CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter discussed the aspect of multimedia learning in the context of its elements and tools. The learning style and strategy focus on the different learning styles of learners and the relation of sensory modalities in memorization. The Quran memorization also reviewed the memorization techniques and their applications. Theories and models related to the study have also been reviewed as the foundation of model development. This chapter also discussed the theoretical and conceptual framework of this study and the conclusion.

2.2 Multimedia Learning

Multimedia learning enables a variety of approaches to facilitate learning. Most researchers approve that multimedia could be developed as a teaching aid for students (He, 2021; Othman & Wan Yahaya, 2015). Richard E. Mayer & Moreno (2012) stated that multimedia learning is a learning process that constructs mental representations through pictures and words. It is used in multimedia presentation, which involves teaching approaches within an organized environment. Mayer (2009) also claimed that multimedia learning can happen once learners build mental models from words of printed or spoken text and pictures of graphics and video. This can be applied to any subject and the learning process, can either be achieved or enhanced through an interactive multimedia application (Fan, 2017). The process of multimedia learning can be seen through positive responses, knowledge acquisition, information gaining, or

knowledge structure (Mayer 2009). The purpose of multimedia learning is to support and improve the quality of learning (Richard E. Mayer & Moreno (2012).

Richard E. Mayer (2009) explains the learning process from words and pictures through visual and verbal channels represents the human information system. It involves three important assumptions for multimedia design: (i) learners have separate channels for processing visual and audio information; (ii) learners have a limited amount of information that can process in each channel at a time and (iii) learners engage in active learning through the existence of relevant incoming and organizing selected information into coherent and integrating mental representation into prior knowledge. Multimedia learning is more likely to understand the learning materials once the user is engaged in active learning, which is related to cognitive processing through the learning materials that mentally organize and integrate it into a coherent cognitive presentation with their existing knowledge (Park et al., 2018). The use of multimedia for learning can encourage a user to engage in active learning by mentally representing the learning materials in words and graphics through connections between pictorial and verbal information (Clark & Mayer, 2016). Learning engagement through active learning is a major benefit of using multimedia technology for learning. For example, learners' engaging experience in the virtual learning environment, which is an advanced form of multimedia learning employing interactive multimedia technology and found it's a significant effect on learnability aspects. Moreover, when experiencing cognitive active learning, students transform the knowledge they gained by exploring it beyond the central thought. Hence, learners aim to develop a deep understanding of their learning rather than surface learners. Therefore, rather than rote memorization,

they critically engage with their learning understanding and retain the material in their long-term memory (Annansingh, 2019).

According to Abdul Hanid & Mohamad Said (2019), the use of multimedia learning materials brings benefits to the student's learning. It is used to overcome the weaknesses and problems encountered inside the usual teaching process in a traditionally implemented classroom. It can be a stimulus to educators as well as a tool that can help educators deliver lessons effectively. The use of multimedia technology in learning materials allows them to learn in self-learning, improve learning skills, engage effectively with the media and develop their critical thinking (Gómez et al., 2016). The ability to provide self-directed learning as well as a study schedule appropriate for students are also two proven advantages of the learning materials through research. Students can choose the time, content as well their learning goals as quickly as multimedia learning provides freedom for students to choose the information they prefer according to their ability, intellect and learning style. Self-learning through mobile learning aids is better than the traditional method, where through this self-learning students can control learning based the ability and suitability of the time period including their location. Students can explore on multimedia learning content at home using their own mobile devices, able to review the topic on their way to class, with no limitation on places and time (Halili et al., 2019). This indirectly encourages them to engage with the multimedia learning content within their capabilities.

There are positive influences of multimedia learning materials through cognitive technology on students' performance (Ye et al., 2021). The reasons for the need for the use of multimedia learning are (i) the storage space and distribution facilities that take up space of textbooks, magazines, and so on; (ii) ease of searching and access to

information; (iii) reference and association of information through unlimited sources; (iv) provide more flexible learning control and (v) effective learning through the use of various methods to media. Moreover, multimedia design helps to enhance the learning process and leads to better knowledge retention. For example, educational videos can provide more opportunities for students to engage with the content. Video can sometimes demonstrate complex ideas and access other times and places better than speaking (Ling, 2017). In this study, the multimedia learning design is employed as an effective way to learn and create engagement in cognitive abilities that relates to cognitive skills of information learned and delivered through the teaching approach applied.

2.2.1 Multimedia Elements

Multimedia plays an important role in various fields including medicine (Mayer, 2020), science (Liu et al., 2021), psychology (Wang, 2020), and education (Abdulrahaman et al., 2020). Multimedia is a good way to communicate and create effective teaching and learning approaches (Almasseri & AlHojailan, 2019). In general, multimedia is a combination of visual and audio representations. These representations could include elements of texts, graphic sound, animation, and video. However, multimedia is controlled in such systems where information is digitalized and processed by a computer. Multimedia provides the students to gather information through media that encourage their imaginations and interests. It is also combined with the sense of learning and will create a successful teaching and learning method. Multimedia technology provides students with easy-to-access information, accelerated learning, and fun opportunities to practice their teaching and learning. It enables students to explore new

subjects and deepen their understanding of difficult concepts of learning. Using multimedia, students can easily recognize and solve a variety of problems in learning. Multimedia material with multimodality learning is more attractive, appealing, and proficient in engaging students (Lin et al., 2021). Moreover, multimedia can reduce the time it takes to learn and practice.

Made Rajendra & Made Sudana, (2018) stated that multimedia is classified as interactive multimedia learning with the elements of text, graphics, photos, videos, illustrations, sound, and animation. Interactive multimedia instruction is an effective approach to teach cognitive skills and psychomotor skills and it incorporates the retention of learning content. The students taught with interactive multimedia instruction with the use of video as a tool showed higher performance than those taught with text sheet instruction, because of the effectiveness of the methods used. According to Jamaluddin (2000), the process of disseminating information is now has progressed with the development of various media. It is an interactive communication process based on computer technology that combines the use of numerous elements of digital media namely text, audio, graphics, animations, and videos to transfer information. The use of multimedia applications is said to be a catalyst in teaching and learning because multimedia elements provide an effective medium for students' learning. Stimulation of memory patterns using multimedia elements in the presentation of information is easier to follow, remember and store longer in the memory (Vaughan, 2014). The latest developments in multimedia technology provide multiple modes of presentation of information dynamically compared to traditional teaching methods and media (Park et al., 2018). It also provides more application-based information presentation modes of instruction as an alternative to traditional media-based teaching methods. When

compared to other instructional media, the application mobile is the most efficient and effective cognitive tool because of its advantages in terms of interactivity as well as a user control (Abdul Hanid & Mohamad Said, 2019). Research studies by Nicolaou et al., (2019) agree with the new approach to traditional teaching methodology is through the use of audiovisual media technology in teaching and learning. It is serving a practical purpose by providing the knowledge and skills that contribute to obtaining media literacy. The use of audiovisual media technologies in the educational procedure also has outcomes. The multimedia learning environment applied multimedia elements involving various senses namely audio, video, animation, words, and pictures into one learning medium.

In human communication, body motions, namely shaking, head posture, facial expressions, hand gestures, and upper-body posture, as well as speech, are known to transmit feeling and intention (Ishii et al., 2018). The gesture is a visible action as an expression and is often performed while speaking, but can also stand for itself (Hassemer, 2014). The body parts involved in gesturing are called articulators. Gestures are one of the most important forms of non-verbal communication or sign language vocabulary that includes movements of hands, head, and other parts of the body motions that allow individuals to communicate a variety of feelings, thoughts, and emotions (Noroozi et al., 2021), emphasizing the words and phrases expressed (Adithya & Rajesh, 2020) and convey information (Oudah et al., 2020). Examples of gestures or communicative gestures are waving, saluting, handshakes, pointing, or a thumbs up. Levy et al., (1992) propose a general classification of four types of hand gestures: beat, deictic, iconic, and metaphoric. Beat gestures refer to spontaneously produced biphasic movements of the hand. It is the most frequently encountered co-speech gesture in

human communication. They are closely temporally aligned to the prosodic characteristics of the speech signal, typically occurring on lexically stressed syllables. Beat gestures reflect the tempo of speech or emphasize aspects of speech that can generate motivation and stimulation perceptual skills that will lead to enhanced learning. Beats are hand movements that emphasize the spoken discourse itself, the function of speech, and convey minimal or no extra information. Examples of beat gestures are up-and-down or back-and-forth hand movements that coincide with spoken clauses, breaks, or sentence ends. Deictic gestures or pointing gestures are pretty basic, connecting speech to another idea, object, or location. For instance, when talking about someone across the room, might point them out. Iconic gestures refer to hand gestures that represent meaning that is closely related to the semantic content of the segments of speech that they complement (McNeill, 1985). Iconic gestures represent object attributes, spatial relationships, and actions. For example, describe gesturally a tall person or a wide river as we were talking about each of those things. Metaphoric gestures put an abstract idea into a more literal, concrete form. For example, making hands into a heart shape and placing them on the chest might indicate care for a loved one. A study by Chaves et al., (2012) used methods of image frames of body motions and hand gestures focused on distinguishing which parts of the image are associated with the user in the given scene to create some type of representation for his or her body, preserving relevant information. Using a multi-modal affective state through body postures, body motions, hand gestures, and, facial expressions, are sufficient as video content and image frame can identify the interest in the e-learning process. (Ashwin & Guddeti, 2020). A study by Hwang et al., (2020), stated that in their experiments when an emotion and body posture vocabulary appears on the screens or pictures, learners

pronounce it and imitate facial expressions on an image. It showed significant differences in their learning in terms of understanding vocabulary, making sentences, and memorizing postures. The experimental study by Mirehi et al., (2019) also used an image of hand gestures and sign language recognition to evaluate the communication of non-verbal gestures. Hassemer, (2014) showed that the hand is the most important part of human communication in comparison to other body parts for gesturing namely facial, arms, and body movements. Furthermore, studies by Tsai et al., 2020; Varga et al., 2008) suggest that an intuitive set of gestures can be designed, which is not only usable in the specific multimedia application, but can be generalized for other purposes because there are typical gestures for each function.

According to Ashwin & Guddeti, (2020), visual cues recognition in multimedia learning uses the elements of video clips and pictures of body motions and hand gestures for designing the learning aids in teaching and learning environments. Research on instructor embodiment has shown that students learn better when the instructor gestures while orally explaining onscreen pictures rather than simply standing still (W. Li et al., 2019). This is in line with the principle of the embodiment that people learn better from a multimedia instructional message when the onscreen instructor engages in human-like gesturing, movement, eye contact, and facial expression (Mayer, 2020). This can be applied both to human instructors as well as animated agents that appear on the screen.

Studies by Meixner (2017) state that interactive multimedia presentations consist of different media with temporal and spatial synchronization that can be navigated via hyperlinks. The interactivity allows students to control, manipulate and explore information in instructional applications and these aspects have a very positive impact on students. This field includes a combination of instructional, learning, development,

management, and other technologies used to solve educational problems (Khan & Mustafa, 2019). The combination of various ways of data presentation is the core of the multimedia learning theory developed by Richard E. Mayer who distinguishes four cognitive processes choice, arrangement, transformation, and integration of data (Tkachuk et al., 2020). The development of multimedia technology also emphasizes interactive learning and theories of learning as well as the current needs.

Multimedia-based learning is related to the process of how a student learns. Multimedia-based learning must generate and use certain ideologies and be reinforced with the use of various types of media and suitable approaches in teaching and learning. Interactive elements and attractive design are also important for producing meaningful learning and also effective in helping students understand their learning. Moreover, the designers need to remember that multimedia effects work well for different learners (Aryani et al., 2021; A. Othman & Wan Yahaya, 2015). The benefits of using interactive multimedia in learning as stated by Made Rajendra & Made Sudana, (2018) are: (i) more learning system; (ii) an innovative and interactive; (iii) the teacher will always be required to be innovative in seeking a breakthrough creative learning; (iv) able to combine text, pictures, audio, music, animated images or video in the unity of mutual support to achieve learning goals; (v) increase the motivation of learners during the learning process to obtain the desired learning objectives; (vi) able to visualize the material which has been hard to be explained merely by an explanation or a conventional property; and (vii) to train more independent learners in gaining knowledge.

In this study, the researcher applied the multimedia elements of pictures of motion and hand gestures as an extension of Mayer's model instead of pictures and

words to the EzHifz model. EzHifz model applied the elements of graphics, audio, text, and video, as it is the most appropriate for cognitive processes to use in multimedia design and more relevant to support the model of Quran memorization based on VARK learning style (EzHifz model). Although multimedia elements are available, the student also needs to choose the right multimedia tools to achieve the objectives of learning.

2.2.2 Multimedia Tools

Multimedia tools refer to a set of hardware and software employed in the task of developing multimedia applications or products (Sait et al., 2019). It is used to deliver information to people for a better understanding of concepts and enables people to communicate information or ideas with digital and print elements (Abdulrahaman et al., 2020). The design application of multimedia tools and the multimedia component must be high enough to combine the different elements of the cognitive processes to achieve the goal through the best mimicking of the teacher and stimulating experience by delivering information for a better understanding of learning concepts, improving the efficiency of learning technology, strengthen the educational process and improve the quality of training (Sait et al., 2019). It is also important to develop various multimedia tools for effective teaching delivery that emphasized the uniqueness, focus area, and target age. Studies by H.S. et al., (2017) also mention that visual aids with interactive tools contribute positively to the pedagogical value that helps students in a clear understanding of learning. Apart from visualization it also helps in assessing the student's understanding as stated in Fleming's VARK model that 60-65% of people are visual learners and thus learn best by using pictures and visual aids. Research by Abdulrahaman et al., (2020); Guan et al., (2018), stated the benefits of multimedia

application tools for teaching and learning are: (i) the ability to turn abstract concepts into concrete contents; (ii) the ability to present large volumes of information within a limited time with less effort; (iii) ability to stimulate students' interest in learning and (iv) provides the teacher with the ability to know student's position in learning. According to Aryani et al., (2021), multimedia tools using mobile devices provide many learning experiences, including ease of use, availability of content at any time, portability, and collaborative learning for the process of teaching and learning. Emerging technologies are utilized to learn words and expressions in the second languages of the Quran is considered that mobile versions of the Quran can provide portability and accessibility in comparison to the physical copy of the Quran (B. M. Alsharbi et al., 2021). This is also to utilize mobile and computing technology to promote Quranic learning and leveraging of providing interactivity through the contents designed in multiple media namely video, infographic, and text-based to accommodate the need for VARK learning styles based on the student's differences in their VARK learning style (Roslan et al., 2019). Multimedia tools are also delivered using different technologies and multimedia components and can be categorized as web-based or standalone (Abdulrahaman et al., 2020).

The previous Quran memorization tools had focused more on the function of technology to support self-learning namely mobile learning (Buzdar & Farooq, 2020; Elobaid et al., 2014; Zakariah, Khan, & Tayan, 2017; Zameer et al., 2013), web system (Suryana & Oktaviany, 2021; Tedi et al., 2020) visual word recognition (Faiza, 2019; Raja Jamilah, 2011), voice recognition (Abdullah et al., 2019; Al-Khatib et al., 2020; Mohammed et al., 2015; Musa et al., 2018; Omer, 2017), cognitive intelligence (Sirin S, Metin B, 2021; S. Slamet, 2019), memory strategies (Berglund & Gent, 2018; Shukri

et al., 2020) content and methods (Afifah et al., 2020; Ariffin, 2011; Aziz et al., 2019; Dzulkifli & Solihu, 2018; Sulaiman, 2018) of the product developed.

In this study, an interactive multimedia application in standalone tools was implemented on a mobile platform that represents the EzHifz model as a teaching and learning aid. It includes materials in visual, audio, video, animation, and text formats for students to self-memorize without the internet but authored to be installed and loaded on teachers' or students' mobile devices. Although multimedia tools are presented related to the field, there is a need to strategize the learning style to absorb their learning.

2.3 Learning Styles and Strategies

Learning style refers to the easiest method for students to absorb, process, and understand the information learned. This comes from the understanding that students take and process information and knowledge in different ways based on their selections of modes of learning (Jamulia, 2018), and describe their behavior and learning habits (Kurdekar & S, 2020). According to Honey (2001), the choice of an individual style of learning depends on suitability based on attitudes and behaviors. This is because the information is received and processed in various ways according to the individual's interests and perceptions. To identify an individual's learning styles, it is important to study the individual's multi-dimensional characteristics (Brunye et al. 2006). According to Norlia et al. (2006), a learning style is the way of learning a student favors in thinking, processing information, and understanding learning. Learning styles are how students learn something (Norasmah & Siti Rashidah 2004).

An individual's learning style refers to the way the individual learns in organizing, understanding, and processing information. Differences in the learning styles of different individuals affect the students' cognitive levels and learning performance (Awad & Street 2014; Galecka 2013; Mssraty & Faryadi, 2012). The results of the study by Norlia et al. (2006) reveal that there is a relationship between motivation and learning style practice. Information about learning style practices can help teachers identify students' learning styles so that the lessons presented can meet the needs of different individuals. Moreover, the success of the teaching and learning process doesn't come merely from the teacher or supporting material but requires the motivation of the learner as well. If the teacher realizes the ability of the learner and provides an appropriate learning environment, the learner will be able to learn based on their skills and learning style. Studies by Little & McDaniel, (2015) show students rely on different signs to develop their memory representations or determine their representations for their design. This proves that individuals have different preferences for memorizing the Al-Qur'an. Thus, the teaching and learning process can be smoothly and effectively to enhance the quality and effectiveness of the teaching and learning process.

According to Made Rajendra & Made Sudana (2018), the educational process is an organized, sequential, and purposeful process that helps the learner and teachers to increase their interaction, develop comprehensive, integrated, and gain knowledge and experiences. It must be carefully planned, as recent trends emphasized the role of the learner and make them focus to interact within the process of learning. Since digital education is looking for a fundamental shift in the educational memorization model to move from a teacher-directed model that relies on the book as the only source of

knowledge, to a learner-oriented model that relies on multiple sources, it is necessary to understand how the learners learn, as it is an important part of the process of selecting educational strategies (Shakir & Ebrahim, 2020). Studies by Halili et al., (2019) indicated that the person in charge of the teaching process is responsible for diagnosing the students' preferred methods, and for helping and encouraging them to learn and work with their preferred learning style. By encouraging them to diversify and expand learning styles, the teacher must be aware of the diverse individual patterns in the learning process and complement appropriate strategies in his instructional design. Thus, it became necessary to prepare a multimedia design that considers their different learning styles, as the instructional design describes the procedures related to the selection of the educational material to be designed, to design an educational curriculum that helps to learn in a better and faster way and helps the teacher to follow the best educational methods in the least possible time and effort. Thus, the Quran educational model design requires an appropriate technique for developing learning environments and improving educational activities and making them learn effectively to fulfill their requirement.

Current interactive multimedia research also lies in educational design according to the students ’learning styles, which is considered essential in the educational process, because it helps to build an effective learning environment as well as helps learners gain knowledge in their preferred methods, which may help to retain information, arrange, organize, and use it when they need. The use of more than one kind of representation in the learning content design might convey information, usually with some degree of user control. Even though the common perception is that multimedia learning design implies

the combination of sensory modes, with the combination of multiple visual representations for the same content (Michea, 2006; Sharma & Wadhwa, 2016).

