "Yes, using picture and graphics will definitely develop creativity. Student can utilise problems and will solve them more effectively".

Through the investigation, teachers in School A (SK05) noted that learners engage and showed their creativity when involved in the activities.

Teacher (SK05-T4): "Ya. Ianya sesuai untuk meningkatkan kreativiti serta fokus pelajar" (Yes, the activities are suitable to increase the creativity and learners' focus).

In School B (SK03), teachers commented that the edutainment elements can help to enhance the learners' capabilities to become more creative. Most of activities encouraged and allowed learners to give their own ideas. Moreover, teachers in School C (SK09) highlighted that the activities encouraged the learners to think creatively when they were given a task to complete it.

Teacher (SK09-T3): "Ya, dapat meningkatkan kreativiti murid tetapi boleh diperbaiki lagi iaitu dengan cara menimbulkan satu suasana yang dapat memberangsangkan pemikiran murid (Day 2: Virtual Game-based Learning)" (Yes, it could enhance learners' creativity but could be further improved by creating an atmosphere that influences how learners think.).

Table 5.6: The Creativity between Special Need Learners and Prime Learners

Domain	Creativity	Prime Learner			Special Needs Learner			Inclusive Learner		
		Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Learner's Engagement	Creative thinking	4.17	4.00	.34	3.52	4.00	.97	3.83	4.00	.80
Learner's Performance	Attractiveness	3.11	3.00	.32	2.50	2.00	.61	2.79	3.00	.58

5.5.5 Group Work in the eProjBL Inclusive Classroom

The learner's engagement survey form completed by the teachers captured data on group work criteria. Table 5.7 shows the comparison between the prime and special needs learners.

Table 5.7: The Observation on Group Work between Special Need Learners and Prime Learners

Group Work	Prime Learner			Special Needs Learner			Inclusive Learner		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Learner's Engagement	4.05	4.00	.23	3.16	3.25	.84	3.58	3.92	.76
Learner's Performance	3.08	3.00	.49	2.30	2.25	.62	2.67	2.50	.68

The Table shows that overall the group work skills are better among the prime learners when compared to the special needs learners. The eProjBL pedagogical activities allowed learners to work in groups because one of criteria of eProjBL is working in groups. A minority of special needs learners had difficulty to work with others but they could still execute the task given. Teachers explained that the special needs learners worked less with others. However, the relationship with other learners is still good. Most of the special needs learners would like to execute the task by themselves.

5.5.6 Edutainment Experiences in eProjBL Pedagogical Model

Feedback was collected after every session from teachers to identify the ranking of edutainment elements appropriate for special needs learners in the blended inclusive classroom. This data supported the study to identify the appropriate edutainment criteria for the eProjBL pedagogical model. In School A (SK05), the teachers reflected that the learners revealed the positive point of view on the eProjBL activities. Teachers agreed that the animation project supported learners to explore their creativity to complete the task given:

Teacher (SK05-T4):"melalui project tersebut, pelajar memberi idea yang bernas dalam melakukan animation berdasarkan kreativiti pelajar terbaik" (Through this project, the learners give interesting ideas during creating the animation based on learner's creativity.)

As the result, teachers of School A (SK05) agreed that the benefit of edutainment elements provide learners the opportunity to engage with different teaching methods. The activities were designed to enhance the learners' capabilities to understand the concept in different ways. One of the teachers explained:

Teacher (SK05-T4): "Ya. ianya memberi peluang kepada pelajar untuk memperlajari melalui konsep dan cara yang berbeza." (Yes, it gives the opportunity for the learner to learn the concept and different ways)".

Moreover, teachers of School B (SK03) also responded that overall, edutainment activities had significantly showed that it could make learners motivated in their teaching and learning sessions. The learners understood the topic they were taught and the activities enhanced their skills and knowledge.

Teacher (SK03-T2): "ia memudahkan murid-murid untuk memahami sesuatu tajuk dengan masa lebih singkat." (It helps the learners to understand a topic in a shorter length of time).

Teacher (SK03-T3) observed that the learners easily handled the computer and were able to motivate themselves to stay focused on the topic. Teachers agreed that if they could deliver creatively, the learners were also more excited to learn the topic. Teachers reflected that the edutainment elements could help teachers to enhance the learners' motivation. For example, the learners were really excited when they could animate a static object to move. One teacher concluded:

Teacher SK03-T2: "Ya. ia dapat merangsang pemikiran murid dalam proses memahami tajuk yang diajar dengan lebih jelas." (Yes, it could stimulate learner's thinking during the process of understanding the topic with more clarity).

In School C (SK09), teachers thought that every session had their own strength and purpose. Teacher explained that the learner shows their interest during sessions. The tasks provided useful activities:

Teacher (SK09-T2): "…pembelajaran dengan ICT dan mereka dapat mengaplikasikan kemahiran dengan menggunakan komputer dengan menghasilkan pelbagai gambar yang berkaitan dengan tajuk yang diajar (Augmented Reality)" (…learning with ICT and they could apply computer skills by creating several images related to the topic that had been taught.

Moreover, the activities build the learners confidence to achieve their task with support from their teacher. The teacher explained that the activities helped them to scaffold the learners' learning during the testing sessions. To quote a teacher:

Teacher SK09-T3: "Murid-murid lebih berkeyakinan dan dapat mengikut arahan berdasarkan dari aktiviti yang telah dilalui (Virtual Game-based Learning). Murid-murid telah dapat menghasilkan suatu gambar menunjukkan kitaran air secara individu dan berkumpulan. Dari hasil kerja yang ditunjukkan mereka telah mendapat kemahiran dari program ini. (Animation Project)" (Leaners are more confident and followed the instruction for each activity they experienced. Learners could create their own water cycle individually or in a group. Students' work showed that the learners acquired skills from this program).

Based on these elements of edutainment applied in each session, the teachers agreed with the benefits obtained from the usage of the edutainment applications. The alternative approaches mostly helped the learners to be interested with the lesson. According to Teacher (SK09-T3, Day 4; Animation Project):

Teacher (SK09-T3):"… murid-murid amat berminat menggunakan komputer dalam pembelajaran mereka. (…learners are very interested to use computers in their learning).

However, a teacher (SK09-T3) was also concerned about the session on Day 2 (Virtual Game-based Learning):

Teacher (SK09-T3): "… boleh membantu tetapi tidak untuk semua murid kerana mereka mempunyai tahap pencapaian yang amat berbeza diantara satu kelas dengan kelas yang lain. Ianya sesuai hanya bagi murid kelas 'High Function' sahaja. (… can help but not all learners because the learners level of competency are different between one classroom to another classroom. It will be suitable for learners with 'High Function' only).

As addition, extra questions were also prepared to elicit the teachers' understanding on edutainment. Do the teachers recognize what is the element of edutainment applied on each session? Based on the teachers' understanding, they could identify the purpose of each edutainment utilised in the classroom during the study. Overall, the teachers could explain and list out all edutainment activities applied in their classroom. The results showed that Teacher (SK09-T3) listed the details and explanation of teaching and learning methods in each session. This showed the teacher's understanding about the edutainment activities applied in the classroom (Please refer to Table 5.8):

Table 5.8: Summary of Teacher Understands on Edutainment Activities Applied in the Testing Classroom in School C (SK09)

SESSION	METHOD
Day 1: Augmented Reality	*Kaedah penggunaan computer* (Computer based Method) *Kaedah 'Main Peranan/lakonan'* (Acting Method) *Kaedah Dapatan* (Outcome Method)
Day 2: Virtual Game-based	*Kaedah kontekstual*, (Contextual Method) *Kaedah Pembelajaran melalui pengalaman* (Learning Experience Method) *Kaedah Dapatan* (Outcome Method)
Day 3: Game-based	*Kaedah pembelajaran berdasarkan pengalaman* (Learning Experience Method) *Kaedah 'Fun Learning'* (Fun-Leanring Method) *Kaedah Kontekstual* (Contextual Method) *Kaedah belajar Cara Belajar* (Learning Method)
Day 4; Animation Project	*Kaedah belajar cara belajar berkomputer* (Computer based Method) *Kaedah pembelajaran melalui pengalaman dan pengetahuan sedia ada* (Learning Experience and Pre-knowledge Method) *Kaedah pembelajaran berfikir* (Thinking Method) *Kaedah komunikasi* (Communication Method)

The teachers also gave feedback on a few other experiences that they had in the eProjBL inclusive classroom. These are discussed below (M = Medium, μ = Mean, σ = Std Deviation).

