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Can Bloom and Kolb's Ideas Help Us Reproduce Positive Experiences in Using Teaching Practices to Promote the Development of Active Learning in the Classroom?

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Abstract

This paper sought to find out how teaching techniques and procedures can work synergically to promote the development of active learning in the classroom, aiming to contribute to the consolidation of a scientific basis, both in its concrete application and theoretical foundation, by examining the practices of eleven Engineering professors, from three Brazilian Universities located in São Paulo, whose classes were drawing attention from their course coordinators, due to the positive impact on their students' learning, and who agreed to talk about their ideas and actions. The main research question was "Can Bloom and Kolb's Ideas Help Us Reproduce Positive Experiences in Using Teaching Practices to Promote the Development of Active Learning in the Classroom?".

Keywords: Active Learning, Engineering Learning, Engineering Teaching, Teaching Practices.

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1. Introduction

Throughout the world, traditional classes, focused on the professors, and marked by a unidirectional and linear transmission of fragmented content, still constitute the dominant educational strategy, as it was once considered highly effective in synthesizing and communicating information to students, who were expected to, nearly unconsciously, memorize and reproduce knowledge.

However, in face of the global transformation brought forth by the astounding development of technology, mere recollection of solved problems and direct transfer of previously implemented procedures and solutions are not enough for today's world, as all sectors of human activity are requiring innovation, and a conscious and creative adaptation of old knowledge to new contexts.

Therefore, teachers must, quickly, re-examine their relationship with knowledge, and help their students to effectively adapt underlying theories to their individual cognitive structures, through contextualized questions, carefully designed to stimulate their critical and committed participation in finding explanations and solutions to authentic situations of the real world.

In this way, teaching practices – i.e. the techniques (the activities devise by the professors) and procedures (the ordered sequence of such activities) used for classroom instruction – must lead to active learning – i.e. students' interaction with the theme under study by means of meaningful learning activities which allow them to think about what they are doing, while relating it with what they already know, raising hypotheses, sharing and implementing them.

This paper sought to find out how teaching techniques and procedures can work synergically to promote the development of active learning in the classroom, aiming to contribute to the consolidation of a scientific basis, both in its concrete application and theoretical foundation.

2. Methods

This study examined the practices of eleven Engineering professors, from three Brazilian Universities located in São Paulo, whose classes were drawing attention from their course coordinators due to the positive impact on their students' learning, and who agreed to talk about their ideas and actions.

The main research question was "Can Bloom and Kolb's Ideas Help Us Reproduce Positive Experiences in Using Teaching Practices to Promote the Development of Active Learning in the Classroom?"

To this end, three intermediate objectives were established:

- Objective 1 – to identify the common teaching activities employed by the professors;
- Objective 2 – to identify how these common teaching activities were used by the professors;and
- Objective 3 – to devise a theoretical framework for such practices, using Bloom and Kolb's ideas.

From 1 August 2017 to 29 September 29 2017, the professors were individually interviewed, freely answering questions from a protocol (see the Frame 1), which helped researchers to probe participants for details concerning their actions, thoughts, feelings, and opinions concerning their teaching practices.

How would you describe your typical class?
If I walked into your classeroom during an outstanding lesson, what would I see and hear?
If you overheard some colleagues talking about your classes, what would they say?
What do you bring to your classes that makes it unique?
What is your teaching phillosophy?
How do you handle student motivation in your classes?
In what ways do you encourage creativity in your classroom?
What is one good thing you remember a teacher doing for you?
What is one negative thing you remember a teacher doing that didin't help you?
How would you describe a successful teacher?
Who are some of you favorite education authors?
What's one educational trend that would likely influence your teaching?
What methods of teaching do you emphasize?
How do you account for different modes of learning into you lesson design?
Who is one education author you disagree with?
What is the most frustating about student teaching?
What are the most satisfying moments throughout your student teaching?

Frame 1. Interviews protocol.

From 2 October 2017 to 22 November 2017, data collected were analyzed using McCracken's[1] Five-Step Method (1988), which provides a systematic procedure for analyzing qualitative data in long interviews, as shown in the Figure 1.