There are many different models of learning styles recognized and practiced namely David Kolb's model, Peter Honey and Mumford's model, VAK model, Neil Fleming's VARK model, Anthony Gregorc's model, Dun & Dun model, Onion model, and Felder Silverman's model. The study by Nor Aniza (2011) stated that there are significant differences in learning styles and learning strategies in the domain of sensory modality based on the level of student achievement in subjects involved in the language area. This is because the learning style is related to the learning strategies for achieving excellent performance. Therefore, using the right learning styles and strategies can help students improve their learning performance. Furthermore, her study found that many students learn with ineffective learning styles and learning strategies that lead to poor performance. She believes that low-performance results are due to students with low mental abilities. This view is in line with the study by Shamsuddin & Kaur, (2020) which mentions the existent relationship between learning style and student achievement. Each student plays a role in choosing the right learning style and the selection of effective learning style practices can enhance a student's self-esteem (Aliff et al. 2014). Every student has a variety of learning styles, but students have a tendency to choose a particular learning style, known as the dominant learning style (Sari Asmawati, 2015). Differences in individuals' learning styles affect the cognitive level and student performance of learning (Awad, 2014; Galecka, 2013; Mssraty & Faryadi, 2012). The differences in students learning styles require an interactive learning approach to improve motivation and understanding of learning (Nur Fadhlina et al.,

2015). The use of interactive multimedia learning design has been proven to be effective as the use of multiple senses encourages students to achieve full learning (Woo, 2009).

The study of these learning styles and strategies is very significant to this research as a guide for the researcher to develop the model design based on individual preferred learning styles with the use of multiple sensory in memorization skills of learning. The model design will assist in designing the fidelity prototype of the EzHifz model for memorizing the Quran. Therefore, in this study, the researcher focuses on the determination of individual VARK learning styles through the VARK questionnaire instrument. It helps teachers and students know the students' preferred learning styles and choose learning strategies and appropriate media in the learning process. Creative teachers need to choose the different techniques appropriate to the needs of students and succeed in attracting the students' attention to learning to produce quality learning outcomes (Norasmah and Mohd Hasril, 2010). Therefore, the students need to know their preferred VARK learning styles in achieving good performance and motivating them to memorize efficiently.

2.3.1 Different Learning Styles of Learners

In recent years, learning styles have gained so much attention across different learning environments. Many of the researchers are focusing on the preparation of the learning content using learning styles. Normally, learners differ in the way they learn which is described as differences in individual learning styles (Muluk et al., 2020). Many theories have been proposed in which humans can be classified based on their style of learning. Different characteristics of learners are indications of how the interaction takes place amongst the individuals and their responses to their learning

environment. Fleming, (2012) explained that learning styles are an individual's preference for how to learn or the way how people learn. Some students are more independent than other learners, some may need guidance from the teachers or their friends, some students may tend to take responsibility and be aware of their learning style while others may take little responsibility and are reluctant to learn (Muluk et al., 2020). Some students also may want to do better than their friends, whereas others may enjoy working with other students. For instance, if a learner is an independent learner, they can work alone and be confident to learn on their own. If they are dependent learners, they need feedback and guidance from their teachers or peers. Students may prefer one or more learning delivery modes over another because of their differences in individual learning styles. For instance, some learners face difficulties when teachers change the way of teaching and learning. Since visual learners easily remember what they learn through seeing pictures of visual images, the use of visual tools may assist the students to learn and memorize systematically. Repeating the use of visual tools causes the students to remember the procedures naturally.

According to Fleming, (2012), user use their preferences on VARK learning style modes to learn information, for example, one person prefers to 'read about it' but others prefer to talk or draw, they are multimodal in their preferences. Moreover, the user may be indifferent to their modes and strength of modes preferences to which method they use to express their learning. A common mistake among some inexperienced teachers is to assume that they can teach in one mode. They may suggest that they should teach the topic using Kinesthetic strategies and another topic using only auditory strategies. The modes are always mixed, and it would be almost impossible to use only one mode for any teaching segment. Moreover, while dealing with the learning process, students

have their style to absorb and understand the information. Based on the study by Mustafa et al., (2018), each student practiced the memorization technique differently in the learning process indicating his or her preferred VARK learning style. VARK's learning styles involve the use of various senses namely eyes, ears, and body. This shows that memorizing techniques might relate to the way students memorize and it relies on the method used while memorizing the Quran. It may be the cause of difficulty and confusion for students to memorize the Quran. Thus, the same method taught by the school does not necessarily be applied to every student (Baykan & M Naqar, 2007; Klement, 2014; Othman & Amiruddin, 2010; Pereira, 2019). However, not all teaching styles are appropriate to students' VARK learning styles, as it depends on their age, level, and the subject learned.

Learning strategy is behavior and belief that ease gaining comprehension of knowledge and skills (Ambo & Mokhsein, 2019). An effective learning strategy comes when the learning process facilitates the learners with the appropriate multimedia learning content to reach their goals of learning. Learners from various backgrounds will have to participate in interaction with several factors namely the school environment, motivation, and product of interaction between their belief of self-capability through their selection of learning strategy. The same goes for the process of memorizing, the process, and repetition activity in the application will occur representing the model development. It is undeniable that memorizing is an activity of keeping knowledge. It requires a strong mind and is agreed to be a good way in maintaining memories and mind activity. This was proved by Alsharbi et al., (2021) that found a strategy used showed a significant improvement in children's repeating the

whole verse after trying the system applications as well as performance improvements before and after using the system application.

According to Fleming, (2012), four basic learning styles will support students' understanding of their learning preferences. VARK (Visual, Auditory, Read/Write, Kinesthetic) learning styles are four basic learning styles divided into visual, auditory, read/write, and kinesthetic. Each style has its types depending on learners' abilities. Visual learners tend to learn by thinking using real media namely pictures, movies, or diagrams. Auditory learners absorb information easily by listening to the voice, discussion, or lecturing. However, reading learners tend to learn by reading the subject in word form or making list and taking notes about what they learn which helps them to produce information. While kinesthetic learners learn from movement, imitation, experiment, and hands-on action tools. Most learners do not realize their learning styles (Heenan, 2016; Muluk et al., 2020) In many cases, learners combine several learning styles to get the best out of their studies. For instance, when lecturers use speech as their strategy in learning, the students who join the class cannot get information clearly by simply listening to the lectures because their memory is unable to record all of the information. Therefore, they take notes to help them memorize the information; this strategy is called the bimodal category.

During the learning process, students will adopt different learning styles, especially when they must deal with difficult subjects. Learning content that allows for a substantial amount of textual or multimedia elements for the learners can train learners to be creative and learn effectively (Huang, 2018). Concerning VARK learning styles, read-write and kinesthetic learners who adopt this approach learning strategy in their learning perform better than auditory and visual learners who engage in apparent study

strategies. Thus, for lecturers, knowing students' learning styles can help them implement the best learning strategies (Muluk et al., 2020). The preferred way of the learner in which information is processed and strategies are adopted relies on their learning style for effective learning. It is depending on their preferences, there are various styles of learning that include the categories of unimodal and multimodal. The details of these categories unimodal and multimodal are described in the next subsection.

2.3.2 Sensory Modalities in Memorization

Human memory is dynamic and complicated. Memorization often reflects the interaction between specific cultural elements and the characteristics of particular mnemonic constructs (Wang, 2020). In general, memorization involves a process called the basic cognitive process which includes coding, storing, and recalling the memory as this process occurs in the multiple memory systems which function differently but are interconnected (May & Einstein, 2013; Herrmann et al., 2002); sensory memory, working memory (short-term memory) and long-term memory based on the information-processing model of memory (Banikowski & Mehring, 1999). Sensory memory is a memory system that records the information received through the senses by receptor cells before the information is screened and selected to be processed in the next stage of memory, (May & Einstein, 2013; Banikowski & Mehring, 1999). Meanwhile, working memory is a short-term memory whereby the new information received will be processed mentally which includes understanding and problem-solving (Gamsby, 2016). Long-term memory (semantic memory) is a component that is capable of storing information for a long period and could interconnect the information in the

memory, (May & Einstein, 2013; Banikowski & Mehring, 1999). According to Banikowski and Mehring (1999), several factors could cause the loss of information or memory loss: storage failure especially in the long-term memory, retrieval failure, time decay, insufficient attention, interference or inhibition, recentness effects, and insufficient practice. According to the study by May and Einstein (2013), appropriate learning strategies were executed to maximize the function of the memory. The memory strategies that involved for sensory memory are attention and automaticity, maintenance rehearsal, as well as elaborative rehearsal, and chunking for the working memory as to ensure that the information could be activated.

According to Richard E. Mayer (2019), learners acquire information through three cognitive components of the cognitive system namely sensory memory, working memory, and long-term memory. First, information is received by sensory memory namely the eye and ear, then store in the sensory store that briefly holds raw, unprocessed information until the stimulus pattern is recognized or lost. Pattern recognition involves the matching of stimulus information with previously acquired knowledge (Lee et al., 2019a). Sensory memory or sensory registers consist of two separate channels: one for the processing of visual or pictorial information and one for the processing of auditory or verbal information. It includes the spoken words that are held briefly in auditory sensory memory while pictures and printed words are held briefly in visual sensory memory (Baddeley & H.Logie, 1992; Shiffrin & Schneider, 1977). Initial signals are also considered sensory memory. During perceptual processing, the signals are already in sensory memory After perceptual processing, signals are in working memory until they are stored in long-term memory (Kelly, 2018). Presenting unique information in both visual/pictorial and auditory/verbal formats

allows the learner to use both information processing channels at the same time and enables the learner to construct integrated mental models that make the retrieval of the information. (Richard E. Mayer 2019). In Study by Cuevas & Dawson, (2017) stated that there was a highly significant main effect of condition with those in the visual condition retaining twice as much information as those in the auditory condition regardless of learning style, a result that strongly supports cognitive theory multimedia learning. This refers to the learning styles instruction as an ineffective method instead of incorporating principles of the theory in the learning materials. Research by Miller, (2001) shows that student motivation and performance improvement when instruction is adapted to student learning preferences and styles. The VARK learning style or modality preference model focuses on the modes or senses through which people receive and process information. It is a perceptual, instructional preference model that categorizes learning by sensory preferences. Based on the dissertation of Ramirez (2017), on exploring the individual's sensory input processes of perceptual learning styles modalities, learners have seven styles or sensory modalities namely printed-oriented, auditory, oral, visual, tactile, kinesthetic, and olfactory. Table 2.1 shows the characteristics of seven sensory modalities (or input modes) of memory.

Table 2.1: Characteristics of seven sensory modalities of memory

Sensory modalities/Style	Characteristics (learn through)
Print-Oriented	Reading and writing
Auditory	Listening
Oral (Interactive)	Talking
Visual	Visualize
Tactile (Haptic)	Touch
Kinesthetic (Motor)	Movement
Olfactory	Taste and Smell

Learning style is the preferred way of the learner in which information is processed and strategies are adopted for effective learning. Fleming's questionnaire known as VARK learning styles questionnaire (Fleming & Mills, 1992) is composed of 16 statements each with four multiple-choice options. Each of the options corresponds to one of four sensory modalities namely visual, auditory, reading-writing, and kinesthetic. By choosing one of the options, the learners theoretically reveal a preference for that type of learning. The use of modality preferences in Fleming's questionnaire in this study is to reflect on learners' sensory preferences and modify their study techniques in Quran memorization accordingly. Based on Fleming's studies, many students attributed their learning difficulties to the method in which course material was only presented orally or mostly in written form. These perceptions encouraged the researcher to focus on sensory modalities namely visual, auditory, reading, and kinesthetic as learning style dimensions. The concept that the way information is originally taken in by learners influences the method and techniques of learning. Moreover, learning styles determine how to absorb and process information, they will make a learner able to learn and communicate easily. If learners capture information or multimedia learning materials according to their learning style, then there will be no difficulties in their lessons (Triastuti & Mauliyani, 2018) and it might accommodate the sensory modalities through sight, smell, touch, heard, and taste Allison & Rehm (2016).

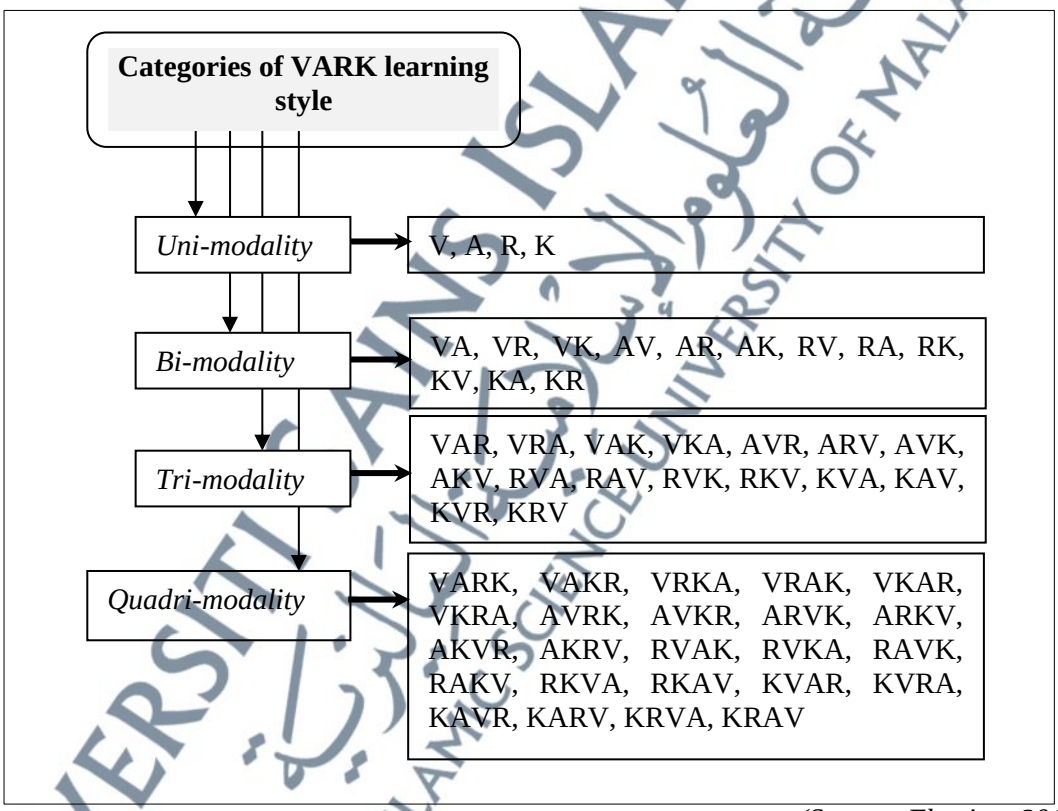
There are various styles of learning namely unimodal and multimodal. Multimodal learners learn via two or more sensory modalities whereas unimodal learners have a strong preference for a particular sensory modality (Sharma & Wadhwa, 2016). A study by Pereira, (2019) stated that the visuals of the educational video need

learners to pay attention to the information presented in visual and auditory sensory modalities equally, if they learned more, they would have recalled more details presented in both modalities. Special attention should be given to the differences between learners in the verbal/visual dimension since educational videos present information through audio and accompanying visuals and thus make use of the verbal and visual sensory channels. Dzulkarnain et al., (2020) determined that auditory sensory may be influenced by the level of an individual's intelligence auditory sensory between *Huffaz* and non-*Huffaz*. Each participant was asked to memorize the series of digits increased or decreased based on the correct or incorrect memory recall. The results from the study show that repetition techniques in memorization only trigger long-term memory rather than working memory while working memory may be influenced by the level of an individual's intelligence.

A study by Mirza & Khurshid, (2020) mentions that learners usually do not only rely on a single learning style but may require more than one sensory modality for information processing. Multimodal learners can be categorized as bi-modal, tri-modal, or quadri-modal with several different combinations for preferred learning styles. Among various learning style models, VARK is the most accepted model which categorizes the learners concerning their sensory characteristics or preferences. VARK learning style model provides sensory modalities information. A study by Sharma & Wadhwa, (2016) also mentions that multimodal learners have a strong preference for a particular sensory modality. It is also referred to as the perceptual learning preference that includes all four perceptual learning modes at the same level namely visual, auditory, reading, and kinesthetic (Fleming, 2012; Jewitt et al., 2016). Studies by Girón-García & Gargallo-Camarillas (2020) show that the implementation of digital learning

content in the classroom improves learners' involvement and motivation in the learning process and encouragement new multimodal learning styles. These findings prove that digital learning content influenced learners' engagement and multimodal learning style preferences through the presentation approach of visual (imagery); auditory (voice); reading (symbol) and kinesthetic (sign).

The sensory modalities in the VARK learning style in multimodal learners include bimodal, trimodal, and quadrimodal and they may have any of the learning preferences combinations namely VA, VK, VR, AK, AR, RK, VAK, VAR, ARK, VRK, and VARK as shown in Figure 2.1.



(Source: Fleming, 2012)

Figure 2.1: Combination of Sensory Modalities in VARK Learning Styles

These learners can adapt to more than one mode of presentation. Studies by Cabual, (2021) suggested that teachers should use Fleming's learning styles instrument at the

beginning of the class to gain a solid consideration of what to teach and how to treat their students in terms of teachings to keep learners involved in the learning activities. The teachers have to adapt and be aware of this fact and reflect on the effectiveness of their modes of instruction (Allen et al., 2013).

Currently, technological application devices had reinforced learners with various modes of perception in a multimodal learning environment. It is a challenge to summarize the information to multiple modalities (or views) in a way that is consistent information. The multimedia representation learning content design needs to anticipate all the sensory learning modalities and has to be formulated well in application learning. It represents the joint interpretations of different modalities which attract, increase attention, and improve cognitive ability (Zhang et al., 2020). Studies by Girón-García & Gargallo-Camarillas, (2020) proved that digital multimedia learning seems to stimulate students' sensory preferences, which leads to positive motivation and, results in more effective learning. Therefore, students' VARK learning styles are a priority, and should be the intent of these differences to integrate the modes of learning for different kinds of learners. In this study, the EzHifz model was developed to serve the learners with integrated multimedia learning content and memory strategies in multiple different modes of sensory modalities based on VARK learning styles namely visual, auditory, reading, and kinesthetic to improve Quran memorizing skills.

2.4 Quran Memorization

Memorization is the method used by the earliest scholars in preserving Quran knowledge (Abd. Fatah Hasan, 2002; Berglund & Gent, 2018; Hirabayashi & Ogawa, 1999; Sulaiman & Kassim, 2020). Strong memorization needs to have a systematic rule

to ensure that memorization is truly conserved in mind (Ariffin, 2011; Sedek et al., 2014). It is the process of committing something to memory, which is a mental process undertaken to focus attention (Berglund & Gent, 2018), recall, and retain the learning (Aziz et al., 2019). Research by Abu Mazaaya al-Hafiz (2005) mentions that each memorizer has a method to memorize the Quran based on their preferred cognitive intelligence. They need to choose an effective technique in the process of learning the Quran by consistently managing their schedule and repeating continuously. Most memorization methods have less emphasis on the comprehension technique that memorizes the translation and understanding of the meaning of the Quran, although it has been shown to help maintain and retain the memory of memorization (Abdul Jalal et al., 2015). They focus more on *tajwid* and verse repetition techniques without understanding the Quran verses memorized (Hashim et al., 2013, 2014). This is proven by Rahim et al., (2018) that stated the majority of students do not perform with the memorization test related to the translation of the Quran. In this context of Quran memorization learning, most Quran memorization learning uses a left-brain compared to the right brain (Nirmalasari 2011). With this imbalance, it is difficult for students to grasp learning efficiently. According to Nirmalasari (2011), the model of memorization learning can enhance the efficiency of the students' memory and make it easier by engaging their different learning needs.