(a) ***Active learning***

As shown in the results listed in Table 5.17 and Table 4.13, the teachers would like to use a variety teaching methods to convince their learners to follow the lesson plan (M = 5.00, μ = 4.75, σ = 0.431). The teachers also modified the lesson plans according to certain learners' capabilities and the result is shown in the Table 5.17. Moreover, the teachers agreed that the learners had been given the chance to participate in the classroom (M = 5.00, μ = 4.61, σ = 0.495). The activities encouraged the learners to manipulate tasks on their own guided by the teacher and their peers. As shown in Table 5.18, the results show that active learning scored the highest mean among other criteria for the learning environment at a value of μ = 4.69. Moreover, the mean value for the special needs learners at μ = 4.65 showed that the eProjBL activities could encourage them to become active in their classroom. Teacher feedback also highlighted that the learners could adapt to the active learning environment through the eProjBL activities. The teacher stated that the learners stayed focused to complete the task even if the class period was long.

SK09-T3: Murid amat berminat dan tidak menunjukkan bosan walaupun waktu pembelajaran yang panjang" (Learner very interested and was not bored even though the learning duration is long).

(b) ***Teaching for understanding***

As shown in the results listed in Table 5.17 and Table 4.13, the teachers felt that giving good explanations support the learners understanding of the lesson and materials given (M = 5.00, μ = 4.74, σ = 0.446). Moreover, the teachers agreed that a lesson plan helped to understand the flow of the process in every lesson (M = 5.00, μ = 4.58, σ = 0.683). The KLU strategy in eProjBL helped the teacher to adapt the lesson plan systematically and encourage the learners to follow the instruction and be committed to their task. Table 5.18, shows that this criterion has a mean of 4.66.

(c) ***Feedback to assist learning***

As shown in the results listed in Table 5.17 and Table 4.13 ,the teachers felt that their explanations were very helpful when the learners had problems in their learning (M = 5.00, $\mu = 4.61$, $\sigma = 0.547$). This means that the role of teachers as scaffolds during the lesson was very useful. In addition, the teachers also provided sufficient feedback to ensure that the learners learn from the work they do (M = 4.00, $\mu = 4.34$, $\sigma = 0.669$). For the criteria 'feedback to assist learning', the learners scored an overall mean of 4.46. The special needs learners scored a mean of 4.33. This means that the special needs learner benefited the same as the prime learners when learning in the blended inclusive classroom.

(d) ***Assessment***

Assessment is to identify the learners' understanding of the lessons in the inclusive classroom. As shown in the results listed in Table 5.17 and Table 4.13, the teacher agreed that the classroom had provided a variety of assessment methods that helped the learners to do well at every stage (M = 4.00, $\mu = 4.34$, $\sigma = 0.669$). The analytical skills needed to ensure them to execute their task well was at M = 4.50, $\mu = 4.50$, $\sigma = 0.507$. Moreover, the assessment tested learners understanding of key concepts in this class which encouraged the learners to understand the lessons which was at M = 4.00, $\mu = 4.42$, $\sigma = 0.500$. The results show that the lessons had benefited the special needs learner as their total mean was lower only by 0.13 compared to the prime learners who scored a mean of 4.48. Based on the teachers' feedback, one of the main advantages of eProjBL was that the tasks managed to capture special needs learners' attention:

Teacher (SK09-T3): Murid amat berminat dan tidak menunjukkan bosan walaupun waktu pembelajaran yang panjang. (Learner very interested and no reveals boring even though the learning duration is long).

(e) ***Workload***

According to the responses shown in Table 5.17 and Table 4.13 ,the teachers felt that the learners managed to complete the requirement of the class activity without feeling unduly stressed (M = 4.00, μ = 3.74, σ = 1.032). Moreover, the teachers also agreed that the workload for learners was reasonable (M = 4.00, μ = 3.74, σ = 0.950). As shown in the results listed in Table 5.18, the difference in the mean between the prime and special needs learners was 0.93. During the observation, the majority of learners could complete the task given and they managed to concentrate to finish their task even if the class session was long. One of the teachers said:

Teacher (SK09-T3): Murid amat berminat dan tidak menunjukkan bosan walaupun waktu pembelajaran yang panjang. (Learner very interested and no reveals boring even though the learning duration is long).

(f) ***Coherence of curriculum***

As shown in the results listed in Table 5.17 and Table 4.13 indicate that the teachers felt that the flow of the eProjBL activities was aligned with the subject matter (M = 4.00, μ = 3.82, σ = 1.010) and the selected subject matter as also integrated with the national curriculum (M = 4.00, μ = 4.32, σ = 0.525). Coherence of the curriculum for the special needs learners was scored at a mean of μ = 3.73 which was 0.72 less compared with the prime learners which was scored at μ = 4.45. Many of the teachers highlighted that the eProjBL pedagogical model was very effective and systematic to achieve the lesson objectives. Teachers said:

Teacher (SK09-T1): Pada pendapat saya,proses aliran pedagogi amat baik dan nampak begitu berkesan. (In my opinion, flows process of pedagogy very nice and seen to be effective).

5.5.7 Learners' Feedback on eProjBL Activities

At the end of each lesson, a feedback form was given to the students (Appendix D, Post-Question for Learner).The feedback among the learners was collected to describe the learners' experience of the alternative pedagogical model investigated in this study. The learners' feedback form was used simple questions on how they felt during the testing sessions. The collection evidence (feedback) was to identify whether the learners were comfortable with the activity (Table 5.9). The learners responded that they had difficulties in the beginning; however, they could adapt to the new learning environment very quickly. They also expressed that the activity was more entertaining than the conventional method. Learners' feedback was rated one to four (1=Most Dislike, 2=Dislike, Like, Most Like). The mean of the overall activities was 3.65 with standard deviation of 0.745. Table 5.9 showed that the learners' responded positively to the activities and the animation project session scored the highest mean value (3.82) compared to all the edutainment applications employed.

Table 5.9: Learners' Feedback during the eProjBL Activities

Group		Day 1: Augmented Reality	Day 2: Virtual Game-based Learning	Day 3: Game-based Learning	Day 4; Animation Project	Overall
Prime Learner (N = 18)	**Mean**	3.61	3.83	3.89	3.89	3.72
	Median	4.00	4.00	4.00	4.00	4.00
	SD	.61	.38	.32	.32	.57
Special Needs Learner (N = 20)	**Mean**	3.40	3.75	3.55	3.75	3.65
	Median	4.00	4.00	4.00	4.00	4.00
	SD	.94	.64	.94	.79	.75
Total (N = 38)	**Mean**	3.50	3.79	3.71	3.82	3.68
	Median	4.00	4.00	4.00	4.00	4.00
	SD	.80	.53	.73	.61	.66

From the open-ended questions for teachers, it was found that overall the implementation of the alternative pedagogical model among the learners in the blended inclusive classroom in School A (SK05) received positive feedback. However, the teachers highlighted their concern about their lack of knowledge and confidence to handle ICT facilities. Moreover, they also commented on the time constraint needed for the preparation of equipment before the start of the lessons. Furthermore, it was also found that the teacher level of acceptance of edutainment elements in the blended inclusive classroom in the context of School B (SK03) which is in a rural area was higher than School A (SK05). The learners responded positively during every testing session. However, the teachers showed their concern about the level of their confidence if they wished to extend the usage of some edutainment application because of limitation on facilities and equipment in their schools.

5.5.8 Continuity with Edutainment Activities for Future Implementation

The teachers in School B (SK03) explained that some edutainment elements could continue (game-based learning and animation project) to be used even after the study. However, their concern was that a lack of equipment and facilities could limit them to explore and execute lessons in their classroom. Teachers would like to implement the activities if the school management could provide the facilities.

Although, teachers in School C (SK09) informed and shared some technical problems they faced during the testing session, most of them agreed to execute the edutainment activities continuously in the classroom even after the study. Nevertheless, they were concerned about differences of learner capabilities, time constraint and how appropriate content can be used in implementing it in the inclusive classroom.

5.6 Teachers' evaluations of learners' performance in the eProjBL pedagogical model

To answer third research question, the teachers' evaluation using the evaluation rubric was captured during the testing session as the learners' presented their own model among their peers and teacher (please refer to Appendix E) for the rubrics form for evaluation). The limitation of this evaluation was obviously teachers' bias. However, the data triangulation among three schools minimised the bias that may occur.

The teacher's evaluation was consisted of the four elements namely Character, Teamwork, Artefact and Presentation. All these elements were adapted from the preliminary study that had been conducted and supported by literature.

