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The place of the problem in the teaching of plate tectonics in Morocco

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ABSTRACT: Successful teaching of earth sciences, in particular the theory of plate tectonics, requires, among other things, a pedagogical change, which is the factor that almost all teachers do not yet take into account. These sciences are unfortunately presented by our teachers in a way that leaves them in the eyes of our students as a series of discoveries that is made in a random and simple way and away from any problem that gives birth to them.

KEYWORDS: Teaching, earth sciences, plate tectonics, problem solving, explanatory model, scientific research approach, language activity.

1 INTRODUCTION

Learning Earth sciences can no longer be a simple acquisition of frozen scientific knowledge, but it can present itself as a scientific problem that will be the object of a language activity. Indeed, geology has the particularity of being both a functionalist science that is interested in the current functioning of the Earth and a historical science that aims to reconstruct the past of the Earth (Orange, 2005). These two functionalist and historical dimensions lead us to differentiate between dynamic problems and those of historical reconstruction of our terrestrial globe during such a learning of geology. Plate tectonics, for its part, is mainly concerned with plate movements and the resulting consequences.

How does the theory of plate tectonics appear in Moroccan classes? And what is the degree of motivation of our students in this theme?

2 PROBLEMS

The work that we have proposed to develop is to investigate and take a closer look at how our SVT teachers teach earth sciences, and what is the impact of this type of teaching on learning and learning. assimilation of this discipline by our students? And finally, what is the condition or the conditions necessary for such a successful teaching of earth sciences in our classes?

3 METHODOLOGY

One way for us to estimate a successful teaching of earth sciences in our Moroccan classes is to write a questionnaire whose purpose is to collect data, this questionnaire is intended for teachers of the Life and earth sciences (SVT). A non-probability sample composed of a number of teachers from different colleges and high schools who have undergone initial training.

This questionnaire has four parts with open, semi-open and closed questions. The first section includes respondent identification, the second section discusses seniority, the third discusses classroom practices, and the last part deals with the use of information and communication technologies in the classroom.

The table below shows our sample to which the questionnaire was given, based on gender, grade level and seniority. This workforce is part of a population that corresponds to all teachers of life sciences and land Moroccan institutions public and private college and qualifying. It seems that this sample can fulfill the conditions of a random sample. And even if the latter is

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reduced, it is valid and representative of all the current teachers of the SVT from which representative statistical data can be extracted.

Table 1. Breakdown by seniority, gender and grade level

Professional experience.		1 to 3 years old. (D)	4 to 8 years old. (M)	More than 9 years (E)	Total by sex.	Total by level.
College teachers.	Female	25	12	4	41	89
	Male.	24	16	8	48	
High School Teachers	Female	15	12	4	31	67
	Male.	18	13	5	36	
Total.		82	53	21		151

4 RESULTS AND DISCUSSION

The teachers who participated in this research were classified into three categories according to their professional experience:

- Category D: groups teachers whose teaching practice is between one year and three years, they are beginning teachers (D).
- Category M: groups teachers who have practiced the teaching profession for an average duration of between four and eight years (M).
- Category E: encompassing all teachers who have a length of experience of the order of 9 years and over (E).

It should be remembered that the earth sciences are taught in the two secondary, college and qualifying levels: in the first and second year colleges and in the first and second years of the baccalaureate.

4.1 COMPARISON OF THE PRACTICES OF THE TEACHERS OF THE COLLEGE ACCORDING TO THEIR PROFESSIONAL EXPERIENCE

To enable students to acquire new knowledge in geology, the majority of teachers in categories D and M, prefer to start their courses with a problem situation to show the usefulness of this knowledge in everyday life. Whereas for category E teachers, in addition to a problem situation, they also prefer to "expose the knowledge in a clear and structured way" and "to rely on the initial conceptions of the students to make them evolve". A minority of only 10% of teachers in different categories ticked the boxes for "Presenting historical examples of scientific controversy" and "Suggest situations of interaction between students to promote argumentation."

This shows that most teachers do not know the interest of science history in the progression and development of scientific research.

But the history of science should not be taught as an anecdotal discipline, as we always see in our school textbooks and textbooks. It is also distinguishable from a simple statement of chronological landmarks because its interest is quite different: first of all it makes you aware of a lot of change of thought that has occurred in the evolution of ideas for example, the evolution of ideas concerning either the theory of continental drift or the theory of plate tectonics. These theories have been the subject of several debates and controversies between the researchers of the time. Note that several teachers of the Life and earth sciences confuse between the two theories because of a lack of research in the history of science.

In addition, trying to put oneself in the place of a researcher makes it possible to focus and understand that all the arguments developed often have meaning only for the one who is convinced, in fact, that in teaching it is the most often the teacher who is convinced, the pupil often only restoring the knowledge without having modified his own conceptions that is to say without having made his own scientific revolution.

And according to these same results, the problem situation does not alone make it possible to engage students in a scientific research approach.

The problem situation as we know it is perfectly framed and directed by a situation of the daily life which directs the teacher and consequently the pupils in activities generally aimed at the resolution of the problem and not its construction. But this construction of the problem or problematization is it, no doubt, that will rather take students to become familiar with a process of scientific research and make them active in the classroom.

This proves that these teachers do not try to renew their professional practices because the mastery of these practices can not be done through initial training or even continuing education, but it is always necessary to self-study if we really want our practices in class are up to the needs of our students.

