Developing Self-Learning Competence for Students Based on Learning Theories Combined With the Support of AI Chatbot in Teaching

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ABSTRACT: To ensure the educational goals of the 21st century, creating a "learning society" and "lifelong learning," the development of self-learning competence in the teaching process is crucial. Constructivism and Metacognition theories have shown that teachers need to create a learning environment that helps learners build and create knowledge for themselves based on thinking, exploration, and practice. This approach aids in the development of students' self-learning competence. AI Chatbot serves as an effective tool in building a virtual assistant, a virtual practice medium that allows students to interact, inquire, and experience 24/7 from anywhere. With AI Chatbot, students will receive support according to their needs, desires, and self-awareness levels. Moreover, AI Chatbot provides a suitable environment for developing self-learning competence for students.

KEYWORDS: AI Chatbot, artificial intelligence, learning theories, self-learning competence, teaching methods.

INTRODUCTION

Developing self-learning competence for students is one of the key objectives in the teaching process because these competence strongly influence students' learning outcomes. An experiential learning environment helps students develop self-learning competence during their educational journey.

In teaching, AI enables the creation of customized lessons based on students' existing knowledge and suggests learning content suitable for their cognitive load. AI can help connect concepts and knowledge logically and systematically, enhancing students' learning efficiency. AI can also create virtual practice tools, allowing students to experiment without the need for physical materials and equipment. This not only reduces training costs but also provides reusable learning resources for students, who can access them anytime, anywhere. AI has successfully harmonized the advantages of human factors and machines, creating a virtual assistant tailored to individual students' learning styles and paces, resembling a real tutor. AI also allows simultaneous support for multiple students, saving time and reducing costs compared to traditional one-on-one tutoring. Additionally, integrating AI into teaching creates an experiential learning environment that aids in developing students' competence [Stuart Russell, Peter Norvig (2016)], [Baker, T., & Smith, L. (2019)].

Teaching practice has shown that personalized support is essential, especially in classes where students have different abilities and interests. Even the most expensive schools worldwide cannot provide this type of education. That's why Chatbots are considered the most reasonable alternative solution for personalized learning [Branislav Srdanovic (2017)]. AI Chatbots are becoming invaluable learning tools, providing personalized learning experiences while effectively developing students' self-learning competence during their educational journey.

1. Theoretical Foundations for Developing Self-Learning Competence

1.1 Competence

In psychology and educational theory, there are various perspectives on competence. According to Hung,D.T (2012) "Competence is an individual attribute that allows a person to successfully perform specific activities and achieve desired results under specific conditions". Denyse Tremblay defines competence as "the ability to act, succeed, and progress based on efficiently mobilizing and using synthesized resources to cope with life situations" [Denyse Tremblay (2002)].

Competence is shaped and developed through education, self-improvement, and each individual's practical experience. Therefore, teachers aim to create an experiential learning environment to allow students to interact and develop both common and individual competencies.

In summary, competence is the synthesis of knowledge, skills, and attitudes acquired through the learning process, along with the existing knowledge and experience of each individual, to responsibly and effectively achieve high results in a specific field.

1.2 Self-Learning

According to Bolhuis (1996) and Garrison (1997), "Self-learning is the integration of self-management with the learner's self-control, a process in which the learner monitors, evaluates, and adjusts their cognitive strategies. The learner is the subject in the close collaboration between the teacher and classmates."

Ky,N (1995) believes that "Self-learning means actively taking the initiative to find solutions through one's actions, expressing oneself, and collaborating with peers, teachers, and everyone else. Self-learning is putting oneself in a learning situation, in the position of a self-researcher, handling situations, solving problems set for oneself to identify problems, collect process old information, build problem-solving solutions, and test solutions".

In general terms, self-learning is the process of becoming aware of learning, enabling individuals to choose, search, and master knowledge, skills, techniques, and human experiences to meet their personal needs, motivations, and desires, aiding in self-improvement. For students learning in schools, self-learning often occurs under the guidance and supervision of teachers.

1.3 Self-Learning Competence

Self-learning capability is a crucial factor determining an individual's success in the learning process. According to V.A. Cruchetxki (1981), "self-learning capability is highly important because self-learning is the key to acquiring knowledge with the contemporary notion of lifelong learning. Only with self-learning competence can one engage in lifelong learning. Self-learning capability includes positive thinking, independence, and creativity". Lap,T.Q (2008) states that "self-learning capability is demonstrated through the learner accurately determining their learning motivation, having the ability to self-manage their learning, maintaining a positive attitude in activities to work independently, adjusting learning activities, and evaluating their learning results, working independently, and collaborating with others".

From these perspectives on self-learning competence, it is evident that self-learning capability is an individual's ability to independently choose, search, and grasp new knowledge effectively to solve learning tasks and apply knowledge and experiences independently or collaboratively with peers or teachers.