5.6.1 Findings on Rubric Evaluation Form (Learners' Performance)

The teachers' evaluation was important evidence to visualize learners' performance for both the special needs learners and the prime learners. Moreover, it also helped to identify the pattern of learners' capabilities and the learning environment based on the eProjBL pedagogical model in the inclusive classroom. The rubric evaluation was utilised to capture and quantify the criteria through the teachers' observations and evaluation during lessons. The teachers then gave their grades according to the rubric criteria given (please referred Appendix E).

Table 5.10: The Comparison of learners' performance between special needs learners and prime learners

Group	N	Median	Mean	Std. Deviation
Prime Learners	18	73.50	73.78	11.52
Special Needs Learners	20	62.00	62.50	13.08
Total	38	69.50	67.84	13.47

As shown in Table 5.10, marks obtained by the special needs learners was at the average level of 62 percentage. At The same times, the value of standard deviation of special needs learners was higher than standard deviation of the prime learners. Based on Figure 5.3, the average marks obtained by special needs learners (62.5 percent) falls within the range of value of the prime learner (minimum value is 60 percent, maximum mark is 85 percent).

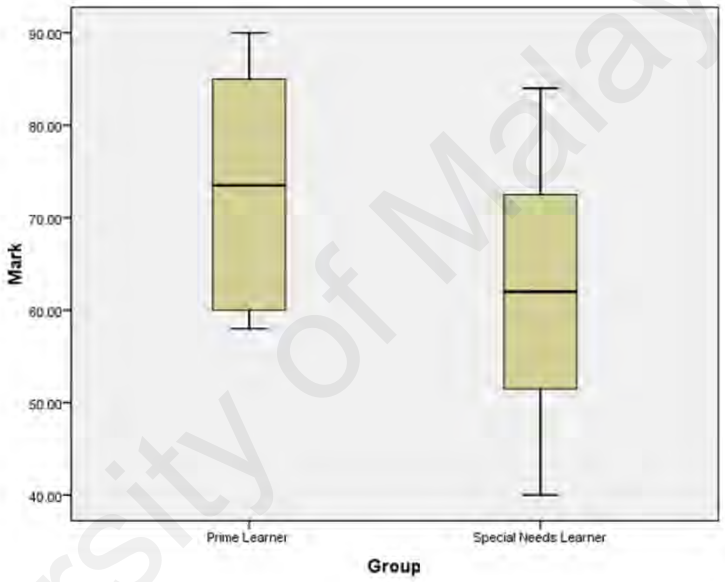


Figure 5.3: The Box Plot Normality of Learner's Performance

Figure 5.4 (page 142) and Figure 5.5 (page 142) show the histograms related to the learners' performance based on teachers' evaluation. It shows that selected participants among prime learners have the same level of learners' capabilities compared with special needs learners.

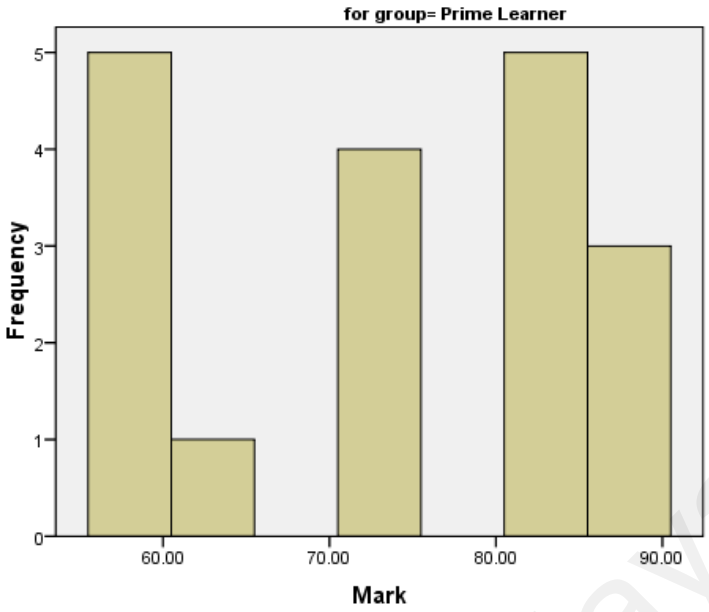


Figure 5.4: The Histograms Indicating the Evaluation Mark for Prime Learners (Based on Evaluation Rubrics)

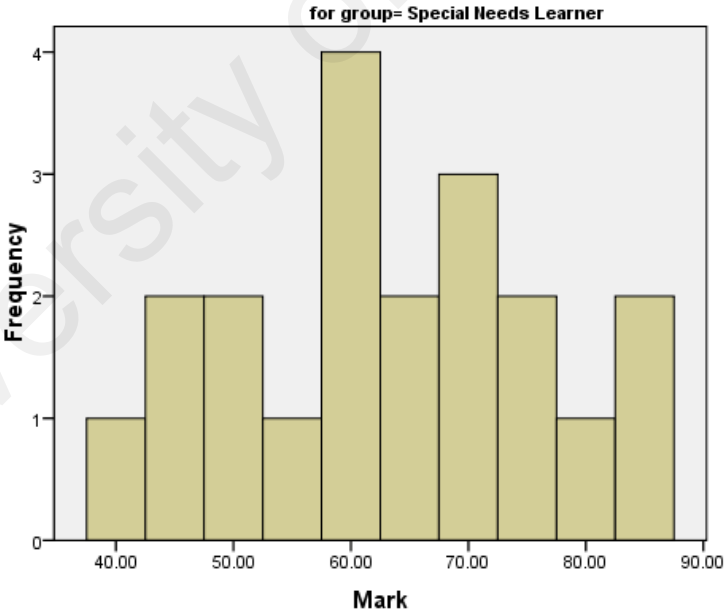


Figure 5.5: The Histograms Indicating the Evaluation Mark for Special Needs Learners (Based on Evaluation Rubrics)

5.6.2 The Four Themes of Learners' Performance

Based on Rubrics Evaluation, the result shown in Table 5.11 shows how the results based on learners' performance were grouped into the four main themes, namely, Character, Teamwork, Artefact and Presentation. These themes were identified from the preliminary study. These four themes are indicators to evaluate learners' performance in eProjBL pedagogical model. In general, both of the learners' performance the prime learners and the special needs learners were high for the Artefact criteria with a mean value of 2.74. The Presentation criteria for special needs learners showed the highest value compared to the other three criteria. However, the Teamwork criteria for prime learners showed the highest mean value of 3.08.

Table 5.11: Overall Mean for the Four Themes of Learners' Performance

CRITERIA	Prime Learner			Special Needs Learner			Inclusive		
	Mean	**Median**	**SD**	**Mean**	**Median**	**SD**	**Mean**	**Median**	**SD**
Character	3.05	3.25	.54	2.43	2.42	.54	2.72	2.50	.62
Team Work	**3.08**	3.00	.39	2.32	2.13	.52	2.68	2.75	.60
Artefact	2.98	3.00	.25	2.53	2.50	.45	**2.74**	2.86	.43
Presentation	2.75	2.64	.77	2.59	2.64	.72	2.67	2.64	.74

The details of the Character theme and sub themes are shown in Table 5.12 (page 144). It consists of time management, problem solving, attitude, focus on task, preparedness and pride. Based on the Character criteria for prime learners, the sub-theme of problem solving showed the lowest mean value at 2.83. The Attitude criteria for both types of learners shared the same level of highest mean value of 3.08 compared to the other criteria.

Table 5.12: Sub-Themes Criteria for Character in Learner's Performance

CHARACTER	Prime Learner			Special Needs Learner			Inclusive		
	Mean	**Median**	**SD**	**Mean**	**Median**	**SD**	**Mean**	**Median**	**SD**
Time Management	3.06	3.00	.42	2.40	2.00	.60	2.71	3.00	.61
Problem-solving	**2.83**	3.00	.71	2.50	2.00	.76	2.66	2.50	.75
Attitude	3.56	4.00	.51	2.65	2.50	.75	**3.08**	3.00	.78
Focus on the task	3.06	3.00	.87	2.40	2.00	.75	2.71	2.00	.87
Preparedness	3.06	3.00	.87	2.40	3.00	.75	2.71	3.00	.87
Pride	2.72	3.00	.57	2.25	2.00	.72	2.47	3.00	.69

As shown in the results listed in Table 5.13, the four elements from the 'Teamwork' criteria that consist of workload, contributions, monitors group effectiveness and working with others. The capabilities of special needs learners in teamwork shows the highest mean for monitor group effectiveness which is 2.40. However, prime learners recorded the lowest at 2.83 for group effectiveness. The prime learner showed the same and highest mean for workload and working with others at 3.17. However, special needs learners recorded the lowest at 2.35 for workload and working with others. Combination, the workload sub theme and working with others recorded the highest mean at 2.74. An overall comparison can be seen in that the special needs learners may face challenges working as a team compare to the prime learners. In an inclusive classroom, group work would involve prime learners working together with the special needs learners as determined by the teachers.

