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Generative Learning Strategies To Improve Students' Cognitive Engagement In Online Classes At Islamic School: A Systematic Review

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ABSTRACT

Purpose – This research aims to reveal learning strategies based on generative learning theory that have proven effective based on the results of empirical studies. This study was conducted by following the steps of systematic survey techniques in the social sciences.

Design/methods/approach – The study was conducted by following the steps of systematic review techniques in the social sciences. There are seven steps in conducting a systematic review: formulating research questions, determining the type of research, conducting a comprehensive literature search, filtering literature search results, assessing studies that meet the criteria, synthesizing studies, and assessing heterogeneity between studies.

Findings – This research shows how the learning process occurs in individuals based on generative learning theory. In addition, this study also reveals several learning strategies based on generative learning theory, including learning through summarizing, learning through mapping, learning through drawing, learning through imagining, and learning through teaching.

Research Implications/Limitations – The results of this study can be used as a reference for teachers who want to implement learning strategies that can involve students' cognitive aspects to produce more meaningful learning achievements.

Originality/value –

The results of this study provide educators with insight into how information processing occurs in a person's cognition and uncover several learning strategies that align with information processing theory.

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Introduction

Online learning is the most popular learning model applied today. The student engagement factor is an important component that determines the effectiveness of this learning model (Chiu, 2022; Windiastuti, 2022). Even some researchers state that the quality of online learning can be measured by the extent to which students actively participate in it (Beer et al., 2010). Several studies have reported the effect of student learning engagement on student achievement. Students can interpret the knowledge they build when engaging in their activities (Omar et al., 2012). For example, when students are actively involved in academic activities, participating in campus activities, and interacting frequently with instructors, their skills and self-efficacy develop to complete their education (Meyer, 2014). Accordingly, it has been a general consequence that students who are actively involved in learning activities will show faster learning improvements than those passively engaged ones (Barlow et al., 2020).

However, these studies cannot explain the extent of student learning quality (Cotton & Yorke, 2006). These assessments are based solely on student participation in online learning and are not considered to reflect the actual process and quality of student learning (Beer et al., 2010). Low participation rates do not necessarily reflect disengagement (Zyngier, 2008). Active participation does not necessarily result in learning, and quantity does not equal quality (Dennen & Paulus, 2005). Students' knowledge does not develop when they engage in argumentative activities (Ogan-Bekiroglu & Eskin, 2012). In other words, students may be able to respond frequently, but the responses delivered reflect a general scientific understanding (Eşkin & Ogan-Bekiro ğ lu, 2009).

Therefore, researchers need to look for other critical variables that are more reliable as parameters of online learning quality. One variable that can be used as a benchmark for the quality of online learning is the cognitive engagement level of students who learn in an online environment (Shukor et al., 2014). Cognitive engagement refers to how much mental effort students employ when completing learning tasks (Chiu, 2022) and when interacting with learning material (Richardson & Newby, 2006; Walker et al., 2006) by using strategies to learn more intelligently, not superficially. In-depth cognitive processing allows the formation of mental connections and the elaboration of knowledge that improves higher-level cognitive learning outcomes. Conversely, superficial processing allows rote learning to occur due to a lack of active engagement with the learning material (Walker et al., 2006).

Several studies have shown that cognitively engaged students can form new knowledge (Zhu, 2006) and achieve higher understanding in online discussions (Persell, 2004). According to Spanjers (2007) and Greene (2015), in-depth cognitive engagement is also a significant predictor of academic achievement. The abilities can be assessed in online learning by analyzing student behavior in their written messages in online discussion forums (Van der Meijden, 2005; Zhu, 2006).

However, cognitive engagement is the most challenging issue to address regarding student performance, especially in online learning environments. Study findings of Kew & Tasir (2021) analyzed 267 discussion forums created by students during a semester that examined the effect between student cognitive engagement, gender, and the number of posts on the forum. The results revealed that half of the students posted without explanation, showing low levels of cognitive engagement. Most of these posts had a small contribution to the cognitive engagement level. Suharti et.al (2021) concluded that student disengagement is a hallmark of online learning. Low levels of engagement have been found in several countries around the globe. As explained earlier, students' cognitive engagement is essential in online learning. Therefore, instructors must find strategies to increase students' cognitive engagement in an online learning environment (Meyer, 2014).