With the increasing integration of technology into our lives, many self-learning support tools have been effectively utilized, such as websites, learning apps, and artificial intelligence technology. These tools provide timely, continuous guidance and support, helping learners study more effectively while developing their self-learning competence.

1.4 Teaching Aligned with Developing Self-Learning Competence

Teaching that focuses on developing competence is a current trend in innovating teaching methods at all levels, aiming to produce students with both character and skills to meet the increasing demands of society. There are various viewpoints on teaching aligned with developing competence. According to Cuc,H.T.H (2018), teaching focused on developing competence is a process that transforms learners, enhances cognitive abilities, hones thinking skills, and elevates learning attitudes to a higher level. Thanh, T.H (2019), believes that teaching aligned with the development of learners' competence is the synthesis of coordinating teaching and learning methods to enhance the learner's role in forming and developing a system of competencies based on defined training goals.

In this context, teaching aligned with developing self-learning competence is understood as the teacher's process of designing and organizing lessons to create an environment where students can actively, positively, and independently choose, search, and dominate a system of knowledge, skills, values, and personal experiences to effectively solve learning tasks and emerging problems.

1.5 Theoretical Foundations Guiding the Development of Self-Learning competence

1.5.1 Constructivism

Constructivism can be considered the next developmental step on the foundation of cognitive theory (addressing the nature, structure, process, and activities of cognition) [Bernd Meier, Nguyen Van Cuong (2016)]. According to the Vietnamese dictionary, "Construct" means "to build." Constructivism is a verb that denotes the human activity of influencing one or more objects to create a new object according to one's needs [Nguyen Nhu Y, Nguyen Van Khang, Vu Quang Hao, Phan Xuan Thanh (2013)]. The main concept of constructivism is that knowledge is not just an objective entity existing independently but is created through the subject's self-perception structuring within its internal system. This implies that knowledge has a subjective nature, built based on each individual's experience, thinking, and information reception style. According to constructivism, the learning process is not merely

absorbing information from the external environment; it is an interaction between the learner and the learning content. In this process, the learner interacts, constructs, and generates their own knowledge based on their ability to think, explore, and practice. Thus, knowledge is not only the final result of the learning process but also a product created by each individual [Jonassen, D. (1999)], [OECD (2005)]. According to Brandt: "The theory of constructivism is a teaching theory based on research into the human learning process and believes that each individual builds their own knowledge, not just passively absorbing knowledge from others" [Phan Trong Ngo, Nguyen Duc Huong (2003)]. Serhat Kurt (2021), As an educator, it is important to understand the theory of constructivist learning. Each student that enters your classroom has a unique perspective on life that has been created by their unique experiences. This will impact their learning. If the basis of the constructivist theory states that students construct new knowledge on what they have already had, the entry point of their learning journey is of utmost importance. Learning theories are as valuable as credentials to educators; it is important to understand what will affect the learning journey of your students.
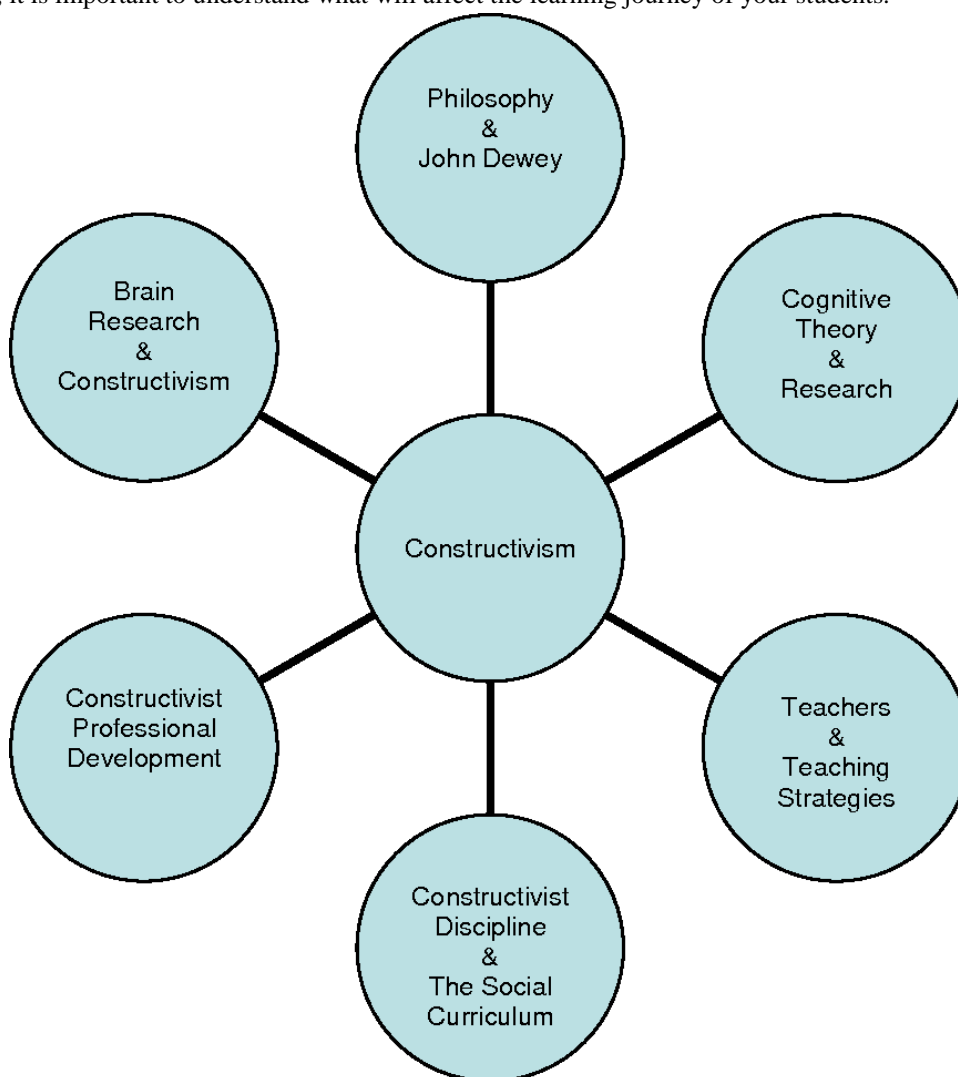

