Kolb's Experiential Learning Model: Enlivening Physics Courses in Primary Education

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Abstract. *Kolb's experiential learning model involves the group as well as the individual, stresses process as well as content, is active rather than passive, and emphasizes participant rather than instructor responsibility for outcomes. Kolb's model presents a way for structuring a session or a whole course using a learning cycle. The different stages of the cycle are associated with distinct learning styles. This paper discusses how Kolb's model can be linked to effective teaching in the primary education physics classroom. Following presentation of the model, an effort is made to apply Kolb's ideas to the phenomenon of evaporation.*

Keywords. Kolb's experiential learning model, primary education, the phenomenon of evaporation.

1. Introduction

The diversity of learning styles which characterizes student populations makes it necessary for teachers to constantly look for variety in the methods they use [1], [14]. The full involvement of students in the learning process could be achieved through active, rather than passive, learning approaches. Active learning, as opposed to passive learning, involves students directly and actively in the learning process. This means that instead of simply receiving information verbally and visually, students are receiving *and* participating *and* doing [11]. Active learning includes everything from listening practices which help students to absorb what they hear to complex group exercises in which students apply course material to "real life" situations or / and to new problems.

Numerous writers in physics education point out that active learning has many positive outcomes: it can enhance motivation, increase inquisitiveness, facilitate retention of material, improve classroom performance, and foster development of critical thinking skills. Furthermore, active learning promotes the personal relevance and applicability of course material to students and often improves overall attitudes toward learning [5], [7], [12], [13], [15].

Kolb's experiential learning model [8] is regarded as one of the best ways for both addressing diversity of learning styles and for engaging students in active learning approaches. Kolb's experiential learning model is used and recommended for use in a variety of disciplines [2], [4], [6], [10], [14]. However, there are teachers who are not aware of [4] or do not use or ignore this method of work [3], [14], and for this reason it is important to find ways of informing them as to how this strategy can be used in educational activities. The goal of this paper is to apply Kolb's model to the teaching and learning of the phenomenon of evaporation in the primary education physics classroom.

2. Kolb's Experiential Learning Model

In Kolb's model, the process of learning is divided into four stages, all of which must be gone through for learning to be most effective. A brief description of these stages follows.

Concrete experience provides the basis for the learning process. Lessons at this stage engage the individual personally and learning relies on open-mindedness and adaptability rather than a systematic approach to the situation or problem.

Reflective observation makes sense of the experience. In this stage, students consider their concrete experiences from a variety of perspectives and articulate why and how they occurred. Learning occurs as a result of patience, objectivity, careful judgment, and observation. Reflection helps students break their experiences into parts and to categorize them for use in the next stage of learning.

Abstract conceptualization assimilates and distills the observations and reflections into a theory or concept. In this stage, students come to understand the general concept of which their concrete experience was one example by assembling their reflections on the key parts of their experience into a general model. Abstract conceptualization requires students to use logic and ideas to understand situations and problems. Students can require considerable help from the instructor to proceed through this stage.

Active experimentation tests the theories and leads into new experiences. In this step, students use the theories they developed during the abstract conceptualization stage to make predictions about the real world and then act on those predictions. Students' actions, of course, are a new concrete experience. The learning cycle begins anew.

The key to planning lessons that take students full cycle is to note that the second word in each of the four stages' names indicates what the learner experiences. The learner begins by having an experience that involves him or her in a situation (experience) and then reflects on the experience from several perspectives (observation). From those reflections, the learner draws concepts or conclusions and formulates them into theories or models (conceptualization) that lead them to experiment or act (experimentation).

Kolb found that learners typically did not use all four learning stages equally, but preferred to concentrate on one or two of them. He identified four learning preferences, each of which shows learners being most comfortable in a different pair of learning stages. Based on responses to a set of questions called the Learning Style Inventory, Kolb described the four learner preference groups as divergers, assimilators, convergers, and accommodators. Understanding the preferences is critical to understanding how students may respond to lessons designed specifically for each stage.

