CHAPTER II

LITERATURE REVIEW

2.1 Gamification Website

The process of gamifying a website aims to incorporate game-like features into the website, which usually contains non-game contexts. The purpose of gamifying a website is to increase users' engagement level and motivation. Hsieh (2020) stated that gamification incorporated websites enhance communication efficiency by improving learnability, pleasure, engagement, and satisfaction (p. 21). Through gamification website, the delivery of information becomes more efficient, engaging, and motivating for the user. Based on these theories, the author intended to use gamification website as a media to increase the learning quality of high school students.

2.1.1 Gamification

Krath et al. (2021) said definitions of gamification vary and usually focus either on game elements and mechanics or the process of gaming and gameful experiences in serious contexts (p. 2). Gamification in the education field is identified as *Game-based learning* or GBL. In recent years, gamification has become a popular concept since gaming is seen as motivating (Bai et al., 2020). The concept of gamification encourages user to do certain actions in order to get a reward, it is motivating and especially popular in the education sphere. With the usage of gamification, this project aims to motivate high school students to learn more and increase their attention span in class.

2.1.1.1 Types of Players in Game

According to Interaction Design Foundation, gamification is not the same as game design. Although, there are some overlaps between the two, which is within the types of players. To better cater to the players' needs, a designer must understand the players. There are psychologies of the players to know i.e.:

Figure 2.1 Bartle's Player Types
Source: https://public-images.interaction-design.org/...

A. The Achiever

This type of player is all about showing their progress to their peers. Points and status are important to the achievers, they enjoy collecting badges and putting them on display for their friends to see. An example of this type of player is a person who boasts about how they used a quicker route to get to a destination faster than their friend. To play into the achiever's interest, this learning media could implement a leaderboard system and add a variety of badges for the top scorers.

B. The Explorer

The Explorer's main priority is not points or prizes, rather, they are most interested in seeing new things and discovering new secrets most. This type of players would not mind repetitive tasks as long as they can unlock a new area or find a sort of 'Easter Egg'. Building secret passages or anything similar into the gamification design would communicate well with The Explorer. Implementing easter eggs in this media could be in form of gifting a power up item to the players who clicked a secret button spread across the screen.

C. The Socializer

Almost 80% of people falls into this category, where they find fun in games through interaction with other players. Socializers enjoy joining forces, collaborating to achieve bigger things together. This player

usually does not compete fiercely but does not mean they lack ambition. A chatting, liking, or a feature that bridge the players' interaction with each other could be implemented in this project.

2.1.1.2 Gamification Elements in Learning

Gamification is one of the most popular approaches used in learning. Gamification is used to boost learner's motivation, engagement, and enjoyment in learning something outside of a game context. According to Jackson (2016) there are a few of the most widely adopted game elements in educative gamification e.g.:

A. Achievement

Achievement or progression help users get satisfaction by recognizing their accomplishments. The sense of progression motivates users to continue playing. The concept of achievement can be used in; points; badges; leveling; leaderboards; progression bars; and certificates.

B. Rewards

Rewards are a similar concept to achievement. Rewards can be scheduled in the learning experience, whether after completing certain tasks or at set intervals. Rewards can be implemented in; equipment; tools or in-game resources; collectibles; power-ups; and bonuses.

C. Story

Setting the learning experience in an interesting narrative could help pique the learner's interest and motivation. Adding characters, conflicts and resolution deepens the learner's immersion. Story can be implemented in narrative arc and quests.

D. Time

Timers and countdowns create a sense of urgency in gaming, mostly used in board games. Timing also helps users focus to the task at hand, completing the steps one by one. In the gamification of learning, time is used in things like countdown and schedule.

E. Personalization

Customizing an avatar based on the user's preferred theme is personalization. Only by using the nickname that the user has put throughout the game can create a sense of importance for the user. Repurposing previous responses later in the game makes the user feel known, and makes the design look intelligent or aware. Personalization in game can be implemented in; avatar selection or customization; character naming; and interactive conversation (ICI).

F. Micro-interactions

Small interactions like subtle animations, simple transition screens, and environment complimenting sound could provide a nuance in the game. Details that may not seem important could elevate the game into a whole new level, but designers must be careful to not use it too much. A few examples of popular micro-interactions in game are SFX; toggles; animated rollovers; and easter eggs.

2.1.1.3 Gamification Mechanics in Learning

A successful game mechanics depend on a well-designed gamification strategy. To design a great gamification strategy, designers need to better understand the player, the mission, and human motivation. According to the Interaction Design Foundation (2013), a few elements of game mechanics that can be combined to achieve a great gamification strategy e.g.:

A. Points

The units of measurements in gamification are points. Points help the system tracks the player's actions pertaining to the aimed behaviors in a gamification strategy. Moreover, points also motivate the player. In a learning context, points can be used to measure the students' understanding of the material. The higher the points, the closer the student is in understanding the given material.

B. Badges

Badges are awarded once the players have collected certain number of points. Badges promotes positive reinforcement to the aimed behavior and are a form of virtual achievement for the player. An example of badge being used is how Shopee awarded shops with the title Star+ or Mall after they fulfilled the requirements or targets. However, in learning media, badges can be given to the top scorer in class, or to the students who correctly answered the most.

C. Leaderboards

Badges and points are usually shown when a list of players is displayed in leaderboards. Leaderboards typically show a list of players, from the player with the most points to the player with the least points. A possible disadvantage of using a leaderboard system is that it could demotivate a new player. For example, when new player sees that the top-ranking player has 10.000 points, they might want to give up because they think they might never get to beat the top player. It is possible that if implemented in a temporary class setting, leaderboards can be less intimidating and more fun. Since the relatively short period in each class, and the fun learning environment lessen the tension around leaderboards.

D. Relationships

As a social being, relationship have a powerful effect on how humans feel and do. Children and adults succumb to peer pressure in day-to-day basis. People use relationship to get emotional support and encouragement during a time of need. For example, there are support groups for different careers to offer and receive help in the industry. In a gamification learning media, relationship between learners can be built using several features such as chatting; helping; liking; etc.