Table 5.13: Sub-Themes Criteria for Teamwork in Learner's Performance

TEAMWORK	Prime Learner			Special Needs Learner			Inclusive		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Workload	3.17	3.00	.51	**2.35**	2.00	.59	**2.74**	3.00	.69
Contributions	3.00	3.00	.59	**2.35**	2.00	.59	2.66	3.00	.67
Monitors Group Effectiveness	2.83	3.00	.71	2.40	2.00	.60	2.61	3.00	.68
Working with Others	3.33	3.00	.49	2.20	2.00	.77	2.74	3.00	.86

Table 5.14, shows the sub-themes for artefact as sources, attractiveness, requirement, content, organization, oral presentation and quality of work. The table highlights that the inclusive learners' quality of work showed the lowest value mean at 2.53 and the requirement criteria of artefact recorded the highest mean value at 2.89. It showed that the capabilities of learners to fulfil the minimum requirement from each session.

Table 5.14 : Sub-Themes Criteria for Artefact in Learner's Performance

ARTEFACT	Prime Learner			Special Needs Learner			Inclusive		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Sources	3.06	3.00	.42	2.65	3.00	.59	2.84	3.00	.55
Attractiveness	3.11	3.00	.32	2.50	2.00	.61	2.79	3.00	.58
Requirement	3.11	3.00	.32	2.70	3.00	.66	**2.89**	3.00	.56
Content	3.22	3.00	.43	2.50	2.50	.51	2.84	3.00	.59
Organization	2.89	3.00	.68	2.55	2.50	.60	2.71	3.00	.65
Oral Presentation	2.78	3.00	.43	2.45	2.00	.51	2.61	3.00	.50
Quality of Work	2.72	3.00	.67	2.35	2.00	.59	**2.53**	2.50	.65

As shown in Table 5.15, the presentation sub-themes such as pitch, comprehension, enthusiasm, props, stay on topic; posture eye contact and volume are shown. The special needs learners recorded the highest mean value for props and stay on topic at 2.75. The comprehension of prime learners was better than special needs learners with a

difference of 0.29 in the mean value. During the presentation, the special needs learners had difficulty with posture and eye contact which recorded the lowest mean value (0.60). It must be noted that special needs learners could stay on topic (2.75) on par with the prime learners (2.72), but posture and eye contact needs to be improved.

Table 5.15: Sub-Themes Criteria for Presentation in Learner's Performance

PRESENTATION	Prime Learner			Special Needs Learner			Inclusive		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Pitch	2.56	2.00	.92	2.50	2.50	.69	2.53	2.00	.80
Comprehension	2.94	3.00	.87	2.65	3.00	.88	2.79	3.00	.87
Enthusiasm	2.83	3.00	.86	2.55	2.50	.89	2.68	3.00	.87
Props	2.83	3.00	.71	**2.75**	3.00	.85	2.79	3.00	.78
Stays on Topic	2.72	3.00	1.32	**2.75**	3.00	1.25	2.74	3.00	1.27
Posture and Eye Contact	2.72	3.00	.67	**2.40**	2.00	.60	2.55	3.00	.65
Volume	2.67	2.00	.84	**2.55**	2.00	.69	2.61	2.00	.75

In conclusion (Figure 5.6), the result shows the learners' performance for the four themes, teamwork, character, artefact, and presentation. Table 5.11 shows that the teamwork criteria collected the lowest of the overall mean in the learners' performance (mean = 2.68). However, the prime learners' performance on teamwork collected the highest overall mean of 0.36 in the learners' performance.

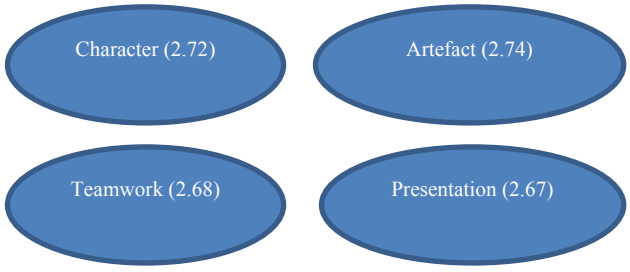


Figure 5.6: Level of Learners' Performance Components in eProjBL Evaluation

Figure 5.6 is based on Table 5.11 and shows the level of learners' performance in character, artefact, teamwork and presentation. The result shows that character and

artefact are arranged at almost the same position / level with an overall mean of learners' presentation (mean = 2.72 to 2.74). The criteria of teamwork and presentation could also be arranged at almost the same position / level (mean 2.68 to 2.67). It also shows that the mean for the criteria of character and artefact in learners' performance were higher than the mean for the criteria of teamwork and presentation among learners involved in the eProjBL pedagogical model.

5.7 Extent of Skills Acquired in Utilising the eProjBL Pedagogical Model by the Learners

To answer this fourth question, certain important skills that were acquired by the learners were identified from the engagement form. The learners' capabilities were described after the implementation of the eProjBL activities in the teaching and learning environment.

5.7.1 Cumulative Mean from the Engagement Survey Form

Table 5.16 shows the comparison of the cumulative mean for learner's engagement in the three schools among special needs learners (75.30) as compared to the prime learners (86.17). Table 5.17 shows the descriptive table on learner's engagement according to each code items compared between the special needs learners and the prime learners. Details of the themes for the learner's engagement are shown in Table 5.18.

Table 5.16: The Overall Comparison of Learner's Engagement between the Special Needs Learners and the Prime Learners

Group	N	Mean	Std. Deviation
Prime Learner	18	86.17	4.86585
Special Needs Learner	20	75.30	10.08438

Table 5.17, for code item C16 (Computer Literacy) shows that the mean value of special needs learners (4.55) is higher than the prime learners (4.33). In terms of learners' capabilities, the special needs learner has learnt more about using computers for presenting information. Code items numbers T1 to T4 shows the same mean value for 'active learning' and 'teaching for understanding' which support the learning environment for both special needs and prime learners. This result supports the rationale for the inclusive classroom which allows for topics to be learnt simultaneously by both special needs learners and prime learners.

Table 5.17: Learner's Engagement in the Inclusive Classroom using eProjBL Pedagogical Model

	Prime Learner				**Special Needs Learner**				**Total**			
Code#	N	Mean	Median	SD	N	Mean	Median	SD	N	Mean	Median	SD
C1	18	4.06	4.00	.236	20	3.25	4.00	.967	38	3.63	4.00	.819
C2	18	4.11	4.00	.323	20	3.70	4.00	.733	38	3.89	4.00	.606
C3	18	4.17	4.00	.383	20	3.60	4.00	.995	38	3.87	4.00	.811
C4	18	4.17	4.00	.514	20	3.45	4.00	.999	38	3.79	4.00	.875
C5	18	4.22	4.00	.548	20	3.35	4.00	1.089	38	3.76	4.00	.971
C6	18	4.28	4.00	.461	20	4.05	4.00	.605	38	4.16	4.00	.547
C7	18	4.06	4.00	.236	20	3.70	4.00	.733	38	3.87	4.00	.578
C8	18	4.17	4.00	.383	20	3.65	4.00	.875	38	3.89	4.00	.727
C9	18	4.17	4.00	.383	20	3.20	3.50	1.005	38	3.66	4.00	.909
C10	18	4.22	4.00	.428	20	3.00	3.00	.973	38	3.58	4.00	.976
C11	18	4.17	4.00	.383	20	3.30	4.00	1.031	38	3.71	4.00	.898
C12	18	4.06	4.00	.236	20	3.30	4.00	.979	38	3.66	4.00	.815
C13	18	4.17	4.00	.383	20	3.25	4.00	.967	38	3.68	4.00	.873
C14	18	4.00	4.00	.000	20	3.10	3.50	1.071	38	3.53	4.00	.893
C15	18	4.33	4.00	.485	20	3.80	4.00	.894	38	4.05	4.00	.769
C16	**18**	**4.33**	**4.00**	**.485**	**20**	**4.55**	**5.00**	**.826**	**38**	**4.45**	**5.00**	**.686**
T1	18	4.78	5.00	.428	20	4.75	5.00	.444	38	4.76	5.00	.431