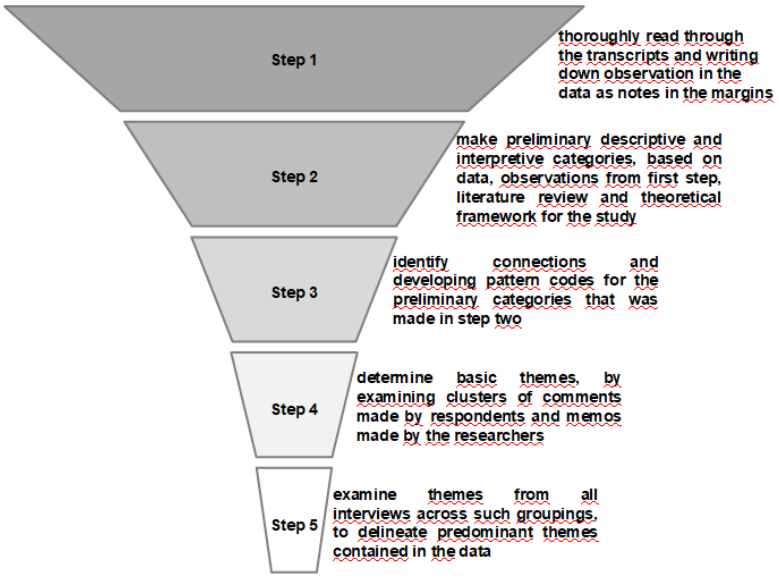

Figure 1. McCracken's Five-Step Method[1].

From 27 November 2017 to 22 December 2017, the researchers studied the categorized data in the light of Bloom's Taxonomy[2] and Kolb's Learning Cycle[3].

Bloom's Taxonomy[2] was inspiring, as it offers a classification for the different learning objectives educators can set, encompassing a more holistic form of education, which allows learners to acquire specific competences from lower (factual) to higher (conceptual) abilities.

The cognitive domain shown in the Figure 2 is a model that classifies thinking according to six levels of complexity, depicted as a ladder, whose lowest three levels are knowledge, comprehension, and application, and whose highest levels are analysis, synthesis, and evaluation.

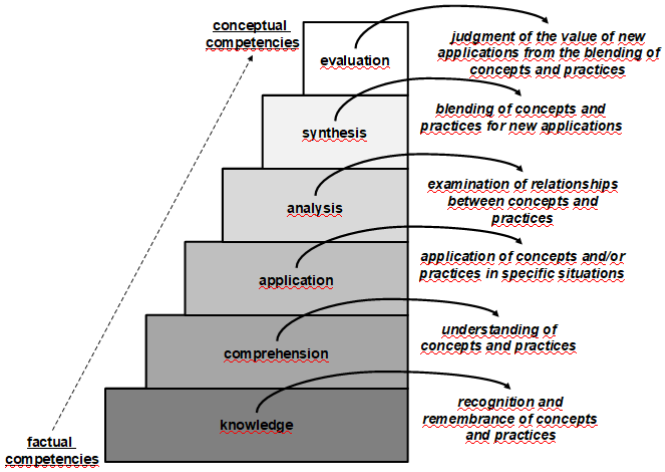

Figure 2. Bloom's Taxonomy[2].

Kolb's Learning Cycle[3] was influential, as it elaborates on the idea that learning involves the acquisition of abstract concepts in a process whereby knowledge is created through the transformation of experience, in a four stage learning sequence as shown in the Figure 3.

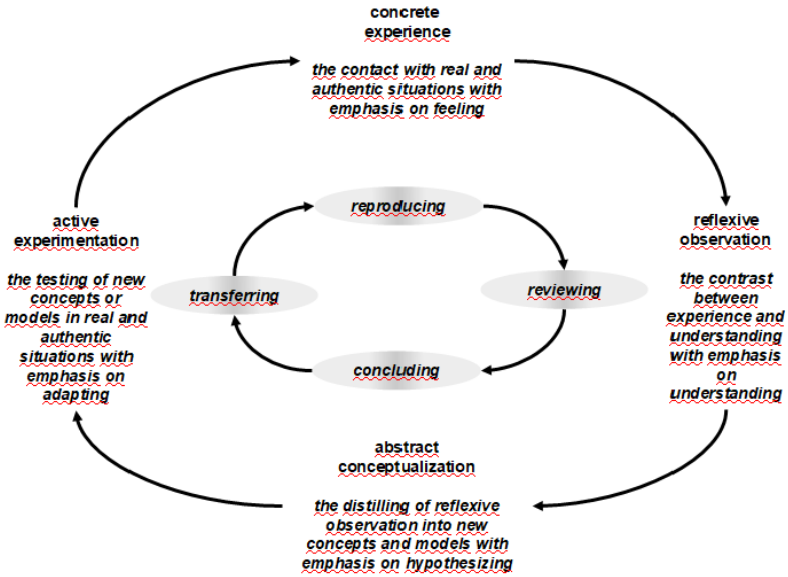

Figure 3. Kolb's Learning Cycle[3].

The reproducing, reviewing, concluding, and transferring learning cycle, respectively, comprises the phases of concrete experience (the contact with real and authentic situations with emphasis on feeling); reflexive observation (the contrast between experience and understanding with emphasis on understanding); abstract conceptualization (the distilling of reflexive observation into new concepts and models with emphasis on hypothesizing; and active experimentation (the testing of new concepts or models in real and authentic situations with emphasis on adapting).