E. Challenge

Challenge is another powerful game mechanic to motivate players. By adding a certain backstory, players can be affected in

overwhelming ways. It drives the player to do better when they believe they are working to achieve something bigger than themselves. This mechanic in a learning situation can be implemented through giving the students a mission that involves learning the material, where they feel like they are not just learning for the sake of learning but rather doing a greater good for a lot of people.

F. Constraints

Urgent optimism is an extreme self-motivation. By combining urgent optimism with constraints or deadlines, it could influence player to take immediate act with a hope they can success. Some registration sites use this by limiting the time the user can take to complete the registration process. In a gamification learning context, these constraints can be in form of limiting the students' time in finishing a certain challenge.

G. Journey

Each player is on a personal journey, whether they are new or have been longer in the game. The journey mechanic recognizes this experience. A few steps of the journey mechanic e.g.:

1. **Onboarding**

   This applies for the new players who are just starting the journey. For starters, offering a brief introduction and help can motivate players to go further on the journey. This part can be used to explain the game's purpose and backstory so the users can immerse into the game. In a learning context, onboarding can be connected to the topic of the material. For example, in the topic of Indonesia's early humans, the onboarding step can provide a brief explanation of Indonesia's early humans and what the students should do to finish the game.

2. **Scaffolding**

   The next step to help the onboarded players is scaffolding. In this phase players are still likely to be inexperienced, scaffolding helps

them to avoid errors and feel a sense of accomplishment. Disclosing more features of a product is helpful as the player gains more knowledge and experience using the product. Explanation of certain features are needed along the way, especially if new features are added in the next levels or chapter of the game.

3. Progress

This step helps players gain a sense where they are in the journey by giving feedback. Progress encourages them to take the next step in the game. In a gamification learning context, the progress bar could show where in the material is the students currently in. In the history subject specifically, diachronic approach is used to learn history based on the chronological period. In gamified history learning, the progress step can be implemented by dividing the students' progress in a chronological order.

H. Narrative

This element is crucial to draw the players into the game's story. Through narrative, players get a chance to express themselves via role-play. In a learning context, the narrative can be directed in an adventurous way, where students can explore and learn by doing fun activities.

I. Emotion

In his book Emotional Design, Don Norman argues our emotions do play a role in how we experience a product. In the context of gamifications, designers invest in a high-quality artwork to appeal the user's emotions. The tone of a design can be conveyed through informational text or messages on the user interfaces. Humor can be used in gamification concept to deflect a negative experience into a positive one. Using humor in a learning context can lessen the students' tension around studying and not be afraid of making mistakes.

2.1.1.4 Mascot Design in Gamification Learning Media

In a game, the character is almost as significant as the game and could help people recognizing the game. According to Room8 Studio (2022), a really good character is what makes the players want to return to the game over and over again. A likeable character makes the players enjoy interacting with them and increase their desire to finish the game. The game will have higher chance of success when the players can relate to the characters in the game. There are a few guides to help creating characters in a gamification learning media i.e.:

A. Creating a Video Game Character

Video game character is used as a strategy for the game to relate better with the user. There are a few ways to increase the relatability of a character. The Room8 Studio provided a guide in creating a video game character, including four things to pay attention to i.e.:

1. **Personality**

   Kieffer (2024) stated that a character's personality determines how a character thinks and operates with their surrounding world, it is more than just a list of traits. To make designing a character a little bit easier, there are existing character archetypes that have been established. There is a universal pattern that that appeals to human, therefore these character archetypes make sense. There are a few character archetypes that can be used in a gamified learning media i.e.: the hero; the mentor; the ally and the guardian.

Figure 2.2 Personality
Source: https://www.nature.com/articles/s44159-024-00295-z

2. Backstory

Creating a strong bond with players is important, hence a game needs to have a backstory. Beside creating a bond with the player, backstories provide the players a good understanding of the game's setting and the character's personality. Depending on the type of backstory, it can motivate the players and help the characters experience the prior storyline before the main one. Backstories also explain why the character dresses a certain way, acts a certain way, etc.

Figure 2.3 Backstory
Source: https://blog.reedsy.com/character-backstory/

3. Appearance

Although games are often used to escape from reality, games also have to have resemblance to the real world. The world is diverse of personalities, races, ethnicities and appearances. Hence, games should also reflect that because it is important to make the game more relatable to real people. The appearance of mascot also has to match the game's theme and settings. As this media is about learning media and history, the character's appearance can be influenced by history teachers, time traveler, early humans, etc.

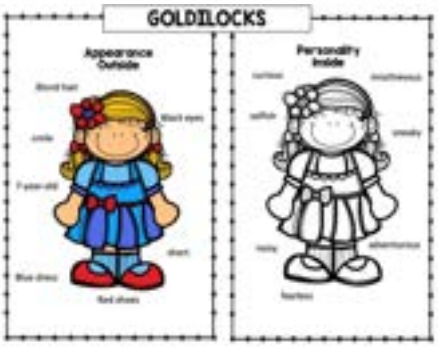

Figure 2.4 Appearance
Source: https://rakovicspeechandlanguagechat.com/?p=2860

4. Flaws and Weaknesses

According to Cavannagh (2024), a character flaw is a negative trait in a character. Character flaws are often the opposite of their strength. For example, a confident (strength) character may also be arrogant (flaw). The goal is again, to make the characters relatable to the players. The supposed strongest characters are often seen to have their flaws and weaknesses, which makes them more relatable. The character's weaknesses in this context can be used as an opportunity to make the learners want to help the character.

Figure 2.5 Flaws and Weaknesses
Source: https://adamlroberts.wordpress.com/wp-content/...

B. Creating a Character for Educational Context

There are a few guides in creating a mascot or character for an educational context. Characters in games are imaginative and free but also must cater to their audience. For an educational context, a designer must consider the shapes, colors and more elements that are appropriate for the younger, student audience. According to Martinez, in a blog post written by Davies, there are a few concepts that can help in creating characters for children i.e.:

1. Shapes

A character's most identifying feature is its' shape. The basic shape of a character transmits a lot of things about the character. A character with square shapes suggests stability, reliability, and strong

personality. Characters with overall circle shapes might suggest a soft and innocent personality, and characters with triangular shapes suggests a sharp, dangerous or balance personality (Shahbazi, 2024).

