

The Use of Stem in the Educational Process

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To cite this article:

Antonios Plageras. The Use of Stem in the Educational Process. *Education Journal*. Vol. 8, No. 6, 2019, pp. 244-248.

doi: 10.11648/j.edu.20190806.12

Received: July 12, 2019; **Accepted:** August 13, 2019; **Published:** September 19, 2019

Abstract: The quality of the teaching provided is a matter of most importance for any educational system, as well as a goal of any educational policy. According to empirical data, it has been observed that teachers who are satisfied with their profession can successfully support the goals of the education system by responding with greater productivity, quality and consistency to their teaching work. The purpose of the present study is to investigate: a) improving students' understanding of applied sciences; b) whether there is a difference in gender understanding. It was carried out using empirical method and bibliographical references related to the particular research area. The sample of pupils used to observe the changes in understanding concerned a Technical School in the field of Electrical Engineering in the Magnesia region. Its results show that students who approached the Ohm's law module with the STEM method, compared to students who attended the same module with the traditional method, understood the subject better. Students at the end of the intervention participated in a joint written test by the classroom teacher. Upon completion of the intervention, it was also found that the students who attended the course using the STEM method as a whole were very satisfied with the approach. Localized knowledge rejects knowledge patterns based mainly on computational processes and structures consisting of symbol systems that are abstract and arbitrarily mapped to the world. The perspective of cognitive knowledge holds that cognitive behavior is integrated and expanding. An integrated approach to knowledge is valuable when combining both theory and practice. Extended knowledge theories go further, arguing that in some cases the social and physical environment, together with the individuals in it, form the cognitive system together.

Keywords: STEM, Interdiction, Learning Science, Learning Environments

1. Import

George Herbert Mead, a realist who worked in the first half of the 20th century, has argued that the interaction of the organization with reality is thought and that communication and language begin as specific and simple gestures and gradually become more abstract, and by Piaget's theory. These approaches remain influential in LS, especially among researchers using qualitative and ethnographic methods to study video cassettes of physical learning encounters [1].

Fundamental principles that have emerged from several decades of elementary learning research have been summarized in several review articles [2]. These reviews converge on a small number of general principles to facilitate learning and the importance of repetition and practice and the management of requirements on cognitive and practical resources. Participating the student in the active structure of meaning and knowledge and the benefits of metacognitive

awareness. This body of research suggests design guidelines for how to develop effective learning environments. Strategically, regulated repetition and learning practice benefit from strategically repetitive practices, especially when accompanied by reliable and timely feedback.

Collaboration can reveal gaps in knowledge and misunderstandings that can be repaired. The argument invites the speakers to reflect on their logic processes, which can promote conceptual change [3]. But with collaboration and argumentation, students are naturally not aware of how to engage in authentic practices. Care should be taken to structure the learning environment and activities in ways that are accessible and follow developmental development. Appropriate pedagogical practices are necessary to encourage and support the development of students, and then, as skillfully, to enhance their autonomy. Technology tools can be designed to show phenomena (eg weather data) that are accessible and accessible and not impressive for learners [4]. Utilizing the distributed nature of knowledge in these socio-

technical learning environments helps individuals manage the potentially high cognitive load [5].

The learning sciences are an interdisciplinary field that emerged from an intersection of multiple disciplines that focus on the design of a learning environment. Consequently, the learning sciences combine research and practice and consider the two approaches as collaborative. For example, observing what happens when a new learning environment is applied often leads to new fundamental perceptions about learning mechanisms and new design principles. The theoretical foundations of LS include a wide range of social and scientific theories. Some of these theories, such as knowledge and construction, focus on learning at the individual level. These theories are generally linked to the methodologies of elementary research.

2. Learning

In order to be able to create the schools of the future, new educational methods, innovation and technology must be based on the learning sciences. The learning sciences show us how to design environments that teach the deep knowledge and adaptive know-how needed in an era of innovation. The societies that can effectively restructure their schools in the learning sciences will be leaders in the 21st century [6]. The issues faced by the learning sciences have been recognized as crucial in 28 of the countries studied by ISTE [7]. The leaders of these countries agree that the global economy has changed into an economy based on innovation and knowledge and that education also needs to be changed to enable each society to make a successful transition. The key issue facing researchers in the learning sciences over the next 10 to 20 years will be to outline an ever more specific vision of the future of learning. In this conclusion, I mainly support my research and start by presenting possible visions of the schools of the future.