Figure 1. Constructivist Learning Theory (Serhat Kurt, 2021)

Discussing constructivism, some authors argue that learning is a process where learners construct knowledge for themselves through various methods to achieve learning goals. With constructivism, it can be seen that the process of students constructing and creating knowledge based on their ability to think, explore, and practice is favorable for developing competence, especially self-learning competence.

1.5.2 Theory of Metacognition

According to H. Flavell (1976), metacognition is an individual's understanding related to their own cognitive processes, products, and other relevant factors. It involves positive monitoring, adjusting outcomes, and organizing these processes to always aim towards set goals. Metacognition is an individual's understanding of their own cognitive processes and the ability to use this knowledge to regulate their thinking and behavior [McCormick, C. B. (2003)]. Alternatively, according to Wellman, metacognition is a form of cognition, a second-order or higher-order thinking process, related to controlling activities outside the process of cognition. Metacognition can also be understood as thinking about thinking or cognition about cognition for each individual [Wellman H. M. (1985)]. Brown defines metacognition as flexibility in knowledge and self-regulation of one's cognitive processes [Brown A. (1987)].

J. Wilson outlines three basic functions of metacognition: the awareness function, evaluation function, and regulation function [Wilson J. (1998)].

- The awareness function is an individual's ability to understand and use their knowledge to learn and solve problems. It includes self-knowledge, task, and learning strategy awareness, as well as self-awareness of one's cognitive abilities.

- The evaluation function of metacognition helps learners identify strengths and weaknesses in their thinking processes and adjust learning strategies accordingly.

- The regulation function of metacognition is an important skill that helps learners study effectively. By developing assessment, thinking, and self-regulation skills, learners can identify and solve problems in learning, enhance learning efficiency, and achieve learning goals.

Metacognition, with its functions of awareness, evaluation, and regulation, has demonstrated its applicability in teaching. Drawing from the theory of metacognition, teachers can create tools and teaching aids that support students in recognizing learning tasks, identifying their strengths and limitations for self-regulation, and formulating effective learning strategies. The process of students thinking, evaluating, and self-regulating to solve problems in learning not only helps students develop effective learning strategies but also significantly contributes to the development of self-learning competence.

2. Developing Self-Learning competence with the Support of AI Chatbot

2.1 AI Chatbot

AI Chatbot is an intelligent chat system capable of processing human language. AI Chatbot is programmed to interact with users like a real human, understanding context and language from its dictionary [Wailthare, S., Gaikwad, T., Khadse, K., & Dubey, P. (2018)]. It interprets user input and provides meaningful feedback based on pre-loaded knowledge [Kumar, R., & Ali, M. M. (2020)].

The basic technologies for AI Chatbot include machine learning, natural language processing (NLP), and artificial intelligence (AI). AI provides numerous opportunities and allows software to perform tasks similar to humans. Natural language processing forms the foundation for AI-based chatbots. Using complex NLP algorithms, chatbots can process textual input: understand, infer, and determine what has been said or written, and then provide a list of appropriate actions [Pavel Smutny, Petra Schreiberova (2020)].

