

Study of Middle School Students Conceptions Regarding the Living Concept

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ABSTRACT

This study aims to bring out the misconceptions of middle school students relatively to the concept of the living and know what pupils perceive about this concept studied in class in order to ameliorate our teaching. The results obtained from questionnaires provided to middle school pupils show that their designs are diversified and they have lots of obstacles to assimilate the characteristics of the living being. First, it was found that the concept of the movement constitutes the major barrier to definite and distinguishes between the living and non-living. Another notable finding is the religious aspect who was influenced students' designs through to use it to justify their answers about the concept of living.

KEYWORDS

Living concept; pupil's conceptions; obstacles; movement; religious aspect

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Introduction

The biology is now defined as the science who studies the life, what implicates a distinction between the living and the non-living. The cleaving of the world in two components ("living " and "non-living") require, in the first, to define the concept of living and to know different forms of it. In this regard, is important to know how children assimilate and understanding of the differences between living things and inanimate entities has been steadily growing (Solomon and Zaitchik, 2012).

Pupils (students) before arriving to the middle school (junior high school), having designs" conceptions " regarding the living, (Charon P Lamarque J.& Nury D., 1976). Those conceptions are to take in account, what they would be

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pertinent or no relative to the referential knowledge, but they are, finally, they're the only anchor in the knowledge. They may constitute aid but also barriers to learning. The apprenticeship, passage of a conception to another more pertinent (Giordan and Vecchi, 1987), is not peaceful progress in the knowledge.

It is primordial for us to know what pupils perceive about the phenomena studied in class (the living concept) in order to ameliorate our teaching. Otherwise, if we do not take into account students designs in our teaching, their first conceptions persist when it would be preferable that they evolve. Different authors, as (Astolfi & Peterfalvi, 1993) or (Favre & Verseils ;1997) will agree that the identification of barriers to the apprenticeship permits to proposing strategies more efficacious of teaching, permitting to pupils to surmount epistemological obstacles that hinder their learning.

The pupils' conceptions serve as anchors for both assimilation and construction of new knowledge and thus may interfere with the learning of any new concepts introduced in the course or may result in unintended learning outcomes. As Wandersee et al. (1994) acknowledge, these alternate conceptions are present at all levels of formal instruction, including college, and cut across ability level, gender, and cultural boundaries, as well as age.

Finally, striving for student understanding as a result of instruction, above and beyond memorizing or knowing, requires that teachers take into account students' prior knowledge and support students in integrating new knowledge with their existing ideas. An explicit confrontation between preknowledge and new knowledge is the critical element in teaching toward understanding put forward by Posner and colleagues' theory of conceptual change (Posner et al., 1982).

Background and Problematic

Students arrive to the middle school uncovering a new discipline with a strange noun: the life science, formerly named natural science. In fact, the pupil is asked to define the living, to distinguishing between the alive and the no alive and to classify the beings living. Knowing what, to the primary school, pupils have studied only the discovery of the livings world and nutritious relations to natural middles (educational instructions of the life sciences and earth on secondary education in Morocco, November 2007).

Scientists studied concepts in life sciences in the Moroccan curriculum are, in most cases, formulations and complex shapes, and whose construction course was marked by epistemological obstacles. In truth, the documents (courses, pictures or diagrams, etc.) that the teacher presents to students, according to the findings of the second part of our doctoral thesis about the critical analysis of the teaching of the classification of living on secondary, may constitute barriers to understanding biological phenomena and often do not allow students to develop the correct designs. More, a such practical does not favor the pupil's motivation, who show often little interested by scientific matters in general. It in results a difficult erroneous conceptualization, who can conduct to scholastic durable difficulties. Erroneous conceptions can, so, to persist in the cursus of teaching as in the life pupil's future. The constructivist approach postulates that learning cannot be reduced to a process of linear and vertical transmission of knowledge

but is the product of the transformation of designs by aggregations of new knowledge in the subject (Posner et al., 1982). All successful learning is understood as a change in students' conceptions to build scientific concepts.

The interest of students' conceptions, if placed in the center of didactic thinking, is to upset classical models by requisition the teacher to adapt the teaching-learning situation to the difficulties encountered by students in their relationship to knowledge.