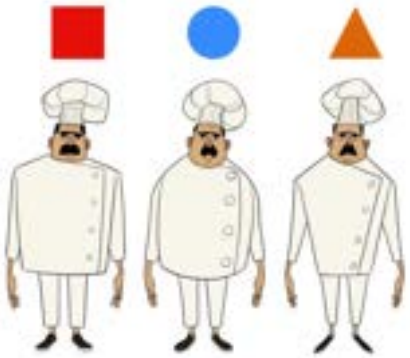

Figure 2.6 Character Shapes
Source: https://www.21-draw.com/wp-content/uploads/2022/04/shape-language.jpeg

2. Line

Lines tell a lot about the character's attitude, whether they are tense, static or relaxed. Martinez suggests that we draw a line from the character's head to feet to tell their personality. Curvy lines refer to relaxed attitude, and the straighter the lines, the more tense their personalities are. In conclusion, characters with flowy lines are more likely to be free, vice versa.

Figure 2.7 Character Line
Source: https://dribbble.com/shots/9800740-Character-design-Line-of-action

3. Proportion

MasterClass (2021) defined proportion as the different sizes of the individual parts that make up one object. The characters in medias that cater to children are often exaggerated, where the different parts of

the character's body are not so proportional like realism drawing. To differentiate a character who is smaller and who is bigger, a designer can play with the head and torso proportions. For example, characters with bigger torso and smaller head will look bigger than characters with smaller torso and bigger head.

Figure 2.8 Proportions
Source: https://i.pinimg.com/736x/c6/64/dc/c664dc2fcabcddf0bb0ff6b9ec504381.jpg

4. Balance

Combining shapes, lines, and proportion create the character's balance. Whether a character is firm and balanced, or unbalanced and dynamic also tells a story about the character. The unbalanced character can be seen as clumsier and fun. Meanwhile the balanced character can be seen as more reliable and charismatic.

Figure 2.9 Balance
Source: https://images.sketchaday.app/tutorials/looknatural/hero.jpg

5. Drawing the Face

The more exaggerated the facial feature, the cartoonish a character gets. Modifying a character's profile to a more exaggerated way can turn the character in a more interesting way. Martinez proposes a way to practice this method which is to: start drawing a character with its' basic features and then modify their profiles using the distortion tools. Exaggerating a character's features allows the character to be more easily recognized.

Figure 2.10 Character Faces
Source: https://i.pinimg.com/736x/8b/47/10/8b471011d2248ce482a4102a35fa885f.jpg

2.1.2 Website

Website is a collection of pages or files linked together and made available on the World Wide Web (Landa, 2019, p. 334). Website can serve many purposes such as editorial; informational; promotional; transactional; archival; or entertainment. This creation uses website for an informational purpose regarding Indonesia's early humans.

2.1.2.1 Website Terms

There are a few website terms that designers use. These terms are usually the principle in a website design. According to Landa (2019) there are a few terms related to website, i.e. (p. 336—337):

A. Content

Content is the body of information that is available to visitors on a website. It is crucial for content to be well organized and easy to access. Headlines, copy or text that are well written can increase the quality of communication with users. The content of the website has to align with the look and feel of Indonesia's early humans in an educational context and has to follow the existing hierarchy.

B. Information Architecture

Information architecture is the organization of website content into hierarchical order. Organizing the content from general to specific helps a user to navigate through a website. Frustration-free experience is important; hence designers should begin with a clear, organized information architecture. In this design, the author ought to tell information of Indonesia's early humans in a chronological order by including the use of missions. Following the information of Indonesia's early humans and the mission, is a quiz to test the users' understanding of the given material, and lastly a leaderboard to increase the gaming-like experience.

C. Navigation System

Navigation system is the visual design of information architecture. Meaning, after the information architecture was established, the next thing to do is to create a graphic interface that harmonize with the information architecture. The visual structure of the navigation system must offer consistent elements from page to page.

D. Home Page

The home page is the primary entrance to a website and contains the central navigation system. The home page establishes the look and feel of a website, setting the tone of what the entire website is about. The most crucial information should be visible in the home page without scrolling. If the home page displays a moving and active graphic, visitors will expect

something dynamic and lively from the site and vice versa if the home page displays a static and clean imagery. Aligning with this project's output, the home page displays something active and dynamic to state the gamification aspect of this project.

2.1.2.2 Typography for Website

In practice, typography for website has similar basic rules with typography that is meant for printing. Typography are used for content and buttons. According to Landa (2019), there are a few things to consider in establishing typography for website (p. 55—56):

A. Legibility

To increase legibility in a website, a designer must avoid typefaces with thin strokes. The weight of the typeface must be thick enough to read from a screen. Choosing simpler shapes like sans-serif typefaces will help, especially for numbers. Set the typeface with larger size than the usual size used for printing to guarantee a legible typography. The fitting typeface for this project could be a thicker one or a thinner but still readable depending on the theme. Thicker typeface can be used to re-instate the fun, adventurous feeling of learning Indonesia's early humans. And the thinner typeface can be used to suggest a magical, time traveling, traditional aspect of learning Indonesia's early humans' history.

B. Readability

The first thing to mind to in readability is the color of the background and the color of the type. High contrast offers the best reading experience for the audience. Shorter line lengths help with readability, the standard is no longer than about twelve words, on conditions that the words are longer, it can be less than twelve words. On screen, people usually prefer to read short, smaller paragraphs rather than large text blocks. Keep the spacing decent, not too tight and neither too distanced as it can interfere with readability. In this learning media, the designer intends to minimalize

the use of text by giving shorter explanation paragraphs to keep the learners' attention.

C. Voice and Branding

Selection of the typeface can help differentiate a brand from other brands. The designer must make sure the typeface selection is suitable for the brand. In some cases, the existing typeface from a brand may not translate well to a screen, i.e. brands that use thin strokes with serifs. The chosen typeface should not only fit the brand's voice, but also functionally increase the communication's effectivity. In this learning media, the designer intends to use fonts that represents historic, adventurous, strong and fun feel that cater to high school students.