3. Activity Learning

Many learning scientists are conducting research at these levels of analysis and this is part of what distinguishes the field from experimental cognitive psychology, where the usual field of analysis is the individual. The focus of research on learning sciences is often related to how people learn by engaging in activities such as solving a problem or building and designing a model. An activity system can be as large as a classroom with a teacher, or as small as a person interacting with a text or a computer program. Research on activity systems focuses on the ways in which individual components interact and interacts, and also focuses on larger frame systems that provide resources and constraints for these actions and interactions [8].

Schools are organizations with distinct practices for students to learn, in a way that teachers appreciate, to adapt to practices related to school systems of activity, including participation in classes, study groups and at home work. The teacher in the first phase usually asks a question. Then he

invites a student, in the second phase, to give an answer. Finally, the teacher, in the third phase, evaluates the student's response, and sometimes adds feedback or providing clarifications or edits [9]. Discussion analysts have intensively studied the rotation patterns they are taking in short episodes [10]. The study, mentioned above, analyzes the focus on couples, where two phases complete a functional conversation session [9].

Scientists are actively working with teachers to develop teaching practices in which students are actively involved. Examples have been presented by the study [10], which refers to exploratory speech. There are many examples of research in exploratory speech [10]. Some researchers have cited the academic productive debate [12, 13]. For example, the interaction of fifth grade students and their teachers with classroom activities developed under the project Promoting Communities of Learners [4] has been studied, reporting on some endangered species [14]. The analysis focused on the appearance of extensive discussion among students about how to classify orcas (often called "killer whales"), such as whales or dolphins. It has also been thought that students would be more involved and motivated to learn science if they had come into force and accountability [14]. As a result, they tried to promote a new speech practice that encouraged the reflection of substantive issues in science and which provided resources that supported the reception, and the supportive positions of the students on these essential issues.

Vygotsky's social theory of cognitive development is recognized as one of the most innovative psychological theories of the 20th century. This theory is based on the assumption that culture plays an important role in cognitive development. Each period in a child's development is associated with a dominant activity that is dominant in the given time period. Emphasis is placed on emerging cognitive functions that are perceived through the concept of the area of impending development. Teaching and learning are perceived as drivers of a child's cognitive development and not as a consequence [16]. Based on this theory, there are three basic elements of a system of activities, one is an issue (which can be a person but can also be a group of people), an object (the subject is working) and the resources it uses an individual trying to transform the object according to a goal [15]. This framework assumes that an activity system is intended to transform the object to the desired result. For example, learning systems in learning environments aim to lead learners to the desired learning outcome.

Refers to this interaction pattern as an extended framework and then conducted another empirical study and found that when a teacher used an extended framework, students were able to transfer their learning to new contexts more successfully than students in conditions [17]. Many researchers propose educational activities to include extensive changes to the subject of activity [18, 19]. In other words, the content of the knowledge to be learned, the student, is not presented as a series of static events that have to be memorized but transformed into a different category - an active commitment to building materials and knowledge.

Student activity could be presented as a construction text only to meet the requirements of a job. The teacher characterizes student contributions as important for the wider audience and for large-scale events. And this has led to deeper conceptual learning and greater transfer.

Researchers have suggested that a conceptual field, such as mathematics, could be considered a natural environment for metaphors [20, 21]. It has been studied that the knowledge and understanding of mathematics is commensurate with the knowledge of cooking and the understanding of the properties of the ingredients that can be used to contribute to the taste and texture of a dish which it decides to prepare, the knowledge of the processes performed according to during its preparation [22]. The philosophical theory of integration proposes that knowledge be transferred to the learner through a channel that "pushes" into the real world [22].

4. The Necessity of the Stem Method

The need for an interdisciplinary approach to Mathematics, Science and Technology, although obvious to many scientists in these disciplines, has become more imperative at the beginning of this century. In the 1990s, the National Science Foundation [23] has acted this approach with the acronym "SMET" (science, mathematics, engineering, and technology) to replace it a few years later with today's "STEM" engineering, and mathematics [24]. Many use the components of this acronym as a definition of STEM interdisciplinary education. In other words, they identify the STEM with the individual objects that make up it [25]. STEM education should be defined as an integrated approach to the curriculum and teaching. It is an approach that removes the boundary between particular objects and treats them as a "whole", under the premise that modern problems are complex and multidimensional to be tackled by a single science [26]. The unified understanding of the STEM components is vital for a nation's economic competitiveness and the ability of young people to succeed in the 21st century. Because what is missing from education today is "An interdisciplinary approach to learning where strict academic concepts are presented in conjunction with real problems. An approach that students apply science, technology, engineering and mathematics in contexts that highlight links between school, community, work, and global business..." [27].