Finally, in this present study, the following questions are examined: 1. Do children relate different meanings to the concept "alive"? 2. How well can students differentiate between living and non-living? 3. What criteria do they employ to characterize the living concept?

Method

a. Instrument

To understand and analyze the designs of students about the concept of living, we have adopted a Joint Study (quantitative and qualitative). The combination of quantitative and qualitative methods has been used in educational research, particularly in the study of the phenomenon of learning (e.g., Marton & Säljö, 1984). mixed-method designs "provide more a thorough understanding of a research problem because of the opportunity to examine multiple forms of data that are more comprehensive than data that might be collected via either quantitative or qualitative methods alone" (McMillan, 2012, p. 318). Data collected by the questionnaire technique. The choice of this technique seems wise to the objectives assigned to this research. We used the questionnaire as a method in diagnosing alternative ideas due to various advantages such as the ease of application, the guarantee of anonymity, or the access to broad samples in a relatively short time (Selltiz et al., 1976; Fox, 1981). The questionnaire contains seven separate questions posed in the two cycles: primary school and college in order to collect student designs about the living concept.

b. Sample

Our study was conducted on middle school (12 – 14 years). It is centered on a survey in which we tried to build a representative sample from this population of students, therefore, our sample consisted of a group of students (N=240) of the Academy of Tangier-Tetouan, Morocco. The subjects were chosen from 6 schools in three educational delegations (Tetouan, M'diq-Fnideq and Chefchawen). The questionnaire was administered at the end of the last term of the 2015/2016 school year in the main classroom, during the teaching of sciences of life and earth.



Results

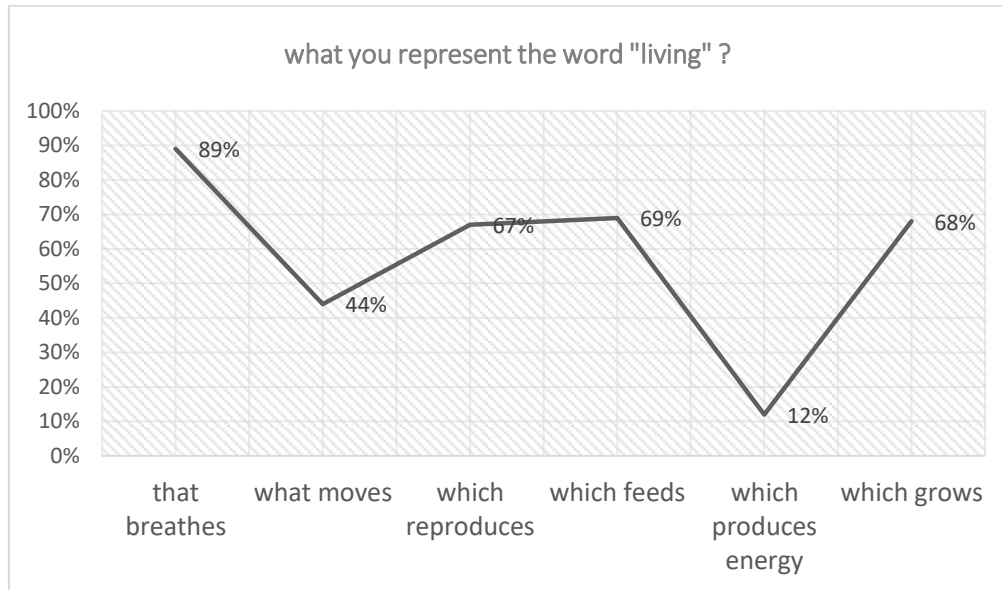


Figure 1. Percentage of each characteristic used by students to definite the word living

We note that 89% of students see that the living is what breathes. A very high percentage shows his big relationship with respiration. 44% of students think that the living is what moves from one place to another. Then, almost the same percentage (67%, 68% and 69%) of students say that living is what to reproduce; what feeds and what grows. Only 12% of students see that the living is what produces energy. 50 % of pupils mentioned more than one characteristics to explain who is the living.