2.2 AI Chatbot in Education

Crockett (2017) introduced OSCAR, an intelligent conversational tutoring system modeling students' learning styles using natural language while personalizing tutoring for each student. Predicting students' learning styles is done by capturing independent behaviors during the tutoring session. Some authors argue that Chatbot systems are effective tools for measuring and enhancing learning efficiency. Students using Chatbots in learning exhibit better memory retention and academic performance. The quality of students' questions also improves through interactions with Chatbot systems. Authors Esteban Vázquez-Cano, Santiago Mengual-Andrés & Eloy López-Meneses (2021) suggest that educational Chatbots designed and programmed to adapt to different learning and communication situations can create educational pathways based on the results obtained from interacting with Chatbots, providing deeper and more accurate learning.

A common application of AI Chatbots is the creation of intelligent tutoring systems, offering personalized learning environments by analyzing students' feedback and how they experience learning content. AI Chatbots can deliver lessons through a series of messages, images, and videos while supporting students with basic to advanced knowledge. AI Chatbots help provide

instant answers and support to students 24/7 in an intelligent and automated manner. This can aid students in quickly, efficiently, and personally resolving their learning issues. Additionally, Chatbots exhibit infinite patience, impartiality, and don't mind answering the same question from a student multiple times (Giam & Thanh, 2022).

2.3 Application of Learning Theories for Developing Self-Learning Competence with AI Chatbot Support

2.3.1 Application of Constructivism

From the perspective of constructivism applied in this paper, we propose a self-learning support tool, namely AI Chatbot, towards self-discovery learning. The aim is to enhance learners' active and creative roles in approaching and constructing knowledge while simultaneously developing their competence. The constructivist theory examines the human learning process, suggesting that each individual constructs their own knowledge according to their preferred methods or means suitable for their own learning. Through understanding the operation mechanisms and benefits of AI Chatbot in education, we propose the development and utilization of AI Chatbot in education to foster self-learning competence in students:

- Build an AI Chatbot to answer, explain, and provide feedback to students immediately, supporting them 24/7 on various knowledge paths to simplify the learning process and cater to individual learners. Create an interactive, friendly, and flexible learning environment where learners can ask questions, experiment, and explore knowledge freely.

- The learning process with AI Chatbot encourages learners to use learning strategies such as self-assessment, self-regulation, self-reflection, and self-management to enhance their self-learning and independence.

- Use AI Chatbot to assist learners in constructing new knowledge based on the foundation of existing knowledge, connecting new concepts with old ones, and applying knowledge to real-world situations.

2.3.2 Application of Metacognition Theory

With the functions of metacognition, each individual can become aware of their own cognition and thinking processes, recognize tasks, perform those tasks, evaluate and adjust to perform them more effectively. There are two crucial parts in managing information and task execution:

- The first part is determining "what needs to be done?" where we identify main ideas, gather necessary information, create links and images, use memory techniques, organize documents to facilitate memorization, apply testing and outline key ideas. This component refers to the ability and capability to recognize what needs to be done to achieve goals. It combines the internal organization of AI Chatbot to structure the subject matter in a way that learners, when interacting with AI Chatbot, know what to do to learn and explore knowledge, thereby developing their self-learning competence.

- The second part is "how and when to do it?" These are the regulatory mechanisms where students check their understanding, predict outcomes, assess performance, plan for the next steps, test strategies, decide how to allocate time and effort, and review or switch to other strategies to overcome difficulties. AI Chatbot will provide better support in helping learners figure out "how and when" to dominate knowledge. The AI Chatbot will suggest steps and knowledge buttons for learners to rely on to assess their understanding, imagine related concepts for reference, and learn with the AI Chatbot 24/7 anytime and anywhere. AI Chatbot, through machine learning, will remember and understand the learner's behavior and proficiency to suggest suitable knowledge, helping learners be active, autonomous, and experiment during the learning process. This aids learners in knowing how to absorb knowledge and build a specific learning plan with the support of AI Chatbot. Personalizing data in AI Chatbot will help send notifications, advice, reminders, and encouragement for each student easily and immediately. AI Chatbot helps provide instant answers to students' questions in a smart and automated manner. Timely encouragement will boost students' confidence and motivation to learn. This can help students quickly and effectively resolve their learning issues. Unlike humans, Chatbots possess endless patience and do not mind answering the same question from a student multiple times.

3. CONCLUSION

Developing self-learning competence in the teaching process essentially involves teachers creating an experientially rich learning environment that empowers students to be proactive and confident on the path to mastering human knowledge. Learning theories have indicated that if students are supported at the right cognitive level and meet their desires and needs, learning will be more effective. With the support of AI Chatbot, teachers can create a learning environment where students unconditionally receive knowledge and skills support. Applying learning theories in teaching with the support of AI Chatbot not only helps students easily and effectively acquire knowledge but also creates an experientially rich learning environment that fosters the development of self-learning competence in students during the learning process.

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