Although much previous research, has studied an effective method of memorizing the Quran (Abdullah et al., 2005; Abdullah et al., 2003; S. Ariffin et al., 2013; Sedek Ariffin, 2011), they're still weak students and not able to memorize the Quran properly. The younger generation of *Tahfiz* students shows a lack of interest in learning and conventionally memorizing Quran. The previous research specified that

there are no standardized modules, methods, or techniques to memorize the Quran in *Tahfiz* schools (Musa et al., 2018). Many students faced difficulty in memorizing the Quran because they were confused, weak (Laila et al., 2015; Musa et al., 2018; Shahrulkarnain, 2013) not confident, lack of knowledge and experience (Eizan Azira, 2019) as well as length, similarity, and its complexity of verses in Quran (Salisu, 2020). Furthermore, the research by Shahrulkarnain, (2013) claimed that the level of memorization among the students who studied at *Darul Quran* was not fully satisfactory due to the absence of special techniques used within the duration of specified time of study. Most of researchers also agreed with this claims, the reason why students weak are because of no strong techniques applied consistently in their memorization skill of learning (Hashim et al., 2013; Jemali et al., 2014; Misnan & Ahmad Sadadi, 2003). The weaknesses identified in the oral test (*tasmik*) when students forget the verse memorized (Abdullah et al., 2003; Sedek et al., 2010) and written test (*tahriri*), do not know the meaning of the Quran verses memorized (Abdul Jalal et al., 2015; Azlan Shaiful & Rosni, 2015; Hashim et al., 2013).

Al-Ghazali's curriculum framework places religion in the process of teaching and learning, namely the study of the Quran namely reading, and memorizing the Quran and hadith (Sheikh & Ali, 2019). The best way to learn and memorize the Quran is through the method of *Talaqqi* and *Musyafahah*. *Talaqqi* is performed face-to-face with the teacher. *Musyafahah* means looking at the lips of the teacher to get the correct pronunciation of tajwid and *makhraj*. The methods of repetition (*Takrar*) and *Tasmi*' are often performed by students in the teaching and learning of *Tahfiz* institutions. The *takrar* method is the main method of memorizing the Qur'an and the amount of *takrar* is determinant. Al-Qabisi's teaching and learning model emphasizes moral education

and the Qur'an and should be taught as early as 7 years old. Referring to the Al-Qabisi learning model, previous researchers conducted a study on the educational background of the Quran among outstanding students in the model of *Tahfiz Ulul Albab* and *Tahfiz STIFIn* who successfully memorized the Quran in less than two years (Sheikh & Ali, 2019). From the study, the researchers found that parents are the main supports in educating children's love for the Al-Qur'an through exposure to reading and memorizing the Quran consistently at home.

2.4.1 Quran Memorization Techniques

Memorization requires strength and power of the mind and might be improved using a specific memory technique (Sulaiman & Kassim, 2020). The longer it takes to remember new knowledge, the longer it sticks to memory (Shahrulkarnain 2013). The *Tahfiz* education introduced various Quran memorization methodologies and techniques because of the experiences of the *Tahfiz* teachers and students from all over the country. The Quran memorization methodology is the fundamental method practiced by *Hafiz* in the process of memorizing the Quran with a different technique. It is also referred to as the systematic learning process or procedure while Quran memorization techniques are the way of carrying out the process or procedure for completing the 30 *juzuk* of the Quran.

Most of the Quran methodologies approaches today, do not fully practice the four methods taught by the Prophet Muhammad SAW namely (i) reading the Quran correctly; (ii) explaining the meaning; (iii) reciting through the method of writing; and (iv) practicing the teachings of the Quran verses that were memorized (Kamarul Azmi & Mohd Aderi 2013). A study by Mohamad Rasyidi (2018) indicates that there is a

different methodology introduced by the school and shows a few techniques that were less used by the student in memorizing Quran. Based on the research by Ariffin & Wahid (2014), they present six types of Quran memorization methodologies that can train the *Huffaz* to memorize 30 *juzuk* without looking at the Quran, namely Deobandy from India, Panipati from Pakistan, Luh from Saudi Arabia, Cirebon from Indonesia, Turkey from Turkey and Malwali from Bangladesh. The study introduced three principles in the process of memorizing the Quran, which are the new memorization, repetition of new memorization, and repetition of old memorization that may facilitate the student to accomplish the 30 juzuk of the Quran. However, most of the previous researchers determined that all the techniques taught to memorize the Quran, are less used by the student because each student has a preference to memorize the Quran (Hashim et al., 2013, 2014; Ikhwanuddin, 2007). Therefore, the teachers should find out what the preferred techniques are chosen by the students to achieve the objectives of learning to preserve the Quran. (Hashim et al., 2013, 2014; Ikhwanuddin, 2007). There are many types of Quran memorization methodologies and techniques introduced in various *Tahfiz* educational curricula in the traditional approach and most of the techniques had been applied in the mobile application/ web-based platform as supportive material for learning. However, several techniques are being practiced by *tahfiz* students to achieve the objective of Quran memorization learning. The following are the types of Quran memorization techniques that apply in the previous studies either used to memorize the verse only or with the translation:

a) *Talaqqi & Musyafahah* Technique

The method of *talaqqi* and *musyafahah* is the technique where the teachers and students face-to-face directly, and individually, listen to the verse memorized by the

teacher (Hadi, 2018). It is the process that is carried out to know the memorization of students as well as to obtain guidance directly from the teacher. Most of the Quran memorization methodologies in the traditional approach begin with the technique of *talaqqi* and *musyafahah* through the teacher's reading of the Quran verses before the process of memorization is implemented (Hashim et al., 2014; Marzuqi et al., 2020).

b) Repetition (*Takrar*) Technique

The *takrar* technique is to repeat the memorization that has already been memorized (Marzuqi et al., 2020). *Takrar* is intended to keep memorizing the Quran verse memorized so as not to forget easily (Hadi, 2018). Also known as *taqriri* is one of the commonly used methods in Quran memorization, as a traditional approach to repeatedly reading the verses to achieve the target verses memorized. The level of memory retention depends on the number of repetitions or *takrar* performed in memorizing the Quran (Azmil et al. 2014). Students need to retain their memory and not lose information (Ahmad Murad, 1999). This is further reinforced by the study of Hashim & Tamuri (2012) which found that the tendency of students in maintaining memorization is through repetition, especially the difficult verses of the Quran. In the context of memory, repetition is included as one of the principles that benefit memorization skills (Tulving & Schacter, 1990). Once the repetition technique is utilized in digital tools (Muhammad et al. (2012), it may assist to revise the verses. According to the research by Hashim et al., (2013) on the Al-Qabisi model, the repetition technique with the use of sensory modalities namely viewing, listening, reading, and writing helped the learners to retain memory (Amirah et al., 2019; Azmil & Misnan, 2015; Hashim & Tamuri, 2012). Multiple repetitions have been proven may

strengthen the memory of knowledge learned (Abdul Hafiz et al., 2005; Hashim et al., 2013). A study by Dzulkarnain et al., (2020) discussed the auditory sensory between *Huffaz* and non-*Huffaz*. Each participant was asked to memorize the series of digits increased or decreased based on the correct or incorrect memory recall. The results from the study show that repetition techniques in memorization only trigger long-term memory rather than working memory while working memory may be influenced by the level of an individual's intelligence. Research by Shaiful Bahri & Yusoff (2014) determines the positive response through repeating exercises and the failure to remember the translation is due to not continuously repeating their learning (Mohd Fakhruddin et al., 2013; Said et al., 2010). Research by (Olichney et al., 2000; Pang & Elntib, 2021), stated that repetition of hearing or seeing effects short-term memory, which supports cognitive intelligence and visual word recognition (Faiza, 2019). They proved that difficulties in memorizing and recalling the verse memorized can be overcome through repeating listening and reviewing words even unconsciously. Moreover, the continual repetition technique supports the strength of the memory (Ali et al., 2019; Shahrulkarnain, 2013), easy recall, and retaining the memory (Hidayah, 2014; Maimun & Yasin, 2019; Purwanto, 2007; Sedek et al., 2014; Shaiful Bahri & Yusoff, 2014).

c) Comprehension (*Fahm*) Technique

Comprehension (*Fahm*) is a technique of knowing the meaning of the verses of the Quran that have been memorized (Ahmad Bazli et al., 2017). Most *Tahfiz* institutions introduced students to the Quran memorizing without understanding its meaning (Gent & Muhammad, 2019) but some studies proved a comprehension

technique supports Quran memorization and motivation, although less used in the process of memorization (Rahim et al., 2018; Sidek et al., 2020). The process of memorizing the Quran accompanied by comprehension as well as the ability to distinguish the confusion that occurs can produce a sense of meaning (meaningful) in performing the task to memorize (Husin et al., 2016). The pleasure of memorizing the Quran is an award that is difficult to have, it is even the key to continuous memorization practice because of this internal motivation that can motivate a student to memorize consistently without being forced (Marzuqi et al., 2020). The comprehension method has been proven to help strengthen the Quran memorization process (Abdul Hafiz et al. 2005; Abdul Jalal et al. 2015; Azmil et al. 2013; Azmil et al. 2014). The study by Abdul Jalal et al. (2015) found that the comprehension method in learning Quran memorization using the translation of the Quran can enhance the students' understanding before the memorizing process. Furthermore, the method of memorizing using the translation of the Quran is easy (Fahriyah 2011). A study by Hadri & Fuad (2013); Umita Sofa (2014) shows that the ability to understand the meaning of the Quran verses is still at a very low level. The integration of comprehension with repetition techniques is used in the program of the Quran memorization translation to help society understand the meaning of the Quran (Umita Sofa 2014).

d) Writing (*Kitabah*) Technique

The writing (*Kitabah*) technique is a method of memorizing through writing the verses that students will memorize on a piece of paper (Hadi, 2018). Then it is memorized. To memorize it, the students can write many times while memorizing it in their hearts. The method of writing is used to support the process of memorization,

especially the difficult verses (Abu Al-Wafa 1999; Al-Qabisi 1955; Muhammad & Ahmad 1994). This is because the use of various senses coupled with handwriting in memorizing the Quran can help reinforce the students' memory, especially the difficult verses. However, the writing method does not attract much attention in the process of learning Quran memorization (Abdul Hafiz et al. 2005; Azmil et al. 2013; Azmil et al. 2014).

e) Reading (*Wahdah*) Technique

The reading (*Wahdah*) technique is a method of memorizing verses per verse, where each verse is read ten times or more (repetitively), the process is capable of forming a pattern in the mind of the student. Once the students have memorized it, it is continued in the next verses, in the same way, and so on and if it has reached one page of the Al-Qur'an then memorized repeated many times to smoothly (Hadi, 2018). The tutoring teacher is not too rigid in the evaluation session, it depends on the ability of the student and there is freedom until it is truly memorized. It can be conducted in front of peers in learning class or privately, and then every student memorizes in front of the teacher.

f) Listening (*Semaan*/ *Sama'i*) Technique

The listening (*Semaan*/*Sama'i*) technique is a method of listening to the verse memorized by a teacher or groups of students or the digital Quran (Ahmad Bazli et al., 2017). According to Mazaayaa (1996), the *semaan* method gives a positive effect on the effectiveness of memory retention because memorization involves another person who carefully examines the recitation and corrects if there is a mistake or anything

forgotten. Students can choose the verse they want and listen to it over and over. Then, students try to follow it until it is completely memorized, and then move on to the next verse. After being completely sure of memorization, students try to repeat it themselves without the help of the Quran (Marzuqi et al., 2020).

g) Cooperative (*Jamai'e*) Technique

The cooperative (*Jamai'e)* technique is a way of memorizing the Quran that is performed collectively, or memorized verses read collectively; or together, are led by a teacher. Memorization material is memorized together several times, and if it is perceived to have been memorized it then moves on to the next verse (Hadi, 2018)

h) Segmentation (or Chunking) Technique

The segmentation or chunking technique is used to break the lesson into smaller manageable parts (Mayer, 2019). it is implemented by splitting long-text information or symbolic encoding for retaining long-term memory (Chernow, 1997; Egan & Schwartz, 1979; Pinker, 1997; Ramdani et al., 2019). Segmenting multimedia instruction into short, user-controlled segments leads to increased recall (Mayer, 2017; Mayer & Moreno, 2002). Research by Miller, (2001) stated that humans can temporarily store information through chunking techniques in working memory approximately seven chunks of information. Because each channel has a relatively limited capacity, it is easy for the cognitive system to become overloaded if more than a few segments or chunks of novel information are processed simultaneously (Gamsby, 2016; Leahy et al., 2003). According to Abdul Hafiz et al., (2005), the chunking technique of memorizing verses has been used by a student to overcome the problem of recalling long verses and

misunderstanding Quran verses, namely *mutasyabihat* verses. Cowan (2009) and Gathercole et al. (2008) argue that short-term memory requires individuals to remember in the form of separate small items rather than recollect them into large items. Transform verbal or textual information into visual information through the chunking technique has proven affected to focus attention (Blume et al., 2016), long-term memory, and improve memorizing and recall skills (Dehn 2008). In Quranic research, text-line segmentation of the *mushaf Quran*. based on the processes for segmenting the Arabic/Jawi handwritten texts with markings called "diacritics" (Radzid et al., 2018). These markings represent the short vowels and cause variations in pronunciation which preserve the meaning of the word in the Quran. The element of recitation speech signals was segmented into frames based on diacritics in Quranic Speech Model (QSM) (Shafie et al., 2017). A study by Sidek et al., (2020) determined that the techniques of breaking the text into thematic-based categories known as text structure analysis may assist memorization effectively together with understanding its meaning.

i) Movement Technique

The movement technique is a sign technique by which the teacher gives an idea of the meaning of Quran verses. Every word in every verse of the Quran has a sign that is the meaning of the verse, it is transferred through simple hand movements (Hadi, 2018). In this way, the student easily understands every verse of the Quran. It is also known as a sign of movement technique that involves an act of body motion and hand gesture. The Kaisa method is oriented to memorize and understand the Quran verses with their meaning through movements or kinesthetic (Salamah, 2019). Memorizing the Quran using the Kaisa method from the perspective of multiple intelligence which is

adapted to the meaning of each verse to remember and understand the Quran verse easily. A study by Marliana et al., (2021) determines that using symbols of hand movements that correspond to the sound showed an improvement in the learners' cognitive abilities and memory. Research by Farid Wajdi & Nur Makiyah (2015, 2016) introduced the text-based book Quantumaky method showing the techniques of memorizing the Quran verses and translation through a movement technique in the video display. They also specified that this technique allows learners to imitate or demonstrate the movement of the teacher to memorize the Quran verse. According to Jégo et al., (2013), the user-defined gestural interaction is the ability of the user to memorize the gesture set. Memorizing a set of abstract gestures suggests the process of memorizing a list of numbers. Miller's law exposes that working memory allows remembering only five to nine numbers. Working memory supports some human memory systems and provides an interface between perception, long-term memory, and action. It is suitable for learners with dominant kinesthetic preferences (Indra 2009; Metzler 2016; Schnarr 2016) depending on their strength of sensory modes. A study by Hwang et al., (2020) enhanced Mayer's original theory with the creation of a kinesthetic channel in learning through movement techniques or kinesthetic recognition mechanism to support the commands of physical movement and posture, object recognition gestures, direction recognition, speech recognition, and emotion recognition. The mechanism asked the learners to imitate the same and correct posture or gesture based on the system screen, for the corresponding vocabulary. A study by Suryabi (2015) creates an active learning environment through the use of movement techniques and focus skills in interactive multimedia design. Knowledge and ability occur once learner used musical-rhythm and kinesthetic-bodily intelligence through

clapping while reading, remembering, listening, and watching videos (Norizah et al. 2014) as well as demonstrating it through movement techniques (Cabual, 2021; Jamulia, 2018).

j) Visual map /Mind map Technique

A visual map (known mind map) is a technique for delivering effective and creative thinking of learning to present information and data represented using an image visual and text. The technique helps in arranging and presenting concepts visually around a central keyword or idea (Kotob et al., 2016). Visual presentations are used to memorize facts through colored images; and it is easy to memorize and recall (Hamiz et al. 2014; Nur Ainaa & Hasnul Hadi 2013). Many previous studies recommend teachers use a mind map as an effective memory technique (M. Abdul Aziz & Ahmad, 2008; Almosallam et al., 2015; Anas et al., 2019) Students with visual preferences should be taught through the presentations of sketches, pictures, or mind maps because they can learn and memorize information easily through vision (Hazilah & Nur Haizum, 2014). According to Almosallam et al., (2015) mind map is similar to a tree with many categories of branches called a visualization structure tool that helps *Huffaz* memorize faster than the conventional ways. ITQAN was a mobile-based application, which uses Topical Interpretation and visualization techniques or mind mapping to display the various Quran verses and connect one verse with another. ITQAN application proved to be a useful tool to facilitate Quran memorization learning with an understanding of the verses without the confusion of similar verses. The quality of a mental map helps the learner from an accurate understanding influenced by the visual representation (Kotlarek et al., 2020). Previous researchers study mind maps (Allibaih et al., 2020) as

graphic organizers that enable students to create ready-made mental images of Quran verses and translations and produce graphic representations to memorize. Quran text digitization namely visual aid, graphic organizers, and mind maps simplifies memorization in the context of text presentation and understanding of the meaning embedded when facing a large amount of information (Allibaih et al., 2020; Kotob et al., 2016). Moreover, the text illustrations might be efficient in offering visual-spatial information and descriptions that are difficult to be expressed in words.

k) Keyword Technique

The first keyword technique was introduced by Atkinson & Raugh (1975) in cognitive retaining experiments on language vocabulary They found that keyword techniques can make a strong link between unknown words and words with meaning. It is defined as a two-tier procedure to remember new words with components called acoustic and mental links (Pressley et al., 1982). They found that learners can easily recall the vocabulary learned by creating an illogical link between words and imagining the keywords. Other researchers researched keyword mnemonics namely González et al., (2021); Ni & Nurul Asyikin, (2019) who believe that this technique can benefit students in terms of immediate recall, memory skills improvement, and support word retention. Furthermore, research by Taheri & Davoudi (2016) found that keyword techniques can form relationships with mental links and images and might affect long-term memory. Further research by Mutawalli & Zainuddin (2012) mentions that students need to use a keywords as a code to remember or recalled when memorizing the long verses (Yahya, 2020).