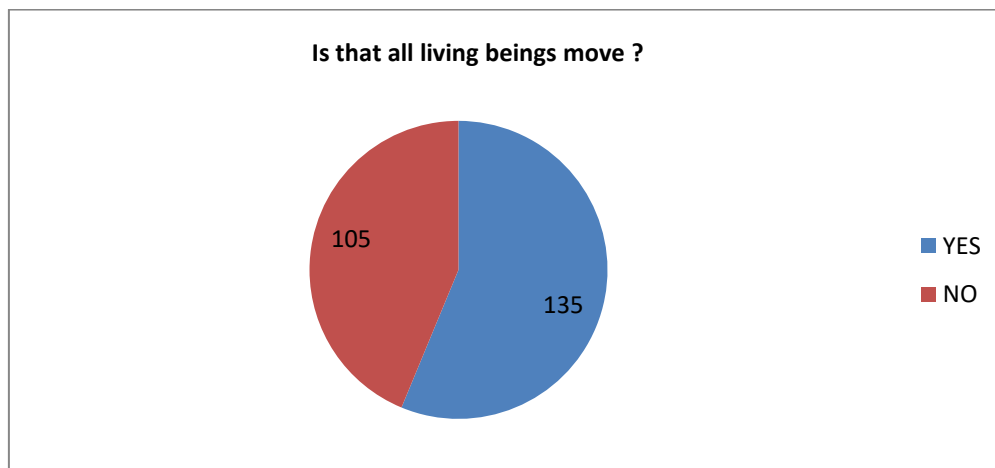


Figure 2. Number of students who consider all living beings move

135 students think that all living beings move. On the other side, 105 who see no. This result shows that movement concept constitutes a big barrier for pupils to characterize the living being.

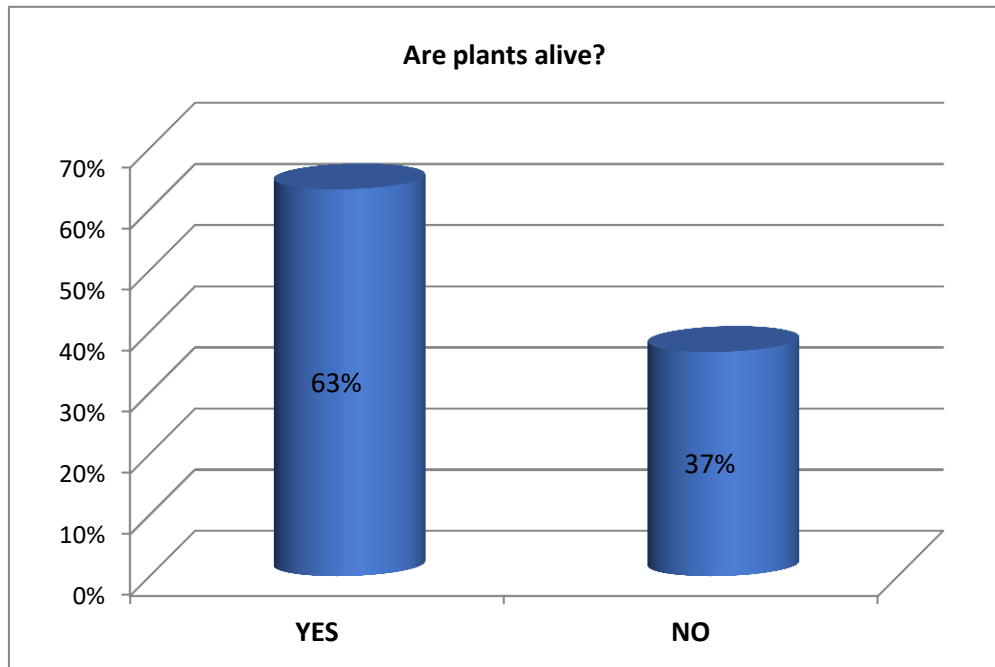


Figure 3. Percentage of pupils who consider plants to be/not to be alive

We note that 63% of pupils say that plants are alive. They justify their answers frequently by two characteristics: feeding and growth. On the other hand, 37% of pupils see that they are not alive. The most frequently mentioned characteristic, was the lack of movement ('they are still', 'they cannot move'). Some of them think that plants don't have respiratory system, they cannot be breathing.

