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3 Experiential Learning with Digital Storytelling: A Website Studies Review of Sensory Design Elements & Interactive Strategies

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Abstract. This research is a further study that discusses the use of parallax scrolling as a technique that can be used for experiential-based learning models. This is expected to be an alternative to distance learning media, which is still dominated by the presence of tutorial videos, with many limitations related to the level of interactivity, participation, and learning effectiveness of the latest generation. The development of the SOLE (Self Organized Learning Environment) learning model design, which focuses on independent learning, is still very limited with media designs that have not been able to deliver experience-based learning with a novel visual approach that can activate students' feelings and emotions (sensory). This is one of the important elements of the interrelated experiential learning axis that was introduced by Kolb. This essay explores and identifies sensory stimulation used in several case studies of commercial websites with an interactive storytelling approach. Through this review, the identification of experience elements used in commercial websites can become the same elements in designing effective digital learning media. The research was conducted through a literature review and descriptive qualitative analysis, which will be useful as the basis of the experience design framework model for the next prototype stage.

Keywords: Experiential Learning, Website Design, Digital Storytelling, Sensory Design

1 Introduction

During the pandemic, the academic world was encouraged to aggressively use digital learning, utilizing all digital-based media to overcome distance restrictions. Distance learning has been developed long before the pandemic came, but has never been pushed this far. Every educational institution is adapting to the recovery of the post-pandemic education system and model by not completely abandoning distance learning (blended learning). This model is considered effective for achieving learning outcomes in cognitive aspects. The development of distance learning models in the non-formal education sector for commercial purposes in the form of courses for re-skilling and up-skilling has progressed considerably but is still very limited to the features of the flexible

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learning model. The knowledge of subjects by students, particularly Generation Y, who were born after 1980 and are referred to as digital natives, cannot be separated from the effectiveness of distance learning [1]. This generation has experienced rapid technological advancements and the advent of artificial intelligence, which has fundamentally altered information connectedness. The acquisition of knowledge must be processed, though, in conjunction with a successful learning approach that involves experiencing and exploring the knowledge as well.

The three primary categories of distance or digital learning include those that completely utilize web-based mixed or hybrid formats [2] but still only include formative quizzes and video lectures, which are often delivered using asynchronous and synchronous techniques [3]. We are also aware with a well-known idea model called the "flipped classroom." The flipped classroom concept treats the classroom and the home as two separate but complementary learning environments. Both before and after class activities, students can learn the topic. They are able to start conversations, share knowledge, and resolve issues as a result. This paradigm gives students more learning control and trains them to become procedurally fluent as needed [4]. It also motivates them with tough projects.

