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The adoption of the interdisciplinary approach in the teaching of life and earth sciences at university: a reality or a wish?

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ABSTRACT
The interdisciplinary approach is a convergent pedagogy approach. It allows learners to develop new skills that enable them to group knowledge in different disciplinary fields. This reveals the many advantages of this approach that distinguish it from the traditional teaching approach that conveys compartmentalized knowledge. This approach is widely used to understand complex phenomenon such as those forming the subject of the study of biology and geology.
The present, via a survey conducted among students holding a basic license in life and earth sciences, from the faculty of sciences of Tetouan, has set out to know whether, yes or no, the said approach has been integrated into their training and to collect, if necessary, their appreciations as for the interest which they would carry towards its adoption in university education. We use, in this analysis, the Likert scale in five points.
The results obtained show that the interdisciplinary approach is not adopted in the faculty of sciences of Tetouan. However, the students of this faculty expressed the need to include this approach in their training course, given its importance in the overall learning of life and earth sciences.

Keywords: interdisciplinary approaches, University education, life and earth science.

1. INTRODUCTION

Faced with the increased specialization experienced by contemporary scientific practices, the call for the adoption of the interdisciplinary approach is a constant and plural call both in the field of research and education. According to UNESCO (1986), the concept of interdisciplinarity is defined as a product of the association of several disciplines.
In the field of life and earth sciences, the rapid development of knowledge, as evidenced by the change of name of the same discipline over the years (natural sciences, then biology and geology, and finally life and earth sciences), has imposed a change in the orientation of university education. In this sense, the development of life and earth sciences has been, and crossed by the borrowing and increased use of both conceptual and methodological tools from various fields: tools from physics and chemistry, cybernetics and information theories among others, and of which the advent of molecular biology constitutes the prodigy. These words refer to a conception of the study of scientific concepts at different levels unifying the living and the earth. (Demounen & al, 1996).In the same end" different specialists cooperate and unite, in the same laboratory, on the same theme of analysis". (Jacob, 1970).This, it will be agreed, has led to a diversity of approaches to knowledge and should lead to a metamorphosis of the conception of the teaching of scientific disciplines.
Also, in the field of life and earth sciences, the interdisciplinary approach can induce, once adopted, a revolution in the mode of teaching and lead to a global understanding of scientific phenomena and to a perception of fundamental unit of the functioning mechanisms of living beings and the terrestrial globe. (Demounem & al, 1996). According to Paulin (2015), this is an innovative approach that allows the emergence of new knowledge and the study of the different unifying levels of living things and the earth. Along the same lines, Develay (1996) and Apostel (1983) emphasize that interdisciplinary pedagogy facilitates the bringing together of disciplinary fields of study and is articulated around the essential unity which constitutes the epistemological principle of its foundation. Unlike traditional pedagogical approaches based on scientific knowledge compartmentalized in different disciplinary fields, the interdisciplinary approach makes it possible to develop transversal skills, which are expressed in the ability to solve problems and take initiatives for new professional skills. (Chauvigné & al, 2014).
The interdisciplinary approach has occupied a large place in the pedagogical reforms of educational systems. According to Lenoir (1995) and Morin, (1990), the educational system in the United States was the first, in

1880, to question the question and the advantages of integrating the interdisciplinary approach in education. Since the seventies, this teaching approach has been introduced in France under the guise of early learning activities and in Quebec under the guise of subject integration. (Lenoir & al, 1998). In France, initial training in interdisciplinary didactics was entrusted, in 1952, to the regional pedagogical centers, then, in 1989, to the university institutes for teacher training. (Tixeront & al, 1987). In the United Kingdom, the Dearing Report (1997) requires higher education institutions to achieve an optimal balance between the dimensions of the disciplines taught. (Chettiparamb, 2007). In Morocco, lever 12 of the strategic vision of the 2015-2030 reform, stresses the importance of adopting interdisciplinarity in education at the qualifying secondary level to strengthen the fruitful interaction between the different specializations of this cycle.
These remarks lead us to ask the following question: is the interdisciplinary approach integrated into university teaching practices, particularly those related to the teaching of life and earth sciences?