Divergers prefer learning through concrete experience and reflective observation. They may be particularly adept at viewing a situation or problem from many perspectives and developing imaginative solutions. Assimilators favor abstract conceptualization and reflective observation. These individuals are often able to pull together very different observations into an explanation or theoretical model. Convergers learn best through abstract conceptualization and active experimentation. Their strength lies in the practical application of ideas. They tend to organize their thinking to use hypothetical-deductive reasoning to focus on specific problems. The dominant learning preferences of accommodators are concrete experience and active experimentation. Accommodators tend to be risk takers who thrive on action and new experiences.

Teaching techniques that provide opportunities for concrete experiences include experiments, observations, simulations, fieldwork, films, storytelling, jokes, cartoons, newspaper articles, examples, problem sets, taking a survey, or reading texts. Techniques that provide opportunities for reflective observation include logs, journals, discussion, brainstorming, thought questions and rhetorical questions. Listening to lectures, seeking out and critiquing models in texts or articles, building models and construction analogies, generating hypotheses, papers and projects draw upon abstract conceptualization. Doing simulations, case studies, fieldwork, homework, projects, conducting an experiment in the laboratory or in the field require students to engage in active experimentation [2], [4], [6], [8], [9].

3. An Application: The Phenomenon of Evaporation

The proposal which follows simply offers some basic guidelines on the content and techniques which could be used in each stage in order to successfully apply two sequences of Kolb's experiential learning cycle regarding the teaching and learning of the phenomenon of evaporation. The amount of time which will be made available for the completion of this process is a decision which depends on many and various factors such as number of students, length of teaching time, or total available time for the completion of the specific course.

<u>Lesson 1</u>

Stage 1: Concrete Experience

The teacher wipes a damp sponge across the chalkboard. The class should watch and notice the streak slowly disappear.

Stage 2: Reflective Observation

The students answer questions such as: Where does the water on the board go? What happens to puddles after it rains? Where does the water go? Have you ever seen clothes hung out on a line to dry in the sun and wind? Where does the water from the wet clothes go? The teacher writes on the blackboard the answers given by the students.

Stage 3: Abstract Conceptualization

The teacher with a view to showing the basic attributes of the phenomenon comments on students responses, emphasizes and retains significant points raised by them, but, also, if necessary, he / she adds information, which is scientifically important, but was omitted by the participants. The final product is copied on a flipchart for future use. In preparation for the next stage, the teacher provides guidelines as to how the students will find other examples of the phenomenon from sources such as the Internet or their everyday life.

Stage 4: Active Experimentation

The students find their own examples of the phenomenon.

<u>Lesson 2</u>

Stage 5: Concrete Experience

The students present to the class the examples they found.

Stage 6: Reflective Observation

The students point out and discuss similarities and differences among the examples presented.

Stage 7: Abstract Conceptualization

The teacher, following the discussion on the examples presented in the previous stage, makes comments on the strengths and weaknesses of the discussion. However, if important and representative examples were omitted, he / she will have to cover that gap. The information copied on a flipchart at stage 3 is available for reference purposes with all new information being promptly added. Finally, the teacher gives the students guidelines as to how to prepare themselves for the activities to be carried out at stage 8.

Stage 8: Active Experimentation

The students apply what they learned in previous stages through such activities as experiments or role-playing.

As can be seen from the above sequences, opportunities are provided for all four learning stages and that students with each of the learning preferences have the opportunity to use their preferred learning style and develop the other three. At each learning stage, students with the corresponding learning preference will excel. This has the dual benefit of allowing students to serve as role models for each other and of increasing individual students' self-confidence for learning the new skills. Students learn to value their own gifts as well as those of their peers. The Kolb model stimulates students regardless of their learning preference and challenges them to develop and build all the skills necessary for effective thinking and problem solving.

4. Conclusion

Two of the biggest challenges facing the contemporary teacher are to respond effectively to the diversity of learning styles which characterizes student populations and to successfully engage students in active learning approaches. This paper presented the basic characteristics of Kolb's experiential learning model and proposed a method of applying the model to the teaching and learning of the phenomenon of evaporation in the primary education physics classroom. However, beyond the phenomenon of evaporation, the proposal put forward in this paper may prove useful to other subjects in the discipline of physics, other physical sciences and even to life itself.

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