STEM training is a learning environment where students explore, invent, and discover using real problems and situations [28]. It encourages innovation by combining science areas, helping students to make new connections between disciplines and sometimes helping to create entirely new disciplines. It promotes a learning environment so that students acquire not only skills of the 21st century but also have the opportunity to create new skills.

Some of the key outcomes of STEM training are highlighted. Those who complete STEM training will be: Successful problem-solvers, able to identify questions and problems, design research for data collection and

organization, draw conclusions and then apply the findings to new situations [29].

Innovative: They use creatively the concepts and principles of Science of Mathematics and Technology by applying them to mechanical design.

Self-sufficient: they are able to take initiatives and put in-house incentives to define an action agenda within defined timeframes.

Logical thinkers: They are able to apply reasonable thinking processes of Science, Mathematics, and Technology Design for Innovation and Invention.

Technological literacy is students who are able to understand and explain the nature of technology, develop the skills required, and apply the technology appropriately.

5. Methodology

5.1. Known Object

Electrical Engineering (DC and AC)-Laboratory Part, Physics (Electricity chapter).

5.1.1. Class to Which It Is Addressed

The following is an excerpt from the material and the corresponding instructions for the teaching of the Electro technical (Laboratory) course in the Department of Electrical, Electronics and Automation of the Second Class of Technical School.

5.1.2. Duration of Script Implementation

3rd teaching hours.

5.2. Application Framework

After completing the script, students will be able to:

- (1) They report that in a single circuit with a given resistance value, as the supply voltage in a circuit increases, the current in the circuit increases.
- (2) Recognize that in a single circuit with a resistor, the higher the value of this resistance, the lower the current in the circuit, keeping the voltage constant.
- (3) Indicate the correct way of connecting the voltmeter and the ammeter to measure the resistance of a single circuit.
- (4) Calculate one of the U, I, R if they know two of them.
- (5) Use the virtual environment for modeling, simulation and graphical representation of electrical circuits.

5.3. Script Documentation

5.3.1. Existing Knowledge

For this scenario to occur students must have already been taught the law of Ohm in the theoretical part of the lesson and the three basic electrical quantities (of electrical resistance, electric current and voltage) associated with Ohm's law. They should also know how to connect the resistors and the electrical quantities that measure the ammeter and voltmeter respectively. Also be familiar with solving very simple circuits consisting of a resistor and a source.

5.3.2. Cognitive Misconceptions About Unity

It has been reported that students have their own ideas of

how electrical circuits work and ask questions that often focus on circuit operating mechanisms [30]. The approach of Ohm's law to the use of ICT allows students to experiment without risk for the student. Ohm's law relates to three basic sizes, and the most common misconceptions of students in relation to them and to simple electrical circuits are:

There are four basic misconceptions that usually make it difficult for students to describe the flow of a current in a simple circuit [31]:

1st: Students have trouble understanding that there is no current on the return path and that only one conductor at the source supplies current to the circuit. So in the laboratory lesson, they only connect one terminal to the circuit, believing that the other is not necessary.

2nd: Students believe that the current goes to the lamp or the resistor at both ends of the source.

3rd: Students consider that the current circulating in the circuit starts from one pole of the source and part is lost in the resistor and returns back to the source less current.

4th: Students believe that power is distributed equally to all consumers in the circuit. Students have difficulty understanding that there are two different variables, voltage and current, those are needed to interpret a simple circuit. In many work on DC circuits, students use a concept called electricity or energy and have the properties of movement, storage and consumption [32].

6. Conclusions

Several scholars have suggested that the building perspective [33] may explain learning in PBL. The interaction of social and intellectual activity that supported the creation of collaborative knowledge has been documented, as PBL teams have been working together to support the collective improvement of ideas. This is in line with the prospect that knowledge begins in the outside world (eg, team building knowledge) and is later internalized by the individual [34].

In conclusion, the acquisition of problem-solving skills is very important in engineering education, but the PBL approach is inadequate and should be complemented with problem-solving activities on a shorter time scale. For smaller problems, teamwork with guided and teacher-led discussions is more appropriate. PBL is possible as a partial strategy, in particular to illustrate the implementation framework in the initial stages of a curriculum. For learning to solve major engineering problems, the project appears to be more appropriate because the time scale and range of project activities work more closely with reality. It is therefore believed that the integration of STEM and / or STEAM into education can enhance the quality of the provided knowledge by teachers. It can increase student comprehension and improve learning outcomes. It is a modern way to harmonize the offered knowledge with the needs - the requirements of everyday life, so that students can understand the value of the knowledge provided and harmonize it with the requirements of everyday life.

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