The purpose of this study is to describe several types of strategies that can make students cognitively active in online learning activities at the madrasah level. Such strategies should be based on the science of learning about how humans learn (Mayer, 2011). In other words, implementing effective learning strategies prepares for proper cognitive processes during learning. The cognitive processes that lead to learning include paying attention to relevant material, mentally organizing it into coherent representations, and integrating it with prior relevant knowledge (Clark & Mayer, 2016). Fiorella & Mayer (2015) call this activity generative learning. Learning is a generative activity if students enthusiastically produce learning outcomes by interpreting what is presented instead of just accepting it.

According to generative theory, learning is a selective activity, an activity of building structure, and an activity of integrating knowledge. These activities can be influenced by student learning strategies, such as summarizing the material or giving an advance organizer (Ausubel, 2000) before learning to provide an overview of the material. In short, learning outcomes depend on the material delivered to students and students' cognitive activity during learning (Sorden, 2005). Effective teaching not only presents or delivers material to students but also helps students direct cognitive processes toward the material during learning (Bull, 2013). This study aims to describe several generative learning strategies based on learning outcomes, which lead to appropriate cognitive processes during learning and higher academic achievement.

Methods

This study was conducted by following the steps of systematic survey techniques in social sciences proposed by Petticrew & Roberts (2006). Petticrew & Roberts suggest seven steps in conducting a systematic review: formulating a research question, determining the type of research, conducting a comprehensive literature search, filtering literature search results, assessing studies that meet the criteria, synthesizing studies, and assessing heterogeneity between studies.

The first step in the study was to define the research question clearly. The following questions were taken from the literature on information processing systems according to cognitive learning theory and learning strategies according to generative learning theory.

a. How does the learning process occur according to cognitive learning theory?
b. What learning strategies support generative learning theory?

Second, determining assessment criteria to decide the type of research that deserves to be included in this systematic review. The study only had literature written in English and published in a peer-reviewed journal. The publication year of the literature ranges from 2000 to 2022. The next step was determining inclusion and exclusion criteria to filter literature search results and then selecting the literature that best meets the requirements. In addition, the authors also adapted indicators from the experimental study of the quality by Gersten et al. (2005) as criteria to ensure the validity and reliability of the review and assessment results of the selected literature quality. Table 1 shows the inclusion and exclusion criteria for selected literature.

Inclusion	Exclusion
All levels of formal academic education	Non-formal training or courses that do not focus on academic skills
Quantitative studies or mixed methods studies (with evidence of learning effects)	Qualitative studies or conceptual studies
The study focus relates to subjects in school or college.	Studies are focused on areas in the world of work, training, courses, and others.
Empirical studies that have applied generative and cognitive learning theories as the main theoretical framework.	Empirical studies did not make generative and cognitive learning theories the main theoretical framework.
Empirical studies applied generative and cognitive learning theories as the main theoretical framework.	Empirical studies that did not use random sampling techniques

Table 1. Literature Inclusion and Exclusion Criteria

Based on the above criteria, several databases and search terms were determined, and relevant literature was found. The databases used in this search are ERIC, APA PsycInfo, APA PsycNet, Web of Science, Google Scholar, IEEE Xplore, Willey, Elsevier, SAGE Journals, SPRINGER, Science Direct, and so on. The search terms used in this study can be seen in Table 2 below. A total of 23 search terms were used with Boolean expressions (A1 OR A2 OR A3... OR A23) AND (BI OR B2OR B3... OR B6).

Search Terms	
A1. Generative*	B1. Online Learning*
A2. Generative Learning *	B2. Blended-Learning*
A3. Generative Learning Strategies	B3. Massive Online Open Course *
A4. Generative Learning Theory	B4. MOOC
A5. Studying*	B5. Traditional Learning*
A6. Learning Engagement	B6. Face-to-face*
A7. Learning Strategies	
A8. Cognitive*	
A9. Cognitive Learning Strategies	
A10. Cognitive Engagement	
A11. Online learning*	
A12. In-depth Learning	
A13. Summarizing* Strategy	
A14. Teaching* Strategy	
A15. Mapping* Strategy	
A16. Drawing* Strategy	
A17. Imagining* Strategy	

Results and Discussion

1. Cognitive Process and Generative Learning

How does the learning process occur? According to generative learning theory, learning occurs when students apply cognitive processes that correspond to incoming information (Mayer, 2014). Figure 1 illustrates the model of selecting, organizing, and integrating abbreviated to SOI (Fiorella & Mayer, 2015). This SOI model focuses on three cognitive processes exhibited by arrows. As the arrow from learning to sensory memory shows, external stimuli enter our cognitive system through the eyes and ears (or other senses). The information is briefly stored in sensory memory for a few seconds. If we pay attention to some of this quick information, we transfer the material we are paying attention to working memory for further processing (indicated by a selecting arrow). In working memory, we can mentally rearrange selected material into a coherent mental representation (indicated by organizing arrows). We can also activate relevant previous knowledge from long-term memory and integrate it with new material in working memory (indicated by integration arrows).