l) Pointer, Highlight, and Zooming Technique

The signaling principle introduced by Richard E. Mayer, (2020) defines as highlighting essential material. Research by Arifah Fasha et al., (2019) determines that the signaling technique applied in visual and audio representation through highlighting or pointing to the written text or higher tone of voice in audio or graphics or zooming effect may improve the multimedia instructional design. The highlight is considered one of the encoding behaviors of kinesthetic code through highlighting some key contents to achieve better memory performance (Cheng & Yang, 2017; Gamsby, 2016). A study on the implication of the signaling principle in multimedia design on video by Mohamed Ibrahim (2011) shows that students focus on relevant content in audiovisuals through several techniques: giving related elements the same and labeling with a color (Kelly, 2018), providing sign or cues like gestures as guides to related elements (Fruchard et al., 2018), or by adding an outline and headings (Mayer, 2005). Although signals do not provide any functional information, the research found that learner learns deeply from audiovisuals when essential material is highlighted or signed (Gagne et al., 1992; Mayer, 2017). The previous experiment shows students who learned a signaled lesson performed better on a transfer test than the students who learned a non-signaled lesson (Mayer et al., 2011). Studies by Chuang (2010); Mohamed Ibrahim (2011) also points out that learning using multimedia animation aids helps highlight important instructions and information in ensuring students maintain a focus and guide attention on learning. The pointer or finger indicators are often used as indicators in the reading (Ayuni 2014; Sulistyohadi 2015). The teacher points with the finger to the Quran verse that is being read to provide a focus once learning occurs. (Salamah, 2019). The zooming technique is a method that stressed a limited range of information details to be focused on and

remembered (Czachesz, 2010) with zoom-in functionality, better view, and easy identification of the artworks displayed (Nicolaou et al., 2019). This is to identify, at a glance, what are the most relevant of their interests in Quran memorization for a visual learner. It also provides the user with additional display space to present an image clearly with a full-screen view without losing the context of the image (Byrne et al. 2010). Mobile devices with smaller screens, need a zoom-in function to allow flexibility and functionality of an application used (Katsuhisa et al. 2010).

m) Open-Close (or Hide-Show) Technique

The open and close technique is defined as a method of opening and closing the *mushaf* alternately while memorizing the Quran verse. The conventional approach is implemented in the *Al-Huffaz* method and is proven to be an effective technique and able to help memorize the Quran (Ariffin, 2011). The research found that the *Al-Huffaz* method can discipline students in a continual repetition through the five-time open and five-time close approach through the open and close technique. A study by Purbohadi et al., (2019) on the digital approach determines the features of hiding or showing (or open-close technique) of the words in their Quran memorization learning model is very useful once the learner is in the process of memorization. The features apply by disabling the words in the paragraph and other words in the paragraph and vice versa in their model. It provides the learner to press the button to record the learner's voice, then automatically words in the paragraph of the Quran verse hide. This technique also relates to minimal and extraneous elements in the model design (Mayer, 2019; Mayer & Moreno, 1998; Michelle, 2017; Stephen, 2012). The simple designs acquire minimal

performance loads, enabling the learner to better focus on the information of learning (Lidwell et al., 2010).

n) Association Technique

The association technique is a mnemonic strategy that helps the user to memorize declarative knowledge that facilitates the memorization process by building an image of mental association between the learning content and visual-spatial cues (Huttner et al., 2018). Research by Shaiful Bahri & Yusoff (2014), stated that mapping images coupled with color elements have a positive impact on helping students to remember well. Colors also play an important role in creating a desire for users to know what they are seeing (J. Pelet & Nantes, 2008). The color usage of graphics and animation used is consistent according to the theory of multimedia learning, helps students understand the contents of teaching (Umar et al., 2011), and facilitates the level of students' recall the memorization (Alyahya & Nasser, 2019). Multi representation or the way of presenting information verbally or visually (symbolic, pictorial), can stimulate cognition and memory as the main tool in learning to memorize the Quran (Chalid et al., 2018). A study by Madar & Buntat, (2007) stated that media elements namely pictures, color, music, and animation can help students visualize unexplained abstracts using words that are easy to understand. Using mnemonic associations also leads to better performance in recalling the vocabulary (Anjomafrouz & Tajalli, 2012). Applying the Quran verse and translation through object or image association might strengthen Quran memorization (Mustafa et al., 2019). Research by Huttner et al., (2018) stated that visual integration of the association technique in the virtual multimedia presentation facilitates the memorization process. Research by Basavaraju et al., (2019) determines that object

memorability can stick on to humans' memory after a single view thorough understanding of its features which influence the memorability of an object. Besides, the user performs better using the association technique when they have to imagine the content through virtually presented multimedia learning content (Huttner et al., 2018). There are many types of Quran memorization methodologies, processes, and techniques introduced in *Tahfiz* educational curricula from different countries that apply certain types of techniques that are related to this research as shown in Table 2.2.

Table 2.2: Quran Memorization Methodologies and Techniques

No.	Author (s)	Method	Country	Process of Memorization	Technique(s)
1.	(Ariffin et al., 2014)	Deobandy	India	• *preparation before memorization.* • *sabak (repeat new memorization).* • *para sabak (repeat weekly memorization).* • *ammokhtar (repeat all memorization).* • *halaqah dauri (repeat memorization class).* • *syahadah hafiz (special examination that requires reading 30 juzuk of the Quran without looking at the verses of the Quran).*	• *Talaqqi & Musyafahah* • *Repetition* • *Pointer* • *Reading* • *Listening* • *Cooperative*
2.	(Ariffin et al., 2014)	Panipati	Pakistan	• *sabak (new memorization).* • *six sabak (six-time new memorization).* • *sabki (repetition one juzuk behind six sabak)* • *separah (repetition of old memorization)* • *mutlaah (read Quran verses to be memorized by looking at the Quran mushaf with tajweed)* • *tertib wifak (repetition of the whole 30 juzuk Quran)* • *dastar bandi (certificate graduation after khatam Quran).*	• *Talaqqi & Musyafahah* • *Repetition* • *Pointer* • *Reading* • *Listening*
3.	(Ariffin et al., 2014)	Luh	Arab	• *tasmi'luh (listen to recitation by the teacher before memorizing).* • *reverse memorization (repeat memoriz**ing** Quran from the back page to the front).* • *repeat memorization (repetition of new and old memorization).* • *memorization test (test with grades).*	• *Talaqqi & Musyafahah* • *Repetition* • *Pointer* • *Reading* • *Listening*

4.	(Ariffin et al., 2014)	Cirebon	Indonesia	• *hifz al-jadid (repeat new memorization).* • *al- hifz al-usbu'iy (weekly repetition).* • *al-hifz al-qadim (repetition of old memorization).* • *syahadah hifz Quran (examination of 30 juzuk Quran).*	• *Talaqqi & Musyafahah* • *Repetition* • *Pointer* • *Reading* • *Listening*
5.	(Ariffin et al., 2014)	Turkey	Turkey	• *khatam 10 times (reading the mushaf Quran before memorizing)* • *chi (new memorization)* • *zor pismis (repetition of old memorization for difficult verses)* • *kolay pismis (repetition of old memorization for easy verses).* • *takrar (repetition of old memorization for difficult and easy verses).* • *takrar hepsi seyfa (repetition of the whole page of juzuk memorized)* • *has (cycle repetition after khatam Quran).*	• *Talaqqi & Musyafahah* • *Repetition* • *Pointer* • *Reading* • *Listening*
6.	(Ariffin et al., 2014)	Malwali	Bangladesh	• *tayyar Rehna (grouping based on ability).* • *nazirah (reading the Quran in front of the teacher).* • *sabaq (repeat new memorization).* • *sabqi (repetition of new memorization).* • *manzil (repetition of old memorization).* • *shabina (review repetition of old memorization).* • *musyafahah or Talaqqi (face-to-face with the teacher to look at the lip movements while reading Quran).* • *sabaq musyafahah (new memorization from the teacher's reading).* • *syahadah (examination of the whole 30 juzuk of the Quran).*	• *Talaqqi & Musyafahah* • *Repetition* • *Pointer* • *Reading* • *Listening* • *Cooperative*

7.	(Farid Wajdi & Nur Makiyah (2015, 2016)	Quantumaky	Indonesia	• *read the surah 2 to 3 times while listening or readings using a cassette or DVD video display (with a set of beat tones).* • *memorize a fragment of a verse based on the correct Quantumaky method (mimic a gesture & write);* • *repeat 5 times each piece of the fragmented verse (understand and translate surah).* • *5 times the whole verse, until it is repeated 10 times;*	• *Talaqqi & Musyafahah* • *Repetition* • *Comprehension* • *Writing* • *Pointer* • *Reading* • *Listening* • *Cooperative* • *Segmentation* • *Movement*
8.	(Salamah, 2019)	Kaisa	Indonesia	• *greetings by the teacher.* • *instructions to the students.* • *attendance of the students.* • *reading basmalah and prayer.* • *muroja'ah (repetition of memorization).* • *memorization of verses in movement.* • *explaining the tajweed of recitation and its meaning.* • *students reciting the verses repeatedly until they are memorized.* • *students reciting the verses with tajweed and translating them per word.* • *the teacher listens while the students memorize.* • *the teacher confirms an error of tajweed and its meaning.* • *the student memorizes the next verse.* • *reflecting the learning with verse-related games.* • *closing the study with a prayer.*	• *Talaqqi & Musyafahah* • *Repetition* • *Comprehension* • *Writing* • *Pointer* • *Reading* • *Listening* • *Cooperative* • *Segmentation* • *Movement*

9.	(Munhamir, 2020)	Tajdied	Indonesia	• *memorizing deposits through the teacher reading the verses correctly and thoroughly, students muraja'ah, and memorizing rote classically.* • *memorizing itself is done to enrich and increase memorization while at home,* • *memorizing in pairs, memorizing begins after they agree on the verse to be memorized.* • *memorizing with the help of digital tools, selecting the desired verse and listening to it repeatedly, and trying to follow it by heart, then moving on to the next verse.* • *memorizing with a recorder, this method begins by recording our voice.* • *memorizing by writing, this method can only be done for children who can read and write correctly.* • *Muraja'ah faces to face so that it can be easily monitored, one pair sits next to the teacher, then begins to do muraja'ah by obliging to close the mushaf.* • *internal munaqosah is held every three months.*	• *Talaqqi & Musyafahah* • *Repetition* • *Writing* • *Pointer* • *Reading* • *Listening* • *Cooperative*

10.	(W. Zakry, 2020)	Al-Ghawthani	Arab	• *Tasdis is the division of memorized recitation into six parts. Each section contains five constituents.* • *Tasbi ', Example: the division of memorized recitations for seven days and khatam every Friday.* • *Khatam memorization every 10 days.* • *Every week three constituents are repeated until the end.* • *In a combination of the third and fourth ways, for example, the first two constituents are read daily throughout the week and the second, each day one new constituent is read by making each day three constituents read.* • *Khatam once a month.* • *Readings in prayer.* • *Listening to recordings of the recitation of the Al-Qur'an.* • *Repeat like starting to memorize.*	• *Talaqqi & Musyafahah* • *Repetition* • *Pointer* • *Reading* • *Listening* • *Cooperative* • *Segmentation*
11.	(Sabiq et al., 2020)	Al-Qosimi	Arab	• *read and repeat as many as 25 times per verse, that is, by the way, the teacher reads the verse* • *the student imitates his teacher's reading 25 times* • *memorize verse by verse at least per verse read 40 times.* • *muroja'ah*	• *Talaqqi & Musyafahah* • *Repetition* • *Pointer* • *Reading* • *Listening*

12.	**(Rettalina & Aulia, 2020)**	Al-Jawarih	Indonesia	• *The teacher explains the verse and translation* • *The teacher reads or pronounces the sentence to be memorized in full, do it at least 3 times while the students are asked to listen carefully.* • *The teacher divides the verse into several parts and recites the pieces of the verse.* • *Students are asked to repeat until memorized.* • *After being memorized, the teacher imitates the movement for the meaning of each word in the verse. Students are asked to imitate the reading as well as imitate the movement, if they have memorized the pieces of verse, it is time for the teacher to put them together into one perfect verse.* • *Read while mimicking his movements. Do it correctly and memorize.* • *After all the verses are introduced, the teacher and the child repeat from the first verse, and then the teacher evaluates the memorization of the child's letter as a whole.*	• *Talaqqi & Musyafahah* • *Repetition* • *Pointer* • *Reading* • *Listening* • *Cooperative* • *Segmentation* • *Movement*

Based on Table 2.2, there are 12 different methods identified used in memorizing the Quran that apply the techniques to assist the student in strengthening their memory of learning. The common technique used in memorizing the Quran is *Talaqqi* & *Musyafahah*, repetition, pointer, reading, and listening. However, comprehension, writing, segmentation, visual map/mind map, the keyword, and association technique are less used in memorizing the Quran. In the aspect of memorizing the Quran verse and translation, most of the methods used to apply the technique of comprehension and movement to imagine the object or image that represents the meaning of the Quran (Farid Wajdi & Nur Makiyah, 2015, 2016; Salamah, 2019). A study by Husen (2009) used an object or image that represents a stepping stone paper or a visual map/mind map for each verse in the Quran. This method also allows the learners to create their stepping stone paper by drawing their object or image that is easy to remember. However, most of the teachers in the *Tahfiz* institutions today tend to practice the same method and techniques as the students regardless of their differences in VARK learning style. It might affect students' memorization, even though, most teachers admit that the use of technology will help raise the quality level of Quran memorization (Abdul Rahim, 2008).

In this study, the researcher analyzed the comparison of the previous research on Quran memorization techniques used for designing the EzHifz model. The studies consisted of 12 techniques within the 12 Quran memorization studies found and presented. Table 2.3 presents the comparison of Quran memorization techniques.

Table 2.3: Comparison of Quran memorization techniques

No.	Techniques	Methods												Total	Percentage (%)
		Deobandy	Panipati	Luh	Cirebon	Turkey	Malwali	Quantumaky	Kaisa	Tajdied	Al-Ghawthani	Al-Qosimi	Al-Jawarih		
1.	*Talaqqi & Musyafahah*	√	√	√	√	√	√	√	√	√	√	√	√	12	100
2.	Repetition (*Takrar*)	√	√	√	√	√	√	√	√	√	√	√	√	12	100
3.	Comprehension (*Fahm*)							√	√				√	3	25
4.	Writing (*Kitabah*)							√	√	√				3	25
5.	Pointer	√	√	√	√	√	√	√	√	√	√	√	√	12	100
6.	Reading (*Wahdah*)	√	√	√	√	√	√	√	√	√	√	√	√	12	100
7.	Listening (*Sama'i*)	√	√	√	√	√	√	√	√	√	√	√	√	12	100
8.	Cooperative (*Jama'*)	√					√	√	√	√			√	6	50
9.	Segmentation (*Taqsim*)	√	√	√	√	√	√	√	√	√	√	√	√	12	100
10	Movement (Sign)							√	√				√	3	25
11	Keyword							√	√				√	1	8
12	Association							√	√				√	1	8

Based on Table 2.3 of the Quran memorization techniques review, the researcher found that most of the techniques used the *talaqqi & musyafahah*, repetition, pointer, reading, listening, and segmentation to memorize the Quran which shows the highest-ranked elements (total=12, 100%) followed by a cooperative (total=6, 50%), comprehension, writing, movement (total=3, 25%), keyword and association (total=1, 8%).

2.4.2 Application of Quran Memorization Techniques

Nowadays, technology has influenced the process of Quran memorization learning. Many techniques were applied in teaching aids to facilitate the process of memorizing the Quran through various media technology (Robiatul & Halimah 2011). Digital interactive multimedia technology enhances the student's cognitive intelligence and, skills of memorizing through a combination of various learning media namely text, graphics, animation, audio, and videos (Michea, 2006; Robiatul A'dawiah & Halimah, 2011) and also determined that interactive multimedia has a greater impact on the teaching and learning process. The major trends of educational multimedia in Quran education are areas including security, authentication, online learning, web and mobile applications, hardware tools, cloud computing, knowledge base sciences, quality, and standards (Zakariah, Khan, Tayan, et al., 2017).

The Ministry of Education Malaysia (MOE) introduced several ICT programs to produce IT-literate students (Zaidatun & Haslina 2008) and launched the Smart Schools in 1999 and 2002. Thus, multimedia-based learning approaches are necessary for implementing teaching and learning nowadays, especially in the study of Quran memorization. According to Mayer (2005), multimedia learning is similar to how people think because it involves the use of a variety of multimedia elements in the

development of educational applications that combine the use of hearing and vision. The use of multimedia technology improves the quality learning process and cognitive intelligence (Slamet, 2019) as well as supports flexible learning using digital technology that impacted positively students' achievement (Kasem & Farah, 2020). The study by Abdul Hafiz et al., (2005); Abu et al., (2007); Benta et al., (2004) found that memory with continual learning increased a learner's understanding and motivation with the correct selection of a student's learning style (Amirah et al., 2019). The learning process of memorizing the Quran should emphasize the methods that improve the understanding and the memory of the students; the teaching methods should be integrated with interactive multimedia elements that can provide an effective learning environment (Ahmad & Tamuri, 2010; Aris et al., 2002; Hammza et al., 2013; Husaini et al., 2010) and computer technology for easy access to the Quran memorization activities without boundaries (Tedi et al., 2020). Moreover, the teaching aids used should be appropriate to the student's cognitive level, which will facilitate an independent learning process based on the student's needs and cognitive abilities (Annansingh, 2019; Tamuri & Nik Mohd Yusoff, 2010).

Multimedia integration in the Quran teaching and learning media helps increase students' motivation, effectiveness, and mastery of learning based on their senses (Saluki 2006; Ab. Halim Tamuri et al. 2004). Teaching and learning that incorporates multimedia technology require a systematic application design and development. The multimedia application can provide various strategies in the learning process by using materials that make learning interesting and enjoyable (Ahmad Fakrudin et al., 2014). The multimedia application is capable of delivering teaching strategies quicker to improve students' learning quality and motivation (Isham Shah & Mohd Arif, 2008).

Teachers are often confronted with students of different levels of abilities in the process of learning. The teachers have the difficult task of adopting appropriate teaching and learning strategies to stimulate the students' active learning and meet their needs. Therefore, a multimedia application developed that incorporates the learning process in the Quran memorizing method and strategies can contribute to the quality and effectiveness of teaching and learning outcomes.

In the aspect of teaching materials development, the selection of theories related to the human memory system and the drilling strategies form a part of the process to create stimulus and student feedback (Jamaluddin, 2000; Zaidatun & Haslina, 2008). This may contribute to the quality and effectiveness of the teaching materials embedded in the platform of the model. Researches by Jamaluddin (2000); Newby et al. (2000); Zaidatun & Haslina (2008) show that theory selection and the application of strategies in the application development are tailored to generate student motivation and feedback. The integration of various learning media namely graphics, text, audio, and videos in the teaching materials helps to enhance the effectiveness of the teaching process by providing instruction, modules, and feedback to the students as well as monitoring the learning performance. Moreover, the use of technology has been predominantly limited to improving the approach of teaching and learning, whereby teaching is facilitated with the use of a personal computer and the requirement of electronic teaching materials (Oke & Fernandes, 2020). Therefore, the use of digital technology should be compatible with the learner-centered approach for it to be effective in enhancing students learning experience. Thus, the combination of theories and strategies in a digital technology environment can improve the student learning process and motivation.

According to Ahmad Fakrudin et al., (2014), the use of teaching materials that fit the cognitive level of students can facilitate self-learning based on individual abilities and needs, namely their learning styles. Therefore, flexible learning strategies of the curriculum employed in the application may provide the students with an appropriate time to explore information based on their level of abilities. Hence, teachers must be prepared for the change in learning strategies and explore multimedia technology in supporting the various dimensions of students' learning styles, especially those that are related to memorizing the Quran. Thus, the integration of learning strategies using multimedia technology in Quran memorization would have an impact on the students' learning. The existing Quran memorization applications discussed include a variety of learning media that use multimedia elements in the form of applications, web, and systems.