3. Results Instructions

The identification the common teaching activities devised by the professors in their classes is shown in the Figure 4.

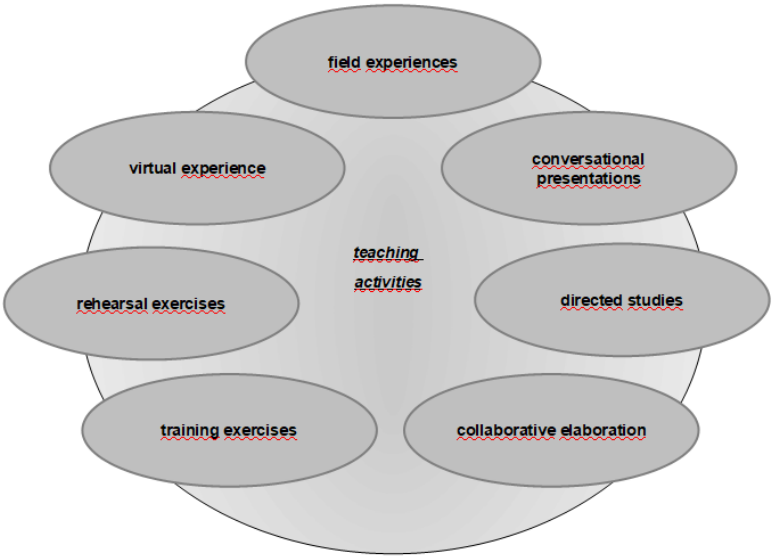

Figure 4. Common teaching activities devised by the professors in their classes.

Basically, these activities can be summarized as follows:

- conversational presentations: professors make use of a two-way communication with students to introduce concepts and practices in an integrated way;
- directed studies: professors provide guidance to students in reading and interpreting short texts addressing concepts or practice;
- collaborative elaborations: professors provide students with the opportunity to use their prior knowledge in group thinking to help them get insights on a specific problem or situation;
- training exercises: professors provide students with the opportunity to make a focused use of single concepts or practices;
- rehearsal exercises: professors provide students with the opportunity to make a coordinated use of integrated concepts or practices;
- virtual experience: professors provide students with an opportunity to analyze other peoples' decisions who were faced with real world difficulties and chances; and

- field experiences: professors use decision-forcing cases to put students in the role of people who are faced with real world difficulties and chances.

As a common practice, the use of these activities was guided by a "think-do/do-think" rule as shown in the Figure 5.

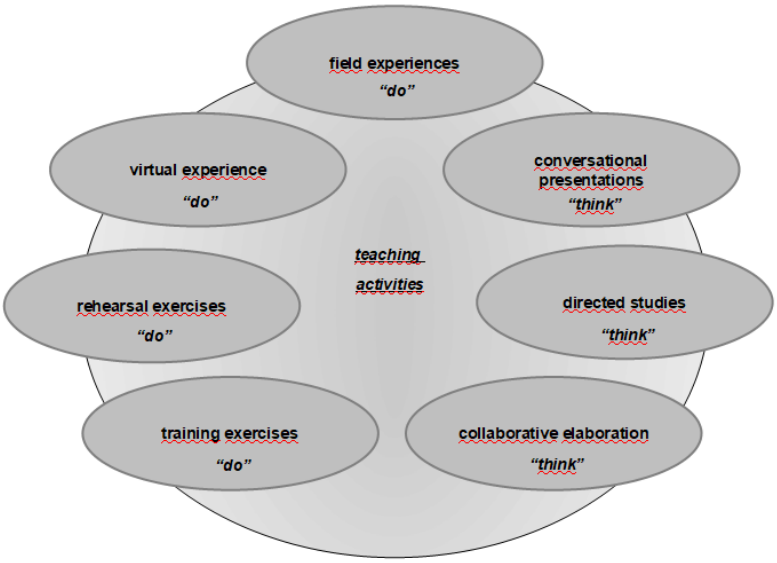

Figure 5. How common teaching activities were used by the professors in their classes.

According to the professors, some activities had a more "think" component (meaning they were basically concerned with grasping – mentally getting hold of – information), while others had a more "do" constituent (meaning they were fundamentally involved in applying – putting into action – ideas, beliefs and methods).

This meant that their use should be subjected to an integrated approach which followed four basic rules in order to create a "know-why" learning environment:

- classes should start with providing students with contextualized information and tools;
- then, students must have the opportunity to "play with this knowledge";
- next, students would need "to get perspective and see it in used a real scenario"; and
- finally, students could "go on test drive, applying it for themselves".