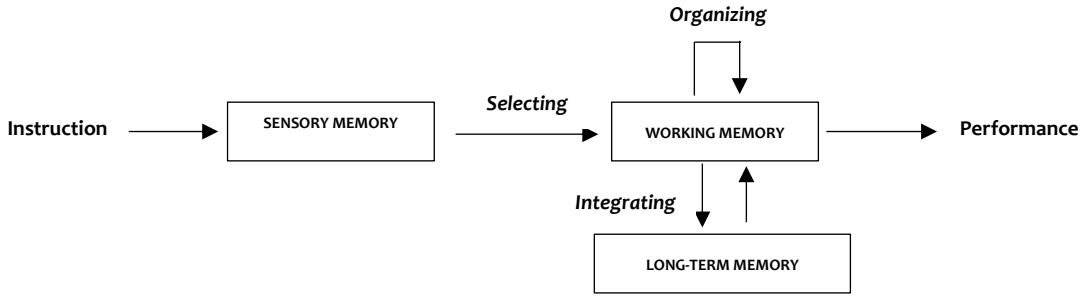


Figure 1. SOI Generative Learning Model (Fiorella & Mayer, 2015)

The knowledge we build in working memory can be stored in long-term memory for future use (indicated by arrows from working memory to long-term memory) and can be used to solve problems we encounter in the real world (indicated by arrows from working memory). memory to performance).

An important learning implication of this SOI model is that the instructor's job is to present information and ensure that students are engaged in the appropriate process during learning through selection, organization, and integration (Mayer & Moreno, 1996). Similarly, the student's task is not only to remember the information precisely as it is presented but also to engage in corresponding cognitive processes during learning (Stark et al., 2018).

2. Generative Learning Strategies

The following will describe generative learning strategies that are summarized based on several studies of research results.

2.1 Learning by Summarizing

Summarizing involves repeating the main idea of the lesson in our own words. For example, a student may read a chapter in a textbook on the history of Islamic civilization and write a one-paragraph summary stating the main idea of each paragraph. The theoretical rationale for summarizing encourages students to select the most relevant material from the textbook, organize it into concise representations, and integrate it with the existing knowledge using their words (Susar & Akkaya, 2009). A summary can show the comprehension level of a reading (Özdemir, 2018) since studying the summary can also increase comprehension of a reading (Ramirez-Avila & Barreiro, 2021).

Also, summarizing can be used to help students understand lessons in which words are presented orally (such as in a lecture) or for presentations featuring words and images simultaneously (such as slideshows, narrated animations, or printed text with illustrations). Summarized sections range from short (e.g., each slide in a slideshow, each animated narrative segment, or each paragraph in a chapter) to long (e.g., entire slideshow, animated with narration, or chapters), and summaries that students produce range in length, from sentence or title to paragraph. The main feature of the summary is a shorter

but coherent statement of the lesson's main points (Pečjak & Pirc, 2018) . Figure 2 is a summary example of a learning strategy.

According to the Gujarat theory, which originated in India, it is said that Muslim traders brought the teachings of Islam. Islam entered the territory of Indonesia and gradually spread to all corners of the archipelago around the 13th century AD. Besides the Gujarati theory, there is the Meccan theory. This theory states that Muslim traders pioneered the initial conversion to Islam in Indonesia from Arabia, which occurred around the 7th century AD. At the same time, the Persian theory reveals another view. Although the role of the merchants is very prominent, the merchants are the main goal to trade with Gujarat.

Write a summary sentence here.

