Chapter 2
LITERATURE REVIEW

Recently, computer game is believed able to help in educational environment. Recent researches in the educational application of computer games have focused on the skills which children can develop while playing the computer games. However, it is more important if we can create an immersive learning environment in developing the knowledge. Thus, encouraging children to play appropriately designed games can be used to enhance their learning. By allowing these children to create their own computer games will further offers range of learning opportunities. Constructionism is both a theory of learning and a strategy for education. It involves two intertwined types of construction: the construction of knowledge in the particular context and the building of personally meaningful artifacts. This chapter attempts to investigate computer game authoring and constructionism learning theory. Then, the significance of computer game making and history learning is investigated. Finally, several cases of implementation of computer games making in educational setting were reviewed.

2.1 Traditional history learning context

In traditional classrooms, history learning is conducted by dictated, and textbook. Teachers summarize the textbook contents for the students. The students are “fed” by the notes that provided by the teachers. Students are expected to receive information relayed by a teacher, absorb it, and to understand it in the same way that the teacher understood it. In this case, the teacher plays the active role and student acts as the passive role in learning. This process is called as transmission learning.

History subject has high cultural values but most of the students refused to study this subject. Some students study on history just to sit for the examination but neglected the zeitgeist and the cultural context of the history. Indeed, several approaches have
been taken in promoting history learning. For instances, playing video or making play
have been adopted in history learning. An interview session had been conducted by
the researcher prior to the workshop, the participants claimed that these methods
didn’t bring prominent effect to them.

Perhaps history is a challenging subject to be taught in school. This is because history
textbooks were written as the presentation of years and facts. Rote learning and
memorization are not the best way in learning history. Researches showed that
teaching history in school by applying textbook-based practice is unsuccessful in
developing historical understanding as defined by either the developmental or
narrative-based model (Levstik, 1986). Hence, creating an interesting history learning
context is crucial in order to promote history learning. Turning the students as active
participants would be an alternative for history learning. The theories will be
discussed in the following sections.

2.1.1 Issues in history learning
A few issues in learning history have been identified (Ellis & Bruckman, 2002).
Firstly, we are living in the present world; it is a vast difference between the world
that we are living now and what’s in the past. For example, it is difficult for people
who live in the present world to understand normal in the past. Hence, students need a
medium which can help them to develop a deeper understanding in the context of
history.

Secondly, the facts which given to students are based on the interpretation from the
authors or teachers. In history learning, students should be given the opportunities to
practice, or construct the history itself in the classroom. In other words, student acts as
a historian to reveal the mask of the historical events. These methods would be able to
stimulate their thinking towards the history events. Hence, the learning would take
place.
It is crucial to make learning material become meaningful to students. The teacher cannot do the learning for them, but the students have to be the active participant in this learning process.

2.2 Constructivism as the learning context
In the constructivist approach, learning is an active process, in which people actively construct knowledge from their experiences in the real world. People don't get ideas but instead making them. Constructivism (Piaget, 1971) is a learning theory that argued against the objectivist philosophy. In objectivist philosophy, instruction or teaching is the process of helping the learner to interpret and operate correctly in the real world. In this case, the instructor acts as the active role to transform the knowledge to learners. In contrast, constructivism holds that the only reality is our individual interpretation of what we perceive (Alessi & Trollip, 2001). It emphasized the actions and thinking of learner rather than what is taught by a teacher. From here, learner is encouraged to discover the knowledge by their own effort.

The constructivist approach puts its emphasis on the active process of learning and deemphasizes teaching activities. This is because constructivism holds that the only reality is our individual interpretation of what we perceive from the real world.

2.2.1 Role Playing Game (RPG) as a constructivism learning context
Games can make learning more enjoyable (Squire, 2003). The existence of uncertainties in game environment promotes student’s engagement towards learning. The creation of fantasy in the game context is the major factor in motivating the student in learning the subject. The narration presents in the game becomes the branching tree of sequences which allows the players to create their own stories by making choices at each branch point (Crawford, 1982).
RPG is believed to be able to help in developing student’s thinking abilities in learning history. Student responds to the various kinds of game events by analyzing the historical events. This could facilitate in micro-historical learning that provides students have the complete pictures about life and context. This is different with the traditional history learning that follows the macro-historical approach. Macro-historical approach requires students to remember dates and event, the sequences of empire, and so forth. In the historical RPG context, students are exposed to the details of the history events and also able to see the relevant of each event while playing the game. Thus, students act as active players because they choose how the story should go. Table 2.1 concludes the comparison of history learning between the constructivism context and the traditional context.

