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Activatingstudents' Prior Knowledge: The Core Strategies

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Abstract: Researches on effective learning are dominantly based on learning and teaching strategies in the process. However, many of the studies have proved that the students' prior knowledge have vital function on students' new knowledge. This is the way how students construct learnings based on their prior learning. Though it is dealt much in related writings, there is limited information on how to activate and assess prior knowledge of the students. It is really difficult to find such strategies even in reference books. Either one or two of them has been described or just mentioned separately. Thus, it is important to gather these strategies and to describe them. Within this framework, the main purpose of this study is to describe and analyze the importance of prior knowledge as one of the crucial components of effective learning. In this context, the need for assessing prior knowledge has been discussed and then some important activating strategies have been analysed

Key words: Assessment · Activating strategies · Constructivism · Prior knowledge

INTRODUCTION

There are countless factors which can be from cognitive, affective and psychomotor domains to affect learning. In order to carry out learning effectively, it is necessary to determine and realize all these factors. One of the elements is undoubtedly prior knowledge of students. Ausubel [1] made this statement about the prior knowledge: "If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly". Dochy [2] declared that through prior knowledge, it could be explained the variance of learning outcomes about between 30% and 60% [3]. This number is really significant, when it is thought there are numerous factors having impact on learning. From this point of view, it can be said that assessment and activation of prior knowledge of students help create effective leaning environment.

Prior knowledge issue has been considered mostly by constructivist theorists. Thus, a brief background about constructivism can be beneficial to understand prior knowledge deeply. Bruner [4] asserted that constructivism started with Kant's ideas. Kant believed that human being can learn through his/her sensation, which is about how to world appear to us, rather than the exact world itself [5]. He focused on importance of prior knowledge to be able to understand the world or simply to learn. According to constructivists, knowledge is constructed rather than received from an objective world or external reality [5]. Piaget [6] describes learning as occurring as the result of constructing meaning based on individual's experience and prior knowledge. In short, it can be said that prior knowledge is one of the vital necessary components of learning. in this study is it is aimed to point out the importance of prior knowledge and describe activation strategies.

Literature Review

Prior Knowledge as a Concept: After the mentioning importance of prior knowledge, describing prior knowledge helps to understand entirely and to draw the framework of the topic. In the literature, although, there are many studies about prior knowledge, it is hard to find clear definition of prior knowledge in most of them [7]. Also, while in some of the studies, prior knowledge is defined superficially, some of them deal with it much more deeply. For example, Knuth and Jones [8] defined prior knowledge as some life experience, either real or vicarious; previous works read; and experience with language. According to Jonassen and Gabrowski it is defined as the

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knowledge, skills, or ability that students bring to the learning process [1]. On the other hand, a more comprehensive definition is that prior knowledge is dynamic in nature; available before a certain learning task; structured; can exist in multiple states [i.e. procedural or declarative]; both explicit and tacit in nature; contains conceptual and metacognitive knowledge components [9].

Moreover, prior knowledge can be distinguished into two different knowledge types as declarative and procedural knowledge. Declarative knowledge is mostly related to "knowing about" that a person having this knowledge remember many facts and details, but without wholly integration. Thus, declarative knowledge can be thought as surface knowledge. On the other hand, procedural knowledge is a kind of higher level of knowledge that includes integration of knowledge, understanding the relationships between concepts and problem solving skills by this knowledge. Therefore, procedural knowledge is mostly related to "knowing how" [10]. Also, in the literature, it has been found that procedural knowledge is much higher predictor than declarative knowledge on students' achievements [11].

Furthermore, there is a tendency to believe that having prior knowledge in an area always affects new learning positively about this area. In numerous studies, prior knowledge has been taken in hand as correct knowledge [12]. However, it is possible to have not only correct and complete pre-knowledge, but also not well-structured knowledge and misconceptions [13]. Lipson [12] found out in his study that the students having misconceptions about a topic learn this topic much harder than the students having correct pre-knowledge or even no prior knowledge. As a result, it can be supposed that correct prior knowledge helps learning positively and conversely, incorrect prior knowledge is an obstacle to learn [14].

The Necessity of Prior Knowledge Assessment: At this point, it can be beneficial to mention the importance of prior knowledge assessment. In general, assessment is a fruitful tool for instruction and learning [15] that viewing students' progress, grading, evaluating teaching methods, planning for future are attainable results by assessments. In addition, assessment specifically for students' prior knowledge may provide some desirable outcomes. Firstly, it has been said that prior knowledge generally explains between 30% and 60% of the variance in study results and it overthrows all other variables related to learning [13]. Thus, prior knowledge assessment can cater reasonable predictions for students' level of performance. Moreover, it can be obtained some valuable information via assessment of prior knowledge that teachers may design their instructions and supply necessary guidance to the students needed [13]. For instance, inadequate prior knowledge issue can be a problem that teachers expectations about their students' prior knowledge level may be far from the reality without prior knowledge assessment and this hinder seriously the effectiveness of instruction [1]. Also, misconceptions are one of the detrimental factors affected students future learning severely if they are not identified [16]. By assessment of prior knowledge before new topics, inaccuracies would be revealed effectively. Prior knowledge-assessment helped students become aware of their own knowledge based and they understand that fresh learning will become previous learning in future and it is necessary for gaining comprehensive future learning [17]. Furthermore, prior knowledge concern is not only a challenge for students and instructors, but also an essential matter for curriculum design [11]. In Turkey, new curriculum is based on constructivist theory and this theory says that new knowledge is founded on previous knowledge. In order to effectively process information, learner's previous learning related to new content need to be activated [18]. If this activation is not guaranteed, rote-memorization or surface learning can be occurred [11]. Thus, students' prior learning should be assessed to design curriculum successfully.