D. Variety

A type family, extended family, or super family in typeface provide a variety of weights and widths. For a website, select type that has contrast in weight and width. Variety in typography also applies to the different types of fonts used for headline, sub-headline, and body text. In this project, the authors intend to use a font variety in headline, sub-headline and body text. The headline has to be firm and eye-catching, the sub-headline is a little more ordinary but bold, as for the body text it has to be simpler with high readability.

2.2 Design Principles in Gamification Website

According to The Interaction Design Foundation (2016), design principles are guidelines, biases and design considerations that designers apply with discretion. Design principles are purposed to help designers create an easy-to-use and pleasurable design. There are a few principles to follow in order to create a gamification website, those principles e.g.:

2.2.1 User Interface

According to the Interaction Design Foundation (2016), User Interface design is the process designers use to build interfaces in software or

computerized devices. Focusing on looks or style. The purpose of designing interfaces is to make it as easy and pleasurable as possible for users.

2.2.1.1 Graphical User Interface

Graphical User Interface (GUI) give users the ability to intuitively operate complicated technological devices through the simplification of certain commands with graphical icons. Instead of putting users through complicated commands, GUI shows users what functions are possible to do. For example, a computer's desktop is a GUI.

2.2.1.2 Components in Graphical User Interface

To create a UI that is user-friendly and easy to navigate, UI designers use UI elements to create a visual language. Maintaining the consistency across the design is also prevalent in creating UI that does not make user think too much. There are some of the most common user interface elements, e.g.:

A. Banners

Banners usually contain important messages, spanning on the top of the page. Banners can remain on screen for a certain period or all the time. There are a few structures that construct a banner i.e., color; icon; message; action. In a gamification context, banners are used to inform the users about an action that have not been done or done wrongly by the users.

Figure 2.11 Banners
Source: https://spectrum.adobe.com/page/alert-banner/

B. Buttons

Buttons are one of the most pivotal elements in user interface. Buttons help users find out what they should do next in order to achieve their goal. There are 3 categories of buttons based on their relationship

with the user, i.e. primary button; secondary button; and tertiary button. Primary button must stand out from any other element for the user to know what the interface expects them to do. The secondary buttons are alternatives to the primary buttons, they should be less prominent than primary buttons. Tertiary buttons are made for the actions that users are unlikely to perform, they should not stand out to prevent users from accidentally pressing them. The buttons could be designed in a more fun and informal look in a gamification learning context, to make it more interesting for the learners.

Figure 2.12 Buttons
Source: https://uxplanet.org/ive-been-doing-buttons-wrong-have-you-2117c0066613

C. Card

The element card resembles a playing card, both in size and shape. Card contains a few information related to the content of the interface. Card is used to encourage users to tap or click to view more details of the content. The use of card in this project can contain visual elements that attract the learners' eyes, for example a visualization of Indonesia's early humans, to make them want to click the card.

Figure 2.13 Card
Source: https://uxdesign.cc/8-best-practices-for-ui-card-design-898f45bb60cc

D. Drop-down Menu

A drop-down menu shows a list of options when users click or hover over a button. Drop-down menu consists of two elements; the control or button; and the list of options. Drop-down menu is also save-spacing by displaying more options only when needed. The use of drop-down menu in this project could be useful to minimize distraction on the learners' screen whilst playing the game. It lets the designer have more space to place visual elements that attract the learners' attention.

Figure 2.14 Drop-down Menu
Source: https://uxdesign.cc/8-best-practices-for-ui-card-design-898f45bb60cc

E. Grid

Grid is a visual made up of columns, gutter, and margins that provide a structure for the layout of elements on a page. The purpose of using a grid is to create a cohesive layout that users can easily scan and use. An article by Gordon (2022) from the Nielsen Norman Group, there are three common grid types used in websites and interfaces, i.e.:

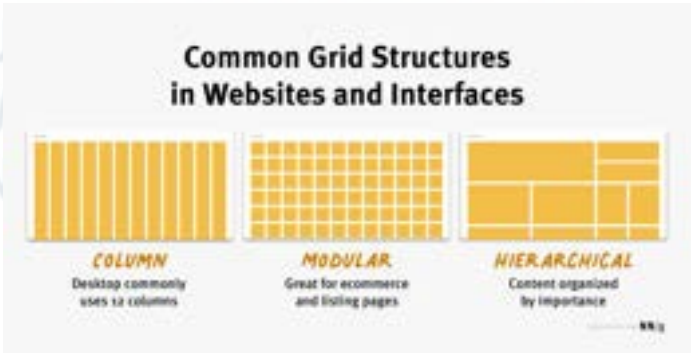

Figure 2.15 Types of Grids
Source: https://www.nngroup.com/articles/using-grids-in-interface-designs/

1. Column Grid

This type of grid is also commonly used in magazines to place the text where the readers can easily read (Velarde, 2024). Column grid is a method which divides a page into vertical columns. Column grids can have two to six columns, or more, but not usual. UI elements and the contents can be aligned according to the columns.

2. Modular Grid

Unlike a column grid, a modular grid has rows. If there are more elements to organize that do not fit into column grid, modular grid is a good option to use. Modular grid can be used in different ways and not as strict. Modular grids are often used for e-commerce, phone homepage, and Instagram feeds.

3. Hierarchical Grid

In a hierarchical grid, the most important content takes a bigger space than the other elements. The contents are organized based by the importance of the content. This type of grid is most common used in websites. It is used in websites to make sure the most crucial information is seen first, usually the call to actions and special notices are at the top of the hierarchy.

F. Icon

Icon is a simplified symbol that represents an information or command. Icons are used to describe a feature in an interface so users can understand without long explanations. A good icon allows users to immediately recognize a feature just by looking.

Figure 2.16 Icons
Source: https://uxcel.com/blog/understanding-the-icons-in-ui-design

G. Text Field

Is an area where users can input information in alphanumeric characters. Text fields allow both single-line and multi-line inputs. Text field for passwords are usually single-lined and often hide the entered characters for security reasons. Text field in the gamification learning context can be used for the users to input their nickname, a short answer, and more relevant information.