In contextualizing information, an "interchanged tactic" should be adopted, sometimes adopting a deductive approach (conversational presentations, directed studies and collaborative elaboration); other times embracing an and inductive line (collaborative elaboration, directed studies and conversational presentations).

In "letting students play with the knowledge", training exercises should precede rehearsal exercises, especially "to let students feel they master a concept or practice before trying to take on a more complex task".

When this information regarding what teaching activities were employed by the professors and how they did it was analyzed in the light of Bloom's Taxonomy[2] and Kolb's Learning Cycle[3] it looked like they were a case of practical application of these authors' ideas. The Figure 6 shows the theoretical framework for teaching activities used by the professors in their classes.

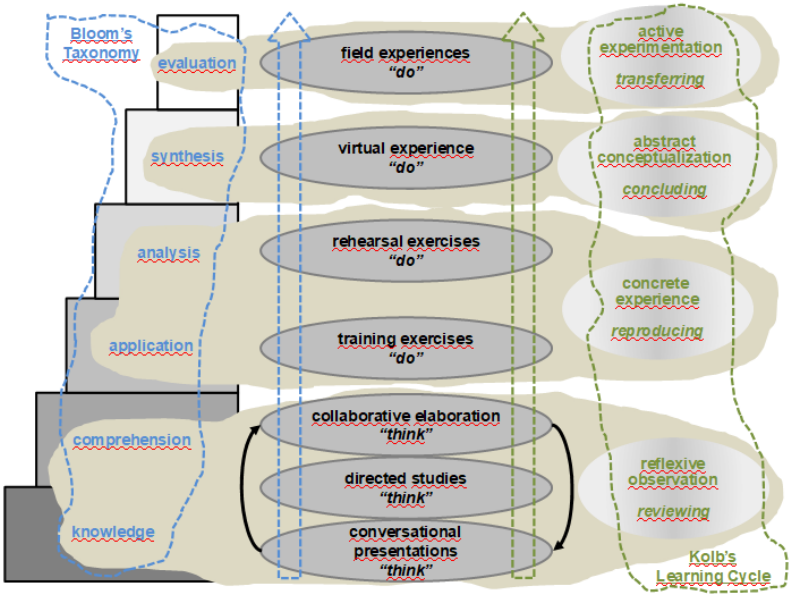

Figure 6. Theoretical framework for teaching activities used by the professors in their classes.

On the one hand, regarding Bloom's Taxonomy[2], the "think teaching activities" (conversational presentations, directed studies and collaborative elaboration) appeared to relate to the knowledge and comprehension abilities, while the "do teaching activities" (training exercises, rehearsal exercises, virtual experience and field experience) seemed to connect to the application, analysis, synthesis and evaluation abilities.

On the other hand, concerning Kolb's Learning Cycle[3], "conversational presentations", "directed studies" and "collaborative elaboration" teaching activities seemed to relate to reviewing (reflexive observation); "training exercises" and "rehearsal exercises" teaching activities appeared to connect to reproducing (concrete experience); "virtual experience" teaching activity seemed to associate with concluding (abstract conceptualization); and "field experience" appeared to bond to transferring (active experimentation).

4. Discussion

The eleven professors invited to take part in this research because of the positive impact of their teaching practices on their students' learning, according to their course coordinators, seemed to have analogous ideas and to adopt similar actions:

- they see themselves as guides, tutors, promoters of discoveries by their students;
- they use topics from their students' everyday life to start and focus meaningful learning;
- they encourage their students to listen and speak, and to read and write;
- they proceed from "more understanding" to "more hands on" activities;
- they foster knowledge sharing and creation among their students;
- they stimulate their students to critically reflect on concepts and activities;
- they strive to help their students build broader and more cohesive competencies/abilities; and
- they see teaching and learning as a gradual cooperative construction of knowledge.

Although none of the professors could provide a theoretical base for their teaching practices, an academic examination using Bloom's Taxonomy[2] and Kolb's Learning Cycle[3] showed that they were implementing these authors' ideas:

- under Bloom's perspective[2], each activity devised by the professors (technique) had specific learning objectives and was related to explicit learning phases;

- according to Bloom's proposal[2], the ordered sequence of such activities (procedures) occurred in such a way as to lead students from factual to conceptual competencies; and

- from Kolb's standpoint[3], that these procedures were organized in a process whereby knowledge is created through the transformation of experience.

5. Conclusions

In these modern times, human action is less associated with memorization and reproduction, and more related to prediction and intervention, which means that education must be perceived as the intentional bond between thought and action by the students. In face of the examined data, it is possible to infer that the theoretical framework presented in this paper constitutes a way for mutual interaction between teachers and students, who are encouraged to listen and speak, to read and write, and to reflect on the concepts discussed and the activities carried out in classes.

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