Components of Authenticity:
CONSTRUCTION OF KNOWLEDGE
K20 IDEALS

The term "construction of knowledge" generally refers to the way people learn by actively connecting new knowledge with existing knowledge to construct deeper understanding[1]. People use their existing knowledge and experiences to make sense of new information rather than passively absorbing it[2]. Constructing new knowledge is also mediated within the social and cultural environments in which learning occurs[3]. Recent studies in cognitive psychology, brain research, and human development have supported these ideas by showing that learning involves complex interactions between learners and their social and physical environments, which result in structural changes to neural networks in the brain[4].

Memory and Learning

Knowledge is stored in networks of neurons commonly referred to as long-term memory. Neural networks in long-term memory are continuously extended and reshaped as new information is received from the environment. The process of connecting new information with existing learning structures in long-term memory is referred to as working memory, and it occurs continually as input from our environment is received and manipulated in the brain[5]. The more that information is manipulated in working memory, the stronger the neural connections become[6]. Each individual's educational background, cultural experiences, and beliefs are unique, so it follows that the meanings each person constructs through their classroom experiences also differ[7]. Such differences underscore the need for teachers to draw each student's prior knowledge to the surface and help them connect it with new concepts to create a deeper understanding as they work toward addressing learning goals and objectives[8].

Constructing knowledge in working memory is an elaborative process that involves manipulating chunks of information—such as facts, concepts, procedures, and events—from long-term memory and connecting them with new information to reconstruct a more complex understanding that reflects the attributes of both prior and new knowledge. As learners generate their new understanding, they extend their knowledge by making logical connections between pieces of information that allow them to use higher-order reasoning to generalize, analyze, or solve problems[9]. This cognitive model for teaching practice implies that students should be provided with multiple opportunities to process information in different ways to strengthen their neural connections[10].

Meaningful Learning

Early studies in cognitive psychology identified two levels of cognitive processing resulting in either shallow or deep processing[11]. Shallow processing involves rote memorization, surface-level comprehension, and/or reinforcement through repetition, which results in short-term retention of information. Deep processing involves the creation of strong links to prior knowledge, use of higher levels of thinking from Bloom's Taxonomy, and/or complex thinking, which results in long-term retention of information. Deep processing has been referred to as meaningful learning (or elaborated learning) and is associated with increased manipulation of information in working memory and longer

retention[12]. Elaborative processing involves active (as opposed to passive) engagement with information in ways that allow learners to use information in working memory to promote lasting neural connections. Classroom strategies that promote active learning provide students with opportunities to activate prior knowledge, share and discuss ideas, organize knowledge, apply new learning, give and receive feedback, or use higher-order thinking to process information[13].

Recent research has shown that, while deep processing has better learning outcomes in general, specific outcomes depend on the complexity and scaffolding of learning activities and the variability in learners' prior knowledge. Shallow and deep processing often occur within the same learning task, which can support or hinder the learner's progress depending on how the task is designed and structured[14]. The implication for classroom instruction is that teachers should provide diverse opportunities for students to engage in scaffolded activities that have been shown to support deeper processing and critical thinking, such as summarizing, drawing, developing explanations from evidence, conducting inquiry, problem-solving, constructing arguments, and metacognitive self-assessment[15]. When students begin a complex learning task, scaffolding may include strategies to reduce the task's complexity and cognitive load, such as graphic organizers or structured prompts. As the use of higher-order reasoning increases in the latter part of the learning process, teachers may use strategies that are less structured, such as guiding questions or purposeful discourse, to help students gain a deeper understanding of critical concepts or ideas, reflect on problem-solving steps, or consider new perspectives[16].

Conclusion

Construction of knowledge occurs when individuals connect new knowledge and concepts with what they already know from prior experience. Brain research shows this is the way people learn. The prior knowledge of each learner is shaped by their educational, social, and cultural experiences, both in and out of school. The teacher's responsibility is to help students make connections that result in meaningful learning by providing multiple opportunities for active learning and the use of higher-order thinking skills.

References

[1] Bransford et al., 2000
[2] Bruner, 1966; Piaget, 1972
[3] Vygotsky, 1978
[4] Liu et al., 2017; National Academies of Sciences, Engineering, and Medicine [NASEM], 2018
[5] Lordanou et al., 2019; Loaiza & Halse, 2019; Ricker et al., 2018
[6] Kenney & Bailey, 2021; Morey & Cowan, 2018
[7] Esteban-Guitart & Moll, 2014; Hammond, 2015
[8] Gutierrez, 2008; NASEM, 2018; Reeve, 2016
[9] NASEM, 2018
[10] Nokes et al., 2007
[11] Bransford et al., 2000; Craik & Lockhart, 1972
[12] Schott et al., 2013
[13] Sperling et al., 2016
[14] Dinsmore & Alexander, 2016
[15] NASEM, 2018
[16] De Backer et al., 2016; Reeve & Shin, 2020; Reiser, 2004

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