Figure 2.17 Text Field
Source: https://uxcel.com/blog/understanding-the-icons-in-ui-design

H. Navigation

Navigation menus are used by users to move between different pages in a website. Navigation menus are typically placed at the top, side, or bottom of a page. The primary purpose of navigation menus is to guide users through the website. In a gamification learning context, the navigation menu is supposed to be able to lead the users back to the main menu of the game and continue their game from the chapter that they last played.

Figure 2.18 Navigation
Source: https://dribbble.com/tags/navigation-menu

I. Progress Bars

A progress bar shows a progress of certain command on a website. Progress bars are usually not clickable. An example of a progress bar is a loading animation in games. A loading animation for this project can be designed accordingly to suit the early humans' history theme, so the users do not get bored while waiting for the page to load.

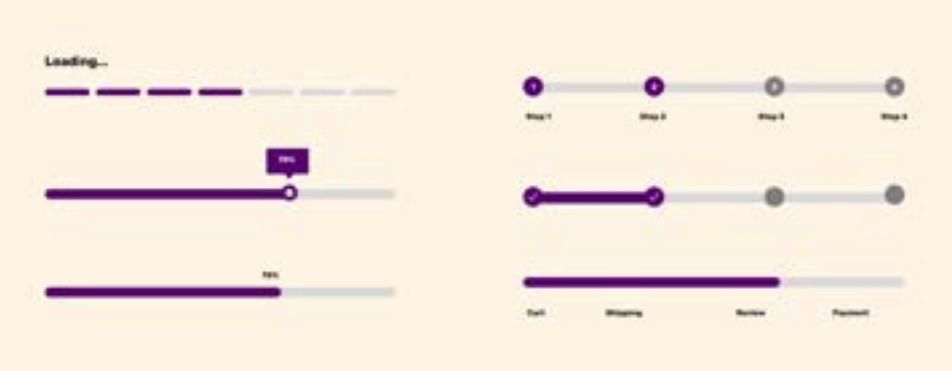

Figure 2.19 Progress Bars
Source: https://think360studio.com/blog/progress-bar

2.2.1.3 User Interface Principles

Taken from the Interaction Design Foundation website, Jakob Nielsen and Rolf Molich established ten user interface design guidelines. These guidelines are used for the author to create a neat interface. Those said ten rules include:

A. Visibility of System Status

System operations must be highly visible on the screen to users. The status of the system must be informed with easiness on the user's side, within a reasonable amount of time. In conclusion, the users must be quickly informed about the system's position, so they can find out what they need to do about the current situation on their screen.

B. System Match to the Real World

Designers should match the system with real language and concepts based on the target user. Presenting the information in a logical order based on the user's real-world experiences could reduce cognitive strain for the user, hence making the interface easier to use. By using

terminology and visuals that are easily found in the real world, designer have avoided possible confusion from the users.

C. User Control and Freedom

The interface must be tolerant of user's possible mistakes. A tolerant interface meaning backward steps are possible, including undoing and redoing previous actions. For example, in a learning context, users or learners can easily go back to an information that they have not completely read yet or accidentally skipped.

D. Consistency and Standards

The graphic elements and terminology should be consistent across the website. An icon that represents a concept in one page should not represent another concept in a different page of the website. This is important to avoid confusion and negative experience from the user. For example, the position, shape, color of the same button has to be consistent from page to page.

E. Error Prevention

Designers should design systems that keep potential errors to a minimum. Detecting and remedying problems may be beyond the user's expertise. To achieve error prevention, designers need to eliminate or flag actions that may result in errors. This process can be done by creating a list of features that are planned to be put on the interface and estimate which ones that are likely to cause misinterpretation or errors.

F. Recognition rather than Recall

Human short-term memory can only maintain five things at one time. Therefore, designers should make an interface that is easy to recognize rather than putting users through a process of recalling information. Recognition involves perceiving cues that encourage relevant information to surface. The designer can help users recognizing a design

by displaying a list of options, then the users can choose the one that are most likely to be relevant to the thing that they want to do.

G. Flexibility and Efficiency of Use

Users demand less interactions that allows them to navigate through the website faster. This can be implemented by using abbreviations, function keys, hidden commands and macro facilities. Frequent actions by the user should be highly visible and suit the users, so it can be achieved through more convenient means. For example, in a page where the action that the users are supposed to do is click next, make the next button highly visible to the user by enlarging the size of the button or removing any unnecessary buttons.

H. Aesthetic and Minimalist Design

The interface should only display necessary and relevant components for the current tasks. Clutter and unnecessary information should be kept to a minimum in order to direct the user's limited attention to the necessary things only. A clean design helps the user to get to their goal faster, by avoiding any visual stress that are not related to their goal.

I. Help Users Recognize, Diagnose and Recover from Errors

Designers must assume that the users do not understand technical terminologies. Therefore, all messages including information and error messages should be expressed in plain language that users can easily understand. Whenever there is an error, the message has to be immediately be sent in a clear way. For example, if there is a field that the user has missed, the error message has to be visible to the user's eyes. The designer has to make sure that the message also clearly states the next action that the user must do to recover from the error.

J. Help and Documentation

Ensure help is available and easily located for users. The help must be specific to the task at hand, and worded step-by-step to guide them

through the issue they are facing. Ideally users should not have to resort to documentation, however documentation may be necessary depending on the type of solution.

2.2.1.4 Tufte's Design Principles for Web Design

Tufte's main principle of designing information is to allow the readers or users to understand, document, and communicate knowledge by envisioning information (Zimmerman, 1997, p.310). There are a few most important principles from Tufte in designing a web such as micro macro design; layering and separation; small multiples; color and information; and integration of words and images. However, the author opted to use two main principles for this project, which are the micro macro design and integration of words and images.

The concept of micro macro design suggests that designer create an always accessible system overview that avoid cognitive overload by stating the goal of the site. Tufte's basic principle of micro macro design are still commonly found in current books about web design. The theory can be implemented by providing a central concept or theme on the interface. This concept is applied in this project through the use of title interface before missions to state the goal of the interface.