This test aimed to distinguish what is alive and what is not alive and collect students' designs from the arguments used to justify their answers. Students should classify objects (Sun, Tiger, egg, water, etc.) in categories (alive or not alive) and argue their choice. The analysis of answers and the arguments presented to characterize the living concept show That students used follows reasons to justify their classification \neg : State and place (it is in the East and West, it swims in the water, when growing up will give a chicken, the egg is alive if contains a chick). Form and structure (material produced by the cow, it is solid, it formed of soil which moves). Function and utility (it's a food, it's delicious meal, we drink it). Belonging (it is an animal, it hasn't blood). Anthropomorphism (God took her soul, good make from water everything living). Tautology (it is alive because it is living).



Table 1. Frequent reasons given by junior high school students to classify objects as alive

object	% Of answers as alive	Frequent reasons given
Sun	26 %	It provides energy; ...emits light; ... moves; ... produces light; ... is in the East and West; ...is bright planet
Tiger	100 %	It moves ;... is an animal ;... is running ; ... attacks the gazelle; ... exists
Fish	100%	It moves ; ... swims in the water, ... can breathe in water; ... grows in water that is a living environment
Milk	32%	It is way to live; ... gives energy
Killed dog	11%	It contains viruses that are living beings
Mountain	9%	It formed from soil that contains living beings such as (annelids, rabbit ...)
water	42%	It is necessary; ... away to live given a verse of Koran: "We made from water everything living "; ... is vital matter; ... survives humanity; ... produces energy;...does move
Tree	69%	It is autotroph; ... can moving; ... gives us the oxygen ; ...produces fruit; ...increases with water
Egg	42 %	It is alive if contains a chick; ...can reproduce a living; After egg incubation will give a living; ... breathes; ...contains the soul; When growing up will give a chicken

Table 2. Frequent reasons given by junior high school students to classify objects as not alive

object	%Of answers as not alive	Frequent reasons given
Sun	74%	...does not breathe, does not move
Milk	68%	...is drunk; ...is a material produced by the cow and does not look to man or animals; liquids are not alive
Killed dog	89%	...does not move; ... lost his vital functions; ... lost his life, God took her soul
Mountain	91%	It is solid and does not move; ... hasn't blood; ...does not respire
Water	52%	...to drink
Tree	31%	It's not breathing; ...does not move;... belongs to plants
Egg	58 %	It is solid; ... is manufactured by the hen that is a living being; ... is a food ; ...is inert;... is delicious meal; ...is rejected material

The students presented diverse arguments based on the criterion of movement to animals and the existence of the characteristic functions: respiration (breathing); food (it eats, it drinks) and growth (it grows) to plant and animals. Only 42% classify egg as living, it was considered alive if contain a chick or when will give a hen. Other students see the sun and water as a living, the main argument is the movement and broader activity: "it moves" and " it produces energy". Other arguments are: water is necessary for life and impossible to live without water, justified by verse of Koran (the Islamic sacred book): the god say "we made from water everything living".

The category "not alive" is more presented for the inert mineral (mountain). The main arguments used by the students are the lack of movement and vital structure bodies (blood, cells, etc.). Another major argument is the state of the matter "it sucks" and "it's solid". About organic products, students see the milk is not alive because it is liquid and material produced by the cow giving energy or it's an alimentary nature "it is to drink ".

Discussion

The analysis of the results shows that the notion of movement (locomotion) constitutes a real obstacle to understand and assimilate the living concept. This animistic conception: 'what is animated which mobilizes' (developed by Aristotle) based on locomotion as a clear criterion to define the living. The concept of mobility alone cannot characterize the living: there are many animated objects (water, air, car, etc.) are not the living(Piaget,1929). This design is present to children as to adults. This design is a barrier to learning: the movement (animation), whether internal or external, whether independent



or not, is not a feature of the living. This obstacle is at the origin of errors: all moving objects can be considered living. More, it prevents the transfer of the concept of respiration in plants where respiration does not manifest by movements. However, this design encourages some learning: the reference to respiration, visible movement in some animals, as well as the reference to growth in plants. Although this design is not relevant (to the knowledge of reference), can be considered a prerequisite to learning, which allows students a good recognition of human, animals in general and plant as being living. These findings are almost similar to those obtained in other studies undertaken with pupils at primary educational levels (Pinchas.T & all.1981; Stavy & Wax 1989; Tunnicliffe & Reiss 2000).