As a test of understanding of the story, without looking back at the reading or summary, please circle the letter that corresponds to the most appropriate answer to the following questions:

Who is the most instrumental group in the spread of Islam in Indonesia?

a. Immigrant workers
b. Warriors
c. Merchants
d. Tourists from India

Figure 2. Examples of summarizing as a learning strategy

2.2 Learning by Mapping

Learning by mapping occurs when students convert text into a spatial arrangement of words, such as concept maps, knowledge maps, or matrix graphic organizers. A concept map is a spatial arrangement of vertices (usually oval or rectangular) containing words describing relationships written along connecting lines). Buluh (2012) defines mapping as a link between two nodes where the link represents a relation and the node represents the state of knowledge.

The theoretical rationale for mapping is that students mentally select key elements and organize them into a coherent structure. In terms of practical application, mapping can be used as an effective learning strategy, especially for students with low learning ability. Mapping can visualize facts, concepts, and essential relationships (Wang, 2020). However, effective mapping strategies require lengthy training, depending on the student's willingness to do additional work. Implementing a mapping strategy requires learning material that has a clear basic structure. Figure 3 is the material that will be used as a concept map.

The Walisanga plays several roles in Indonesian civilization, which can be grouped into five areas: education, making mosques or pesantren as centers of da'wah; the art of architecture, making the mosque a house of worship as well as the center of people's activities; arts and culture, building harmony between old culture or traditions and Islamic teachings; culture, getting used to greetings, utterances of good sentences and prayers; politics, adding elements of Islamic politics into the political system of government of Islamic kingdoms. In education, the guardians educate and teach the public about Islam and other fields. In architectural art, the guardians built mosques with beautiful architecture with a touch of ethnicity and local culture. In the arts and culture, the guardians use wayang art from the Hindu Ramayan and Mahabharata stories and replace the contents of the stories with Islamic teachings, introducing the art of tambourine and qasidah. In the field of culture, the guardians spread Islamic customs in the life of the Indonesian people and nation. In the political field, the guardians influenced the Islamic urban planning system that combines the palace as a place of government activity, a mosque as a place of worship, a market as the economic center of the community, and the square as a community gathering place.

Figure 3. An example of a material to be mapped

Now we can change the above text into a concept map by creating vertices (representing important concepts) and lines between them (representing relationships), as shown in Figure 4.