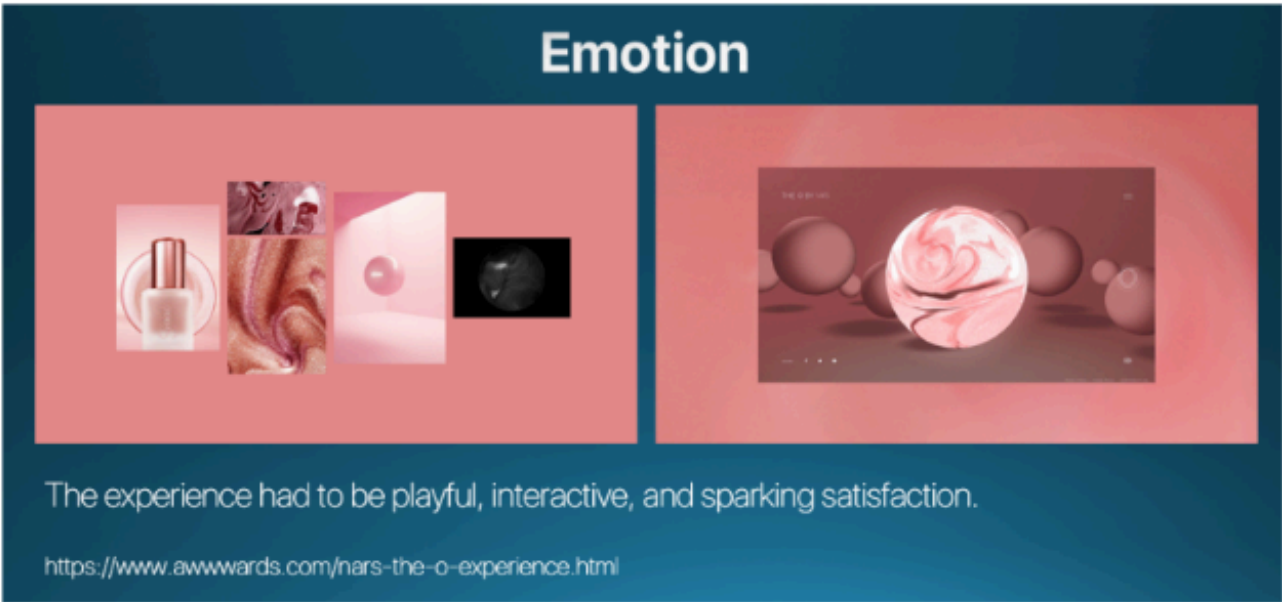


Fig. 1. Initial Research on Website Design Analysis. A Case Study on Sensory Stimuli in Nars-The O Experience, A Commercial Website

Previous research on the use of the parallax technique on commercial websites came to the conclusion that the design of educational learning materials should take into account usability, sensory, and aesthetic factors equally. It has been demonstrated that these three factors influence how learning is experienced overall. This corresponds to the experiential learning pedagogy's tiered learning cycles concept that Kolb [5] initially put forth. Kolb uses the four axes of see-do, think-feel, and think-do to describe the elements of experiential learning.

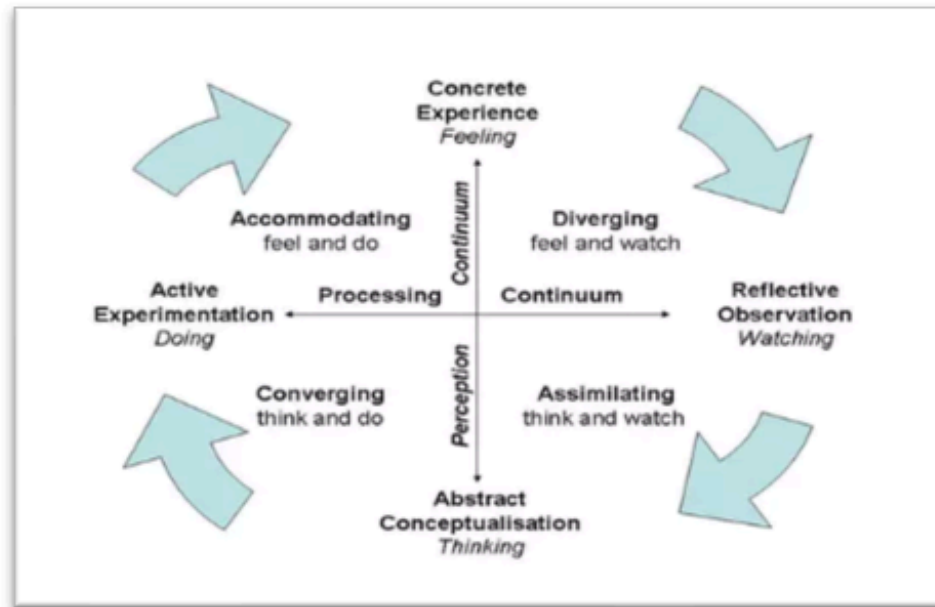


Fig. 2. The Concept of Experiential Learning as Pedagogy Methods by Kolb Is Used as Fundamental to The Student Experiences Concept

A learning activity has a variety of activities of observation, interaction, analysis, and feeling sensations from other sensory senses. In learning materials, context can be packaged in storytelling methods or story narratives accompanied by four dimensions of stimulation categories: sensory, affective, behavioural, and intellectual [5].