The micro macro concept is similar in purpose with the integrating words and images concept. Both concepts are used to minimize the user's cognitive load and help the user understand the page easier. Text and graphical navigation buttons should be used to assist the user to navigate through the web page. Designers should use minimum attention-grabbing text, which are well-written and minimalistic (Zimmerman, 1997, p.312). This concept is implemented in the game by using simple, command-like words or text that describe the button's function or context.

2.2.2 Illustration

Illustration is used to communicate ideas in an aesthetic and informative way. It is the visual representation of an idea or concept. Illustration

comes in many styles, and the style that designers choose must depend on the project's purpose and audience. Designers must choose the most complementing style depending on cultural and social context, functionality, and more consideration.

2.2.2.1 Visual Styles in Game Illustration

Visual styles in a game can vary from realism to cartoonish, depending on the game's theme. The author has to choose a style that fit the audience. There are a few styles that are usually chosen in games, e.g.:

A. Cartoon Illustration

Usually implemented in children's books, comics and animated media. Cartoon illustration exaggerate the shapes of characters and environments to create an entertaining and fun story. Cartoon illustration is usually complimented with bold line art, bright color palette, and humorous compositions.

Figure 2.20 Cartoon Illustration
Source: https://www.vecteezy.com/vector-art/1212469-cartoon-style-safari-kids-set

B. Flat Illustration

The flat illustration is a style that does not depict small details. Instead, this technique relies on two dimensional visuals. Flat illustration typically uses simple geometric shapes and flat color. To give the illustration a more dynamic feel, designers that use flat illustration could play with different shapes and shading technique. Flat illustration usually used in icons, apps, websites, logos, banners, etc.

Figure 2.21 Flat Illustration
Source: https://graphically.io/blog/all-you-need-to-know-about-flat-style-illustration/

C. 3D Illustration

Utilizing various technique like lighting, shadows, texture and perspective, 3D illustration aims to create an illusion of depth and volume. Using 3D illustration provides an accurate depiction of the designer's ideas, or closer to reality. This visual style is used widely in many industries such as animation; architecture; product design; and gaming.

Figure 2.22 3D Illustration
Source: https://polydin.com/3d-character-design/

D. Realism

The realism visual style seeks to recreate the real world in precise detail. This style of illustration depicts the physical appearance of people, object, and landscape as close as possible to reality. Realism does not exaggerate, rather tries to represent the objects and scenes realistically. Realism is often used in book covers, paintings, games, etc.

Figure 2.23 Realism Illustration
Source: https://www.21-draw.com/id/illustration-styles/

2.2.2.2 Color Theory

According to the Interaction Design Foundation (2016), Color Theory is the study of how colors work together and how they affect our emotions and perceptions. By choosing suitable colors, the designers can convey the message in their project better. There are a few theories used to choose the color palette such as:

A. Color Properties

There are millions of colors, each color can be described in a few attributes. These attributes decide what the colors look like, dark or light, saturated or vivid. A few color properties are as explained below:

1. **Hue**

   Hue is the identifier of color's family or name, such as red; blue; green; or any other specific color on the color wheel. It is one of the main properties in color. It is the pure pigment before the addition of tint or shade.

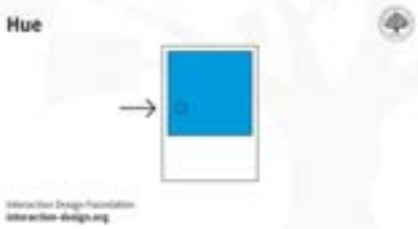

Figure 2.24 Hue
Source: https://www.interaction-design.org/

2. Value

Value identifies the color's relative lightness, darkness, or grayscale. Value is important in creating a visual work to create contrast and depth. A very light color has high value, meanwhile a very dark color has low value.

Figure 2.25 Value
Source: https://www.interaction-design.org/

3. Saturation

Chroma or saturation refers to the intensity of a color. Whether the color is pure or vivid, saturated (vibrant) or desaturated (grayed). Low saturation colors are closer to black, white, or gray.

Figure 2.26 Saturation
Source: https://www.interaction-design.org/

B. Color Scheme

There are a few combinations of color that suits each other, these colors are proven to increase the uniformity and balance in a design. These combinations are called color scheme. There are a few types of color scheme i.e.:

1. Monochromatic

Monochromatic color scheme is using a single hue and creating a variety of colors using the shades and tints of said hue.

Contrast is necessary when using monochromatic color scheme to differentiate the elements and emphasize the important elements.

Figure 2.27 Monochromatic Scheme
Source: https://www.interaction-design.org/

2. Analogous

Analogous color is the three colors that are located side-by-side on the color wheel. Analogous color has similar hues. Therefore, the designer needs to use one dominant color to avoid confusions and use the other two colors as accent colors.

Figure 2.28 Analogous Scheme
Source: https://www.interaction-design.org/

3. Complementary

Complementary color scheme are the colors that are placed on the opposite sides on the color wheel. Complementary colors are contrast to each other, the enhance and complete each other. The designer can choose one color as the main color and the other one as an accent color.

Figure 2.29 Complementary Scheme
Source: https://www.interaction-design.org/

4. Split-Complementary

Split-Complementary colors lie on either side of a color's complement on the color wheel. It contains a combination of three colors. This color scheme is used to soften the contrast.

Figure 2.30 Split-Complementary
Source: https://www.interaction-design.org/

5. Triadic

Triadic colors are three colors that have equal distance on the color wheel. The triadic colors may not be vibrant but is highly contrasting and harmonious. This palette offers a wide range of contrast.

Figure 2.31 Triadic Scheme
Source: https://www.interaction-design.org/

6. Tetradic

Tetradic colors are four colors that are two sets of complementary colors. This color scheme can create interesting and rich design, but the designer must choose one dominant color. The designer also must watch the balance between warm and cool colors.