The common techniques used in the application are repetition, reading, listening, segmentation, pointer, and highlight technique (Manal et al., 2014; Mohamad Tanvir & Sameh, 2017; Muhammad et al., 2012). Studies by Manal et al. (2014) in the Noor Quran application provide a sign language of *Tafseer* in video form. However, no application provides sign language for the verse and translation. The application of E-Hafiz (Muhammad et al. 2012), i-Tasmik (Musa et al. 2018), and Te Book (Abdullah et al. 2019) used the technology of voice recognition to record the reciters and compare with the experts' voices stored in the database. It helps to minimize errors or mistakes in the process of memorizing the Quran with tajweed rules. However, the application does not allow any two-way learning or *Talaqqi* and *Musyafahah* between the learners and the teacher to validate the memorizing effectively because the system only caters to the mismatch at the word level and not the letter level for the pronunciation of

makhraj. Even the learner can only allow to find out mistakes after completing the recitation through the voice recognition technology used in the application. The application is seen to need improvement in terms of the process of learning to memorize the Quran. Therefore, mastering the procedures of a certain application is vital for the learner, which is why this study also examines the students' level of knowledge when it comes to the digital Quran application's procedures (Norazmi et al., 2017). The iHafaz (Senan et al. 2017) is developed with a simple interface design concept consisting of fewer graphics and animation. An audio recitation and Quran text are displayed in a large size using the zooming technique. The application helps children easily recognize the sequence and select the desired Quran surah in a printed form. In other developmental studies, researchers have emphasized the flexibility of reading and comprehension techniques of the Quran translation on the various memory strategies of learning using application mobile (Roslan et al., 2019; Shukri et al, 2020). The use of modern technology would enhance the memorization quality as a teaching aid. However, many teachers' misunderstand and fail to consider the techniques used through multimedia teaching aids from audio and video resources that can help the memorization that would affect the student's performance level and motivation (El-Sofany & El-Haggar, 2020; Marzuqi et al., 2020).

2.4.3 Comparison of Quran Memorization Techniques Elements

This study has reviewed previous studies on multimedia design principles and elements for designing the model of Quran memorization techniques for mobile applications. Several electronic databases were used, namely, Science Direct, Google Scholar, Springer, Scopus, IEEE Explore, ACM Digital Library, Web of Science,

Taylor & Francis, EBSCOHOST, ProQuest, Wiley Online Library, and Research Gate. Other sources include secondary data through books and web pages. The search terms used were “Quran memorization mobile design”, “mobile Quran memorization design principle” and “apps Quran memorization design”. Studies were included if the articles were published between 2012 and 2021, with full text provided and written in the Malay and English language. Findings were collected from various Quran memorization design studies for mobile applications/web based. Table 2.4 presents the existing Quran memorization applications that are relevant to this research. Within these applications, they apply numerous memorization techniques. Subsequently, Table 2.5 shows a comparison of studies on Quran memorization techniques developed for a previous study to identify the most common Quran memorization technique elements in Quran memorization design for mobile applications. Then, the proposed elements for the Quran memorization technique design were developed to summarize Quran memorization techniques design elements for a mobile application that represents the EzHifz model.

Table 2.4 Comparison of Studies on Quran Memorization Techniques

No.	Author(s)/ Website(s)	Web-based/ Mobile Application	Studies	Features of Application	Quran memorization technique elements
1.	Husen (2009)	Al-Husen	developing the web-based software that is entitled "*Al-Husen"* for memorizing the Quran verse and translation using the visual map.	(i) learn the meanings of per word using an image, or symbol, and associate with stepping-stone (visual map) papers. (ii) look at the writing of Quran verses and their per-word meanings. (iii) listen to the audio readings of the Quran verses by the teacher or mentor; repeat using stepping-stone paper and without using stepping-stone paper.	• *Repetition* • *Comprehension* • *Writing* • *Pointer* • *Reading* • *Listening* • *Segmentation* • *Visual map/Mind map* • *Keyword* • *Association*
2.	Muhammad et al. (2012)	E-Hafiz	designed, implemented, and tested E-Hafiz. Speeches signals will be gained by a sound spoken by a person in a microphone. Users of the system can find mistakes and enhance recitation skills.	(i) recording the reciter's voices and compared with the experts' voices stored in the database (ii) repetition audio recitation	• *Repetition* • *Reading* • *Listening* • *Segmentation* • *Pointer* • *Highlight*
3.	Manal et al. (2014)	Noor Quran	developing application software that is entitled "*Noor Quran"* for android devices". The project aims to proliferate the learning of the Holy Quran using the latest technologies for Non–Arabic speakers.	(i) audio Tafseer, root words with meaning (ii) video of sign language translation, Tafseer (iii) option to memorize a set of verses (iv) segmenting verses	• *Repetition* • *Comprehension* • *Reading* • *Listening* • *Segmentation* • *Pointer*

				(v)	listening and repeating the recitation of a specific verse	• *Movement* • *Keyword* • *Highlight*
4.	Almosallam et al. (2015)	ITQAN	a mobile-based application, which has been developed for helping memorizers to master their memorization skills by taking advantage of the "Topical Interpretation" of the Quran that utilizes visualization techniques namely mind mapping to connect the various verses and their topics and display them in an orderly manner.	(i) (ii) (iii)	Mind map visualization techniques (mind mapping to connect the various verses) View specific topic text listen to a specific topic	• *Repetition* • *Reading* • *Listening* • *Segmentation* • *Visual map/Mind map* • *Keyword* • *Pointer* • *Highlight* • *Association*
5.	Senan et al. (2017)	iHafaz	an interactive Quran mobile application namely iHafaz to facilitate autistic children's reciting and memorizing Quran.	(i) (ii) (iii) (iv) (v)	recognize the sequence and select the desired Quran verse in a printed form. Fragment of verse by displaying verses line by line. zoom out technique for display in a bigger size. repetition or takrar technique of the audio of each verse maximum of 60 times. the pointer technique applied to the highlighted verse.	• *Repetition* • *Reading* • *Listening* • *Segmentation* • *Pointer* • *Highlight* • *Zooming*

6.	Mohd Tanvir & Sameh, (2017)	Quran memorization learning model	identifies the common memorization steps followed in various disciplines and then automates some of these steps to enhance the memorization process.	(i) (ii) (iii) (iv)	audio of recitation. audio repetition. annotation in a rectangular shape highlights the verse. selection of surah or verses (fragment of verse)	• *Repetition* • *Reading* • *Listening* • *Segmentation* • *Keyword* • *Pointer* • *Highlight* • *Open-close/Hide-show*
7.	Musa et al. (2018)	i-Tasmik	proposes a conceptual solution to assist *Tahfiz* students in practicing memorizing Quran easily and independently. i-Tasmik is a mobile application that aims to provide a platform for Madrasah Tahfiz students, Ustaz, and Ustazah to help enhance their Quran memorization and monitor their students' performance.	(i) (ii)	recording the voices using voice recognition repetition audio recitation	• *Repetition* • *Reading* • *Listening* • *Cooperative* • *Segmentation* • *Pointer* • *Highlight*
8.	Abdullah et al. (2019)	Te-Book	act of identifying the content of the Holy Quran for the location of specific verses or surah according to the scripts. The purpose of this application is to provide a means for Holy Quran's recitation evaluation without the involvement of a third party by leveraging the use of speech recognition and an	(i) (ii)	recording the voices using speech recognition repetition audio recitation	• *Repetition* • *Reading* • *Listening* • *Cooperative* • *Segmentation* • *Pointer* • *Highlight*

			online Holy Quran search engine. W			
9.	Purbohadi et al.(2019)	Mobile Quran	design mobile learning that students can memorize independently; teachers can still listen to review their reading sample, evaluate, and give guidance. The student module comes with a paragraph of verse view, including the translations.	(i) (ii) (iii) (iv)	repetition audio recitation recording and comparing voices using speech recognition segmenting word of verse hide and show an image of word paragraph Quran verses	• *Repetition* • *Reading* • *Listening* • *Segmentation* • *Pointer/ Highlight* • *Open-close/Hide-show* • *Comprehension*
10.	Sidek et al., (2020)	Thematic based	analyze the text structure of Surah Yasin, to use the processed text structure as a scaffold for memorization.	(i) (ii)	breaking the text into thematic-based categories repetition audio	• *Repetition* • *Comprehension* • *Reading* • *Listening* • *Segmentation* • *Keyword* • *Pointer/ Highlight*
11.	Quraninteractive.com	Live Qur'an tutoring	Provide the user with a live platform to learn Quran memorization.	(i) (ii)	repetition exercise through audio and video resources playback and recording capabilities	• *Repetition* • *Writing* • *Reading* • *Listening* • *Pointer*
12.	imaanstar.com	Quran memorization program	Provide a web-based to memorize Quran using text and audio.	(i) (ii) (iii) (iv)	memorize the Quran step-by-step through audio CDs /mp3 format show and hide Quran texts play recitation, repetition (loop a verse or *surah)*	• *Repetition* • *Reading* • *Listening* • *Segmentation* • *Pointer/ Highlight*

13.	Qurantracker.com	Quran Memorization and Revision Software	Provide a web-based to memorize Quran using text and audio to track the verses memorized.	(i) (ii) (iii)	Quran recitation. Audio verse and translation. repetition of audio play-pause capabilities	• *Repetition* • *Comprehension* • *Reading* • *Listening* • *Segmentation* • *Keyword* • *Pointer/ Highlight*
14.	islamicity.com	Quran Memorizer	Provide a web-based platform to recite and memorize Quran using text and audio.	(i) (ii)	repetition (looping audio recitation) Audio verse	• *Repetition* • *Reading* • *Listening* • *Segmentation* • *Keyword* • *Pointer/ Highlight*
15.	houseofQuran.com	Quran Memorization Online	Provide a web-based to learn Quran memorization using text and audio with repetition, hide and show verses memorized.	(i) (ii) (iii)	repeating a verse, hide and show the text of a verse after x number of repetitions play text and audio recitations.	• *Repetition* • *Reading* • *Listening* • *Segmentation* • *Keyword* • *Pointer/ Highlight* • *Open-close/Hide-show*

Table 2.5: Matrix Comparison of Quran Memorization Technique

No.	Techniques	Application(s)/Web-based														Total	Percentage (%)
		Al-Husen	E-Hafiz	Noor Quran	ITQAN	iHafaz	Quran memorization learning model	i-Tasmik	Te-Book	Mobile Quran	Thematic based	Live Quran tutoring	Quran memorization program	Quran memorization and Revision Software	Quran memorizer	Quran Memorization Online		
1.	*Talaqqi & Musyafahah*											√					1	7
2.	Repetition (*Takrar*)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	15	100
3.	Comprehension (*Fahm*)	√		√						√	√			√			5	33
4.	Writing (*Kitabah*)	√										√					2	13
5.	Reading (*Wahdah*)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	15	100
6.	Listening (*Sama'i*)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	15	100
7.	Cooperative (*Jama'*)							√	√								2	13
8.	Segmentation (*Taqsim*)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	15	100
9.	Movement (sign)			√													1	7
10.	Visual map/Mind map	√			√												2	13
11.	Keyword	√		√	√		√				√			√		√	7	47
12.	Pointer	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	15	100
13.	Highlight	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	15	100
14.	Zooming					√											1	7
15.	Open-Close/Hide-show						√			√						√	3	20
16	Association	√			√												2	13

Table 2.4 summarized the 15 studies and websites that were identified and extracted during the literature review, which included various types of Quran memorization techniques and design applications. The comparison of Quran memorization design studies consisted of Quran memorization technique elements for mobile application/ web-based where 16 elements within the 15 Quran memorization design studies are found and presented. Table 2.5 presents the matrix comparison that identifies the common Quran memorization techniques elements found in Quran memorization design studies.

From the comparative matrix, this study has identified the 16 most common elements of Quran memorization technique design in 15 studies. The common elements of the Quran memorization technique have been summarized in Table 2.6.

Table 2.6: Ranking of the Quran Memorization Techniques Elements

No.	Elements	Total	Percentage (%)
1	Repetition (*takrar*)	15	100
2	Reading (*wahdah*)	15	100
3	Listening (*sama'i*)	15	100
4	Segmentation (*taqsim*)	15	100
5	Pointer	15	100
6	Highlight	15	100
7	Keyword	7	47
8	Comprehension (f*ahm*)	5	33
9	Open-Close/Hide-show	3	20
10	Cooperative (j*ama'*)	2	13
11	Visual map/Mind map	2	13
12	Association	2	13
13	*Talaqqi & Musyafahah*	1	7
14	Writing (*kitabah*)	1	7
15	Movement (sign)	1	7
16	Zooming	1	7

Based on Table 2.6, the researcher found that most of the techniques used in Quran memorization application are repetition (*takrar*), reading (*wahdah*), listening (*sama'i*), segmentation (*taqsim*), pointer, and highlight are the highest-ranked elements (total=15, 100%) followed by a keyword (total=7, 47%), comprehension (*fahm*)

(total=5, 33%), open-close/hide-show (total=3, 20%), cooperative (*jama'*), visual map/mind map, association (total=2, 13%), *talaqqi* & *musyafahah*, writing (*kitabah*), movement (sign), and zooming (total=1, 7%). These elements contribute almost 7% of the importance that influences Quran memorization technique design for mobile applications/web based.

The researcher found that most of the Quran memorization techniques design elements used in the mobile application/ web-based are related to the sensory modalities that may affect the students' cognitive intelligence (Slamet, 2019). The researcher categorized the Quran memorization techniques elements based on the VARK learning style that represents the sensory modalities as shown in Table 2.7

Table 2.7: Quran Memorization Techniques Related to Sensory Modalities

VARK Learning Style		Techniques																	
		Talaqqi & *Musyafahah*	Repetition *(Takrar)*	Comprehension *(Fahm)*	Writing *(Kitabah)*	Reading (*Wahdah*)	Listening (*Sama' i*)	Cooperative (*Jama' *)	Segmentation *(Taqsim)*	Movement (Sign)	Visual map / Mind map	Keyword	Pointer	Highlight	Zooming	Open Close/Hide-show	Association	Total	Percentage (%)
Sensory Modalities	Visual	√	√	√					√	√	√	√	√	√	√	√	√	12	75
	Auditory	√	√	√			√	√	√			√				√		8	50
	Reading		√	√	√	√			√			√	√	√	√	√		10	62.5
	Kinesthetic	√	√	√	√			√	√	√		√				√	√	10	62.5

In this study, the comparison of the elements of Quran memorization techniques in Table 2.7 shows the embedded techniques in existing mobile applications or web-based that are related to sensory modalities are almost 75% used visual mode of learning style, 62.5% used auditory kinesthetic mode, and 50% used auditory mode of

learning style to influence the cognitive intelligence in the process of memorizing the Quran.

Most of the Quran memorization applications and web systems developed applied only two modes of learning style consisting of the multimedia elements of words and audio. There is fewer applications or web system developed applied to use the multimedia elements of visual and kinesthetic. Therefore, in this study thirteen (13) Quran memorization techniques elements were selected repetition, comprehension, reading, listening, segmentation, movement, visual map/mind map, keyword, pointer, highlight, zooming, open-close/hide-show, and association applied in the EzHifz model. Another three (3) Quran memorization technique elements were not selected because this EzHifz model is considered for designing a mobile application with a standalone type. The element of *talaqqi* and *musyafahah* need a teacher while the cooperative element needs peers to memorize the Quran. Moreover, the less use of writing elements in the previous development model caused it not selected to be applied in the EzHifz model. The selection of thirteen (13) Quran memorization techniques elements shows the contribution of techniques that is related to all four modes of VARK learning style in sensory modalities to influence the cognitive intelligence in the process of memorizing the Quran. Thus, this is the reason why the Cognitive Theory of Multimedia Learning (CTML) needs to be adapted with the kinesthetic element instead of visual and verbal in memorizing the Quran and formed with a new model called the EzHifz Model (see Chapter 4).

Most of the existing applications and web systems in the technology approach can show the words and play back the audio of the reciter with the looping method. In this study, a researcher provides the user with the selection of students' preferred VARK

learning styles to memorize the Quran verse and translation. However, fewer of the applications developed emphasized the visual mode and kinesthetic mode with the Quran memorization technique that supports individual differences in VARK learning style and sensory modalities in memorizing the Quran. There are a few features in the application and web system that are the research gap for this study. Hence, it is important to have alternative Quran memorization techniques with a systematic learning process (Abdul Hafiz et al., 2010; Hashim et al., 2014) that might solve the problems of student's cognitive ability to memorize and retain the memory of the Quran (Ahmad Murad, 1999; F. Z. Ismail et al., 2019). Determining the student's learning style and emphasizing the sensory modalities in the multimedia learning content should be given special attention to achieving the objectives of Quran memorization learning (Abdullah et al., 2005; Salisu, 2020). Teachers also need to adapt to the different methods and teaching strategies that facilitate understanding of learning through technological approaches (Mohamed Yusoff et al., 2014; Norasykin & Mohd Miza Shahril Shah, 2008; Roslan et al., 2019) and identify the students' learning styles to acquiring knowledge of Quran (Chalid et al., 2018; Hazilah & Nur Haizum, 2014; Norlia et al., 2006; Nur Fairuz Hayati, 2009). Therefore, there is a need to develop some supporting learning materials for the Quran memorization techniques based on the VARK learning styles (EzHifz model). Thus, the researcher needs to choose suitable Quran memorization techniques for memorizing the Quran verse and translation that support both the sensory modalities based on the VARK learning style that might influence cognitive intelligence. The important elements of sensory modalities namely visual, auditory, reading, and kinesthetic should be considered in the EzHifz model for memorizing the Quran verse and translation. The sensory modalities are also known as

sensory memory. The sensory memory was the element represented in the extent of the Cognitive Theory Multimedia Learning (CTML) elements from Mayer's original theory with newly added elements based on the VARK learning style (see Chapter 4). Designing the model of Quran memorization techniques based on the VARK learning style (EzHifz model) needs a proper plan according to the phases in the research framework (see Chapter 1). As a result, based on the comparative of Quran memorization techniques applied in the traditional approach and mobile application/web-based system from the literature reviews. Researchers found that a combination of thirteen (13) memorization techniques may give an impact on the successful development model of Quran memorization techniques based on the VARK learning style. It is because each type of memorization technique has a specific function and benefits between different types of learners.

2.5 Learning Theory in Model Development

The theory is a set of assumptions, interrelated concepts, and generalizations that systematically describes and explains regularities in behavior (Hoy, 1996). Learning is a change that occurs relatively within behavior or performance as a result of the learning process and motivation (Richey, R. C., & Klein, 2007), experiences, and interactions with the surroundings (Gunesekera et al., 2019). From the point of terminology, learning theory describes individual ways, human beings learn, which indirectly gives an understanding of the learning process complexly inherited from ancient times (Shariffudin, 2007).

Therefore, in this study, learning theory is discussed in detail to relate the VARK learning style modes and the learning of Quran memorization techniques. Thus, this discussion presents several learning theories for reference in the process of teaching and

learning in the VARK learning style mode, so that the learning problems that are faced can be overcome with the integration of the theory. According to (Hwang, 2016) view, the learning theory can give guidance through scientific and detailed knowledge for the improvement of teaching and learning. Theories and models studying the cognitive learning possibilities of multimedia are relevant: information processing theory, cognitive theory of multimedia learning, cognitive load theory, and multiple intelligence theory. All these theories relate to cognitive learning predictions with the conditions in which learners and teachers learn, in the transfer of information. Therefore, the Cognitive Theory of Multimedia Learning (CTML) by Richard E. Mayer (2005) is predicted to have the closest fit in the context of this study. Based on this theory, some principles can be applied in designing a model of Quran memorization techniques and their components.