Context can be provided in educational materials using narrative techniques or storytelling techniques. The act of creating stories is a way for people to convey their emotional interactions with the real and made-up world around them. In other words, storytelling is a way to express experiences, and creating the best narrative story possible means accurately simulating those experiences. Experience stimulation falls under the sensory, affective, behavioral, and intellectual categories, according to Brakus [7].

2 Objectives

This study aims to identify how independent variables (storytelling, experience elements) affect user experience

- ∞ H1: Storytelling and Experience Elements is a key strategy for delivering an effective distance learning method, encouraging students to explore knowledge by activating the senses through sensory experience.
- ∞ H2: The website is one of the media that is still effectively used as a digital learning medium because it is easily accessible in various formats.

The objective is to identify design elements and interactive strategies in several websites as case studies, especially on interactive storytelling websites that use a wide range of sensory stimuli.

3 Methods

A literature review and a qualitative descriptive analysis using two websites as case studies were two steps in the study process. The artifact was chosen through a purposive sampling process and grouped according to numerous criteria, including storytelling, interactivity, sensory design, and instructional intent. To identify sensory design & interactive strategy aspects (Connection, Emotional Expressions, Movement, Nature aspects, Playfulness) and user experience dimensions analysis, the first experimental step involves cooperating experience (immersive) with website platforms. Additionally, the experimental phase of next immersive technology research will be facilitated by this framework.

4 Literature Review

4.1 Digital Storytelling

The practice of telling stories using technology is what digital storytelling is at its core. Digital documentaries, computer-based narratives, digital essays, electronic memoirs, interactive storytelling, and a variety of other terms are also used to describe this practice, but they all generally refer to the idea of fusing the craft of storytelling with various forms of multimedia, such as graphics, audio, video, or advanced technologies such as virtual reality and augmented reality.

Digital stories typically have a particular subject and point of view, much like traditional stories do. But as the name implies, digital stories frequently combine recorded audio narration, text, moving images, or motion graphics with various sound and visual effects.

According to Gregori-Signes [7], digital storytelling gives pupils the opportunity to "examine their environment around them and develop their understanding of it. The development of knowledge-based skills, interaction with the outside world, social and civic competency, and cultural competence are all unquestionably aided by this. According to a study [8], the ability of digital storytelling to tailor the educational experiences of students promoted student diversity, raised students' self-assurance, and enhanced their social and psychological abilities.

The digital stories [9] categorize the major ones into three groups:

1. Personal narratives, which are recounts of key events in a person's life.
2. Historical Documentaries, which look at dramatic occurrences that provide light on the past.
3. Narratives, that inform or instruct the audience on a certain concept or technique.

One of the most effective ways to sway, uplift, and educate both children and adults is through storytelling. This is due to the fact that it forges bonds that bind and solidify relationships by connecting individuals and ideas. This idea is developed more in interactive storytelling.

Interactive storytelling in e-learning is a technique for making the context of the learners' work the story's main focus. It replicates the circumstances, setting, and cultural context that the learners are accustomed to. The unwillingness to adapt and the willingness to embrace new behaviors are two of the biggest obstacles to adult learning. Successful interactive storytelling fully removes the learners from their surroundings by engulfing them in the learning environment. It's comparable to becoming lost in a good book or watching a fascinating movie.

In contrast to books and movies, a student acts as the main character who is a real participant empowered to develop the story. With immersion, learning becomes more intense and engaged. The depth of learning increases with the ability to apply knowledge in the workplace.

Setting establishing a situation that the learners are familiar with greatly aids in removing their reluctance and fear of the unfamiliar, allowing them to embark on their journey of discovery.

4.2 Immersion Experience & Sensory

Technology researchers have talked about and used the word "immersion" for many years. The phrase is frequently used to discuss experiences in video games, paintings, books, and movies. Immersion is defined by Slater & Wilbur [10] as "a description of a technology, that describes the extent to which the computer displays are capable of delivering an inclusive, extensive, surrounding, and vivid illusion of reality to the sense of a human participant"

Our body and senses are deceived into acting and responding as though the virtual environment is real while we are immersed, and this process seems to be more physical than psychological in nature. the potential to change the cognitive elements influencing how one experiences their body and space that are controlled by technology-based websites, instructional videos, and smartphone apps. Our bodies and senses are tricked into acting and reacting as though the virtual environment is genuine in this situation, making immersion more of a physical experience. The psychological act of believing the virtual environment to be genuine, or the experience of "being there," is thus referred to as presence [12].

