

How Do Trainee Teachers Conceptualize the Notion of Fossils?

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Abstract. This work in hand tends to identify the problems encountered by trainee teachers in constructing the concept of fossils. In this respect, the methodology adopted in the light of this research is based on a questionnaire survey. The results obtained allowed us to raise various obstacles most trainee teachers have indeed encountered challenges in identifying the fossil and, most of them do not manage to apply the principle of actualism.

1 Introduction

Geology is a field science in which a geologist relies on recorded clues, field observations, experimentation and laboratory analyses, and modeling to reconstitute the earth's history [1]. Nevertheless, the acquisition of geological concepts is not that easy for learners [2]. Teacher trainers have unveiled various types of epistemological obstacles [3], which are generally related to problems of mobilization on a spatial-temporal scale. [4], through analyzing explanations of high school students regarding geological issues such as the reconstitution of the past of an ocean, the evolution of the area of a ridge, ophiolites, and the origin of life, pointed out that these learners do not use the factor of time the same way as scientists.

Fossils are potent tools for the spatial-temporal reconstitution of a paleoenvironment; they are also witnesses testifying in favour of the synthetic theory of the evolution of species [5] There are particular studies in the didactics of the sciences of earth that have addressed the various issues encountered by students during the structure of the fossil concept. [6] stressed that the images of fossil and fossilization constitute the converging core of several epistemological obstacles linked to the construction of the concepts of time, space, and transformation of matter.

Moreover, many studies in the didactics of the sciences of the earth have been devoted to the problem of the initial conceptions of trainee teachers of scientific disciplines, more particularly biology-geology. [7, 8, 9,10] have de facto affirmed that future teachers could have the same perception of initial representations as students. The study of these representations has become a specific teaching. The objective that teachers must become aware of and take over during their training [11-12]. Identifying the obstacles to overcome

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allows the determination of training objectives and can better guide the preparation of the training program [13].

2 Methodology

We submitted our questionnaire to 30 trainee teachers from the Regional Center for Jobs in Education and Training of Fez (RCJET) at the start of their qualification training program. As far as the choice of our sample is concerned, we adopted simple random sampling. Effectively, our population corresponds to a subpopulation of all trainee teachers in the Earth and Life Sciences discipline of Moroccan RCJETs. This available subpopulation may qualify for a random population. Thus, it is valid because these two groups undergo the same training with the same didactic and pedagogical means and similar socio-cultural conditions.

3 Findings and discussions

The findings obtained reveal that the majority of trainee teachers experience different types of obstacles concerning the identification of a fossil, and the reconstitution of the stages of the fossilization phenomenon in time and space.

These results highlighted three types of obstacles:

The obstacle of identifying the fossil: The majority of trainee teachers overvalue animal origin at the expense of plant origin.

The prototype obstacle: some of the future teachers have defined the fossil through providing examples such as "pollen grains, foraminifera" in question 2, and others have justified their choices by giving examples of fossilized organisms: "mammoths " and " dinosaurs".

The obstacle of reconstructing fossilization

Future teachers are unable to reconstruct the stages of the phenomenon of fossilization in time and space. We have found that future teachers do not possess enough knowledge about all the procedures and modes of fossilization. Accordingly, the majority of future teachers have not identified any mode of fossilization.

Despite their higher education courses, future teachers are unable to conceive the epigenesis procedure. They are unable to carry out feedback in time (temporal extrapolation) to imagine the substitution of the original mineral of the shell (old mineral), by another replacement mineral (more recent mineral).

For the spatio-temporal evolution of the stages of fossilization, the respondents conceive the evolution in time (in cyclic or linear form) separately from the evolution in space (scale of the indurated strata); however, these two parameters are inseparable for any geological phenomenon.. Therefore, they are unable to go back in the arrow of time to imagine the progress of the fossilization procedures during the sedimentation of the host rock and at the scale of the sedimentary basin (paleo-environment).

4 Conclusion

This study takes part in a series of work to improve the act of teaching / learning the discipline of Earth Sciences (ES), in which its aim is to identify the obstacles related to the comprehension of the fossil concept by future teachers of the discipline of Life and Earth Science(LES). Particularly those granted to the perception and mobilization of time and space.

To do this, we based our survey on a set of questionnaires. In this regard, the results obtained highlighted various types of initial representations granted mainly to the use of time

and space factors. Indeed, by identifying the fossils, these respondents overvalue the element of time at the expense of the factor of space. In this respect, when it comes to fossilization, most of them fail to apply the principle of actualism. Consequently, they conceive the evolution of fossilization procedures outside the space-time framework (two-dimensional model).

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