4.2 COMPARISON OF THE PRACTICES OF THE HIGH SCHOOL TEACHERS ACCORDING TO THEIR PROFESSIONAL EXPERIENCE

The high school teachers share the same views as the college teachers with one difference regarding the question of "Allow them to experience explanatory hypotheses. "Allow them to experience explanatory hypotheses".

4.3 CLASSROOM ORGANIZATION: HOW MANY TIMES A YEAR DO TEACHERS DO GROUP WORK AND WHY?

In all levels and for all categories, no teacher organizes his class as a group. And for some of these teachers the organization of the class can be done to motivate students and to involve them more.

As we can see, the teachers of the Life and earth sciences, whose totality do not organize their class in the form of a group, therefore do not exploit the scientific debates and the controversies in their classes of instruction which proves their ignorance in the importance debates and discussions in the construction of new scientific knowledge. And that each new knowledge is the result of a controversy between the researchers, remember that the scientific research is based on these kinds of activity either within the laboratory in the form of the internal discussions or outside the laboratory in the form of a seminar for example or scientific articles is an external discussion hence the interest of problematization that puts forward a scientific debate in the classroom.

As we can see, with regard to the place of scientific debate in the pedagogical approach and its didactic function, almost all teachers in high school or college do not use the debate in their teaching. And if it is practiced some teachers think that it must be especially placed at the end of learning component and a validation phase of the proposed results "we can discuss what we found as a response to proposed activities," says a teacher.

4.4 PRACTICE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ACCORDING TO SCHOOL LEVELS AND LENGTH OF EXPERIENCE

The practice of information and communication technologies is little used at the college level or at the qualifying level, and it is the category (D) and category (M) teachers who use them more because they have suffered training in this area. Other teachers do not use ICTs, it is not because they have not been trained, but because their institutions are little or not equipped with the necessary IT tools. But a rate of 61% of teachers say that ICT can be attributed to improved learning of earth sciences.

The results show that teachers practicing ICT in their classroom practice, regardless of their level of education, find that audiovisual aids and three-dimensional animations can facilitate the understanding of earth science concepts.

However, as has been shown in a subsequent study that "successful integration of ICT in science education such as SVTs can be achieved not with the simple use of these technologies while retaining traditional and dogmatic habits, but rather with an active pedagogy that invites the student to problematize and build the problem. We can speak of a pedagogy based on problem solving and whose role of ICT is to push the student to ask questions, but at the base it is necessary that a pedagogical scenario is installed. (Bidari et al.)

4.5 COMPARISON OF COLLEGE TEACHERS' OPINIONS ON STUDENTS' UNDERSTANDING OF EARTH SCIENCES BASED ON TEACHERS' PROFESSIONAL EXPERIENCE

According to the results obtained, all teachers at this level regardless of their level of experience, (D), (M) or (E) state that the level of students in earth sciences tends to be mediocre to zero.

According to these results still 90% of the teachers of the degree (D) college find that the level of the pupils in geology is weak, against 85% for the teachers of the degree (M) ditto for the teachers of degree (E). It appears, therefore, that in general college students are not motivated to learn the sciences of the earth.

This demotivation and non-interest of students in earth sciences can be explained by the way in which this theme of geology is presented by teachers.

4.6 COMPARISON OF HIGH SCHOOL TEACHERS 'OPINIONS ON STUDENTS' UNDERSTANDING OF THE EARTH SCIENCES ACCORDING TO PROFESSIONAL EXPERIENCE

As in the previous case, high school teachers regardless of their length of teaching practice, also find that the level of learning among high school students is also low.

From these results we can say that the opinions of teachers regardless of their level of education, college or high school, converges to the same point that students are not motivated in the learning of the sciences of science. and their level is below average. This can be explained by some teacher by the nature of the concepts of these sciences that are abstract and theoretical which makes them difficult to imagine and understand.

To answer this question, we can say that the earth sciences are concrete sciences that are observed in the field. Unfortunately, however, this discipline commonly appears as a rather boring and arduous science, and hence it does not support a purely informative descriptive teaching. The best approach to this discipline remains the construction of problems that lead to a scientific research approach.

In other words, one of the peculiarities of sciences such as earth sciences resides in the fact that the real is not limited to geological experiments and outings, we must add a construction of the problem which will be the object of a discussion among the students.

5 CONCLUSION

In conclusion, if there is a discipline that should be the subject of didactic researches provided, it is the earth sciences because the development of these sciences must be done under a critical vision, making activities in the form of scientific debates. Currently the research work focuses mainly on work related to the problematization which has become a necessity to improve and succeed the learning of earth sciences and to familiarize our students with the approach of scientific research and consequently the to bring them to a scientific representation by providing them with the conceptual and methodological tools that are essential for those wishing to understand territories and societies (Baldner & al., 1995).

Now, a presentation of scientific knowledge devoid of any trace of questioning and problematization can be understood as if the Earth sciences constitute a series of discoveries made randomly and simply. This does not allow in any case to display them in the form of activities of building explanatory models, animated, guided and framed by questions and well-defined problems. And as Orange (2005) shows, going from ideas to reasons is to move from communication logic to validation logic. The geological knowledge as presently presented in our classrooms conceals the problematization from which they come and they can only engage in problems specific to the school Astolfi (1992). They are rather propositional knowledge closer to common sense than true scientific knowledge, which explains why the earth sciences are barely reusable outside the classroom.

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