To convey this experience, the selection of media & technology is one of the success factors. Immersive technology is constantly evolving with an emphasis on the manipulation of one sensation by another. In the figure below, Kitson [13] maps immersive interactive technologies based on immersive depth to function.

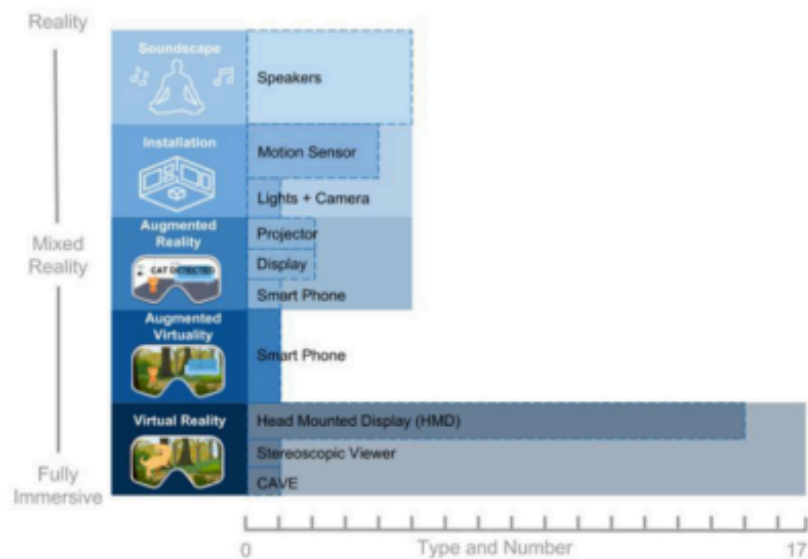


Fig. 3. Immersive Interactive Technologies Based on Immersive Depth to Function

With the limited ratio of educational technology to a large population, especially in Indonesian education, the website is an effective medium to achieve the mixed reality level by presenting an optimal experience.

According to Brakus [6] experience is the fusion of a person's environment and themselves. He argues that knowledge, which includes categorizing, analyzing, and making arguments about objects, is only a small component of a person's overall grasp of the universe. He challenges the exclusively cognitive view of experience as knowledge. Experiences include knowing and the intellectual experiences that follow, as well as sensing, feeling, and acting. Additionally, people are essentially connected. Intellectual, emotional, social, and bodily pleasures are the four "pleasure dimensions".

The 4 dimensions of stimuli are:

- 1.The sensory dimension is connected to the activation of the five senses of sight, hearing, touch, and taste in humans.
- 2.Stimuli that arouse either positive or negative thoughts or attitudes are related to the affective dimension.
- 3.The intellectual dimension has to do with how media or information piques the viewer's interest and encourages critical thought.
- 4.The behavioral dimension is one that prompts the user to act and behave a certain way.

Instrumental, non-instrumental, and emotional are three categories that have been used to define user experience [11]. Non-instrumental attributes refer to the system's aesthetic appeal, whereas instrumental qualities refer to the usability of the system. User emotions are influenced by both instrumental and non-instrumental aspects. These days, interactive systems must also be aesthetically pleasing in order to be designed. Visuals and experience are necessary in educational strategy to achieve student learning effectiveness. In order to construct the user's input into the virtual world simulation, immersion technology will use a variety of sensory organs in the human body, including the eyes, ears, and skin. This will allow for predictable information output design,

whose predictability is derived from the body's self-protection mechanisms and acquired learning experiences [14].

Figure 4, which incorporates the results from earlier studies, illustrates the comparison of the information perception characteristics of several perceptual senses and demonstrates how a single sensory modality cannot satisfy the user's needs for getting comprehensive multidimensional information. A multi-sensory interactive online education system can more efficiently convey information if it is designed properly.