	Prime Learner				Special Needs Learner				Total			
Code#	N	Mean	Median	SD	N	Mean	Median	SD	N	Mean	Median	SD
T2	18	4.67	5.00	.485	20	4.55	5.00	.510	38	4.61	5.00	.495
T3	18	4.72	5.00	.461	20	4.75	5.00	.444	38	4.74	5.00	.446
T4	18	4.72	5.00	.575	20	4.45	5.00	.759	38	4.58	5.00	.683
T5	18	4.72	5.00	.575	20	4.50	4.50	.513	38	4.61	5.00	.547
T6	18	4.56	5.00	.616	20	4.15	4.00	.671	38	4.34	4.00	.669
T7	18	4.33	4.00	.594	20	4.30	4.00	.470	38	4.32	4.00	.525
T8	18	4.61	5.00	.502	20	4.40	4.00	.503	38	4.50	4.50	.507
T9	18	4.50	4.50	.514	20	4.35	4.00	.489	38	4.42	4.00	.500
T10	18	4.50	5.00	.707	20	4.35	4.50	.745	38	4.42	5.00	.722
T11	18	4.56	5.00	.616	20	4.45	5.00	.686	38	4.50	5.00	.647
T12	18	4.28	4.00	.461	20	3.25	4.00	1.164	38	3.74	4.00	1.032
T13	18	4.17	4.00	.514	20	3.35	4.00	1.089	38	3.74	4.00	.950
T14	18	4.00	4.00	.485	20	3.25	4.00	1.020	38	3.61	4.00	.887
T15	18	4.17	4.00	.618	20	3.25	3.50	1.164	38	3.68	4.00	1.042
T16	18	3.89	4.00	.323	20	3.20	4.00	.951	38	3.53	4.00	.797
T17	18	4.06	4.00	.236	20	2.90	3.00	.912	38	3.45	4.00	.891
T18	18	4.33	4.00	.485	20	3.35	4.00	1.137	38	3.82	4.00	1.010
T19	18	4.56	5.00	.511	20	4.10	4.00	.447	38	4.32	4.00	.525

Table 5.18: The Differences in Mean values of Engagement for Prime Learners and Special Needs Learners

Learner's Capabilities	Prime Learner (N=18)			Special Needs Learner (N=20)			Overall (N=38)		
	Mean	**Median**	**SD**	**Mean**	**Median**	**SD**	**Mean**	**Median**	**SD**
Critical thinking	4.08	4.00	.26	3.47	4.00	.75	3.76	4.00	.64
Creative thinking	4.17	4.00	.34	3.52	4.00	.97	3.83	4.00	.80
Self-managed learning	4.25	4.00	.43	3.70	4.00	.73	3.96	4.00	.66
Adaptability	**4.11**	4.00	.21	**3.68**	**4.00**	.69	3.88	4.00	.56
Problem solving	4.19	4.00	.30	3.10	3.00	.93	3.62	4.00	.89
Communication skills	4.11	4.00	.21	3.30	3.50	.89	3.68	4.00	.77
Interpersonal skills and group work	4.08	4.00	.19	3.18	3.25	.89	3.61	4.00	.80
Computer literacy	**4.33**	4.00	.42	**4.18**	4.50	.65	4.25	4.50	.55
Learning Environment	**Prime Learner (N=18)**			**Special Needs Learner (N=20)**			**Overall (N=38)**		
	Mean	**Median**	**SD**	**Mean**	**Median**	**SD**	**Mean**	**Median**	**SD**
Active learning	**4.72**	**5.00**	**.43**	**4.65**	**5.00**	**.43**	**4.68**	**5.00**	**.43**
Teaching for understanding	4.72	5.00	.49	4.60	5.00	.50	4.66	5.00	.49
Feedback to assist learning	4.64	5.00	.54	4.33	4.50	.49	4.47	4.50	.53
Assessment	4.48	4.50	.43	4.35	4.17	.43	4.41	4.33	.43
Relationship between teachers and students	4.53	5.00	.63	4.40	4.75	.70	4.46	5.00	.66
Workload	4.22	4.00	.46	3.30	4.00	1.09	3.74	4.00	.96
Relationship with other students	4.08	4.00	.49	3.25	3.50	1.03	3.64	4.00	.91
Cooperative learning	3.97	4.00	.21	3.05	3.50	.84	3.49	4.00	.78
Coherence of curriculum	4.44	4.50	.38	3.72	4.00	.72	4.07	4.00	.68

Table 5.18, shows that the learner's capabilities for the special needs learners in computer literacy indicate the highest significance which is mean 4.18 and prime learners is 4.33. This means that both types of learners were not having much difficulty in operating the computers during their lesson.

5.7.2 Extent of Skills Acquired in the eProjBL Pedagogical Model

In this section the skills that the learners could have acquired is discussed. These include creativity, computer literacy, and team work collaboration and many more.

(a) ***Creative thinking***

Table 5.18 shows that the level of creative thinking for special needs learners compared to prime learners was higher compared to critical thinking ($\mu = 3.83$). Therefore, the average level of creative thinking recorded by the teacher was supported by the teacher's feedback at the end of the activities. The teachers claimed that the eProjBL environment increases the level of creative thinking especially among special needs learners.

Teacher (SK09-T3) (Day 2: Virtual Game-based Learning): Ya, dapat meningkatkan kreativiti murid tetapi boleh diperbaiki lagi iaitu dengan cara menimbulkan satu suasana yang dapat memberangsangkan pemikiran murid. Walaupun begitu bagi tahap murid Pendidikan Khas ianya sudah memadai." (Yes, it can increase learners' creativity but it can more improve with a way to create the condition that enhanced learners' thinking. However, the level of special education was acceptance).

Moreover, the teachers explained that the learners kept exploring and found that the learners managed to follow the instructions, as they were curious about each challenge. Furthermore, they were motivated as they were able to manipulate the objects as they wish.

Teacher (SK03-02):"Ya. Murid akan menggunakan apa sahaja ikon di dalam perisian animasi tersebut untuk menghasilkan objek dan pergerakan. Selain itu juga, murid dapat membuat penceritaan melalui gambar yang dilukis dan menggunkan pelbagai warna untuk menjadikan projek yang dibuat kelihatan lebih menarik." (Yes. Learners will use whatever icon in the animation software to produce objects and movement. Besides that, learners can make storytelling through pictures drawn and are using a variety of colours to make that project look more attractive).

(b) ***Computer literacy***

The results in Table 5.17 and Table 4.12 shows that the majority of the learners had confidence in using the computer (M = 4.00, μ = 4.05, σ = 0.769) and learnt more by using the computer for presenting their information (M = 5.00, μ = 4.45, σ = 0.686). As shown in the results listed in Table 5.18 , the learners' capability in computer literacy value was higher than the other criteria of learners' capabilities (μ = 4.25). The teachers agreed that the special needs learners could focus their attention on their lesson (μ = 4.18). The teachers' feedback concluded that the ICT equipment become helpful tools to link the interaction between learners and content.

Teacher (SK03-T2): "Murid akan berpusatkan kepada komputer sebagai medium perantara diantara guru dan murid. Guru akan membimbing murid untuk melaksanakan aktiviti yang dirancang."(Learners will utilized computer as middle medium between teacher and learners. Teacher will guide learners to implement planned activities.)

(c) ***Critical thinking***

According to the table of learners' engagement (please refer to Table 5.17) and Table 4.12, the majority of learners reached a high-middle level of critical thinking where the learners can develop their abilities to make judgement about alternative perspectives (M = 4.00, μ = 3.63, σ = 0.819). Moreover, the teachers claimed that the learners were willing to consider different point of views (M = 4.00, μ = 3.89, σ = 0.606). The level of critical thinking for the special needs learners (μ = 3.48) was lower than that of prime learners (μ = 4.09). It means that the activities encouraged them to find or discover more than one solution creatively. However, there was a difference between special needs learners and prime learners in their level of critical thinking skill (μ = 3.76). The results showed that, the special needs learners have a potential to align their critical thinking capability with prime learners during the activities. It was supported by

teacher's feedback that the special needs learners appear to think harder to find the solution during the given tasks as below.

Teacher (SK05-T3):"… mencuba untuk mencari idea bagi menyelesaikan setiap tugas yang diberikan" (… trying to find the idea to solve every task that given.)