Issue

In this part, we are going to focus on a set of elements that allow us to base our research problem which justifies the use of an interdisciplinary approach in the teaching of life and earth sciences at the faculty of sciences of Tetouan in Morocco:
-The synthesis of the literary review defined the interdisciplinary approach and highlighted its advantages in learning. According to UNESCO (1986), the concept of interdisciplinarity is defined as a product of the association of several disciplines. According to Lenoir (2015): "It is about linking two or more school disciplines which are exercised at the same time at the curricular, didactic and pedagogical levels and which leads to the establishment of links of complementarity or cooperation, interpenetrations or reciprocal actions between them under various aspects (objects of study, concepts and notions, learning approaches, technical skills, etc.), with a view to promoting the integration of learning and the integration of knowledge", (p. 7). However, in the Moroccan educational context, in relation to the teaching of SVT, the interdisciplinary approach, for an effective teaching, is far from occupying a place of choice (Madrane & al, 2009) to overcome the challenges imposed by the diversity of scientific knowledge and the needs of the quality of work. In this perspective, a transformation of the conditions of exercise of the profession of university teacher is necessary to deal with these problems (Demougeot-Lebel & al, 2010).
-Despite the proliferation of pedagogical reforms (The national charter for education and training: 2000-2013, The national education emergency plan: 2008-2012 and the strategic vision: 2015-2030), the Morocco occupies a disappointing place in the world ranking of the quality of education, as highlighted by the UNESCO report established in 2017.
-The percentage of success, in the entrance examination to education in Morocco, is 5% among candidates holding a fundamental license from the faculties of science, while it is 60% among candidates holding a professional license in pedagogy of life and earth sciences. These results question the university courses of training of the students and the conditions of success in this competition which selects the students according to their professional, didactic and pedagogical expertise.
Here is a set of data that allow us to know, whether or not, the interdisciplinary approach is adopted in the curricula of science faculties in Morocco, and if necessary, to highlight the need of students for this approach.

2. RESEARCH METHOLOGY

Two situations are considered in this research. The first, which could be described as direct, aims, via a questionnaire, to collect the opinions of fifty students forming the target population, to determine closely whether or not the interdisciplinary approach has been effectively adopted in their own training within the faculty of sciences of Tetouan. The second, indirect, is an attempt to accredit the statements made by these students on the interests and advantages that the interdisciplinary approach could offer to their acquisition of general scientific knowledge in the two fields of biology and geology. To achieve the objectives of the first situation of our research, we tried to learn about:
-The university training profile of these students to find out whether it would allow them to adopt the interdisciplinary approach (results of table 1);
-The nature of the teaching objects and pedagogical practices adopted to measure their alignment with the objectives targeted by the interdisciplinary approach (results of table 2);
The level of mastery of the said approach, by inviting students to list the different disciplines to deal with summary subjects in biology and geology (results of table 3);
-For the achievement of the objectives of the second situation of our research, we have tried, through a set of statements, to learn about the ideas that students have of the interdisciplinary approach and the advantages they attribute to it (results of table 4).

3. SEARCH RESULTS

This research aims to show if the interdisciplinary approach is adopted in the teaching of life and earth sciences, at the faculty of sciences of Tetouan, or it is only a wish for the students. For this, we have targeted, through a survey of fifty students of this faculty, a set of elements with an aspect of complementary study, including the discussion of the results that can provide answers to our questions. These elements are: the training profile of the students; the nature of the objects taught and the pedagogical practices adopted in class; the degree of mastery of the interdisciplinary approach by the students and the ideas that the students have on the said approach.

3.1 Students with a specialized training profile that does not allow the adoption of the interdisciplinary approach

According to the results of table 1, we note an unequal distribution of the specialty of the students in the two disciplinary fields of biology and geology: 40 students out of 50; that is 80%, hold a degree in biology, while 10 out of 50 students; i.e. 20%, hold a bachelor's degree in geology. In the same disciplinary field of biology, the forty students still have very different specialties: 12 in biotechnology; 6 in biochemistry; 10 in immunology; 5 in animal biology; 3 in plant biology and 4 in genetics. The same goes for the disciplinary field of geology where the ten students also have very divergent specialties: 2 in general geology; 1 in stratigraphy; 3 in tectonics; 1 in sedimentology; 2 in applied geology and 1 in paleontology.