Characteristics	Vision Sensory	Auditory Sensory	Tactile Sensory
Expression dimension diversity	Extremely high	General	Singular
Reaction time of attention	Relatively slow	Rapid	Extremely responsive
Time change sensitivity	Insensitive	High sensitivity	Low sensitivity
Perceived range size	Limited range, strongly related to visual field range	360° omnidirectional spatial perception	Limited range, strongly related to visual field range
Expression of emotional changes	Difficult to express emotional changes	Easy to express emotional changes	Inability to express emotional changes
Spatial positioning accuracy	High accuracy	Low accuracy	Low accuracy
Multiple concurrent interference intensity	Weak interference	Strong interference	Strong interference
Environmental relevance	Weak correlation	Strong correlation	Weak correlation

Fig. 4. Information of Perception Qualities of Touch, Aural, And Visual Inputs [15]

4.3 Interaction Strategies and Design Elements.

In 33 immersive texts and interactive experiences, Kitson [13] outlines 12 major topics and interaction paradigms. The simplification and selection of themes are done in accordance with the following to fulfill the primary objective of designing design components to be directed at learning media.

5

1. Connection: Users can feel a sense of belonging and relatedness through telepresence and communication.
2. Emotional expression: Emotions of the users can be expressed through audio and visual mappings, mainly through capturing physiological markers such as arousal.
3. Movement: Users physically moved their bodies to interact with the system. The movement was used as a way to promote health.
4. Nature elements: These experiences involved some aspects of nature. Some experiences used natural sense (water, fire) as visualization and also sounds.
5. Playfulness: Users were invited to interact with the system that supports curiosity and creativity to make the experience as inviting and non-invasive as possible. This was achieved through exploring a narrative.

5 Design Review

This design review was conducted to identify sensory design elements and interactive strategies used in several commercial websites. The case study used a purposive sampling model and considered its empirical characteristics as the dependent variable.

Websites were selected through the [awwwards.com](https://www.awwwards.com) site which contains a curated collection of website designs from around the world based on the categories of technology, design, creativity, function, technique, and uniqueness. Some of the variables used for element identification are as follows:

Table 1. Design Review and Comparative Studies

Case Studies	Storytelling	Immersive Type	Stimuli Dimension	Sensory Type	Design Elements & Interaction Strategies
Nomadic Tribe www.2019.makepulse.com	Personal Narrative	Mixed Reality	Sensory, Affective, Behavioral, Intellectual	Vision, Auditory, Tactile	Connection, Emotional, Movement, Playfulness
US Air Force www.airforce.com/intothestorm	Personal Narrative	Mixed Reality			Connection, Emotional, Movement, Natural Elements, Playfulness
The Andrei Sakharov Museum www.Sakharov.space	Instructional Narrative	Mixed Reality			Connection, Emotional, Movement.
Sons of Gallipoli https://sonsofgallipoli.com	Historical Narrative	Reality			Connection, Emotional, Movement.
1917 Movie Intotherenches1917.movie	Instructional Narrative	Full Immersive			Connection, Emotional, Movement, Natural Elements, Playfulness
Kerry gold, The Magical Pantry www.themagicalparty.com	Instructional Narrative	Reality			Connection, Emotional, Movement, Playfulness
Medal of Honor: Above & Beyond https://www.oculus.com/medal-of-honor/	Instructional Narrative	Full Immersive			Connection, Emotional, Movement, Natural Elements, Playfulness

5.1 Stimuli Dimension Review

In the sensory and affective dimensions, it is found that almost every website study utilizes sensory experiences effectively. At Nomadic Tribe, digital storytelling is presented with several visual elements that are reactive to user interaction, causing sensation, curiosity, and playfulness. Audio narration and background music help users dive into a linear storyline. In the US Air Force, the storyline about efforts to rescue a stranded plane is displayed dramatically with a cinematic visual appearance, users are invited to interact with the mission accompanied by audio narration of the real US special forces involved. Dramatic war battle themes can also be seen in the 1917 and Medal of Honor case study, where users are also given a fully immersive experience through a first-person perspective evoking mixed emotions along with background music, sound effects, and visual interactions as if the user were directly involved.