(d) ***Self-managed learning***

In the self-managed learning criteria (Please refer to Table 5.17 and Table 4.12) both types of learners showed their capabilities that they can manage and take up responsibility for their own learning (M = 4.00, μ = 3.76, σ = 0.971). However, the special needs learner showed a larger standard deviation (σ = 1.089) because the special needs learners still need monitoring by the teacher. The majority of learners also showed their confidence in their abilities to pursue further learning (M = 4.00, μ = 4.16, σ = 0.547), It means that the learners are ready to continue their lesson independently and are able to take responsibility for the task given. Table 5.18, also shows the difference in the mean value for both groups was 0.49. One teacher commented:

Teacher (SK09-T1):"Ada murid yang dapat menyelesaikan masalah dengan sendiri…" (There are learners who could solve the problem by their own…)

(e) ***Adaptability***

As shown in the results listed in Table 5.17 and Table 4.12, the teachers (observer) noted that the majority of learners showed that they were able to adapt to the new knowledge and the new method with guidance from teacher (M = 4.00, μ = 3.87, σ = 0.578). They were also willing to change their views and to accept the new ideas (M = 4.00, μ = 3.89, σ = 0.727). Based on Table 5.18, the adaptability for the special needs learner was slightly different with a value of 0.18 compared with the prime learner. In relation to this, a teacher commented,

Teacher (SK09-T2):"Penggunaan ICT dapat membantu mempercepatkan pemahaman murid." (The usage of ICT could help to increase understanding among learners.)

(f) ***Problem solving***

As shown in the results listed in Table 5.17 and Table 4.12, the learners improved their ability to use the knowledge to solve a problem during every given task (M = 4.00, $\mu = 3.66$, $\sigma = 0.909$). Moreover, the learners also brought the information and different ideas to solve problems and to finish the project that has been given (M = 4.00, $\mu = 3.58$, $\sigma = 0.976$). For the problem solving criteria (please refer to Table 5.18, page 150), the mean value was at the average level ($\mu = 3.62$). If special needs learners and prime learners are compared, it appeared that the ability of special needs learners to perform their task depended upon how the teacher could scaffold them with the activities using the eProjBL pedagogical model ($\mu = 3.10$). Moreover, the activities helped the learners as the scaffolds to achieve the lesson objective at the end of their lesson. This finding is complemented by the comment below,

Teacher (SK05-T3): "Murid akan terus mencuba untuk melakukan terbaik untuk projek mereka, seterusnya murid tersebut akan lebih kreatif dan mencuba untuk mencari idea bagi menyelesaikan setiap tugas yang diberikan" (Learners tried to do their best for their project. Moreover, the learners were more creative and trying to find the idea to solve every task that given).

The teachers also noted that the individual tasks were encouraging learners to apply their problem solving skill. The overall evaluation mark for the problem solving criteria showed that learners achieved a mean value of $\mu = 2.66$, with a standard deviation of $\sigma = 0.745$. The achievement for both groups was the same at the "Accomplished" level (refines solutions suggested by others) as the special needs learners scores were $\mu = 2.50$, $\sigma = 0.761$, which were almost the same as the prime learner $\mu = 2.83$, $\sigma = 0.707$.

This means that both type of learners' capabilities for problem solving skill was frequently utilized in the eProjBL activities.

(g) ***Communication skills***

As shown in the results listed in Table 5.17 and Table 4.12, according to teachers' judgement, the activities also supported the learners' communication skills and how they presented their project. Moreover, it built the confidence and public speaking skills of the learners. The communication among group members showed that it involved the range between two to five scales where the mean is 3.71 with a standard deviation of 0.898 (Please refer Table 5.17). If a comparison is made between the means obtained by the special needs and prime learners, the prime learners recorded a difference of 0.17 higher than the special needs learners ($M = 4.00$, $\mu = 3.30$, $\sigma = 1.031$). The special needs learners also could convey their ideas well which allowed them to convince their group members ($M = 4.00$, $\mu = 3.66$, $\sigma = 0.815$).

(h) ***Interpersonal skills and group work***

The eProjBL activity also explored the interpersonal skills and group work for the both groups which was needed to complete their tasks. By defining their engagement through the eProjBL activities (please refer to Table 5.17 and Table 4.12), the teachers agreed that the learners preferred to do their tasks in groups ($M = 4.00$, $\mu = 3.68$, $\sigma = 0.873$). However, the learners felt confident in dealing with a wide range of people ($M = 3.50$, $\mu = 3.53$, $\sigma = 0.893$). Through the engagement survey form results (Table 5.18), interpersonal skills and group work among special needs learners and prime learners were the lowest value for learners' capabilities at $\mu = 3.61$.

In addition, through the learners' performance, the team work criteria were also evaluated by their teacher at a mean value of $\mu = 2.66$ (Table 5.13, page 145). When the four criteria of teamwork such as workload, contribution, monitor group effectiveness and working with others are compared, the special needs learners were found to be at an average level with a mean value of $\mu = 2.34$.

As shown in the results listed in Table 5.17 and Table 4.12, it was found that the special needs learners had no difficulty in their relationship with the other learners ($M = 4.00$, $\mu = 3.61$, $\sigma = 0.887$) and appeared to have a sense of belonging to the class ($M = 4.00$, $\mu = 3.68$, $\sigma = 1.042$). Based on Table 5.18, the special needs learners showed a difference of a mean value 0.84 compared to the prime learners. Teachers felt that this was possible because the prime learners were willing to help the special needs learners in completing their tasks. Thus the blended inclusive classroom provided a conducive environment for both types of learners to collaborate and help each other.

(i) ***Cooperative learning***

Cooperative learning is also one element of engagement which is important in an inclusive classroom (Please refer Table 5.17 and Table 4.12). The learners discussed their idea with their friends when they needed to choose the best solutions during the execution of the task ($M = 4.00$, $\mu = 3.53$, $\sigma = 0.893$). Generally, the learners also shared information with other learners which increased their own understanding and build new knowledge and enhanced their ideas ($M = 4.00$, $\mu = 4.05$, $\sigma = 0.769$). Nevertheless, based on Table 5.18, the cooperative learning among special needs learners had the lowest mean value of $\mu = 3.05$ compared with prime learners with a mean of $\mu = 3.98$. This was supported by the teachers' feedback that a few special needs learners preferred to learn on their own when solving problems and did not share with their peers.

The relationship between the teacher and learners had an effect on the learners' engagement in the classroom. The teacher facilitated the learners by followed the lesson given and modifying according to the learners' situation. Based on Table 5.18, the relationship between the teacher and special needs learners was higher than the relationship between the teacher and prime learners with a mean value of $\mu = 4.53$ because the teachers showed more concern to ensure that the special needs learners could understand the lessons.

5.8 Summary of the Chapter

In Chapter Five, the findings collected from the various instruments were interpreted and triangulated. Data was collected based on the teachers' feedback and observation in the Malaysian context of inclusive classroom. Moreover, the usage of edutainment applications among learners was reflected in this chapter. The first research question in relation to the strengths and weaknesses of the eProjBL were discussed. Secondly, the teachers' perceptions of the special needs' and prime learners' learning as they utilised the eProjBL pedagogical model was described. Third, the teachers' evaluation of the special needs' and prime learners' performance was discussed and fourthly, the extent of the skills acquired by the learners was put forward.

CHAPTER 6: RECOMMENDATIONS AND CONCLUSION

6.1 Overview of Chapter

"I've worked across the whole age range from nursery to College but the majority of my time was spent working with special needs children in main stream schools. I'm saddened by the way things are heading. The main focus now is on results not the all-round education and well-being of the children. Somewhere along the way in schools today they have lost sight of the child! Good teachers are no longer given the freedom to inspire their pupils. They are told what to do and how to do it. In my case this has changed so many times and was never any benefit to my special needs children. I was always passionate about teaching and made learning fun. I wish project based learning was part of the National Curriculum once again!" said Helena Ward from (Stager, 2012)

The comment above was expressed by a teacher who believes on project based approach in special education which could be a reality if the relevant stakeholders are aware of the benefits of this approach. The purpose of this study was to determine if the alternative eProjBL approach that utilized the capabilities of project based learning in the national curriculum was applicable especially to those in special education. The implementation of the blended inclusive classroom shows learners' engagement and capabilities based upon the theoretical framework of the study.

Therefore, in this last chapter, the summary, implications for future studies and the conclusion is discussed. In addition, ethical issues are also highlighted to ensure that future researchers have some guidelines to follow.

6.2 Summary of the Research

The current scenario in the inclusive classroom is that the special needs learner is labelled as a learner with low capability. In addition, the content and learning environment was designed for prime learners but not for special needs learners. Thus, the special needs learners did not receive the appropriate instruction in the inclusive classroom. Therefore, the present study put forward an alternative pedagogical model that captures special needs learners' attentions as well as supports the ability of special needs learners to collaborate with prime learners in an inclusive classroom.