2.5.1 Cognitive Theory Multimedia Learning (CTML)

The cognitive theory of multimedia learning evolved from the dual coding theory (J. M. Clark & Paivio, 1991), the model of working memory (Baddeley, 2003), information processing theory (G. Miller, 1997), cognitive load theory (Sweller, 2011), generative theory (Merlin C. Wittrock (1989), 1989) and SOI model (R. E. Mayer, 1996). According to the theory, the learner has a visual and verbal information processing system, such that auditory narration goes into the verbal system whereas animation goes into the visual system. The reason for choosing the cognitive theory of multimedia learning approach is mainly because he has made significant contributions to the theories of cognition and learning, related to the design of educational multimedia. The theory suggests that an ideal of learning occurs when visual and verbal education materials are presented together at once. Nowadays, these theoretical

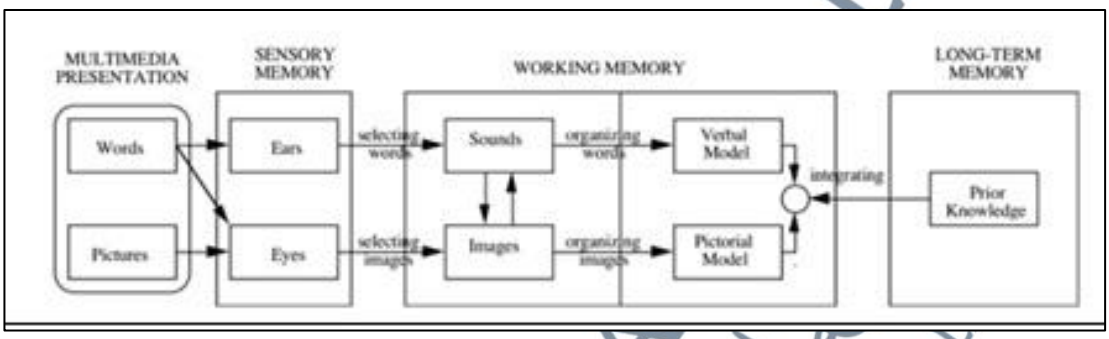
approaches and concepts that they introduced have received extensive attention and are often used as references in various fields and disciplines of thought. Many researchers have proved that when information was presented in a multimedia format, students learned better by combining audiovisual formats, rather than relying purely on visual formats. It refers to the fact that the learning effect of individuals is better if the materials are composed of animation and theory rather than the materials composed of animation, explanation, and text (Ye et al., 2021). However, inappropriate learning methods can lead to redundant effects, namely explaining the learning while giving written text. Different media combinations led to different cognitive processes, resulting in different learning effects. The integration of verbal inputs and visual imagery appears to improve the retention of memory. Therefore, when conducting multimedia teaching, the teacher should select different media combinations according to the subject matter.

In multimedia learning, when it comes to storing and archiving data and information, three memory functions are active: sensory memory, working, and long-term memory. Words and images represented by a multimedia presentation, through the senses of hearing and sight, enter the sensory memory. The main action of multimedia learning takes place in a working memory that temporarily retains this memory and manages knowledge in active awareness. Moreover, with the technology advanced, the creation of multimedia presentations that combine text with images, animation, and narration can enhance teaching and learning.

In the field of sciences and technology, educators are increasingly turning to these multimedia learning materials as a way to accurately represent complex information (Kirschner et al., 2017). There are many ways to approach multimedia design and therefore an evidence-based approach is required. In this study, the form of

evidence-informed design principles is based on the cognitive theory of multimedia learning created by Richard E Mayer (2005), from the University of California. There are three core assumptions of the multimedia learning theory. The first is the dual-channel assumption that humans possess two separate channels for processing visual and auditory information; the second assumption is that humans are limited in the amount of information they can process in a channel at a time and the third assumption is that humans engage in active learning by attending to relevant information, organizing selected information into a coherent mental representation, and integrating that mental representation with another knowledge. Mayer's theory builds on these assumptions of information processing by examining the cognitive processes involved in active learning with multimedia namely visual images, audio, and text. It is based on the idea that individuals attempt to build meaningful relationships in learning between words and pictures instead of words or pictures only (Mayer & Chandler, 2001; Mayer & Moreno, 2003). Mayer stated that the design of multimedia teaching materials based on cognitive theory should be tailored to the way individuals learn and think. It emphasizes memory storage that involves sensory memory, short-term memory, and long-term memory. Multimedia in the learning process can be used the learner's sense of learning. This sense is focusing and involved actively through hearing, seeing, and touching senses (Vaughan, 2014). Learners can integrate information from various sensory modalities namely the eye and ears to create meaningful learning and experiences. Therefore, instructional designers are faced with the need to choose between multiple combinations of modes and modalities to promote meaningful learning (Purhita et al., 2021). Information or knowledge in visual and audio forms uses sensory memory through short attention before processing in short-term memory. Long-

term memory processes are saved over a long time. The multimedia learning process involves the selection, arrangement, and integration of texts and image representation with the existing knowledge. Therefore, the principle of multimedia teaching is to encourage students to develop coherent mental representations and to understand the information learned using sensory modalities to build new knowledge.



Source : (R. E. Mayer & Moreno, 2012)

Figure 2.2: Model of Cognitive Theory Multimedia Learning

Based on Figure 2.2, Mayer clarifies that the brain takes in information and processes it in multiple channels, namely visually represented and auditorily represented material. Once a learner is presented with visual information, including pictures, videos, or printed words, it will go into the visual channel while auditory information including spoken words in narration and other non-verbal sounds goes into the auditory channel. It will be captured in their senses and processed in the working memory. In working memory, the learner can choose relevant images to remember each of this visual and auditory information is processed and organized into models that support the learner to remember and understand the information. The learner integrates the visual model and the auditory model with their prior knowledge and experiences. When all the information has been combined, the new knowledge can transfer into long-term memory (Mayer & Moreno, 2012). Thus, when designing a model, the visual and auditory channels used to carry the information in the multimedia presentation used in

an interface should activate the appropriate mental representation images of the learners.

The model that integrates multimedia principles of cognitive theory multimedia learning and technology-enhanced learning can influence the learner's attention, encoding, motivation, mental models, and narrowing of individual differences (Abdul Hanid & Mohamad Said, 2019; Chen & Wang, 2020). This model can draw learners to refresh their existing knowledge using graphical diagrams, colored interfaces, bold (italic) text, and imagery strategies in visual teaching. This demonstrates that a combination of cognitive theory multimedia learning and multimedia technology-enhanced learning can influence the formation of new knowledge and experiences in individuals (Bower, 2019). Richard E. Mayer (2019) emphasizes that the development of effective and meaningful multimedia teaching and learning materials requires a thought process based on the theories proven by researchers and has an impact on human memory systems. The cognitive theory of multimedia learning as an architecture related to the multimedia learning design principle might produce quality and effective multimedia aids (Othman & Wan Yahaya, 2015). Therefore, this study that focuses on the Quran memorization subject is also closely related to cognitive theory. This is because it is involving the process of storing information without modification and the ability to retrieve it from their memory system or long-term memory (Norizah et al. 2014).

The multimedia design principles serve as a guideline for developers to design multimedia learning. The principles explain how students learn better when multimedia presentations are designed consistently with the human memory system works (R. E. Mayer, 2017). Further, the principles provide a direction in making use of any

combination of words and pictures in the design. Once the designers decide to use animation and narration, the design must be used together and avoid mixing it with on-screen text (R. E. Mayer, 2017; Stephen, 2012). In multimedia learning, the uses of words need to be written in a conversational style rather than in a prescribed style and the narration needs to be spoken by a human voice rather than a machine voice. Besides, the learning process could be easier if the learning is presented in user-paced segments as compared to a continuous unit and learners already know the names and characteristics of the main concepts. Moreover, the speaker's image is added to the screen, but it does not certainly mean better for learning. There are twelve (12) principles contained in Mayer's theory: coherence principle, signaling principle, redundancy principle, spatial contiguity principle, temporal contiguity principle, modality principle, segmenting principle, pre-training principle, multimedia principle, personalization principle, voice principle, and image principle (Mayer, 2019; Mayer & Moreno, 1998; Michelle, 2017; Stephen, 2012). Designers need to understand further the instructional design principles in the triarchic model of cognitive load to develop an instructional interactive multimedia design. Table 2.8 shows the Mayer's instructional design principles.

Table 2.8: Mayer's Instructional Design Principles

Triarchic Model of Cognitive Load	Instructional Design Principles	Descriptions
Limit Extraneous Processing	Coherence	Instructional materials are enhanced when Irrelevant elements. extraneous, distracting material is not included.
	Signaling	Learning is enhanced when explicit cues are provided that signal the beginning of major headings or elements of the material being covered. Contains callouts, arrows, and highlighting is used to key exactly what to pay attention to on the screen.
	Redundancy	Inclusion of extensive text (transcription) on the screen along with spoken words and pictures delays learning. Graphics, narration (spoken words), and text (printed words) should not all be implemented on a frame. Interactive animations do not include a video that is being used.
	Spatial contiguity	On-screen text or words and pictures should be presented close to one another to limit eye shifting during instructional presentations.
	Temporal contiguity	Pictures and text shown on the screen should correspond to the audio presentation. Words and pictures are continuously presented together, instead of in subsequent order.
Manage Essential Processing	Modality	People learn better from spoken words and pictures than they do from pictures and text alone. Graphics and narration (spoken words) are more effective than text (printed words) and graphics on a frame.
	Segmenting	People learn better when multimedia presentations are divided into short bursts as opposed to longer modules. Information is presented in segments, rather than in one long continuous stream.
	Pre-training	People learn better when there is an advanced organizer that highlights and reviews key content before instruction. Trains the objectives and some of the basic key concepts they will learn about.
Foster Generative Processing	Multimedia	People learn better from pictures and spoken words than from words alone.
	Personalization	Known as the individual differences' principle. Narration presented in a conversational style result in better engagement and learning than more formal audio presentations. More informal, conversational voice than an overly formal voice.
	Voice	Narration presented in a conversational style result in better engagement and learning than more formal audio presentations. Contains a human voice than a computer voice in a multimedia presentation.
	Image	Images should be nonabstract, and represent the content being presented. Not necessarily learn better from a talking head video

Source: Michelle, (2017); (M.J.Kennedy, (2014) Stephen,(2012)

Based on Table 2.8, Mayer's design principles are aligned with the triarchic model of cognitive load (Mayer, 2008). Multimedia learning is a design based on the triarchic model of cognitive load that assumes learners involve in three types of cognitive processing while learning extraneous, essential, and generative. These three types of cognitive processing are limited to a learner's available cognition and are essential for the development of multimedia aids (Mayer et al., 2011; 2017; Stephen, 2012).

The first type of cognitive processing in the multimedia learning theory is to limit or reduce extraneous cognitive processing that does not serve the instructional goal. The coherence principle stated that learners learn better when extraneous pictures, words, and sounds are excluded. In other words, only include keywords pictures, and sounds. The signaling principle stated that learners learn better with added signs to highlight the essential material. For example, if the visual is complex, arrows, circles or highlighting, or zooming can be used to differentiate the parts of the image or text. The redundancy principle stated that people learn better from graphics and narration rather than from graphics narration and on-screen text. In other words, the added on-screen text is often redundant and amounts to extraneous cognitive load. The use of on-screen text should only include keywords and according to the spatial continuity principle, should be placed close to the image rather than at the top or bottom of the page. This helps the brain register the text and image as one single piece of information instead of two pieces. Besides, a temporal contiguity principle stated that for text and images to count as one piece of information, they should be presented at the same time instead of one after the other.

The second type of cognitive processing in the multimedia learning theory is managed essential cognitive processing that represents the critical content of the

instruction. The modality principle stated that learners learn better from graphics and narration than from animation and on-screen text. So, the static image with an audio narration is more effective than seeing animation while reading the text. Furthermore, the segmenting principle recommends that multimedia presentations should be brief and focus on user-paced segments. The learner should be able to go back and re-watch the segments as needed. Another principle to help manage essential cognitive processing is the pre-training principle. Learners learn better from multimedia when they already know the names and characteristics of the main concepts as pre-teach vocabulary concepts with multimedia.

The third and final type of cognitive processing in the multimedia learning theory is increasing the foster generative cognitive processing which is responsible for helping the learner organize and make sense of the essential material. The following principles are related to the presentation of narration and helping the learner connect to the content. At the core of this theory is the multimedia principle stated that learners learn better from pictures and words than from words alone. To reduce extraneous processing using these sensory modalities, additional principles should be followed. The combination of images and audio in learning can also produce memories that are long stored in memory. In addition, some pictures and text are required in one interface as it loads users' eyes and memory. Thus, it can be concluded that personalization principles support the use of different learning styles in individuals through the use of a variety of senses in the learning process. The voice principle stated that people learn better when narration is spoken in a friendly human voice rather than a machine voice. Additionally, we should keep the voice conversational rather than formal or robotic. Finally, the image principle tells us that learners do not necessarily learn better when

the speaker's image is added to the screen. The floating talking head on the screen helps learners to connect more with other people, but research says it is an unnecessary distraction.

In the context of this study, each of the twelve (12) principles is considered practical to apply in designing multimedia learning models. This is because the content involves instructions and guidance to the learners on how to get better learning. Due to the implications of the cognitive theory of multimedia learning in the study, the researcher continued focusing on the VARK learning style model which will be applied in the design and development model of Multimedia Representation Learning (EzHifz model) as an extension of the previous Mayer's model. This is because there are various multiple sensory elements used in the VARK learning style model, which relate to the human memory system in this study as a framework to support each of the issues presented. This is supported by the research (Zainun, et al., 2019) students who are involved in memorizing Quran usually related to reading and writing learning styles have a high spiritual intelligence. This study is about to discover and reveal the most dominant component among all the domains contained in both Multiple Intelligence and learning style.

A study by Mayer et al. (2011) mentions five types of representation that support the sensory memory of multimedia learning (i) an external representation is presented to the learner in the form of a multimedia instructional message namely an on-screen narrated animation, a slideshow presentation, or a textbook chapter. (ii) as the spoken words enforce on the ears, they are held as an auditory sensory copy in auditory sensory memory, and as the pictures and printed words occupy the eyes, they are held as a visual sensory copy in visual sensory memory; (iii) if the learner attends to parts of the fleeting

sensory copies they are transferred to working memory as sounds or images for further processing. (iv) the learner can organize the sounds into a verbal model and can organize the images into a pictorial model in working memory and (v) the learner can integrate the verbal and pictorial models with appropriate knowledge from long-term memory to create knowledge for storage in long-term memory at the right of the figure. Overall, in the cognitive theory of multimedia learning, information is changed from an external representation to sensory copies in sensory memory to sounds and images in working memory to verbal and pictorial models in working memory to knowledge in long-term memory.

2.5.2 VARK Learning Style Model (VARK)

Previous research indicates many important insights regarding individual differences in learning style and intelligence learning that are naturally utilized during their acquisition of content. Though there are conflicting ideas between intelligence and learning style, this study uses Gardner's and Armstrong's definitions throughout the literature review and similar definitions of learning style focusing on VARK's learning style. Gardner applies the term learning style as the way that learner chooses to approach a task while intelligence is described as the capacity of the learner to carry out that task (Gardner, 2011). Though closely related, the difference is strategy vs. capacity. This study does not measure learning capacity but instead uses observable learning strategies as a tool to gain insight into how students choose to learn through the skills of memorizing the Quran verse and its translation based on the VARK learning style.

This study chooses the VARK learning style model instead of other types of learning style models because the elements in the models involve sensory modalities for learners' information processing. There are some learning style models consisting

of elements of sensory modalities namely the Dunn and Dunn model (Dunn, 1990), Felder–Silverman model (Felder & Silverman, 1988), Myers-Briggs Learning Style (I. B. Myers, 1975), and VARK model (N. D. Fleming & Mills, 1992) while none of sensory modalities elements consists in Honey and Mumford's Learning Style (Peter & Mumford, 1982) and Kolb's learning styles model (Kolb & Kolb, 2013) as shown in Table 2.9. However, the VARK learning style was selected as it is suitable for Quran memorization that contains four modes of learning including reading mode that commonly uses *mushaf* Quran that consisting of the Arabic and Malay text element as their teaching and learning material.

Table 2.9: Types of Learning Style Model

Types of Learning Styles	Elements of Learning Style	Sensory Modalities
VARK Learning Style (Fleming, 1987)	• Visual (V) • Auditory (A) • Reading (R) • Kinesthetic (K)	• Visual (V) • Auditory (A) • Reading (R) • Kinesthetic (K)
Dunn and Dunn model (Dunn, 1990)	• Emotional Domain • Sociological Domain • Physiological Domain • Psychological Preferences Domain	• Visual (V) • Auditory (A) • Kinesthetic (K) • Tactile (T)
Felder–Silverman model (Felder & Silverman, 1988)	• Sensing/Intuition • Visual-Verbal • Active/Reflective processing • Sequential/Global	• Sensing (5 senses) • Visual • Verbal
Myers–Briggs Type Indicator (MBTI)(I. B. Myers, 1975)	• Extraversion-Introversion • Sensing-Intuition • Thinking-Feeling • Judgment-Perception	• Sensing (5 senses)
Honey and Mumford's Learning Styles (Peter & Mumford, 1982)	• Activist • Theorists • Pragmatists • Reflector	None
Kolb's learning styles model (Kolb & Kolb, 2013)	• Concrete Experience	None

	• Reflective Observation of the New Experience • Abstract Conceptualization • Active Experimentation

Based on Table 2.9, shows the comparison of learning styles in Dunn's (1990) inventory measures a domain of environmental, emotional, sociological, physiological, and psychological preferences as they affect learning. One of the domains in Dunn's model that used sensory modalities and consider preferences for the modes of learning is psychological preferences. It consists of elements of auditory, visual, tactile, and kinesthetic called the VAKT model. However, Dunn's model does not focus on the mode of reading or the perceptual strengths of each mode of learning. The materials of the Quran memorization that are mostly in word form with the reading features need to consider in this study. Felder & Silverman's (1988) model measures the dimension of sensing/intuition, visual/verbal, active/reflective processing, and sequential/global. The visual/verbal dimension in this model used the sensory modalities and assumes that people learn best once both visual and verbal information is used for instruction with the method of delivering material. However, Felder-Silverman's model does not consider any kinesthetic elements within the model for the process of learning. The kinesthetic mode was an adapting element in cognitive theory multimedia learning to be applied in the model of Quran memorization techniques. Besides, Myers–Briggs Type Indicator (MBTI) is a self-report personality inventory. It represents a trait perspective (personality constructs as continuous variables) based on type theory and conceptualizes four personality preferences as dichotomous constructs. These four preferences are extraversion-introversion (oriented inward or outward), sensing-intuition (reliance on sensorial information versus intuition), thinking-feeling (the

tendency to make judgments based on logical analysis or personal values), and judgment-perception (preference for using either thinking-feeling or sensing-intuition processes for interacting with the world). Sensing and intuition are how the is process information. Learners with strong sensing live in the now and enjoy facts. While being Intuitive means learners try and find the deeper meaning in things. It is how learners take in information. As their names imply, sensors take in information through their senses, and intuitive take in information through their intuition. Sensors use their five senses to take in information about the world around them. However, this model does not consider sensory modality for learning but more on the personality traits of sensing construct. Honey and Mumford's learning style theory measures the distinct styles of activist, theorist, pragmatist, and reflector. This learning styles model proposes that there are four different learning styles and the preference to learn using one, or at most two, of these different learning styles. While Kolb's model represented the stage learning cycle of concrete experience, reflective observation of the new experience, abstract conceptualization, and active experimentation. Kolb views learning as an integrated process with each stage being mutually supportive of and feeding into the next stage. This means that effective learning only occurs once the learner can execute all stages of the model. However, Honey and Mumford's theory and Kolb's model do not concentrate on any perceptual preference or sensory modalities in the process of learning. However, the VARK learning style (Fleming & Mills, 1992) model consists of elements of visual, auditory, reading, and kinesthetic modalities that are suitable for Quran memorization learning (Amirah et al., 2019). This model is generally used in studies for determining students' learning styles working on multimedia. Referring to its basic structure and providing information about learners' preferences in multimedia

learning environments, the VARK learning style model was used in this study. Although there are different ways of classifying learning styles, one of the more commonly used methods is based on the sensory modality or modalities that one prefers to use when internalizing information. An important consideration of learning theory is the sensory modalities that students prefer to use when internalizing information.