Prior Knowledge Activation Strategies: In order to activate prior knowledge, there are several ways offered in researches, theses and papers. These strategies have some advantages and disadvantages with respect to each other. In following part, these methods are described and analyzed.

Reflection and Recording Strategy: One of the simplest ways to activate prior knowledge of students can be reflection or recording strategy. If teachers want to know what their students have already known, they can just ask them "what do you know". They asked the answers orally or in written format. This strategy is quite simple and effective way to activate prior knowledge. There have been a number of studies to prove its efficiency about activation of prior knowledge [19, 20].

Brain Storming: Brain storming simply is that the teacher begins by introducing a problem or a new topic and then, the students tell all the possible answers, ideas and words. Also, the teacher can write the students' sayings

on the board. By doing that, students can see all answers and they can simply make connections between ideas [21]. Also, because in brain storming, students are free to say anything which is true or wrong about a topic, it provides teachers with observing the misconceptions related to topic in some degree [22]. Another advantage can be related time-management issue that it does not take huge time compared to formal techniques such as standardized test. However, to assess the students' prior knowledge one by one is really hard at this strategy.

Small Group Discussion: Small group discussion can be another way to activate students' prior knowledge [23]. In this strategy, teachers give a problem, a situation or a topic to their students to discuss in small groups. After discussion, groups share their ideas and findings with whole class. By doing that, teachers can observe students' prior knowledge related to the topic. An experimental study by Schmidt and his colleagues [24] was found that using small group discussion is a productive way to bridge the gap between prior knowledge and new knowledge. Also, another study stated that small group discussion affected long term memory positively [25]. From this point of view, it can be inferred that by small group discussions, permanent prior knowledge can be obtained for future learning.

K-W-L Strategy: K-W-L technique developed by Ogle [26] is a strategy that it aims to unite prior learning and new learning together. At this strategy, with the beginning of the lesson, a prepared sheet separated into three columns is given to each student. Then, in before learning phase, students are asked to write what is known about the topic and this part forms the K [*Known*] of K-W-L method. At second phase, students write their questions about what they want to learn related to the topic in second column W [*Wanted*]. Lastly, after learning the new topic, students fill the third column L [*Learned*] which is about what is learned [27]. Through K-W-L strategy, students can view their own learning process, improve comprehension and summarizing abilities, increase their motivation and focus on attention to the lesson [26, 28]. It can be used as an assessment tool for teachers. Also, K-W-L strategy can be developed by adding new columns to obtain more detailed activation method. For example, How I find out? or What I still need to find out? questions could be added the columns [29].

Concept Map: Concept map developed by Novak [30] is simply making connections in concepts via a linking verb which tells the relations between two concepts. It is defined as "a schematic device for representing a set of concept meanings embedded in a framework of propositions" [31] It is a multifunctional tool that can be used in summarizing the topic, introducing the topic, assessment as well as prior knowledge activation tool. Concept maps may show students' misconceptions about a topic [32,33] and help both teacher and students connect prior knowledge in a visual format [34].

CONTACT-2 [Computer -*Assisted Activation]: Overall the strategies above are carried out by face to face discussions or paper and pencil. However, CONTACT-2 which was developed by Biemans and Simons[22] is a computer-assisted approach. It provides students with searching for preconceptions, comparing and contrasting these preconceptions with new information and formulating, applying and evaluating new conceptions [35].

PKTandD [Prior Knowledge Test and Diagnosis] Model: PKTandD is another computer-based method developed by Lin, Lin and Huang, [36]. It was designed to diagnose and strengthen prior knowledge of students before new topics. In this system, there is an item bank related to topics and the instructor selects some related items from item bank before new topic as pre-tests. Students take the test on computer through Internet connection and they have user profile to see their information and scores. The study found that PKTandD is an effective way to increase students' motivation and to diagnose and strengthen their prior knowledge [36].

CONCLUSION

To diagnose and activate the students' prior knowledge facilitates students' learning and provides instructors several advantages in many areas such as planning and designing lessons, revealing some obstacles for learning such as misconceptions, assessing students' readiness to new topics. Also, some of effective strategies to activate prior knowledge are discussed in this study. While some strategies are performed via paper and pencil or just oral discussing, some of them are performed by computer and Internet connection. In addition, some of

them take much more time both in preparing and performing with respect to others. On the other hand, some of them provide with assessing students' prior knowledge one by one. Selecting most appropriate strategy to activate prior knowledge depends on some conditions such as time, technological sufficiency of school, grade level of students, course type and student characteristics etc. Thus, when deciding on which strategy to use these conditions should be taken into account. As a suggestion, further studies can handle in order to evaluate these strategies according to the mentioned conditions.

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