The study had four phases. First, was the preliminary phase where issues related to the challenge of special education were reviewed through literature and conversations with relevant stakeholders. The 3 C (Connecting, Content, Confidence) factors (Ponter & Brown, 2007) become the key enablers in capturing the appropriate scenario blended with technologies. Within these enablers, how special education teaching and learning occured was put forward. In addition, the real scenario for inclusive education programmes in Malaysia was summarised from MOE. One main factor was that special education learners in inclusive classrooms were from the high function category. Nevertheless, using the same teaching approaches to teach such classrooms may not be fruitful as teachers need to specifically tackle the problems of motivation, interest and lack of attention among the special needs learners. Furthermore, other issues were teachers' lack of experience with ICT tools, lack of software and hardware as well as the time factor in relation to covering the syllabus.

The second phase of the study focused upon the conceptual design and the theoretical framework together with the content to be utilised through the alternative pedagogical model being proposed. The eProjBl model was based upon the Problem Based learning design blended with technology and edutainment applications. The Theoretical

Framework leaned heavily upon Lev Vygotsky's theory and concept of Zone of Proximal Development (ZPD). The edutainment applications included Augmented Reality, Virtual Game-based, Game–based and Animation components. Furthermore, the Know-Learn-Use (KLU) strategy was applied when developing the edutainment content in this pedagogical model. Based on Figure 6.1, interactivity was also an important factor which connected learner's engagement and learner's performance. Figure 6.2 shows the level of zone of proximal development as interpreted for the eProjBL pedagogical model. The level of challenge increased with each level of competence according to the stage of edutainment activities. Peers and teachers guided learners to execute the eProBL activities based upon the scaffolding priciple especially for the special needs learners.

The samples for the study were selected schools and the learner participants according to the acceptance of each of the approached school's ethical procedures. The data collection techniques included observations, semi-structure interviews, field notes, engagement survey form and evaluation rubrics. Phase three was the pilot testing stage where the instruments were validated and tested. This was followed by the actual testing in the field. The final fourth phase was the analysis and interpretation stage where the data collected were scrutinised carefully.

The strengths and weaknesses of the eProjBl model emerged from the study. The strengths were that learners were able to visualise the topic being taught better, the students displayed self-motivation and the learners also were able to explore the concept on their own which indirectly enhanced their communication skills. The weaknesses included the time that was taken by the teachers to set up the class.