Figure 2.32 Tetradic Scheme
Source: https://www.interaction-design.org/

7. Square

Square color scheme is another version of tetradic colors. Square color scheme are four colors that have even space on the color wheel. Square color scheme can work well if used evenly without a dominant color.

Figure 2.33 Square Scheme
Source: https://www.interaction-design.org/

2.3 Learning Early Humans in Indonesia

Early humans' history is one of the materials that the high school students in Indonesia must learn in the Indonesian History subject. The older early humans are categorized in one terminology which is Homo erectus. Homo erectus lived in the earlier era, the Pleistocene epoch.

2.3.1 Pleistocene Epoch

The Pleistocene epoch is also known as the diluvium period. During this epoch, the glaciation and interglaciation is still happening (Nurani et al., 2020, p. 60). The flora and fauna migrate a lot from constant change of sea to land and vice versa. This process affected the creatures that lived during this period, that is Homo erectus, who still depended on the flora and fauna around them.

2.3.1.1 Homo erectus

Homo erectus is also known as the upright man. Homo erectus were the first species that has human-like body proportions, where the arms are shorter, and the legs are longer. Homo erectus are theorized to originate from Africa and then migrate to different parts of the world. Homo erectus' fossils date back over more than 1.5 million years ago, making it the longest surviving human relatives. It is unknown when

Homo erectus officially extincted, but it seemed to survive in Indonesia until at least 250.000 years ago (Natural History Museum, n.d.).

Figure 2.34 Homo Erectus
Source: https://www.thecollector.com/homo-erectus-most-successful-humans/

A. Archaic Homo erectus

Archaic Homo erectus is the oldest of the species. According to Widianto et al. (2020) the archaic Homo erectus is found only in Sangiran's oldest paleontology layer (p. 155). The geographical distribution data, evolutive level, and chronological date are pointing toward Sangiran as the location that the Archaic Homo erectus first arrived in, 1.5 million years ago. It is speculated that in accordance with the "Out of Africa" theory, Homo erectus first stepped out of Africa 1.8 million years ago into a colder, then temperate, and finally warmer region like the Java Island.

There were only 20 specimens of archaic Homo erectus found in Indonesia, one was found in 1936 and the other was found in 2016 (Solopos, 2016). This type of Homo erectus existed about 1,5 million to 900.000 years ago. The archaic Homo erectus has a shorter skull that expands to the back, sturdy anatomy and strong teeth. Although they have strong teeth, it was speculated they consumed more plants than animals. The brain volume of this species is about 800 cc, way smaller than modern humans with 1.200—1.400 cc, but bigger than apes with 600 cc. Brain volumes determine the intelligence level, therefore archaic Homo erectus have not established a verbal language. Instead, they used signals with

their body. They left stone artifacts as a cultural heritage from their civilization. The Meganthropus palaeojavanicus, Pithecanthropus robustus, and Pithecanthropus mojokertensis fall into the archaic Homo erectus species.

B. Typical Homo erectus

The Homo erectus that were found outside of Sangiran towards the east, are showing a younger evolution phase. The later type of this species is Typical Homo erectus. This type is the most common type that were found in Indonesia, existed about 800.000 to 300.000 years ago. A few findings of this type were able to be identified as female, for their skull were slimmer than the male ones. (BPSMP Sangiran, n.d.). The brain capacity of typical Homo erectus is around 900 cc. Their brow ridge juts forward, with a significant narrowing behind the orbital bone, signifying an undeveloped brain. The back part of the skull tapers to a sharper shape. The bottom part of their face or the mouth area were protruded, with bigger teeth. The Sangiran 17 man and Pithecanthropus erectus falls into the Typical Homo erectus species.

C. Progressive Homo erectus

The progressive type is the most advanced of Homo erectus. Showing a youngest evolution phase, progressive Homo erectus were found only in Sambungmacan, Ngandong, and Ngawi (Widianto et al., 2020, p. 156). Progressive Homo erectus survived up until about 100.000 years ago (Detiknews, 2016). This type reached a brain capacity of 1.100, closer to modern humans. The roof of this skull is higher and rounded, unlike the earlier types which were sharper. The brow ridge of progressive Homo erectus were less promiment.

D. Homo floresiensis

Homo floresiensis were smaller than modern humans, measured to only 1 meter, which gained them the nickname the Hobbit from Liang Bua. Homo floresiensis were theorized to be the origins of modern humans

in Indonesia. Despite that, Homo floresiensis were differentiated from Homo sapiens because of their small anatomy (Tirto.id, 2021). One of the specimens found were identified as a female, ranging around 25—30 years old. Homo floresiensis' physical characteristic were narrow and non-protruding frontal bone, and over all smaller skulls.

Figure 2.35 Homo floresiensis
Source: https://www.livescience.com/29100-homo-floresiensis-hobbit-facts.html

Homo floresiensis' brain capacity ranged from 380 cc to 417 cc. Because of their small anatomy, they only weigh about 25kg. They have stronger jaws, but no chins. By a sediment analysis, they were known to exist from 100.000 to 60.000 years ago. Although their stone tools were estimated to be around 190.000 to 50.000 years old. Homo floresiensis are a mystery for the scientists, as they have mixed characteristics of Homo erectus and modern humans.

2.3.2 Learning Experience

A learning experience is a personal journey that combines the cognitive aspects of learning with a personal, emotional, physical, and circumstantial aspects of human experience. Learning experience design is similar to user experience design, it's more than designing a course, training, or curriculum but also the entire experience from beginning to end.