Table 2.1: History learning in constructivism context and traditional context

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Traditional learning</th>
<th>RPG learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Student’s role</td>
<td>Passive</td>
<td>Active</td>
</tr>
<tr>
<td>Student’s engagement</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Learning environment</td>
<td>Linear</td>
<td>iterative</td>
</tr>
</tbody>
</table>

2.3 Constructionism in learning

As a theory, constructionism is guided on the constructivism by Jean Piaget (Piaget, 1972). In the constructionism, learning process is focused through the making of the artifacts, rather than overall cognitive potentials. The theory said that people learn better through building personally meaningful artifacts and sharing them with other (Papert, 1991). Papert has expanded on this idea by stating that one particularly good way to construct new knowledge is to construct tangible objects that a child (or adult) can reflect upon share with others (Kafai & Resnick, 1996). Besides, constructionism emphasized in how ideas get formed and transformed when expressed through
different media, when actualized in particular context, when worked out by individual minds. In Papert’s own words: "Constructionism - the N word as opposed to the V word- shares constructivism's view of learning as "building knowledge structures" through progressive internalization of actions... It then adds the idea that this happens especially felicitously in a context where the learner is consciously engaged in constructing a public entity, whether it's a sand castle on the beach or a theory of the universal” (Papert, 1991). Although both Piaget and Papert developed their theories through observing the behavior and learning activities of children, Papert in particular, believes that these findings are equally applicable to adults.

Research in educational community has stressed the importance of self-directed, personally meaningful, and cognitively complex projects for student’s learning success (Kafai & Resnick, 1996). Design activities are one example of such project-based activities in which students are engaged in designing complex, interactive pieces of software to be used by other students for learning about a particular area (Harel, 1991). At this point, constructionism is emphasized when the learner actively creating a tangible artifact which is meaningful in a specific domain, and then learns on the subject matter during the creating process. In fact, no one learns to ride a bike by sitting through a class. The same thing can be applied in coaching, sales or other business skills. When people learn by doing, they become energized, they stick with it and they learn.

The design process creates a rich context for learning. Learning by design concerns both the process of learning and its outcomes or products. The essence of learning by design is in the construction of meaning. Designers (learners) create objects or artifacts representing a learning outcome that is meaningful to them. A critical element of learning by design is that learners construct knowledge in purposeful activities. Creating knowledge in functional contexts helps students develop a robust (as opposed to inert) knowledge that can be used to solve problems.
2.3.1 Constructionism Learning Context

A project which to investigate Constructionism learning context was carried out at Constructionist Learning Lab (CLL) addressed the feasibility of Papert’s constructionism as a foundation for designing productive learning environments, not only for a transient population of at-risk teen, but the broader learning community (Stager, 2005). The purpose of the CLL was to create a rich constructionist learning environment. In this project, several at-risk students were engaged in long-term projects based on personal interest, expertise and experience. These students used computational technologies, including programmable LEGO, and more traditional materials to construct knowledge through the act of constructing personally meaningful projects.

The following ideas by Papert for CLL have been adopted in this research:

i. Learning by doing. Learners were believed to learn better when learning is part of doing something really interesting.

ii. Technology as building material. Learners would make a lot more interesting things and can learn a lot more by making them using appropriate technology. Computer game might be the proper technology because it is extremely popular with children and they devote considerable amounts of their free time to playing them (McFarlance, 2002).

iii. Hard fun. Students learn best and they work best if they enjoy what they are doing. Fun and enjoying doesn’t mean “easy”. The best fun is hard fun. The learners work hard on their computer games and enjoy the successfulness at the end.

iv. Learning to learn. Learners have to take charge of their own learning to gain what they need to know.