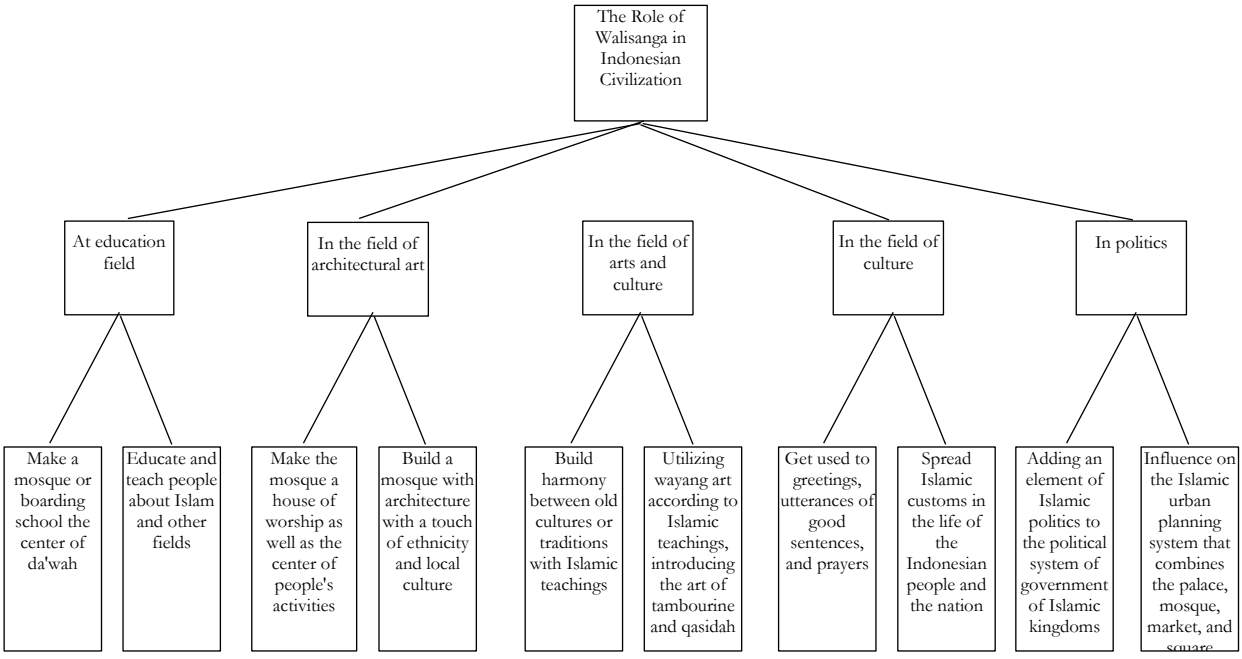


Figure 4. An example of a mapped material

2.3 Learning by Drawing

Learning by drawing occurs when students create drawings that illustrate the content of a text-based lesson (Meter et al., 2006). Learning by drawing includes determining which components are included in the illustration and how to structure them spatially to show structural and causal relationships (Schmidgall et al., 2019). For example, students reading a lesson on how metabolic systems change in the body during fasting can be asked to draw, following the text how the body converts fat into an energy source. The theoretical reason for learning from drawing is that building illustrations according to the

text can prepare students for the generative processes of choosing which components to include, arranging those components in a spatial layout, and integrating (students translate words into pictures). When students actively draw, corresponding cognitive processes such as activating prior knowledge, increased attention, and better memory as new information is integrated into long-term memory (Ainsworth & Scheiter, 2021).

Learning by drawing is intended to help generative processes by preparing cognitive processes such as selecting, organizing, and integrating (Tachie-menson et al., 2015). Selecting occurs when students must determine which important components are included in their drawings. Organizing happens when students have to arrange these components in a spatial layout that shows their interconnectedness. Integrating takes place when students have to use their prior knowledge to translate from verbal representations (learning texts) to visual or spatial representations (illustrations). Figure 5 is an example of the application of learning by drawing on a text.