Table 1: Training profile of students in the target population

Questions: the specialty of your license?		Number of student (n=50)	
Disciplinary field of biology	License of biotechnology	12	n=40 (80%)
	License of biochemistry	6	
	License of immunology	10	
	License of animal biology	5	
	License of plant biology	3	
	License of genetic	4	
Disciplinary field of geology	License of general geology	2	n=10 (20%)
	License of stratigraphy	1	
	License of tectonics	3	
	License of sedimentology	1	
	License of applied geology	2	
	License of paleontology	1	

These results highlight a double specialization of the undergraduate courses of these students: one in each of the two fields of biology and geology and the other within each of these two fields. This double specialization is accentuated by an early specialization of teaching in different teaching streams. In the first year of the university cycle, a single branch of life and earth sciences provides lessons common to all students. From the second year, the lessons are divided between two streams of life sciences and earth sciences. From the third university year, the lessons are divided into optional modules in each of the two bachelor's degrees in life sciences and earth sciences.

This reading reveals a highly specialized training profile of the students of the faculty of sciences of Tetouan. This is reflected by a compartmentalization of teaching which could lead to a mono-disciplinary university scientific knowledge where the common line between the disciplines is lacking. In this sense, the specialized profile of these students can orient them towards scientific research but it will not allow them to adopt the interdisciplinary approach. What about teaching practices?

4.2 Pedagogical practices focused on specialized lectures with mono-disciplinary teaching

According to Mili (2012), the use of the analysis of teaching practices makes it possible to extract “experiential” knowledge from observable actions for the implementation of appropriate teaching methods. It is in this perspective that we have tried, through a survey conducted among students of the Faculty of Sciences of Tetouan, to reveal the teaching practices marking their university training course. The activities covered by this survey and the results of their exploitation are presented in Table 2.

In the answers to question 1, relating to the mode of teaching followed in class, the majority of students (47 out of 50; i.e. 94%) emphasize the predominance of lectures in the teaching of life and earth. These results are consistent with those of several authors. According to Demougeot-Lebel and al (2010), a survey of the conceptions of fifty-five university professors from the University of Burgundy, concerning their didactic

practices in the classroom, showed that the lecture course marks the majority of universities. In this sense, specialized and transmissive lectures constitute a traditional mode of teaching that reflects the dispersion of knowledge in different disciplines. Consequently, the mode of teaching pursued in the faculty of sciences of Tetouan does not allow the adoption of the interdisciplinary approach.

Table 2: University pedagogical practices according to students of the faculty of sciences of Tetouan (life and earth sciences option)

Questions	Answers		
1. What is the teaching style followed in the classroom?	Lecture	Practical activities of synthesis	Exploitation of documents
	47	1	2
2. What kind of competencies develop this teaching method	Restitution of knowledge	Didactics	Reasoning
	48	1	1
3. The lessons pursued, do they allow you to cover broad knowledge in:	Your specialty	The whole field of biology	The whole field of geology
	50	0	0
4. Do these lessons allow you to pass the entrance exam to teaching? Justify your answers	No	Yes	Perhaps
	35	2	13
	The evaluation of the competition coverson synthesis topics but our teachings are very specialized	We'll review on internet other courses that we miss	Success in this competition is a matter of luck

In the results of question 2, relating to the skills that the mode of teaching pursued in class could develop in students, most of the respondents (n=48 out of 50; i.e. 96%) affirm that the skills developed by the mode of teaching lectures are centered on the restitution of knowledge. Didactic skills (n=1 out of 50) and reasoning skills (n=1 out of 50) are far from being acquired by this teaching method. According to EL Hage and al (2011), lectures make the teacher the master of knowledge and the learner a passive receiver, and socioconstructivist theories postulate that students learn only when they are involved in the activities of the lesson than when they construct, through personal effort, their own knowledge. Along the same lines, Astolfi and al, (2008) confirm that: “Knowledge is not transmitted or communicated strictly speaking; it must always be constructed or reconstructed by the student who, alone, learns”.

The results of question 2 show that the skills, which can be developed by the mode of teaching pursued in the Faculty of Science of Tetouan, are of the restitution of knowledge type. This is a factor that also does not allow the adoption of the interdisciplinary approach.