The ideas addressed the important concepts in learning. By applying these ideas, it is hope that history learning can be more effective.
2.3.2 Computer game authoring as Constructionism learning context

Recent projects showed that the educational value of design projects, in which students design and create external artifacts that they can share and discuss with other (e.g., Harel, 1991; Kafai, 1995; Papert, 1993; Resnick & Rusk, 1996; Soloway, Guzdial & Hay, 1994). In some cases, students might create their own video games or animated stories. According to Resnick, design projects (Resnick, 1998) able to provide rich opportunities for learning by:

- Engaging children as active participants, giving them a greater sense of control over (and personal involvement in) the learning process. This conflicts with the traditional school activities in which teacher aim to “transmit” new information to the students. Game authoring technique is good to create an immersed learning environment for student in history learning. Students are given a chance to reconstruct the fact which is happened in the past by their own mean.

- Integrating concepts from the arts, mathematics, and science. In this case, students would learn something which is not explicitly stated in the learning goals.

- Encouraging pluralistic thinking, avoiding the right or wrong dichotomy prevalent. In most of the math and science activities, suggesting the possible solutions are more important instead of that multiple choices. It is important to promote the students have the widen view regarding the history facts.

- Encouraging children to put themselves in the minds of others, since they need to think through how other people will understand and use their construction. It is important when the product is being shared with their friends.

Children gain deeper understanding of mathematic and science concepts while manipulating the physical objects in the school. But the same method is hard to apply when the children move on from the elementary school to the secondary school. This is because many important concepts are very difficult to explore with traditional
manipulative materials (Resnick, 1998). Thus, designing and manipulating objects in the digital world would be the alternative to resolve the problem. LEGO/ Logo which was developed by MIT Media Lab is a successful example for helping children in mathematical and scientific learning (Resnick, 1993).

In past decade, designing and developing computer games are difficult due to programming and advanced mathematic skills involved. However, number of commercial games development tools in the market which only required a little or non programming knowledge involved. For example, 3D GameStudio (http://www.3dgamestudio.com) is a commercial games authoring tool that allow players to build 3D games without any programming language. It introduces scripting language that is near to the natural language. By using the simple scripting, games in commercial quality can be created, successfully published and distributed. Besides commercial products, RPGMaker which is a product from Enterbrain allows RPG fans creating their own RPG games by their own creativity.

Apart of authoring tools, some commercial games provide bundled tools to encourage player further develop the game content. Arcanum (figure 2.1), a role-playing game has released the WorldEdit map creator. It allows the player to create simple dungeons and fill them with basic monsters in the virtual world. Players can easily create scenery for the game since scenery objects are categorized for easier navigation. Players are allowed to add monsters and treasure to find and be able to adjust their attributes and conditions. By providing this tool, players enable to express their ideas in a non-textual medium, giving them the opportunity to exercise their imaginations and producing artifacts which can be enjoyed by others (Robertson & Good, 2004).
The core idea for constructionism is learning by doing. While making a computer game, the learner is forced to think carefully about all aspects of the content and the relationships between them. Thus the learner will think about the content in a concrete and complete fashion.

2.4 The differences between Constructivism and Constructionism

Constructivist and constructionist share the same goal. Both theories support that learners construct and constantly reconstructed through personnel experience. Knowledge is not directly transmitted from one to another but is a personal experience to be constructed. The common objective is to highlight the processes by each person outgrowing their current views of the world, and construct deeper understandings about themselves and their environment.

Piaget's main interest was mainly in the construction in internal stability. In the theory of constructivist, children become progressively detached from the world of concrete objects and local contingencies, gradually becoming able to mentally manipulate symbolic object within a realm of hypothetical world (Ackermann, 2001). Cognitive invariants in interpreting and organizing the world are important in constructivism.
His theory emphasizes all those things needed to maintain the internal structure and organization of the cognitive system. Thus, Piaget's interest was in the assimilation pole.

At the other hands, Constructionism is more towards the dynamics of change. Papert believes that intelligent is being situated, connected, and sensitive to variations in the environment. Papert draws the attention to the fact of "diving into" situations rather than looking at them from a distance, that connectedness rather than separation. In his view, "becoming one with the phenomenon under study" is a key learning.