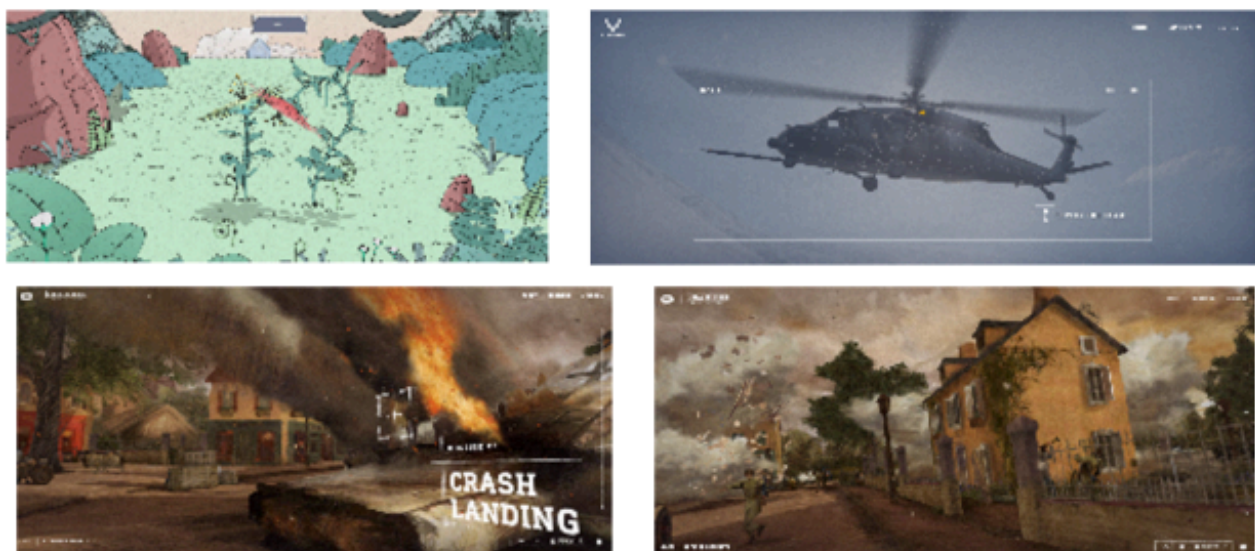


Fig. 5. Website Capture Image of Nomadic Tribe, US Air Force, Medal of Honor

Strategies that evoke emotion can also be seen in website studies that have a documentary theme (Sons of Galopoli, The Andrei Sakharov Museum) both biography and history. Users are not also presented with visual interaction through scroll effects but also through kinetic typography technique so that dynamic movements are seen and give a tactile or reactive impression to the cursor or scroll movements. Here we can see how information is presented, not just material and data, but conveyed in an emotional narrative. Users are invited to not only understand the content but also the context of the story of the character Andrei Sakharov and the history of Gallipoli.

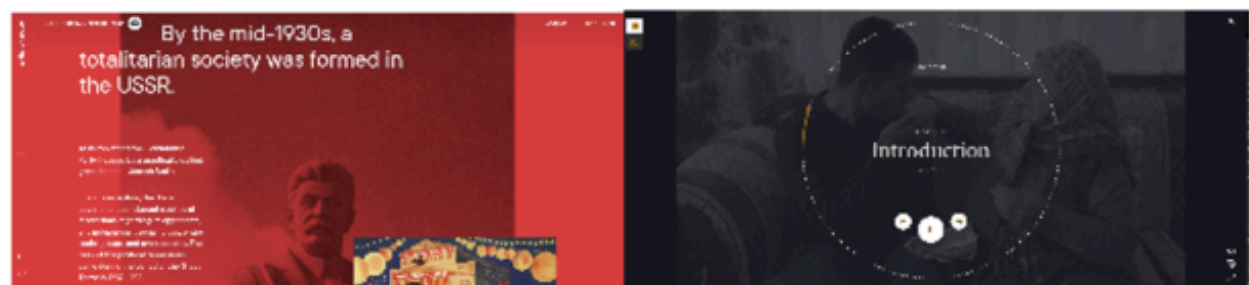


Fig. 6. Website Capture Image of Sons of Gallipoli and The Andrei Sakharov Museum