In the results of question 3, relating to the impact of the method of teaching pursued on the mastery of knowledge in the fields of the students' specialty or in the fields of biology and geology, all the students (n=50) confirm that the teaching conveyed by the lectures allows, only, the mastery of knowledge in the field of specialty of their license. Indeed, the master classes, specialized, convey unique knowledge of a monodisciplinary nature. However, knowledge is not an end in itself, but it is, above all, to be considered as a tool available to students to demonstrate their skills as scientists. This will allow students to convert teaching content for usable educational purposes in order to bring out new scientific knowledge. According to Legendre (1994), the problem linked to the teaching-learning of sciences is underlined by a lack of general scientific culture, of basic knowledge and skills in science, by a massive failure of science teaching and by a rather unscientific attitude towards scientific phenomena.

In the results of question 4, relating to the impact of the courses pursued on success in the entrance examination to education, the majority of students (n=35 out of 50; i.e. 70%) do not count on the courses lectures with linear pedagogy, to succeed in this competition. However, 2 out of 50 students rely on the Internet to fill the gaps imposed by highly specialized courses, while 13 out of 50 students rely on chance to pass the competition in question. These problems require the university to train high-level transversal skills to provide students with broad scientific knowledge in the two fields of biology and geology and which are required by the teaching profession in the life sciences and earth. As a result, the disciplinary knowledge taken separately, does not allow an exhaustive study of the summary subjects of the competition for access to teaching. In this sense, the plurality of pedagogical strategies makes it possible to take advantage of the advantages of each of them. It is in

this sense that Sauvé and al (2007) recommend diversified educational activities offering students the possibility of making choices adapted to teaching situations.
All the results of questions 1, 2, 3 and 4 show that the general scientific culture, required by the interdisciplinary approach, cannot be achieved by traditional teaching practices based on lectures.

4.3 What credibility is given to these different opinions?

In order to give, or not, credit to the previous results, we have designed another methodological situation where we directly evaluate the achievements of our population and their ability to use the interdisciplinary approach in the study of themes of degrees of more or less high degree of generality. Themes that could be inspired by the subjects of the competitions for access to the teaching qualification centers. For this purpose, we presented to the students of the survey two summary topics to assess the degree of mastery of the interdisciplinary approach in the two fields of biology and geology. The biology topic deals with plasma membrane proteins, while the geology topic deals with plate tectonics. The results obtained are presented in Table 3.

Table 3: Degree of mastery of the interdisciplinary approach by the students in the survey

Questions	**Answers**					
1. What are the disciplines providing knowledge on the subject of plasma membrane proteins	Biology cellular	Biology animal	Biology plant	Immunology	Bacteriology	Biochemistry
	47	2	1	0	0	0
2. What are the disciplin providing knowledge on the subject of plate tectonics	Magmatism	Metamorphism		Sedimentology	Analytical tectonics	Paleontology
	2	5		0	40	3

From the responses to question 1, dealing with the topic of plasma membrane proteins, we see that most students (n=47 out of 50, or 94%) rely solely on the discipline of cell biology, to address this topic. Indeed, the discipline of cell biology makes it possible to treat the phenomena of transmembrane exchanges and cellular contacts. (Alberts & al, 2017).
However, the subject of proteins must mobilize multiple knowledge in different disciplinary fields:
- The discipline of immunology to deal with the phenomena of antigen recognition by membrane proteins, the phenomena of cellular cooperation between immune cells and the phenomena of signal transduction by membrane proteins (Roitt & al, 2002). Despite the importance of the discipline of immunology in this summary topic, it was not mentioned by any student;
- The disciplines of endocrinology and the nervous system to treat the phenomena of membrane signal transduction and nervous and hormonal communications (Darnell & al, 1997). However, the discipline of animal biology, providing knowledge relating to this subject of assessment, was only mentioned by 2 students among 50;
-The discipline of biochemistry to deal with: the techniques for isolating and separating these proteins, their physico-chemical properties and the phenomena of the digestion of molecules involving the enzymes of the cytoplasmic membranes of the brush border of the intestinal cells. (Strayer, 2008). However, this discipline was not mentioned by any of the candidates;
-The discipline of plant biology providing knowledge on the mode of action of phytohormones on membrane proteins playing the role of chemical signal receptors. (Maziliac, 2008). However, this discipline was only mentioned by one student.
-The discipline of bacteriology where these membrane proteins play the role of antigenic determinants of Gram- and Gram+ bacteria and means of material exchange in bacteria. (Leclerc & al, 1999). This discipline of bacteriology was not mentioned by any student.
According to the answers to question 2, relating to the subject of plate tectonics (disciplinary field of geology), it can be seen that most of the students (n=40 out of 50; i.e. 80%) rely solely on the discipline of analytical tectonics dealing with brittle and ductile deformations at the level of zones of convergence and divergence of plates. (Caron & al, 2004). However, this subject calls for knowledge borrowed from other disciplinary fields in the field of geology:
-magmatism to explain the phenomena of fractional crystallization at the level of the magma chamber of mid-ocean ridges;