2.3.2.1 Learning Hierarchy of Needs

Don Norman stated, when technology delivers basic needs, user experience dominates (Anderson, 2011, p. 11). Product maturity becomes the basis of Anderson's User Experience Hierarchy model. He proposes

that most technological product and service go through six level of maturity, and each level has to be successful before supporting the next level. The author elaborates Anderson's User Experience Hierarchy model into a learning context in six levels:

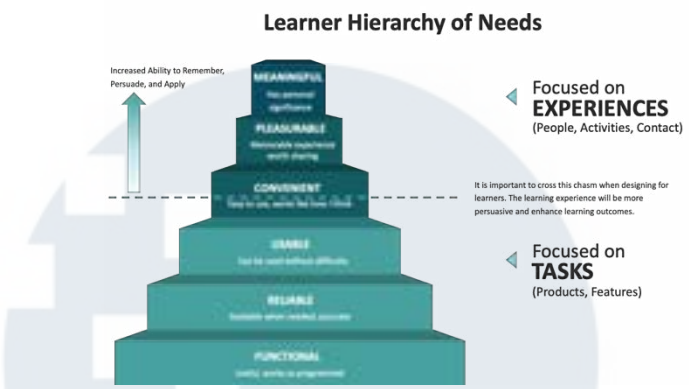

Figure 2.36 Learning Hierarchy of Needs
Source: https://edtechbooks.org/eme_6606/fundamentals_of_exce

A. Functional

Every product or services starts off with a functional value. It has to solve a problem, be useful. A functional learning media has to be able to help students access the material they needed fully.

B. Reliable

Once the learning media is functional, the next level is to test the reliability of the data. The learning media cannot be misleading the learners to wrong information or conclusions. If the data of the learners is involved, the designer has to ensure they are backed up and accessible at all times.

C. Usable and Convenient

Then, the learning media assists the learners to understand the material better, and preferably faster (Usable). Meanwhile convenient is about making the media more fitting with humans' nature. For example, this media could minimize the use of long explanations and maximize visual elements to avoid stress from reading too much information on a screen.

D. Pleasurable

This level is about creating something memorable and emotionally engaging. The learning media can evoke emotions from the learners by using several methods such as humor; arousing curiosity; friendly languages and other similar tactics. This project aims to achieve the pleasurable level by incorporating a small portion of storytelling.

E. Meaningful

To achieve the meaningful level, designers can play with more experiential things such as emotions, language and aesthetics. Some companies achieved this level by developing a story that their audience can believe. Brand stories can escalate the product or services to the next level and create meanings for each of their audiences. This learning media could use stories to turn learning materials into life lessons that hold a meaningful message for the learners.

2.3.2.2 Learning Experience Design

According to LXD.org, Learning Experience Design is the process of creating learning experiences that enable the learner to achieve the desired learning outcome in a human centered and goal-oriented way. Traditionally, materials are designed to fit the educational publishers' client, which is the schools. The students then can learn from their teachers. LXD on the other hand, starts designing based on the learner's need. A desired learning outcome is a relevant, meaningful, and valuable learning outcome to the learner. A human-centered and goal-oriented approach is needed to design a learning experience that support learners to reach the learning outcome.

A. Human Centered

Learning experience design is about the learner's experience and what they learn from said experience. The concept of human centered design is a part of how LXD works. To begin, designers need to empathize with the learners and find out what motivates them and what holds them

back. The design research is important for LX designers to provide learners with a great learning experience.

B. Goal Oriented

Applying a goal-oriented design helps designers to focus on the main goal of the learning instead of getting distracted by ideas, activities, content, and features. By using this method, it ensures designers to see the bigger picture first. Designers can start by formulating the desired learning outcome, then driving the next steps toward that outcome.

2.3.3 Cognitive Development of High School Students

Cognitive development refers to changes in the brain that prepare people to think and learn (HHS Office of Population Affairs, n.d.). Adolescence is the phase of life between childhood and adulthood, from ages 10 to 19 (World Health Organization, n.d.). High school students in Indonesia range between 15—18 years old, this age is determined by the mandatory 9 years of education system in Indonesia. Adolescent brains go through a lot of development, because their brains produce a lot of cells at a very fast rate. This allows adolescents to store more information and learn new skills. The brain also trims unnecessary extra growth in order to easily access their most-used information. Furthermore, the brain strengthens their connection with each other so adolescents can recall information and efficiently use said information. Adolescents gain several advantages from the growth of the brain, such as enhanced learning; abstract thinking; advanced reasoning; and metacognition which helps the adolescents find ways to improve their learning process.

2.4 Relevant Research

Another crucial task for the author is to study the existing relevant research. This is done in order to re-enforce the research background and establish the novelties of this research. In this part, the author will dissect a few significant existing research regarding students' learning process and difficulties, and how interactive media holds an important role in improving the students' learning quality. The existing research provided the author with more knowledge from a

similar case to the topic that the author worked on. This step allows the author to identify the strengths and weaknesses of each existing research, choose the strengths to apply, and avoid the weaknesses.

Table 2.1 Relevant Research

No.	Research Title	Author	Research Outcome	Novelty
1.	Development of Local History Interactive Learning Media Material for National and Regional Figures in Struggling for Independence Class XI SMA Negeri 1 Bandar	Reny Sabrina Simamora, Najuah, Josia P. Manalu, Hotmadian D. Haloho, Ricu Sidiq	An interactive learning media regarding National and Regional Figures using Microsoft PowerPoint. The media contains images, audio, video, and interactive quiz.	**A. The output:** This research aims to design a website-oriented learning media. A website can reach more audience and inclusive of all devices. **B. The topic:** The topic of this project is about Indonesia's early humans. With this project, the designer aims to apply more history materials with interactive media.
2.	The Role of Interactive Media in Increasing Student's Motivation to Learn the Islamic Cultural History Subject	Munawir, Ainur Rofiqoh, Ismi Khairani	A description of interactive media's role in elementary school student's learning process of the Islamic Cultural History subject by using literature review as a source.	**A. The outcome:** The previous research did not result in any media as an outcome. The author uses this previous research as a literature review in order to understand the general issue. Thus, the author intended to create an outcome in the form of interactive media. **B. The subject:** This project is aimed to high school students based on the identified problems in the previous chapters.

				C. The topic: the topic of this project is Indonesia's early humans. Indonesia holds an internationally important role in the reconstruction of early human's history.
3.	Learners' Difficulties in the Learning Process of History	Akhmad Saidillah	A discussion of the internal and external factors of students' difficulties in learning History.	**A. The output:** This research aims to design a solution from the identified problems of internal and external factors in students' difficulties of learning history. **B. The topic:** This project is designed specifically for the Indonesia's early humans' subject. This subject is chosen because it is one of the first material in the Indonesian History subject.