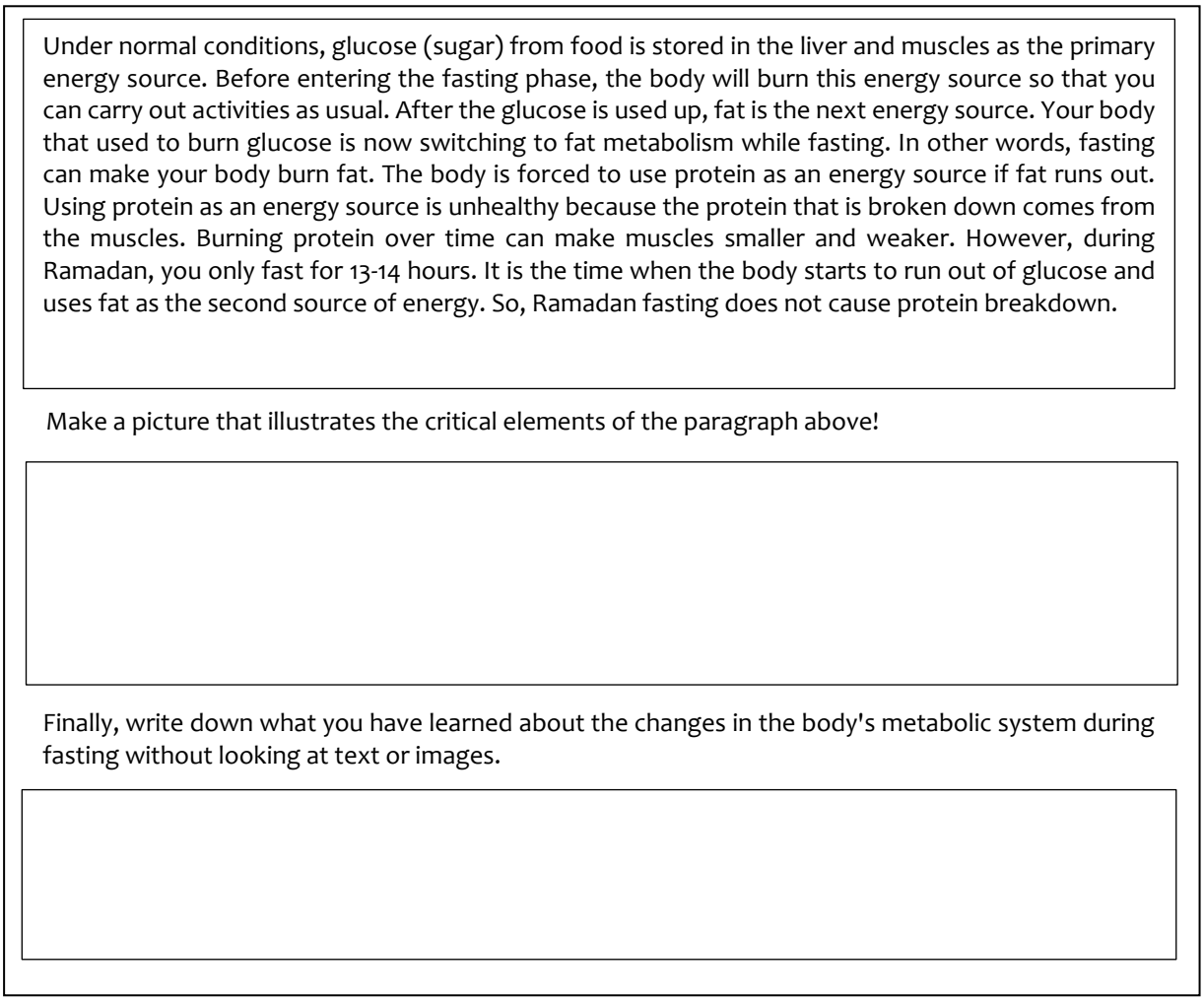


Figure 5. An example of drawing as a learning strategy

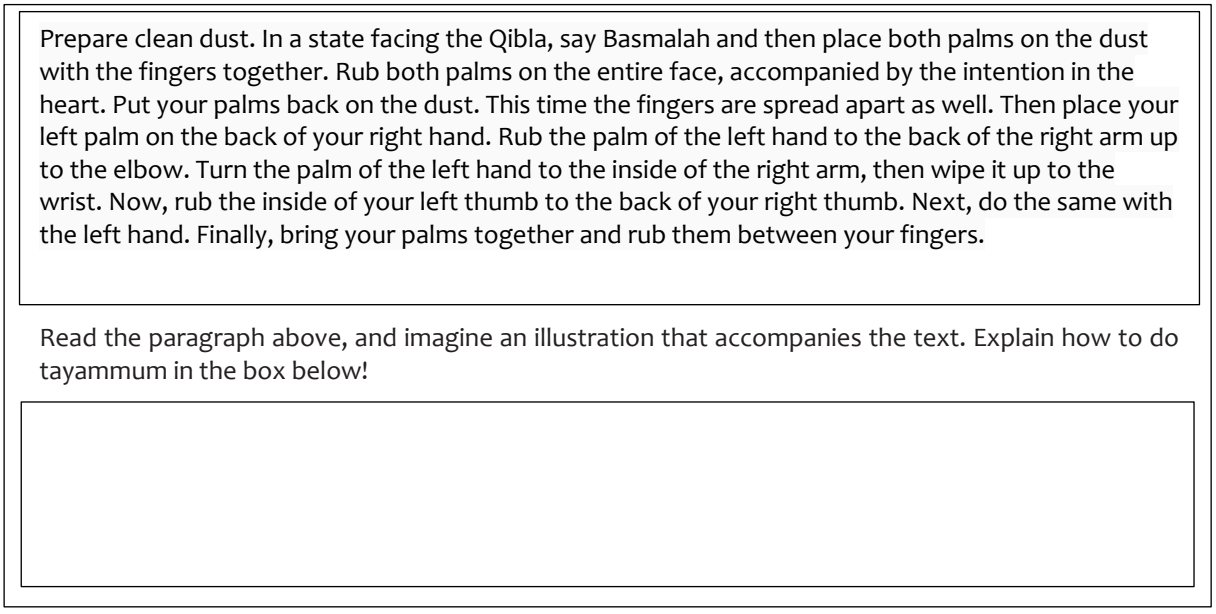
2.4 Learning by Imagining

Learning by imagining occurs when students capture mental images illustrating the content of a text-based lesson. Learning by imagining involves determining which

components are included in the image and how to arrange them spatially to show their causal and structural relationships (Fiorella & Mayer, 2015). For example, an instructor may ask students, who are reading a lesson on how the fat-burning process becomes the main source of energy in the metabolic system of a fasting person, to form a mental image according to the text about the structure or process. system.

The theoretical notion for envisioning as a learning strategy is that the act of constructing a mental image based on the text can facilitate the generative process. (Ponce et al., 2020), Such as students selecting which components to include, organizing these components in a layout, and integrating, where students translate words into pictures. In short, students form a mental representation depicting the process or main structure outlined in each section of the text (Leopold et al., 2019).