-diffusive volcanism at mid-ocean ridges, extrusive volcanism at subduction zones and plutonism at subduction and collision chains. This discipline was only mentioned by 2 out of 50 students;
-paleontology, offering arguments on continental drift, was only mentioned by 3 students among the 50;
-metamorphism to explain, on the one hand, the formation of metamorphic series at the level of subduction zones, and plate collision zones. (Caron & al, 2004). This discipline was only mentioned by 5 out of 50 students;
-sedimentology to deal with the formation mechanisms of the sedimentary basins formed during the divergent movements of the lithospheric plates. (Chamley, 1999). This discipline was not mobilized by any of the students.
According to the results obtained, it can be seen that most of the students do not have general scientific knowledge in the two fields of biology and geology. This is reflected by mono-disciplinary lessons dispersed in different disciplinary modules. It is also, in this case, another factor which underlines the non-adoption of the adoption of the interdisciplinary approach in the faculty of sciences of Tetouan.

4.4 What ideas do our students have of the interdisciplinary approach, and what advantages do they attribute to it?

This last part of the survey constitutes an attempt to accredit the statements made by the students on the interests and the advantages that the interdisciplinary approach could offer to their acquisition of general scientific knowledge in the two fields of biology and geology. To this end, we present these students with a set of statements whose degree of satisfaction will be measured using the five-point Likert scale: 1: very unsatisfactory; 2: unsatisfactory; 3: quite satisfactory; 4: satisfactory; 5: very satisfactory. To make these results more significant, we measured the total score and the level of concern of the students for each of the statements proposed. The results obtained are shown in Table 4.

Table 4

No	Statements	1	2	3	4	5		Score Total	Level of concer
1	Degree of satisfaction with the importance of the interdisciplinary approach in the student training curriculum	42	8	0	0	0	50	58	0,052
2	The inclusion of interdisciplinary training in your university course	0	2	3	10	35	50	228	0,204
3	The interdisciplinary approach allows an overview of the disciplines of the same field of study	0	0	2	7	41	50	239	0,214
4	The interdisciplinary approach is favourable for developing scientific research	36	12	2	0	0	50	66	0,059
5	The interdisciplinary approach increases the chance to succeed in the teaching competition	0	1	1	6	42	50	239	0,214
6	The interdisciplinary approach allows the development of attitudes and group work	0	2	4	12	32	50	224	0,201
7	Degree of mastery and application of the scientific approach in your teaching	43	5	2	0	0	50	59	0,053
Total								**1113**	**1**

The results in Table 4 show that the students' interests are focused on:
- Statement 2 aimed at including the interdisciplinary approach in their university curriculum (level of concern: 0.204). Indeed, although these students have specialized scientific knowledge in their field of study, they expressed their need to include this approach in their training in order to broaden their general culture in the broad field of life sciences and Earth. This will allow them to understand and analyze current and evolving scientific phenomena;