The VARK model that was introduced in 1987 by Fleming has a set of learning styles that involves the use of a variety of senses. This model contains four elements of learning styles namely visual, auditory, reading, and kinesthetic. There is a VARK instrument in version 7.0 comprising 16 questions to determine an individual's VARK learning style (Fleming 2012). This questionnaire-based instrument measures four modes of learning styles: visual, auditory, reading, and kinesthetic. The following are four (4) features of the VARK learning styles available to learners:

a) Learners with visual (V) preferences learn through pictures, charts, diagrams, graphs, and symbols rather than words. The visual mode provides a learning style using eye sense to see pictures or images.

b) Learners with auditory (A) preferences learn through conversations, lectures, and discussions. The auditory mode provides a learning style using ear hearing to listen.

c) Learners with reading (R) preferences learn through words and texts namely reports, assignments, essays, manuals, the Internet, and PowerPoint slides. The reading/writing mode provides a learning approach using eye senses to read/write text.

d) Learners with kinesthetic (K) preferences learn through experiences, training, and simulations in the form of demonstrations, videos, movies, case studies, and

applications. The learner will be able to learn from direct practice. The kinesthetic mode provides a learning style using body movement or motions and gestures.

When learner has many learning options according to their potential preferences, this will lead to motivation for learning (Khongpit et al., 2018). However, some researchers argue that they are more dominant in a particular style; others may prefer a different style. For example, some students are more effective at seeing information in visual forms namely pictures, graphics, and demonstrations than in verbal word and voice forms. Some learn by collecting data through multiple senses. Research on the VARK learning style model has determined that each individual has specific learning styles with possessed sensory strengths and unique learning style preferences (Fleming, 2012; Stirling & Alquraini, 2017). This model also shows that it is much more effective to teach students with their own VARK learning style preferences by manipulating their strengths. By knowing the type of student's learning style, teachers can use it to provide appropriate materials for specific students to improve their learning achievement.

The VARK model is one of the important models that diagnose the preferred methods of students and was the first to systematically present preferences conditional in the form of a questionnaire for learners. The questionnaire is to find out the different types of communication and many researchers have focused on visual, auditory, reading, and kinesthetic characteristics (V, A, R, and K). Fleming, (2012) divided the visual style into two parts: visual (creative) and text (symbolic), which were presumed. Four possibilities for preferences of the preferred method of learning acquisition include the students who have multiple preferences. Thus, Quran memorization subjects learned in school, require the model designed according to the student's preferred learning

styles, to achieve a new learning environment in the teaching and learning process, expand it to achieve many benefits, and improve classroom achievement. Each student has a special style of learning. Some of them like to learn visually, others audio or read/written, and kinesthetic. This is why the model design learning environment must be designed that includes all styles of learning for each learner to arouse according to their style of learning and is accustomed to it and here the learner is the focus of the educational process The foundations and principles of instructional design, and because it has proven its effectiveness in teaching, to develop and improve the Quran memorization material and its teaching methods in line with the students 'ability to acquire information that considers their learning styles (Faruk & Al-Thaf, 2018; Sidek et al., 2020; I. N. Umar & Aziz, 2015).

Learning based on a dominant or preferred VARK learning style is important to help an individual optimize the process of learning. Determining the individual's VARK learning style through the VARK instrument not only helps teachers and students learn about their learning style but also helps teachers and students choose appropriate learning and media strategies in the learning process (Fleming, 2012). In addition, previous researchers discuss the advantages of using the VARK learning styles in learning. This is because teachers that adopt suitable learning strategies with techniques that meet the needs of students and successfully engage the students in learning to produce quality learning performances (Jamaluddin, 2018; Norasmah and Mohd Hasril, 2010). Teaching students with the right style of learning is essential as the students can easily understand what they are learning. Gardner describes learning styles as an effective way for students to understand, apply, retain and recall what they have

learned. In the cognitive aspect, learning styles refer to various ways of acquiring perceptions and processing information in forming concepts and principles.

In the teaching process, the presenting knowledge and activities were transforming the students' behaviors while in the learning process, it is related to the mind-based activities that individuals experience going through their experiences, knowledge, sense, and skills that bring about changes in their cognitive state and behavioral tendencies. Many previous studies declared that Quran memorization learning involves the use of a variety of senses (Azmil et al. 2013; Azmil & Halim 2012) as described in the study on the VARK model of learning styles (Eka et al. 2015; Ishak 2015; Majeedkutty et al. 2015) and Quantum Type VAK (Ariastini et al. 2013; Sasi 2014), which may contribute to the effectiveness of learning. The study by Thepsatitporn et al. (2016) found that testing visual memory performance has an impact on individuals with visual problems or visual impairment. This indicates that individuals can visually store memory and memory level dominates the performance of individuals that tends to read or write. Therefore, teachers need to be concerned about the students' ability in accepting, memorizing, and understand knowledge, especially in memorizing the Quran because the cognitive, psychomotor, and affective stated help prevent misunderstandings in practicing the right way of learning (Halim & Ajuhary 2010).

In the context of multimedia learning, the use of multimedia elements namely graphics, text, audio, and video in the multimedia learning application developed may also support the use of multiple senses when using the VARK learning styles that may strengthen memory and understanding of knowledge received (Ahmad Rizal & Jailani 2005). The multimedia elements used in the application development provide rich

experiences in multimedia technology-assisted learning, a way of knowledge acquisition that stimulates students' thinking and creativity. This is supported by the study by Farid Wajdi & Nur Makiyah (2015); Salamah, (2019) which applies the reading, auditory, and video to contain the kinesthetic mode of learning through the movement of body motions and gestures in memorizing the Quran with the corresponding translation. Therefore, learning that involves the use of more than one sensory experience can enhance individual learning, development, and acquisition of knowledge (Wu & Tai, 2016).

The VARK questionnaire determines a user's preferences for a method that the user can work with information. It consists of 16 questions to be answered by the user. The questions may have more than one answer or can be left blank for any question that is not related to the user. The VARK learning styles require users to respond to the questions through online or printed versions. The updated version of the VARK questionnaire is in version 7.0 developed by Neil Fleming (2012). The questionnaire had also been translated into the Malay language by Ahbul Zailani Begum, a lecturer at Universiti Teknologi MARA Melaka. The VARK questionnaire has been used by most researchers in determining the best learning methods for individuals. A student can choose more than one answer based on individual-related questions. The scores of the VARK learning styles questionnaire are ranked according to the styles preferred, from the highest learning style mode to the lowest known as a stepping-stone, as shown in Figure 2.3:.

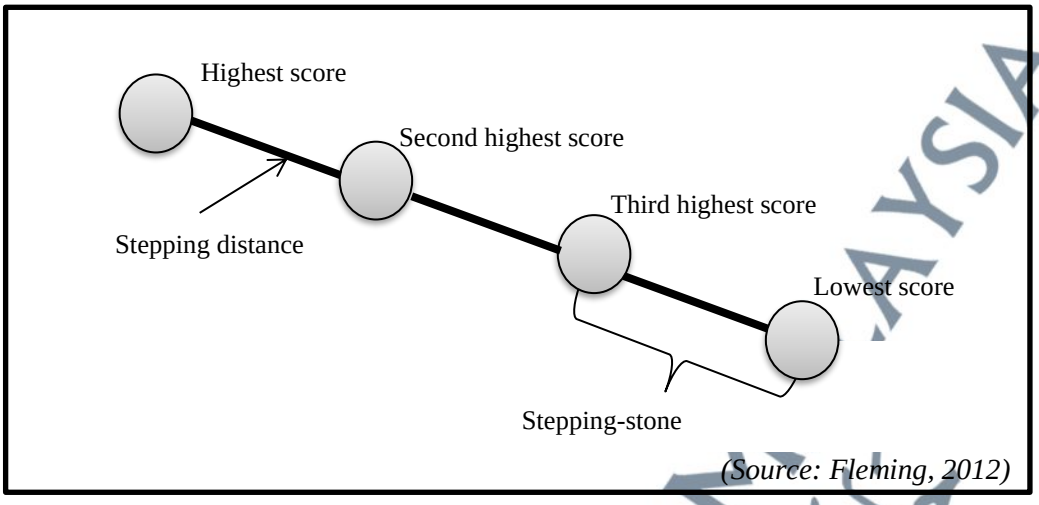


Figure 2.3: Relationship between steppingstone and stepping distance.

The trend of VARK learning styles also has a stepping distance as shown in Table 2.10.

Table 2.10: Stepping distance

Total VARK Score	Stepping distance
14-21	1
22-27	2
28-32	3
More than 32	4

(Source: Fleming, 2012)

The VARK learning styles can be categorized based on the scoring results from the VARK questionnaire. There are four different modes of learning called preferred or dominant VARK learning styles namely uni-modality, bi-modality, tri-modality, and quadri-modality (Fleming, 2012). Uni-modality is a single preference. For those users who have a single preference, their highest score on the total number of responses to the VARK questionnaire stands out above the other preference modes. There are also mild, strong, or very strong types of single preferences that can be determined by the total number of responses to the questionnaire. If the user has selected 14 to 21 options in the questionnaire, a score for the highest preference which is 6 or more points would indicate a very strong preference. A difference of only 2 points between the user's top

2 scores would indicate a mild preference. If the user has selected 33 or more responses to the 16 questions, a very strong preference would require at least nine (9) above the user's next highest preference. Instead of uni-modality, multiple modalities tend to have a different VARK learning style with multiple preferences or more than one preference. It is a combination of the four preferences V, A, R, and K. They may be bi-modality, tri-modality, or quadri-modality preferences. A bimodality set of preferences can be identified quite closely with every single preference. The strength of preferences is either mild and strong or very strong, depending on the different serial combinations of preferred VARK learning style modes. For example, there are two types of preferred VARK learning styles which are bimodality: AR and AK modes. The first alphabet 'A' is a stronger preference than the second alphabet of 'R' and 'K' modes. Tri-modality and quadri-modality preferences also have several VARK modes with a mix of V or A, R, or K; the former has a mix of three modes, and the latter has four modes respectively. There are eleven (11) different types of multiple modal preferences namely VA, VR, VK, AR, AK, RK, VAR, VAK, VRK, ARK, and VARK. Thus, a user with multimodal preferences still has a weak preference for one or two modes. This study continued by focusing on the multiple intelligence model which relates to cognitive intelligence or memory abilities.

2.5.3 Multiple Intelligence Model (MI)

The multiple Intelligence Model is originally proposed by Howard Gardner as a contribution to cognitive science. The multiple Intelligences Model (MI) is a dimension to gain and applying knowledge (Gardner, 2011). Intelligence is often defined as an intellectual potential that learners are born with, can be measured, and a capacity that is

difficult to change. Intelligence is also defined as the intellectual potential of the individual which has different types of strengths. It is based on an understanding of how learners' intelligence operates with combinations of intelligence. To capture the full range of abilities and talents that people possess, Gardner theorizes that people do not have just an intellectual capacity, but have eight of intelligence, including musical, interpersonal, intrapersonal, naturalistic, logical-mathematical, visual-spatial, bodily-kinesthetic, and linguistic intelligence. Multiple intelligence models can be an influential tool for student achievement students and can be used in curriculum development, instruction, and assessment (Fauziah, 2015). There are eight types of multiple intelligence, but four intelligences only were selected that related to this study model design namely linguistic, visual-spatial, bodily-kinesthetic, and musical. Each intelligence can work independently from others. The selection of four types of multiple intelligences is related to sense and was mapped to the VARK learning style as shown in Table 2.11.

Table 2.11: Mapping of Multiple Intelligence and VARK learning style

Multiple Intelligence	VARK Learning Style
Visual-Spatial	Visual
Musical	Auditory
Linguistic-Verbal	Reading
Bodily-Kinesthetic	Kinesthetic

Based on Table 2.9, most learners can learn but at a different level and the quality of this learning depends on providing learners with appropriate learning opportunities that suit their abilities and their types of intelligence, and varying preferences (Padmavathy, Jamal, Rohith, S.S., & Varun, 2017). The diversity of intelligence among learners is added once a lesson is matched to a student's preferences and strengths and through their strongest learning styles, performance and attitudes will greatly be

improved (Armstrong, 2017; Hughes, 2016). In this research, the researcher focused on the four modes of multiple intelligence theory to facilitate students' learning in a classroom and self-learning context. Gardner defines: (i) linguistic intelligence as the capacity to use language to convey thoughts and understand the words of others, either orally or in writing. Linguistic intelligence is a skill and interest surrounding words that can be found within the context of both written and spoken language. Gardner uses the example of the poet T.S. Elliot to describe as an expert on poetry and the written word; (ii) visual-spatial intelligence as the capacity to recognize and perform the illustration of objects received by the brain. Visual-Spatial intelligence is the capacity to understand and mentally navigate through a sense of direction, the ability to match/complement patterns, shapes, or colors, and accurately recall physical objects and spaces in a different context. Gardner uses the example of a puzzle that needs to find an identical visual pattern. Gardner also describes visual-spatial intelligence as an artist who paints a portrait of a physical object. This ability to accurately recall or reproduce something seen or experienced; (iii) bodily-kinesthetic intelligence is the capacity to coordinate the movement of the whole body. Bodily-Kinesthetic intelligence is a deep understanding with the ability to skillfully craft or communicate or amend using the hands and body. Gardner describes bodily-kinesthetic intelligence as athleticism and physicality that can re-represent or recreate an idea or object in a new medium. Gardner breaks with three separate categories of physicality; these are mastery of motion (dancers, swimmer), mastery of tools (painter, instrumentalist), and whom the use of the body proves central" (inventors, actors) and (iv) musical intelligence as the capacity to recognize the sound and composition of rhythm and tone. Musical intelligence is a skill and interest in the formal and informal aspects of music. Gardner describes musical

intelligence as a talented child playing the violin with a feeling, singing, and self-composed it after hearing it only once. A study by Armstrong (2017) stated the ways of learning using multiple intelligence in the context of classroom and self-learning as shown in Table 2.12

Table 2.12: The ways of Learning using Multiple Intelligence

Learners' intelligence	Elements	Ways of learning	Material Needed
Linguistic	words	in words reading, writing, telling stories, playing with word	books, tapes, writing tools, paper, diaries, dialog, discussion, debate, stories
Visual-spatial	images and pictures	designing, drawing, visualizing, sketching	art, video, movies, slides, imagination games, mazes, puzzles, illustrated books,
Bodily-kinesthetic	movement of the whole-body gestures	dancing, running, jumping, building, touching, gesturing books,	role play, drama, movement, things to build, sports physical games, tactile experiences, and hands-on learning
Musical	Audio or sounds	singing, tapping feet and hands, listening	sing-along time, music playing, musical instruments

Source : (Armstrong, 2017)

Based on Armstrong's table outlines, this study is interpreted the four multiple intelligences into memorizing processes or ways of learning or preferred activities and materials needed to memorize once the learning process occurs. Understanding how multiple intelligence can assist in the data collection of this research with concrete examples can be observed in an individual's actions. Certainly, the concern of teachers relates to how much learning is learned. Some teachers have aligned and adapted learning exercises directly to state the standards or developed scales to assess student learning progress and stage within the learning process (Armstrong, 2017). The depth

of Knowledge (DOK) schema provides four levels of guidelines in terms of cognitive complexity for any given learning activity (Hess, 2013) as shown in Table 2.13

Table 2.13: Four levels of Depth of Knowledge (DOK) schema

Levels	Descriptions	Activities
1	Recall and Reproduction	listing, defining, calculating, memorizing, reporting, and identifying
2	Skills and concepts	inferring, categorizing, predicting, interpreting, summarizing, and predicting
3	Strategic Thinking and Reasoning	critiquing, appraising, investigating, testing, hypothesizing, assessing, and revising
4	Extended Thinking	initiating, designing, collaborating, researching, synthesizing, self-monitoring, critiquing, producing, and presenting

Source: (Hess, 2013)

Depth-of-Knowledge (DOK) schema has become one of the key tools to analyze the cognitive demand (complexity) intended by the standards, curricular activities, and assessment tasks. From the context of this study, the elements involve basic tasks in level 1 that require students to recall or reproduce knowledge and/or skills. The multimedia learning content at this level usually involves working with facts, terms, and details. It may also involve the use of simple procedures or formulas through recognizing, responding, remembering, memorizing, restating, absorbing, describing, demonstrating, definitions, procedures following directions, and applying routine processes (Hess, 2013). In the context of the Quran memorization field using the Kaisa method (Salamah, 2019), for each new verse of learning in memorizing the Quran, the teacher demonstrates movement or kinesthetic intelligence. Linguistics intelligence is through the pronunciation of the verses and their meaning. The student will imitate the visual movement many times until memorized. Listening to the audio *murotal* or musical intelligence needs the student to recognize the sound of the recitation. Moreover, better performance can be attributed to the impact of using a learner's

dominant intelligences as a tool to enhance learning. This could be recognized to the use of their dominant intelligence as a foundation to trigger their interest in learning and support them produce a quality of learning (Mokhtar et al., 2008; Singer, 2016).

2.5.4 ARCS Motivation Model

Motivation has many definitions that describe a very broad field of science (Mayer et al., 2011). According to Umeozor (2018), motivation is something that energizes, motivates, and sustains behavior. Tokan & Imakulata, (2019) also describes motivation as an urge that makes people change and reinforce their attitudes, interests, or activities towards behavior. In general, motivation is a stimulus that evokes and sustains an individual's excitement and interest in achieving a particular goal. Although extensive literature from behaviorists and learning theorists has studied how learning and memory can be influenced via reinforcement and feedback (M. Li & Ren, 2018), relatively little research has focused on how motivational drive influences memory (Murty & Dickerson, 2016).

There are many theories of motivation that have been put forward by psychologists. The focus of this discussion is on some extrinsic and intrinsic motivation theories that are suitable for use in designing models of Quran memorization techniques. One general difference is usually made between intrinsic and extrinsic motivation where intrinsically motivated behaviors are experienced as rewarding in themselves, and extrinsically motivated behaviors are driven by their consequences namely coinage, assessment, or the need to meet a goal (Benedek et al., 2020). This is in line with the study by Tokan & Imakulata, (2019) which claims that intrinsic motivation has a direct effect on learning behavior and that both directly affect learning achievement; intrinsic and extrinsic motivation and learning behavior jointly affect the learning achievement

of the students. Indicators of intrinsic motivation, namely interests, ideals, and ability directly influence the learning behavior or habit of the students. However, not all individuals are motivated by the same effects. That is, a particular situation may motivate one individual because of prior learning, experience, or expectations. However, many principles or conditions seem generalizable enough to allow their consideration in the designing model and instructional materials (Gagne, Briggs, & Wager, 1992).