As a conclusion, while constructivism defines learning as the building of knowledge structures inside one’s head, constructionism suggests that the best way to ensure such intellectual structures form is through the active construction of something outside of one's head, that is something tangible, something shareable (Stager, 2001, 2002). Thus, the co-operation among the participants in this research is important to determine the successfulness of the study.

2.5 Authoring RPG as the Constructionism approach in history learning
Traditionally, history subject is taught in schools verbally. Teachers explaining the facts leading by the textbook and students learned through the textbooks. Students are assessed through periodical examinations. However, in the constructionist’s view, educational success was not measured by these measures (Stager, 2005).

Constructionism emphasizes that people learn by actively constructing and interrelating knowledge and ideas rather than by assimilating facts. Constructionism also emphasizes the needs for learning activities to incorporate both personal and epistemological connections (Resnick, 1996). Creating RPG, participants imagine themselves as the characters in the history, which allows them to make a personal connection with the content materials while exploring about the real-world
phenomena in that context. The participants understood the environment of RPG, such as game mode and battle setting, and are engaged by the possibility of creating such game themselves. The large amount of history facts uses the storytelling ways to pave the foundation for students’ epistemological connections. Students are not often taught in school that history can be used to make a RPG, and like the AquaMoose tools, RPG game method gives them the ability to freely explore the possibilities of history events by building on their prior history knowledge. At the end, participants build an interesting RPG that combines their imagination with history facts.

Nowadays, children are more likely to use computer-based tools for doing history-related activities. Children used “WebQuests” (Dodge, 2005), a web-based application which involves Internet searches to enable some understanding of historical events ranging from Civil War to Thanksgiving. Another example is Oregon Trail game, which enable children to play the role of settlers traveling west on the trail. The children need to make decision, trying to survive, and dealing with the many circumstances that arouse. It would be a way in fostering historical thinking among the children. Figure 2.2 shows the game environment of Oregon Trail.

Figure 2.2: Oregon Trail classic game
In movie *XX Ray II* (Osman, 1995) provides some interesting lessons to think historically. Aziz told the tale of a scientist who is living in the 1990s, has been transported back to Hang Tuah’s generation during 1800s. At the beginning, the protagonist of the story finds very hard to understand the cultural background on that time. When the protagonist have the exposures of the events happened, he gradually begins to understand some of the small and large daily events and compromises at that time. At the same time, the protagonist and the audiences of the movie may give the opportunities to see the journey of the Hang Tuah in his contribution towards Melaka Empire. In this example, the protagonist of the story learned about history of Hang Tuah more precisely while he has been exposed in that context. This is a way to instill history thought to the learner.

The *XX Ray II* movie gives a clear background on how history thought can be instilled. But, we do not have a time machine in the reality. However, with the helps of current game technology, history thought development can be achieved by developing a tool which could help in fostering the critical thinking of history content. A review of the literature has uncovered four interrelated characteristics of historical thought (Ellis & Bruckman, 2002):

i) Present vs. past context
This is important in helping students to develop a mental representation of the immense differences between what the learners perceived today of the world and the understanding of those in the past. Learning to avoid thinking that the categories used to understand the world are not static, a pitfall Lowenthal refers to as the “timeless past” fallacy (Lowenthal, 1983).

By reconstructing the historical events, students gain more understanding than just reading from the textbooks. Besides, students are given chance to construct storyline which is not revealed in our textbook by their own means. A critical aspect of good historical analysis is to understand the historical context that made realities different
from the present possible. Since history educators do not have the luxury of using
time machine to transport the learners to different historical contexts, the educators
must find other means of fostering deep understanding of history.

ii) Empathy
Constructionism encourages students to get involved in tailoring the knowledge. Thus,
helping students in understanding the situation, feelings, and motivation allow them to
“see through the eyes of people who were there” (Bradley Commission on History in
Schools, 1988).

iii) Author bias
Students need to have an alternative vision of the past and not only rely on what have
been digested or interpreted by the others. While students are doing historian’s job, it
helps the students to develop a belief that subtext exist and learn to consider the
source of the history.