Although imagining aims at developing generative processes, an important consideration is that students must be highly motivated to persevere in tasks that require invisible activity. In practical application, imagining can be an alternative to drawing as a generative strategy, provided that students obtain proper guidance on what is imagined and have sufficient knowledge to carry out the task (Cooper et al., 2001). Therefore, it can be said that the learning motivation provided by teachers is closely related to student activeness in learning (Mutaqorribain et al., 2022). Figure 6 is an example of the application of learning by imagining a text.



Figurer 6. An example of imagining as a learning strategy

The generative learning model is based on the study of how humans learn. According to this theory, students construct their knowledge actively and not only passively receive lessons (Ariani, 2017). Students actively engage in appropriate cognitive processing during learning, including selecting relevant information in lessons, organizing them into coherent mental representations, and integrating them with active knowledge from long-term memory (Park et al., 2014). According to the principles of multimedia

learning (Clark & Mayer, 2016; Mayer, 2014), generative learning asks students to make connections between verbal and visual representations. It is what happens when students translate verbal lessons into mental images (Fiorella & Mayer, 2015).

2.5 Learning by Teaching

Learning by teaching is an activity that aims to increase the understanding of an individual who previously has learned material by teaching it to others. For example, after reading a moral textbook, a student can improve his understanding of the material by explaining important concepts to other students. Teaching is most effective when students can provide explanations that reflect an understanding (comprehension) of the material rather than simply repeating it (Klingenberg et al., 2020).

Also, Learning by teaching is most effective when students intend to reteach and when the activity involves interaction with other students (e.g. giving feedback and answering questions) (Duran, 2017). The cognitive science and educational research works also support that teaching others is a powerful way of learning (Biswas et al., 2005).

Learning by teaching can also be applied to learning activities through text, multimedia (Clark & Mayer, 2016), and interaction with computer-based pedagogical agents (Ponce et al., 2013) to help students understand scientific concepts. It is also a fundamental component of classroom activities, such as peer tutoring, small group discussions, and cooperative learning (Kagan & Kagan, 2009). Although the availability of empirical research is limited, learning by teaching is a promising learning strategy for improving an in-depth understanding (Fiorella & Mayer, 2015). Figure 7 is an example of learning by teaching as a learning strategy.

Buying and selling transactions are activities that we often do in daily life, as evidence that humans are social beings who need each other. Of course, humans cannot fulfill their needs without getting help from others, both mu'awadoh (commercial) assistance such as buying and selling and others as well as snacks (non-commercial).
In general, buying and selling are divided into three: first, buying and selling goods that are known between the seller and the buyer. The law is allowed. Second, buying and selling are still under the seller's responsibility, and only the characteristics of the goods are mentioned. This contract is permitted by sharia if it is under the properties of the goods mentioned at the time of the contract. This transaction is called a salam contract (order). Third, buying and selling goods that do not exist or neither the seller nor the buyer can witness. The law of this kind of transaction is not allowed.
In the study of fiqh, selling activities are known as bai', while buying is known as syara'. Therefore, the seller is called bai', and the buyer is called musytari. After the sale and purchase transaction, the bai' and musytari have the opportunity to continue or cancel the contract with several conditions. It is known as

Figure 7. An example of learning by teaching as a learning strategy

According to the cognitive theory of multimedia learning (Mayer & Estrella, 2014; Sung & Mayer, 2012), teaching prepares cognitive processes ranging from selecting, organizing, and integrating. In the process of selecting, one picks only the most relevant information from a student to explain to others. In the organizing process, a person reassembles the selected information into an explanation easily understood by others. In the integrating process, a person understands the material to be studied by relating it with

relevant prior knowledge. Thus, the cognitive benefits of learning by teaching (Bargh & Schul, 1980) depend on the extent to which students devote their cognitive efforts to actively construct a coherent representation of the material during the learning process (Fiorella & Mayer, 2015).

Conclusion

Learning activities occur in the cognitive aspects of each individual. Instructors must have a clear and solid theoretical foundation during learning activities. Generative learning theory places its theoretical thinking on the cognitive psychology of human learning. Learning strategies based on generative learning theory prepare students' cognitive processes through three stages, namely selecting, organizing, and integrating activities. Based on the study results, several learning strategies based on generative learning theory have included learning by summarizing, learning by mapping, learning by drawing, learning by imagining, and learning by teaching. Future researchers can then use these study results as a basis for finding other learning strategies based on the principles of generative learning theory.

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