Software Development
Integrating Methodology with Epistemology Promoting Knowledge Production

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ABSTRACT
Currently, many specialties should be mastered to produce software, consequently they fall in different levels of knowledge: project, system, program, or routine. This consideration was obtained through an epistemological approach in software development. Therefore, this article develops this consideration for students learning software production. The epistemological approach compliments the methodologies used during software generation. The main focus in this proposal is on applying learning principles, combining both the epistemological approach and methodologies to promote student knowledge production for software development. The implementation of the proposal provides students with a framework that prepares them to face software development problems with different levels of complexity. Evaluation is based on verifying which of the different epistemological categories the student masters.

Keywords: Applying Learning Principles, Epistemological Model, Learning Software Development, Programming Languages Learning, Software Development Problems

1. INTRODUCTION
Technology and computer development during the late twentieth century promoted interest to include them in classrooms as tools to support the teaching-learning process. Many terms to describe this trend have emerged such as learning online, virtual learning, Computer Assisted Learning (CAL), e-Learning, m-Learning, among others. In many cases the teacher can be replaced by computer programs like online tutorials or online content that use computer questionnaires for students to check their progress.

What to teach and how (Cohen, 1977) has been considered by free-thinkers like Plato, Rousseau, Froebel, Dewey and others dating back several centuries. The ideas discussed by those people follow two extremes: on one hand, children and young people must learn what government dictates, or on the other hand, they should be given freedom to learn knowledge

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and skills. Currently both initiatives are used for teaching and learning and it is hard to notice any separation.

In literature there are many papers and online reports on the use of learning platforms (García, 1996). Learning styles (García, n.d.) could be grouped on presence, distance, and blended learning; and have been applied with different success levels. Evaluation (Balaban & Pipan, 2011) considering several variables measures student progress and the learning process (tools, schedule, and contents) to improve online courses. Interest on these new learning styles is concentrated on teaching different subjects (Harley & Harley, 2012; Stal & Paliwoda-Pekosz, 2012; Stando, Gwozdz-Lukawska, & Guncaga, 2012; Almajali, 2012; Williams, 1996).

Regardless of the method, content domain and tools currently in use for learning the most common strategy to promote knowledge is “reward and punishment”. For example, many children attend school to avoid punishment from parents, and at school they pretend attending the class and learning to avoid punishment or lose points for not paying attention. However, the reality is revealed during exams; the students did not learn and failed the exams. The rewards currently are certificates, scholarships, diplomas, degrees or student grade passes, but this does not provides the skills and knowledge that students use for themselves or for society needs. As a consequence of the “reward and punishment” strategy many students decide to abandon schools at different levels.

Technology and developments such as computers, tablets, smartphones, the Internet and Web do not guarantee that the learning processes occur or students get motivated to produce innovative ideas. Despite technology and the introduction of multimedia presentations students are abandoning the learning process.

The inclusion of computers in the teaching-learning process is an appropriate idea that provides a tool to help contribute the transmission of knowledge (Yunus & Salim, 2013), but it is not the only required element needed because we noticed that humans are still often more efficient and they can also detect the progress of student learning and development contributions more accurately than machines.

In Fetaji and Fetaji (2009) it is reported that the uses of the Learning Management Systems (LMS) Moodle and Angel have the following acceptance percentages: Angel (68.59%), Moodle (48.19%). Although, these values vary depending on designs provided by a teacher and also depend on student interest without the presence of the teacher.

As a consequence of teaching problems and lack of interest of the students, some researchers (Andrews, 2011) question whether reviewing learning theories should be considered. Some theories of learning already proposed are:

1. **Behavioral Theory (Attributed to B. F. Skinner):** This theory is based on reinforcing the action of a person that corresponds to what is expected to be learned. For measuring learning it is observed if there is a change in behavior. To promote learning both the stimuli and the environment need to be organized adequately.

2. **Cognitive Theory (Represented by J. Bruner):** In this theory knowledge acquisition involves an internal coding and structuring by the student. Learning is a process of rearranging or transforming the data so that a student acquires and understands. Learning is expected to occur by discovery (serendipity).

3. **Soci –Historical–Cultural Theory (Attributed to L. S. Vygotsky):** This theory considers that the human being is a social being and learning occurs when multiple people interact.

4. **Theory of Observation and Imitation (Attributed to A. Bandura):** This theory shows that there are internal mechanisms of information representation that allow learning by observation and imitation.

5. **Eclectic Theory (Attributed to R. Gagne):** The learning process is organized based on needs and priorities; therefore this theory is aimed for students achieving specific goals.
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