iv) Understand the multiplicity of history
History is not a fixed story, but a dynamic and continuous uncovering and
re-interpretation of the past (Ellis & Bruckman, 2002). In order for learners to
understand the past’s multiplicity is by the direct experience of learners themselves.
This can be achieved by sorting through the welter of the past’s conflicting vision and
produce a story written by learner’s own hand (Wineburg, 2001). Students are
encouraged to explore history based on their own research and to construct a
representation of it by their own mean. The information gathering could be obtained
by searching, skimming, reading, questioning, viewing and / or listening. An animated
narrative which incorporates the elements of constructionism, make the advantages of
youth’s growing familiarity with history simulations like the Oregon Trail. The youth
were challenged to recreate some of the decisions in the game that would cause the
possible changed of African-Americans in the history who attempted to escape from
slavery in 1850s United States.
Through active engagement with history, students are more likely to understand the virtue of learning history and realize that they are the product of the past, live in the present and shape the future. Having students engage in the processes of historical inquiry is central point to accomplishing the goals of teaching history. Thus, by creating a historical based game can achieve this goal in the history learning.

2.6 Framework in analysis history learning

A framework of Contextualized Historical Thinking (Polman, 2002) has been introduced to cater the history learning. The framework is derived from the expert historians (Bruer, 1993; Spoehr, 1994; Wineburg, 2001) and socialcultural theory (Wertsch, 1998). The framework argues the importance of contextualized historical thinking which consists of five elements; they are location, place within a time flow, perspectives of participants, climate of opinion of zeitgeist, and cultural tools and norms. The five elements of the framework is presented in Figure 2.3.

![Figure 2.3: Framework of Contextualized Historical Thinking](Derived from Polman, 2002)

Besides the five important elements shown at Figure 2.3 (Wineburg, 2001), there are six subtasks that further explained about the contextualized historical thinking framework (Polman, 2002). Each subtask is explained in the Table 2.2.
Table 2.2: Subtask in Contextualized History Thinking

<table>
<thead>
<tr>
<th>Subtask</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Gathering</td>
<td>Performs searching, skimming, reading, questioning, viewing, and listening to gather the information.</td>
</tr>
<tr>
<td>Interpretation</td>
<td>Interpret the meaning of the information on its own and in relation to other information and knowledge of the learner.</td>
</tr>
<tr>
<td>Synthesis</td>
<td>Make the possible of the related threads, events, and themes.</td>
</tr>
<tr>
<td>Recall memorization</td>
<td>Importance in the individual assessment.</td>
</tr>
<tr>
<td>Source judgment</td>
<td>The reliability of the source in the gathered information.</td>
</tr>
<tr>
<td>Evidence to justify the interpretation</td>
<td>Identify the source material, existing theories, or other interpretation.</td>
</tr>
</tbody>
</table>

The analysis concept (Gibson, 1986) works on perception which has been applied in several studies (Norman, 1988; Wertsch, 1998). Each task is examined with the concept of “affordance” and “constraint”. There are two kinds of affordance in this analysis: require and enable; and only one kind of constraint was concerned: disable. Table 2.3 summarizes the three states of the criteria for the framework.

Table 2.3: State of analysis criteria

<table>
<thead>
<tr>
<th>State</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Require (R)</td>
<td>The learner requires forming the analysis of the history thinking during the activity is carrying out.</td>
</tr>
<tr>
<td>Enable (E)</td>
<td>The activity prepares the analytical context, but the learner do not necessary require that kind of thinking.</td>
</tr>
<tr>
<td>Disable (D)</td>
<td>The activity does not prepare the analytical thinking because it is beyond their scope.</td>
</tr>
</tbody>
</table>

By applying the framework, several traditional learning methods (factual multiple choice, essay/ short answer, role play) and constructivism methods (Playing Oregon
Trail, WebQuests) have been evaluated based on the *affordance* and *constraint* criteria. The summary of the evaluation is shown in Table 2.4.
Table 2.4: Analysis of history learning in education tasks (Derived from Polman, 2002)