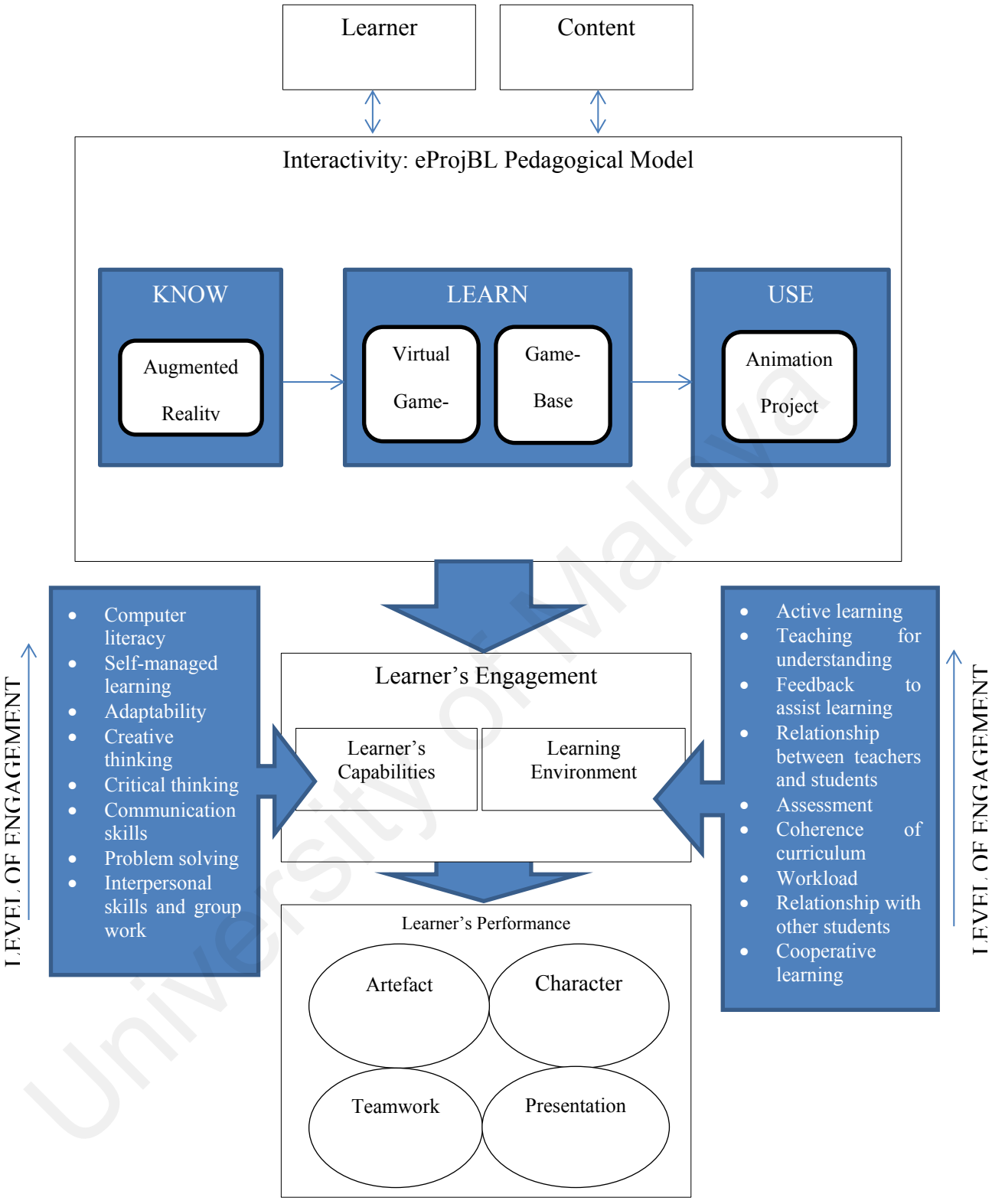


Figure 6.1: eProjBL Pedagogical Model

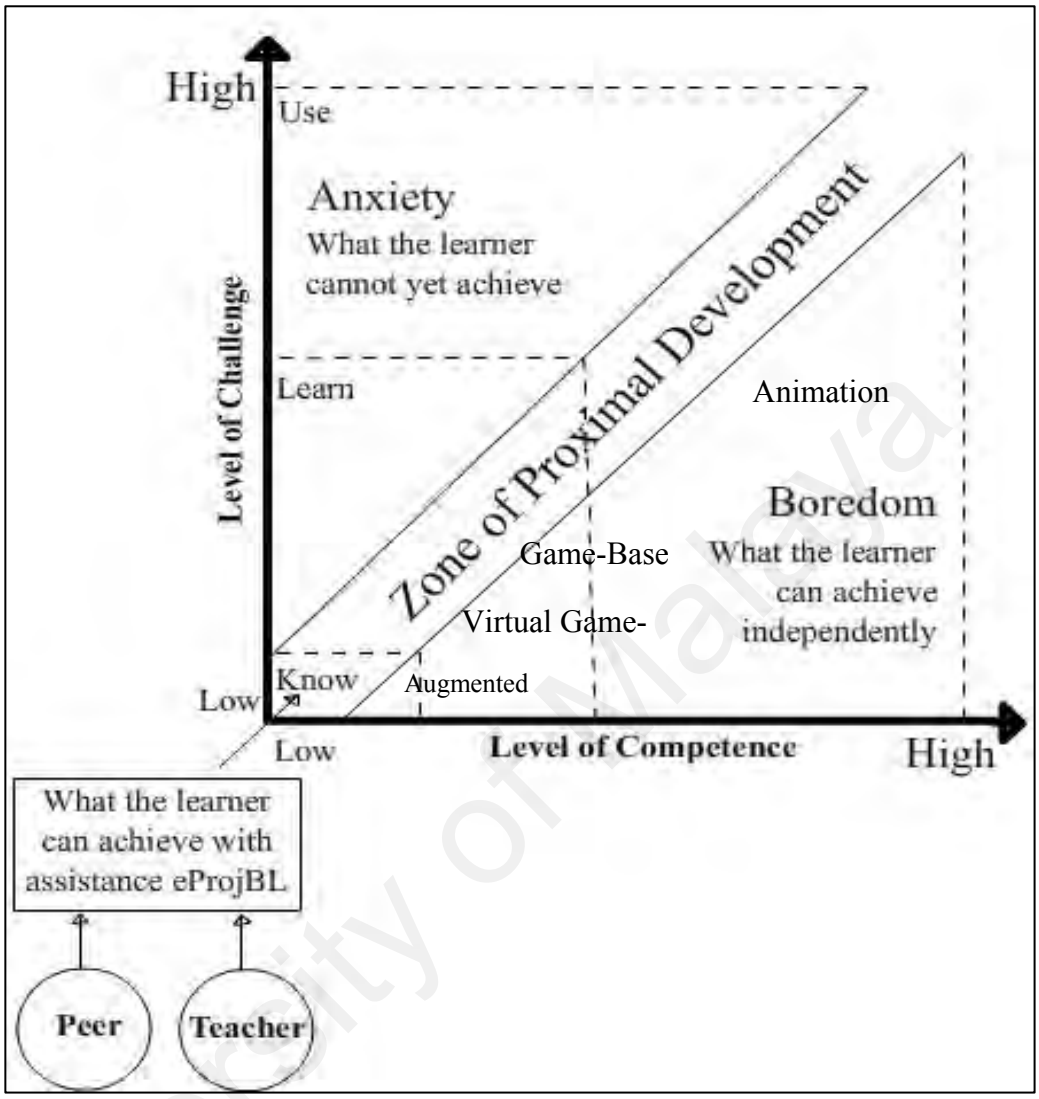


Figure 6.2: Edutainment Design of eProjBL Pedagogical Model

Teachers' perception of the eProjBL model was also investigated. Findings revealed that the flow of the process of the eProjBL pedagogical model was very effective and systematic so as to be able to achieve the lesson objectives (explained in section 5.5.1 Workflow of the eProjBL Pedagogical Model). The tasks given to the learners helped the learners to engage with the content (please refer Figure 6.1, page 161) and collaboratively with other learners. The learners also competed with each other to complete the task even if their time of execution is long (please refer to page 137). The

teachers identified the learner's individual task as an appropriate activity that encouraged the learners to apply their problem solving skills. The majority of teachers agreed that all elements of edutainment are beneficial to the prime learners and especially to the special needs learners. The learners share the information with others and tried to complete the task given together. The teachers also commented that the edutainment elements can help to enhance the learners' capabilities to become more creative. The teachers also felt that the activities built the learners confidence to achieve their task with support from their teacher. Finally, most of the teachers agreed to execute the edutainment activities continuously in the classroom even after the study.

The teachers' evaluation consisted of the four elements namely Character, Teamwork, Artefact and Presentation. The mean values for the prime learners' performance for Character, Teamwork, Artefact and Presentation were 3.05, 3.08, 2.98 and 2.75 respectively; while the mean values for the special needs learners were 2.43, 2.32, 2.53 and 2.59 respectively. The extent of skills acquired showed that overall the mean value for the prime learners were higher than the special needs learners. For example, for the skills of critical thinking, creative thinking, problem solving and computer literacy, the prime learners scored means of 4.08, 4.17, 4.19 and 4.33 respectively as compared to the special needs learners who scored 3.47, 3.52, 3.10 and 4.18 respectively.

6.3 Similarities and Differences with Other Pedagogical Models

The pedagogical model in the present study was constructed by adapting the fundamentals of the social constructivist theory by Vygotsky. This was merged with Schell's game design model which enabled the progress along the Zone of Proximal Development of learners' engagement until they completed the task given. The edutainment design of the eProjBL Pedagogical Model was designed to utilize the

capabilities of special needs learners' experiences on edutainment applications. The edutainment applications scaffold learners to maintain their engagement. The eProjBL pedagogical model is similar to the type of edutainment approaches for special needs learners which was implemented by Green and McNeese (2007); Laghos (2010). In 2013, Patton (2012) analysed the capabilities of edutainment for Children Computer Interaction (CCI) which supports the game simulation to help children engage with learning. The difference is, the edutainment design of the eProjBL Pedagogical Model in the present study integrated the selected edutainment approaches and Know-Learn-Use strategies. The edutainment approaches were identified and chosen from the second phase of research design when reviewing the edutainment technologies practised in the current scenario before aligning it with the eProjBL strategies.

6.4 Limitation of the eProjBL Pedagogical Model

There are some limitations in relation to the pedagogical model compared with other models which needs to be considered are:

(i) The eProjBL pedagogical model utilised the blended learning environment which intergrated the Information Communication Technology (ICT) in the inclusive classroom. Therefore, the 3C key factors need to be available to ensure the success of the eProjBL implementation.

(ii) The teachers' preparedness to execute the eProjBL Pedagogical Model in terms of having to think creatively to design the inclusive classroom with the selected topics is also necessary.

6.5 Ethical Issues

The study conducted involved special needs learners and teachers who utilised an alternative pedagogical model. Several ethical issues needed to be considered. The selected school heads granted permission. In addition, before this, permission was

obtained from the MOE and the state departments of education (Please refer Appendix A and Appendix B). The collaboration and involvement of the science special education teachers involved were crucial to the testing session as well as in creating the lesson plans for the eProjBL Pedagogical Model. The parent's permission also needed before the testing session conducted. The teachers who were involved in the testing phase needed to have permission from the school heads to make some adjustments to their existing timetables to suit the testing duration. On top of that, the venue for the testing session had to be properly organized by technicians to ensure all the equipment and the power supply was up and running and sufficient.

6.6 Implications of the Study

One of the implications of the study is that special needs learners with high function capabilities (they must be diagnosed well before they join the inclusive classroom) can be placed together with high achieving prime learners in an inclusive classroom and not with low achieving learners. Nevertheless, for both types of learners to learn successfully together the teaching and learning approach must be effective for both. The eProjBL model's edutainment application in the study has shown that this approach is applicable.

With the right approach of technology integration, it appears that special needs learners can indeed be engaged very successfully in the teaching-learning process. The attention of the learners, the motivation and interest can be enhanced. This in turn appears to assist the learners to acquire skills such as critical thinking and creative thinking skills, problem solving skills and of course computer literacy skills and many more.

6.7 Suggestions for Future Research

The findings of the present study explain and share the testing of an alternative learning environment in the inclusive program within the Malaysia education system. However, further continuing studies need to be done to help to customize and modify the latest technologies appropriately to special needs learners. The study in particular utilized the benefits of edutainment to gain learners' attention and to try and enhance creativity at a young age.

The study contributed an alternative approach in the blended inclusive classroom for special education, and has also contributed to the framework of the eProjBL pedagogical model (Please refer Figure 6.1, page 161). The study discussed the implementation of the Know-Learn-Use strategies based upon the ZPD concept of learning. Moreover, the four eProjBL evaluation criteria namely character, artefact, teamwork and presentation can act as a guideline for educators. The teachers involved in the study also suggested edutainment applications appropriate to their learners in special education.

As a continuation of the present study, future research can include and expand upon the following suggestions,

(i) Field test the eProjBL pedagogical model in more schools throughout the country (if possible from each state). This can reinforce the findings of the present exploratory research;

(ii) Prepare and test more content which is appropriate to be taught using the eProjBL pedagogical model;

(iii) Test the eProjBl pedagogical model among specific groups only such as only ADHD special needs learners together with prime learners and such. This

can perhaps provide more insight specific as to how to approach specific groups of special needs learners, and

(iv) Other edutainment applications can be tested using the eProjBL pedagogical model to ascertain, which applications best suit different groups of specific special needs learners.

6.8 Conclusion

Educational research has found that the evolution of technology in education has made the process of teaching and learning more relevant to the present generation of learners. In Malaysia, the ministry had announced the significant policies that encourage the school communities to make full use of the ICT as the bridge to connect to several informal skills such as social skills, creativity and confidence to be included in their curriculum. Research such as the work by (Kotwal et al., 1996; Wah, 2010) (including the present research) have also shown that technology integration gives a positive impact for special needs learners such as children with ADHD, autism and slow learners. By developing either mobile content or web-based content for special education, teachers can easily access the contents and the learners would benefit from it.

Nevertheless, the type of technology utilised has its challenges. In addition, it is important to diagnose special needs learners accurately for inclusive classrooms. The creation of edutainment technology utilised in this present study had its challenges, but it was shown to be successful in engaging and motivating higher function special needs learners as well increase interest almost similar to the prime learners. The present study has put forward a guideline and an alternative procedure to help educators execute lessons creatively based for the blended inclusive classroom learning environment.

Nonetheless, technological innovation with present and future edutainment applications needs to on continuously for new content to be beneficial for special needs learners and prime learners.

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LIST OF PUBLICATIONS AND PAPERS PRESENTED

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