Meanwhile, the game experience or playfulness appears when interactions are carried out on The Magical Pantry website. In this case study, storytelling is displayed in digital gameplay where the user can choose an avatar and personalize the character. Forming an emotional bond with the characters created is a crucial element that brings the user into the storyline accompanied by the narrator's voice.



Fig. 7. Website Capture Image of The Magical Pantry

6 Conclusion

The development of experience-based learning through digital learning, especially websites, can still be developed and this study proves that 3 important elements related to experiential learning namely usability, sensory, and aesthetics play a major role. Referring to research that has been done by [15], the information architecture model can be adopted by considering several approaches to design elements and sensor stimuli. As seen in Figure 7, the design elements are broken down to map out interactive strategies to achieve effective cognitive outcomes.

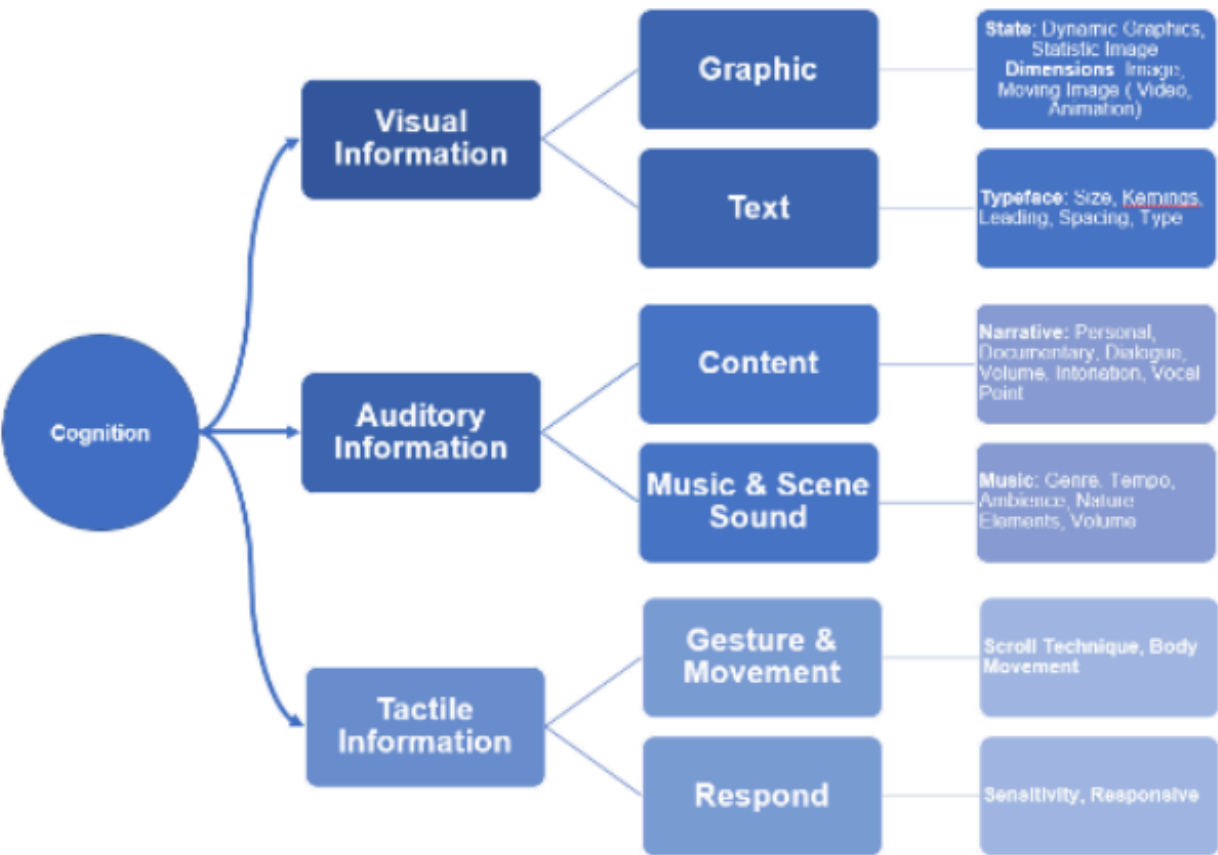