Many students were used more biological reasons in classifying animals, plants, and embryos, and less in classifying inanimate. In fact, a very high number of students see that the living is more related to the process of breathing. This idea probably came from common knowledge (if there is a malfunction of breathing, life seems to stop) (Zghida.N & al.;2016). The functions of nutrition, reproduction and growth are related to the concept of living. This design set the living like a machine performing functions mechanically by organs and cells.

The designs of the students regarding the distinction between the living and the nonliving, are incomplete and spontaneous. In fact, the scientific concepts studied in life and earth sciences in the Moroccan school curriculum are, in most cases, complex formulations and forms, whose construction path was marked by epistemological obstacles not often allowing students to develop correct designs. Thus, these conceptions are mainly due to the type of education provided, common knowledge and lack of constructive activities in the school curriculum (analysis of textbooks). In fact, these activities can help the teacher to emerge misrepresentations learner and drawing teaching learning sequences in order to overcome the obstacles identified by returning to unassimilated content.

The results show also that the concept of energy is part of students' conceptions: they do not speak as a scientific concept, but they have an empirical recognition. This result is important because the concept of energy in general (is the case in college) considered too complicated for the student, while energy is part of the current environment. Therefore, it may be recalled that a concept is built at the empirical referent (objects, phenomena and relations between them) before and / or while it is built on a theoretical level (Martinand; 1987). Others pupils express difficulties in the understanding that moving entities, for example (sun and water) are not living things (Carey 1985).

Many students justified their answers to characterize the living by arguments whereas eating the living fell within cannibalism and an act condemned by society. This is a design ethnosociological considers "what is eaten cannot be alive."

Finally, the religious aspect is a direct effect on students' conceptions regarding the concept of living. In fact, learners presented arguments based on verses from the Koran to classify water into the living, "we made from water every living thing" (Surat Prophets; verse 30). Then, the God is able to do

anything to transform the living or non-living and vice versa, " the God is able to do anything".

Conclusion

This study helps to highlight the richness of the conceptions of junior high school students about the living concept. We announced that this research was a preliminary analysis to the identification of obstacles to the construction of this concept. According to this study, we found that students have a lot of misconceptions (alternatives conceptions) to define the living or to distinguish it to the non-living. Then, movement concept constitutes a major obstacle to the assimilation and understanding of life characteristics. In fact, the students' conceptions are due to common knowledge, consolidated by the Company may hinder the teaching-learning process of living concept. The religious aspect influenced the construction of students' conceptions and beliefs with verses of the Koran misunderstood and explained.

The majority of the students who are the new beginners in the biology lessons at college school have such incorrect concepts regarding the living and non-living things and the characteristics of them. The assimilation of life characteristics will allow the understanding of the diversity of the living world and the distinction of not living life. This award fosters scientific classification of living and that the movement is not a criterion of classification of living things. In addition, students must master the lively mineral definition to overcome confusion with the living, which is the goal of learning.

Identifying these obstacles is to develop more effective teaching strategies, allowing students to overcome the epistemological obstacles emerged learning. In fact, design is not only entered as an obstacle to overcome or ignore, but also as a support, a base and a support on which we build new knowledge. In a teaching-learning situation, debate; confrontation and discussion are important to encourage the learner to question their own representations and to cause it development changes. This will allow us to move from a personal representation to a school scientific conception shared by the whole class. However, choice and adequate educational management educational activities are needed to ensure the passage of a misconception to scientific knowledge. In fact, this ability depends to teacher's disciplinary skills to teaching and to planning strategies. Hence the importance of creating the conditions needed to develop these skills in the context of the initial or continuing training for teachers.

In conclusion, the life concept is central to any life science course, it is important for teachers to be aware of their students' conception of life who will help them in their choice of effective strategies and useful examples to improve pupils' understanding of life.

Disclosure statement

No potential conflict of interest was reported by the authors.

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