<table>
<thead>
<tr>
<th>Location</th>
<th>Participant Perspective</th>
<th>Time Flow</th>
<th>Cultural tools and norms</th>
<th>Zeitgeist</th>
<th>Info gathering</th>
<th>Interpretation</th>
<th>Synthesis</th>
<th>Recall memorization</th>
<th>Source judgment</th>
<th>Evidence to justify interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factual multiple choice</td>
<td>E</td>
<td>D</td>
<td>D</td>
<td>E</td>
<td>E</td>
<td>R</td>
<td>E</td>
<td>D</td>
<td>R</td>
<td>D</td>
</tr>
<tr>
<td>Essay/ Short answer</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>R</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Role Playing</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>E</td>
<td>E</td>
<td>R</td>
<td>R</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Playing Oregon Trail</td>
<td>R</td>
<td>R</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>R</td>
<td>E</td>
<td>D</td>
<td>E</td>
<td>D</td>
</tr>
<tr>
<td>WebQuests</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>R</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
</tbody>
</table>

Note: R = Require   E= Enable   D= Disable
In traditional learning like factual multiple choice, learner perceives the information through the instructors and/or through the textbooks. So, it has disabled the participant’s perspective. The learners are required to memorize the facts which are delivered from the textbook. Thus it would disable the time flow consideration except memorized the dates for specific events. At the same time, it has disabled the historical synthesis by the learners. In essay and short answer, it tends to almost enable every aspect but it is not required. The weight of the assessment is fall under information gathering and recall memorization in order to respond to the specific questions.

Recently, the adoption of modern history learning method has been carried out in fostering the history learning. One of the methods which is widely applies nowadays is role playing. The learners will act out the particular history event. Sometime, the learner requires creating their own dialogue and writing script for the play. In this case, they require several aspects of contextual thinking, participant perspective, and consideration of the location and flow of time. At the same time, the learner requires subtasks in interpretation and recall memorization, but enables the other subtasks.

The rapid growth of computer technology has prepared an innovative platform in history learning. One of the methods is playing the historical simulation game. In Oregon Trail, it requires the location consideration, participant perspective, and information gathering. However, learners are disabled from doing much synthesis, judgment of sources or justification of interpretations based on the evidence.

The invention of internet technology brings a lot of beneficial in the education field. The instructors and student are applying the web technology in the teaching and learning. WebQuests (Dodge, 1995) is one of the web pages on which most of the information to be used by the students is drawn from the internet. Normally, the learners are required to solve the problem at the introduction part, describe the task or the end products, describe the process of information, seeking information from the
web, organizing the information, and evaluate the information. Clearly, the WebQuests has the same nature with essays and short answer questions which enabled everything in the historical thinking, but require information gathering.

2.7 Conceptual Framework for History Learning Using RPG Authoring

Based on the benefits of constructionism learning method and the history learning framework, the researcher proposed a conceptual game based framework for history learning using constructionism approach. Figure 2.4 shows the conceptual framework for learning history.

![Conceptual Framework for History Learning Using Constructionism Approach](image-url)

Figure 2.4 Conceptual Framework for History Learning Using Constructionism Approach
The participants start to create the storyline in the first phase. There are five activities in this phase that required the participants to conduct information gathering, stimulate learner’s perspective, location analysis, character design, and source judgment. During character design, the participants are required to know the cultural tools and norm in the past. This is especially when the participants are creating the battle scene in the RPG. The participants have to determine the tools and the weapons need to be assigned to the characters.

After the storyline has been created, the participants have to develop the RPG as planned. Supplementary materials that use to assist the participants in developing the RPG should be provided by the researcher. This is to give the directions for the participants in creating their RPG. Discussion among the participants also will be taking place in this phase. The discussion is mainly to resolve the technical problems with RPGMaker.

Lastly, the participants are required to present their product to other participants. During the presentation, other participants are allowed to ask questions. Hence, the presenter has to recall facts that he/she had been learned during creating the storyline and RPG development.