Fig. 8. An Overview of The Educational Data Influencing How Much Cognitive Load Users Experience Throughout Experiential Learning

In conclusion, a user's ability to learn via immersive reality learning can be considerably improved by using an ideal cognitive load and information presentation. In light of this, the emphasis should be on the users' sensory experience, which can considerably improve users learning outcomes in digital learning. In order to do this, the emphasis should be placed on the cognitive architecture of the user, the parallel design of the elements & interactive strategies as well as learning materials, and teaching methods. The use of website media as a digital learning medium is still very relevant and can be an alternative medium besides the development of Virtual Reality technology and Augmented Reality which is still very limited due to economic value and practicality factors. Further research can be carried out to design a prototype based on the model and framework that has been formulated in this essay.

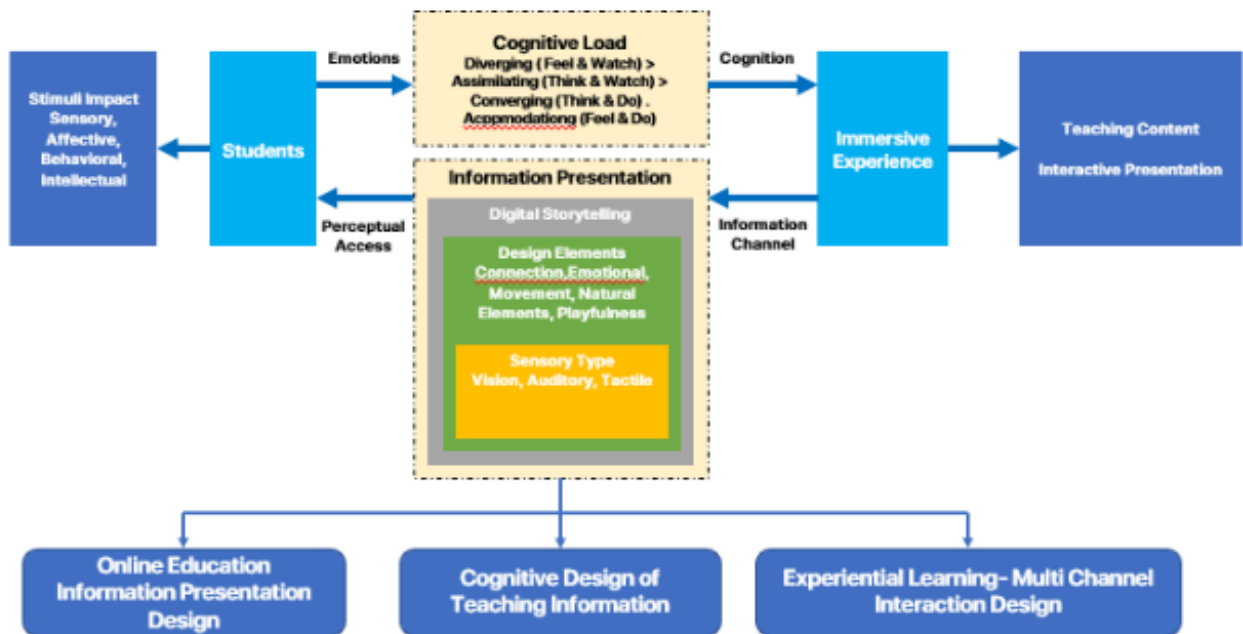


Fig. 9. Proposal of Experiential Learning Model

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