This study chooses the ARCS motivational model instead of other types of motivational models because the elements in the models stress the need to look not only at what to teach, but how to teach it to make learning more meaningful. ARCS motivational model allows learners to set their own goals concerning desired behavior. There are several different stages in acquiring effective behavior. These include awareness, acceptance, and value. This may develop greater confidence in the learners as they move toward more desirable behaviors. There are several motivational theories consisting of elements of affective behavior (A.H Maslow, 1981; Keller, 2010; Malone, 1981; Nakamura, J., & Csikszentmihalyi, 2009) as shown in Table 2.14

Table 2.14: Comparison of Motivation Components

Theory Flow (Nakamura, J., & Csikszentmihalyi, 2009)	Theory Maslow (A.H Maslow, 1981)	Theory Malone (Malone, 1981)	Theory ARCS (Keller, 2010)
Clear goals – clear tasks with instant response and feedback	Physiological need – food, water, sex, temperature, sleep, and exercise physical health.	Challenge - repetitive, pleasureful exercise	Attention – attract and retain.
Challenges - the level of challenge	Safety–security needs	Curiosity	Relevance

appropriate to the skill	- home, environment, finance, and police–law	– continue to arouse, attention and motives or value	– combined with expectancy for success.
Positive feedback	Belongingness need - friends, family, spouse–partner)	Control - engage inactivity	Confidence – determine which goals have the highest saliency and lead to a purposeful effort to accomplish the goal.
Control	Esteem need - for self, from others)	Fantasy - themes or fantasies which they embody or encourage, attempt to assimilate the experience into the existing structure	Satisfaction – maintain success, control, and achieve the goal.
Concentration of attention	Self-actualization need - self-realization, self-determination)		

A comparison of motivation components from several motivational theories that are frequently used in the multimedia design shows in Table 2.14. Based on the comparisons made, the multimedia design should contain several key components namely attention, curiosity, clear goal, control, challenge, relevance, confidence, and satisfaction. However, several components in the applied motivation model, have similar meanings from the aspect of psychological and practical needs. According to Hao & Lee, (2021), Keller's model describes a motivational design process in which the first step is to obtain and retain students 'attention and stimulate their curiosity to learn. Creating a curiosity feeling as found in Malone's model is one way to attract attention. The diversity of content and observations can also keep students' attention on the lesson. The second step must ensure that the learning activities have been aligned with the personal goals and needs as found in Flow's model of the students to be seen as a relevant component in Keller's model. Multimedia design should display clear and

fixed goals that are relevant as well as provide an environment that allows students to create their own goals through their self-determination as found in Flow's model and Maslow's model. According to Alessi, S. M., & Trollip (2001), the three steps to increase confidence levels are explaining what will be learned, providing a reasonable opportunity to succeed in lessons, and allowing students to control their learning. Finally, the reflection learners made on their performance determine their levels of satisfaction and helps them to maintain motivation (Hao & Lee, 2021). Thus, each ARCS model component plays a critical role in motivating students throughout the learning process with intrinsic and extrinsic motivation (Wu, 2018).

The ARCS model is chosen as it is widely used in education learning and information technology research. The ARCS model is also appropriate because the main goal of ARCS is to build a direction of behavior and remain motivated. The ARCS model is selected from the other models of motivation because it is mostly used in educational technology, and multimedia development application research including its validity and reliability in assessing motivation for educational purposes (K. Li & Keller, 2018; Slamet, 2020). ARCS model is also a firm theory that provides a foundation for a motivational design process and approach to stimulate the student's motivation to learn (Keller 2010). ARCS model is an instructional design approach introduced by Keller (2010) that focuses on the motivational aspects of the learning environment. It is also a well-established intrinsic and extrinsic motivation theory that explains motivation in the context of learning to stimulate and sustain student motivation to learn (T. Khan et al., 2019). It is also suitable because the main goal of ARCS is to motivate the learners and ensure the continuity of the motivation to retain motivation. The ARCS motivation model emphasizes four key factors in designing teaching and learning strategies. The

four factors that had been identified to enhance student learning motivation are attention, relevance, confidence, and satisfaction.

Motivation design is described as the process of management of resources and procedures to facilitate positive changes or direction of behaviors to achieve a goal of the system (Keller 2010). Students' attention span is important in helping them focus on learning and should be maintained throughout the learning process. Learning that is relevant to the students can enhance their motivation to persist in learning. In addition, what is learned can be linked to the existing knowledge through the next learning process (Alessi & Trollip 2001). Confidence can be built through experiences and positive attitudes gained during the learning process. Meanwhile, the students' satisfaction is gained through encouragement and positive feedback based on the learning performance indicators provided in the learning activities.

It is an important aspect to ensure that the learners keep on using the learning tools continuously after initial usage. To retain the interest and motivation of using the prototype of the application, it is important to develop an application prototype that encourages retention in the multimedia learning content (Mayer et al., 2011). Learners with high achievement on motivation are attracted to tasks, constantly trying to accomplish the task, and believe in their ability to solve the task (Andrew et al., 2017).

The ARCS model was a well-developed and validated model that has been used widely in different contexts. Motivational materials designed through embedding strategies into videos or instructional texts are needed to build a general view of how the model is applied to multimedia learning (K. Li & Keller, 2018). Moreover, the ARCS model can be used as a guideline and strategy for teachers to enhance learners' motivation in teaching and learning. It has been widely used and validated in numerous

studies at all educational levels. The most effective instructional dimension activities include the preparation of suitable materials for the teaching process, the use of appropriate educational technologies, teaching methods, and techniques including the preparation of the physical environment. Thus, the students had a positive attitude toward the use of ARCS motivational aspects in teaching, learning, cognitive skills, and technology usage (Tugun, 2018).

The success of instruction is directly related to the success of learning. According to M. Li & Ren (2018), the ARCS motivation teaching mode effectively promoted students' learning motivation, corrects their learning attitude, and achieves a positive effect on sports statistics learning. This motivational aspect has been applied in multimedia teaching through the system architecture, methods, approaches, and evaluation of learning. A study by Kember (2016) research, another eight motivational elements in teaching and learning environments that encourage student learning are (i) establishing interest; (ii) allowing choice of courses so that interests can be followed; (iii) establishing relevance; (iv) learning activities; (v) teaching for understanding; (vi) assessment of learning activities; (vii) close teacher-student relationships and (viii) sense of belonging between classmates. Therefore, four components from the ARCS model represent sets of conditions and indicators to show the student's motivation. Therefore, this study proposed to combine the ARCS motivational model into the EzHifz model design framework to solve the problem faced by the student in memorizing the Quran.

2.5.5 Usability Model

Usability is an important factor in ensuring that educational software or technological products can facilitate the acquisition of knowledge (Jordan, 2020). The concept of

usability has been discussed by researchers and standards bodies in the field of human-computer interaction (ISO 9241-11, 1998; Issa & Isaias, 2015; Petersen et al., 2019). Usability has been defined by the International Standard ISO 9241-11: 1998 (ISO 9241-11, 1998) as effectiveness, efficiency, and satisfaction, by which a user can achieve a specific goal in a particular environment. Effectiveness refers to the extent to which goals are achieved, while efficiency refers to the amount of effort used to achieve goals and satisfaction refers to the level of user comfort when using a software or technological product and its acceptance of the software or technological product as a method to achieve its goals.

Petersen et al., (2019) state that usability is the effectiveness, efficiency, and satisfaction obtained by the user using software or technological product. A software or technological product that has high usability will be easy to learn, effective, interesting, and fun to use and errors can be corrected immediately. According to Issa & Isaias, (2015), a simple system with good usability (Sharp et al., 2019) is: (i) understand the factors that determine how people operate and make use of computer technology effectively; (ii) develop tools and techniques that are suitable for the activities for which people will use it and (iii) achieve efficient, effective, and safe interaction in terms of both individual and group interaction.

Usability evaluations can be defined as measuring how well users can learn and use the product or systems. It is an important criterion of decision-making for end-users, consumers, product designers, and software developers for their particular purposes. Many usability evaluation methods have been developed and proposed namely expert methods, empirical methods, automatic methods, formal methods, and informal methods (Roos, 2020). Table 2.15 shows the types of usability evaluation methods.

Table 2.15: Types of Usability Evaluation Methods

Methods	Description
Expert methods	usability experts deploy methods that allow the experts to assess the system being evaluated
Empirical methods	experts rely on methods involving real-end users operating the user interface
Automatic methods	computers evaluate the user interface based on specifications
Formal methods	exact models and formulas are used to evaluate the system
Informal methods	usability is based on the evaluators' previous experience.

Source: (Roos, 2020).

The previous study has shown that usability evaluation has a significant role in user interface design. Usability evaluation focuses on how users can learn and use the product to achieve their goals. (Greenberg & Buxton, 2008) explained the importance of determining an appropriate evaluation method and how harmful it could be if applied incorrectly. Table 2.16 provides information related to the usability evaluation of an application.

Table 2.16: Usability Evaluation for an application.

No.	Author(s)	Usability Model	Dimension						
			Efficiency	Learnability	Effectiveness	Memorability	Satisfaction	Errors	Cognitive load
1.	(Afif, 2019)	PACMAD	√	√	√	√	√	√	√
2.	(Alturki & Gay, 2017)	PACMAD/Nielsen	√	√	√	√	√	√	√
3.	(Roos, 2020)	ISO 9241-11/Nielsen	√	√	√	√	√	√	
4.	(Luckyta Putri et al., 2021)	ISO 9241-11/Nielsen	√	√		√	√	√	
5.	(Suttidee, 2020)	PACMAD/Nielsen	√	√	√	√	√	√	√
6.	(Hussain et al., 2017)	Nielsen	√	√		√	√	√	
7.	(Krzewińska et al., 2018)	Nielsen	√	√		√	√	√	
8.	(Sukmasetya, Setiawan, et al., 2020)	Nielsen	√	√		√	√	√	

9.	(Sani et al., 2019)	Nielsen	√	√		√	√	√	
		Total	9	9	4	9	9	9	3
		Percentage (%)	100	100	44	100	100	100	33

In this study, the investigation of these usability dimensions for evaluating the EzHifz model design through the EzHifz prototype includes the comparisons of the available usability dimension elements. Seven usability dimensions have been found which are presented in Table 2.17. The common dimension of usability evaluation found in most usability models is identified as efficiency, learnability, memorability, satisfaction, and error where the frequency was 9 or 100 %. Effectiveness was 4 or 44 %. Cognitive load was 3 or 33 %. These elements were mainly categorized for evaluating the usability of the application from the perspective of the end-user.

Table 2.17: Seven Usability Dimensions

No.	Dimensions	Descriptions
1	Effectiveness:	• a measure of accuracy and completeness of the user to achieve a specific goal(ISO 9241-11, 1998) • the ability of users to accomplish goals in certain contexts (Afif, 2019) • how quickly users can perform tasks once they are familiar with the design. (Suttidee, 2020)
2	Efficiency:	• a measure of the time spent by the user when using the resources provided to achieve the goal (ISO 9241-11, 1998) • time is taken by a user to perform a task after learning the features and functions of an application. Users can complete it in a short time (Nielsen 2012) • the ability to complete goals based on speed and accuracy, the efficient task completion time was indicated (Afif, 2019) • how fast the user adapts to the design of the application. (Hussain et al., 2017) • task completion time by a user, Ratio of user task completion time to task completion time by an expert, Number of clicks, scrolls, taps, swipes, etc. to complete individual tasks. (Krzewińska et al., 2018) • shows the speed the user is using the application once the user has learned the design. (Sukmasetya, Setiawan, et al., 2020)

3	Learnability:	• how easily a user handles an application for the first time to perform a task. This can be measured through the time and effort required to reach the level of learning (Nielsen 2012) • attribute measures how simple or easy is for the user to perform or implement a task for the first time. (Afif, 2019) • level of difficulty the user will have performing tasks the first time they encounter the design. (Suttidee, 2020) • the easiness of the system when the user first-time encounter the application (Hussain et al., 2017) • an assessment of whether the path chosen by a user at the first step was correct or not. (Krzewińska et al., 2018) • it shows the ease of application for users to accomplish basic tasks. It does usually begin the first time they encounter the design. (Sukmasetya, Setiawan, et al., 2020)
4	Memorability:	• the user's ease of recalling the method of using an application after the user ceased using it for some time. Users can use it without learning the functions again. (Nielsen 2012) • the user interface is easy to be memorized if an interaction happened after a period of inactivity similar to the one that happened before the period defined memorability as a measure that reflects the user's ability to master the use of the application effectively. (Afif, 2019) • how easily the user can become reacquainted with the design after a period of nonuse. (Suttidee, 2020) • the user's proficiency when they return to use the application (Hussain et al., 2017) • comparison of results obtained with selected metrics in two series of tests, e.g. time needed to complete the same tasks. (Krzewińska et al., 2018) • it defined how easily they reestablish proficiency when the user returns to the design after such a long period of not using it. (Sukmasetya, Setiawan, et al., 2020)
5	Error:	• the number of mistakes the users made, including the severity and ease of recovery. Users should have low rates of mistakes that can be easily corrected (Nielsen 2012) • related to mistakes made by users during interactions with the application (Afif, 2019) • quantity, severity, and recoverability of errors. (Suttidee, 2020) • the number of errors made by the user and how they recover the error (Hussain et al., 2017) • the ratio of completed tasks to all tasks, the rate undertaken, and the number of errors made by a user when completing individual tasks (Krzewińska et al., 2018)

		• how many errors do users make, how severe are these errors, and how easily can they recover from the errors. (Sukmasetya, Setiawan, et al., 2020)
6	Cognitive load:	• the level of cognitive processing that the user needs to use the application. (Afif, 2019)
7	User Satisfaction:	• a measure of comfort, pleasantness, and positive feedback when the user operates the application (ISO 9241-11, 1998) • the degree of pleasure and fun enjoyed by the user in operating the application. Users are satisfied with the functionality of the application (Nielsen 2012) • the comfort and acceptability of the work systems to its users. (Afif, 2019) • level of users' satisfaction with the design. (Suttidee, 2020) • how pleasant the application is used by the user. (Hussain et al., 2017) • system Usability Scale score of a questionnaire administered at the end of the whole test, Single Ease Question score of a questionnaire administered to individual tasks (Krzewińska et al., 2018) • how pleasant is it to use the design (Sukmasetya, Setiawan, et al., 2020)

Based on the comparison of usability dimensions and definition from the previous research, the highest-ranking elements in the usability dimension used for the application are efficiency, learnability, memorability, satisfaction, and error from Nielsen's model. In this study, the researcher employed the learnability and user satisfaction from Nielsen's usability model elements for evaluation of the EzHifz model design application to determine the ease of use of the application and user satisfaction. Usability evaluation for the EzHifz model is essential to evaluate the ease of use of the mobile application that represents the EzHifz model and user satisfaction. The ease of use of the application is related to the use of memorization techniques and elements applied based on the VARK learning style in the EzHifz model. This is due to the suitability of the elements used in the EzHifz model for the EzHifz application prototype in memorizing the Quran. The content of the EzHifz model design application does not focus on the elements of effectiveness, memorability, efficiency, error, and cognitive

load elements. Therefore, the researcher employed learnability and user satisfaction from Nielsen's usability to determine the learnability of the application and user satisfaction.

Nielsen's model has introduced the heuristic technique in performing usability testing through the inspection of the fast and easy user interface Nielsen & Molich (1990). Heuristic evaluation is a method of usability testing by the experts, who are asked to review and evaluate the interface based on the guidelines and design principles. The usability assessment method presented by Nielsen & Molich (1990) is an interface heuristic evaluation that allows the experts to review and evaluate the interface based on guidelines and design principles. It is categorized as an analytic process with a technique of heuristic evaluation. The heuristic evaluation approach is an informal method of usability analysis on the interface design, in which several assessors are engaged to give their feedback (Nielsen & Molich, 1990b). Usability is mostly measured with a two-value scale that might rely on the usage and quality of the product to optimize the user interface design for their particular purposes (Nielsen, 1996).

Usability is important in evaluating the application prototype of learning to ensure that the model design is an effective tool for the target users. The systems designed for application usability should be able to increase productivity, reduce errors, and possess acceptable functionalities by providing training or assistance to the users (Jaspers, 2009). This means that application usability is important in producing quality applications to meet user requirements. Usability can be improved through the quality evaluation of the interface design. It can also be used to demonstrate the usefulness of method enhancements during the design process of applications (Bushro, 2008). A study by Sharp et al. (2019), defines usability as a measure of how well a specific user

in a specific context can use a product or design to achieve a defined goal effectively. Usability refers to ensuring that interactive products are easy to learn, effective to use, and enjoyable from the user's perspective. It involves optimizing the interactions learner have with interactive products to enable them to carry out their activities at work, at school, and in their everyday lives. More specifically, usability is broken down into the following six goals (i) effective to use (effectiveness); (ii) efficient to use (efficiency); (iii) safe to use (safety); (iv) having good utility (utility); (v) easy to learn (learnability) and (vi) easy to remember how to use (memorability). The usability Evaluation Method (UEM) was introduced by Gray & Salzman (1998), which refers to the way of evaluation to obtain the interaction between humans and the computer to increase usability. The assessment guides the researcher to improve and fine-tune the usability of the application with its functionalities (Olson & Moran, 1998). The studies by Krishnan (2019) demonstrate the usability testing of cognitive skills through embedding a reviewed Bloom's taxonomy namely remember, understand, apply, analyze, evaluate and create. The design of the course exposes the students to several concepts of graphics techniques and practicality making them apply their creativity to achieve the goal. Therefore, usability testing methods are an important tool for evaluating and improving the interface design. Furthermore, the usability inspection method was also used by previous researchers in the evaluation of an application design (Mendoza et al., 2019; Nielsen, 1994; Pilco et al., 2019; Zakaria & Abdul Nasir, 2020) This method involves the experts evaluating the application's usability without user feedback. It has been proven that this method also solves problems that were not encountered when the usability testing method was used. The cognitive walkthrough is a usability inspection method that assesses the design of a user interface for its ease of

experimental learning, based on a cognitive model of learning (Blackmon et al. 2002) and usefulness (Ponte et al., 2019). This cognitive walkthrough can be performed on an interface during the development process. Thus, both user and expert-based assessment methods are recommended to be used in the study because it is important to improve the overall usability of an application as well as generate valuable feedback (Holzinger, 2005). Moreover, the elements of learnability and user satisfaction were mainly categorized for evaluating the usability of the EzHifz prototype from the perspective of experts and the end-user. Thus, the researcher found that usability testing is important to determine the application prototype value and quality that meet the end user's requirements. Moreover, usability testing based on the user's needs is important to produce a quality model design with effective teaching materials.

2.6 Conclusions

This chapter discusses the literature review of multimedia learning, learning styles, and strategies. The researcher also discussed the result of a comparative analysis between Quran memorization techniques and the application of Quran memorization. In addition, a description of the theory and models underlying the study that are associated with human memory systems is also discussed. Furthermore, the theoretical framework and conceptual framework are considered guidelines for the researcher in this study..