The evaluation of conceptual framework for history learning using RPG development based on *affordance* and *constraint* evaluation discussed in the previous section can be summarized in Table 2.5.
Table 2.5: Evaluation of conceptual framework for history learning using RPG development

<table>
<thead>
<tr>
<th></th>
<th>Required</th>
<th>Enable</th>
<th>Disable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Participant perspective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time flow</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Cultural tools and norms</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Zeitgeist</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Info gathering</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Interpretation</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Synthesis</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Recall memorization</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Source judgment</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Evidence to justify interpretation</td>
<td></td>
<td>√</td>
<td></td>
</tr>
</tbody>
</table>

Applying the constructionism approach, the learners have given a chance to re-creating the history events after the information gathering. They are required in showing their abilities on interpretation of the history events, and synthesizing it into game environment. Besides, they are required to make the judgment on the gathered information over different resources. During making the game, they are required to think about cultural tools and norms for the historical event that they are researching. At the same time, authoring the role playing game inherit the role play learning history. The learner is required to consider the time flow and cast their own perspective for the historical event. However, the game authoring method enabled the location consideration, zeitgeist, evidence to justify interpretation, and recall memorization but not required them.
2.8 Previous research

A Game Maker Workshop was conducted to give young people an opportunity to tell their stories through computer games (Robertson & Good, 2005). The workshop was attended by ten secondary pupils (aged 12-15 year’s old). They explored computer games creation as a method for developing literacy skills. The toolset being used was NeverWinter Nights, which enables non-expect to create 3D virtual environment role-playing games.

The intention of this workshop was to improve the writing skill of learners by tailoring the computer game. This workshop was based on the constructionism approach which learners were engaged with the context of story while creating the computer game for learning.

Several activities such as group discussion, initial trial of Neverwinter Nights game, character design, character model making, plot planning, story boarding with digital cameras, game authoring using the Neverwinter Nights toolset, and reflecting and planning were performed. The analysis on the interview session showed that most of the participants enjoyed the experience, and the participants are more engaged when creating the characters. Figure 2.5 shows the Neverwinter Nights toolset interface.
The Headlight project was focused on learning design by making games (Kafai, 1995). In particular this project investigates on how students as designers integrate planning and problem solving while building an artifact. A class of 16 fourth-grade students was engaged during an extended period of time (6 months) in the design and production of educational games that taught fractions. The students who participated in this project were rarely using educational software; instead, they are working with the LogoWriter to create their own software.

A combination of qualitative methods was used to document the student’s ideas, thoughts, and progress in game development. Pre- and post-interviews were conducted to gather information on students’ knowledge of programming. The researchers found that there was no uniform way in which students handled the early days of creating their games, or furthermore, reinforce the impression that there is no one “right way” to start a design task, and that many of students’ choices in approach and content were related to their personal preferences. Students used approaches of both planning and bricolage in order to solve the task in a successful manner. From
the project, students learned not only through design, but also about design, and reached a level of reflection that went beyond traditional school thinking and learning.

Learning by tailoring the game in school-aged children has been implemented for some topics including general science, social studies, mathematics, and environmental studies. In a study carried out to examine child-invented games as a possible educational material for children and as a potential diagnostic tool for content, understanding, and also cognitive/learning gaps related to the dengue problem (Lenno & Coombs, 2006). In this study, an eight-years-old Filipino American child was asked to draw and describe two games related to dengue fever. The child had no prior knowledge about dengue. The case study took place in child’s home.

In the first game, the child was asked to create a game about dengue fever using papers and pencils. The child completed the game design around 30 minutes. Next, the child was asked to describe the game, its play, and its rules. One day later, the child was asked to create the second game. During this, the child was further instructed by the researcher and asked more about dengue’s infection and cures at the second game.

In the result, most of the game instructions created by the child were orally given. Thus, the game board design may have been more important to the child than the games’ instructions. Both games revealed the child’s content understanding about dengue. The outcomes of the game reflected the understanding by the child’s about dengue transmission and dengue-carrying mosquito control measures. Most of the child’s information was correct. However, some conceptual issues needed correction.

2.8 Conclusion

In this chapter, the principles of constructivism and constructionism learning theories have been presented. The differences between both learning theories have been
discussed. The core learning theory applied in this study is constructionism. It is further elaborated in collaboration with computer games tailoring and history learning. Finally, several studies applying constructionism theory and game authoring examples have been presented.