- Statement 3 affirming that the interdisciplinary approach makes it possible to have a global vision of disciplines in the same disciplinary field (level of concern: 0.214). The interest that students have in this approach is justified by a partitioning and a juxtaposition of singular knowledge in different scientific fields. But this knowledge, as Demounem and al (1996) point out, should not be juxtaposed but deduced from a study based on real facts and presented in a logical order with a common thread between the different axes of the subjects.
-Statement 5 saying that the interdisciplinary approach increases the chance of success in the entrance exam to teaching (level of concern: 0.214). The answers to this declaration are justified by an incompatibility of specialized university teaching with general scientific culture, required by the competition for access to teaching. This may be related to the low success rate (5%) of these candidates in the competition in question. In this sense, Moroccan universities, and within the framework of their autonomy, must increase the number of professional degrees in education to develop the methodological skills of future teachers, as underlined by Maroy (2006) "the many challenges, imposed by the fields of employment, have forced the teacher to diversify teaching methods by adopting innovative teaching practices";
- Statement 6 postulating that the interdisciplinary approach allows the development of attitude and group work. (Level of concern: 0.201). The students' interest in this statement may reflect a negative reaction to the lectures that mark their university course. Students are expected to listen and provide knowledge. According to Davies (1971): "Many teachers tend to concentrate on teaching and not on learning, thinking more about what they will have to do than what the students will have to do". . It is in this perspective that the interdisciplinary approach would allow students to initiate discussions, to consider study approaches, to communicate knowledge and to self-evaluate.
The lowest levels of concern were recorded in statements 1, 4 and 7:
-In the results of statement 1, which invites students to express their level of satisfaction with the place occupied by the interdisciplinary approach in their university curriculum (level of concern: 0.052), we highlight the dissatisfaction of these students with the importance given to this approach. Indeed, the curriculum of the faculty of science of Tetouan is organized into specialized courses and dispersed in different mono-disciplinary teaching modules. These comments agree with de Demounem and al (1996) who emphasize that the organization of an interaction of scientific teaching remains the major problem; this is reflected by the predominance of a hierarchy of disciplinary statuses in the university system. This specialized teaching could orient students towards scientific research, as they confirmed in the response to statement 4 where the level of concern for the interdisciplinary approach is very low (0.059).
-As for the low level of concern of the students (0.053) in statement 7, it also highlights a lack of training in the scientific process. This constitutes, for us, a limitation of the adoption of the interdisciplinary approach, on its own, to improve the teaching-learning conditions of the life and earth sciences. According to Fourez (1998), effective course learning is not limited to the construction of interdisciplinary knowledge, but requires the integration of multiple innovative methods in teaching.
We note, through this research and the results of the survey, that the practice of the interdisciplinary approach is not adopted in the curriculum of the faculty of sciences of Tetouan, while the students of this faculty wish to include it in their teaching. To this end, we suggest some teaching approaches to promote its inclusion in the university education system:

• Interdisciplinary teaching

In this approach, the professors responsible for teaching disciplines belonging to the same field of study, after consultation, can invite students to identify the scientific notions that overlap in all the disciplines of the same field of study. This will allow students to develop transversal skills that promote group work and connection between different disciplines;

• One lesson per group

Teachers of disciplines, belonging to the same field of study, offer students a set of unifying concepts. First, the teachers invite the students, within the framework of group work, to propose a study approach for each of the concepts. In a second step, the different groups of students engage in discussions to develop more useful study approaches. This type of work could develop behavioral, communication and attitude skills in students;

• Teaching by project

According to Boutinet (1992), the project is a collective anticipation of a desired future in the form of a common file setting the objectives of the project, its strategies and its evaluation. To introduce students to project work, it is desirable that at the end of each university training cycle which is spread over three years, teachers ask students to design a study project in which:
- They raise the difficulties related to the compartmentalization of scientific knowledge relating to the same study concept of their choice;
-They make an inventory of all the disciplines that deal with the levels of study of this concept;
- They offer a synthetic and global study of the concept in question;

-The various student projects will be supervised and evaluated by all the teachers involved in the teaching of disciplines in the same scientific field.

CONCLUSION

This research falls within the field of didactics. It clarifies the use of innovative teaching methods to develop new skills in learners, following the increased development of scientific knowledge in different fields of study. In this case, it is the adoption of the interdisciplinary approach by many educational systems, given its many advantages in the grouping of knowledge in different disciplinary fields.

However, the said approach is far from occupying a place of choice in the curriculum of life and earth sciences of the faculty of sciences of Tetouan. Indeed, the results of a survey, conducted among students of this faculty showed that the lessons pursued in class are of the traditional type and do not, in any case, solve the problems related to the multiplication of scientific knowledge. In this study, we targeted a set of situations which allowed us, on the one hand, to judge the adoption, or not, of the interdisciplinary approach in class, and on the other hand, to know if the students wish to include this approach in their training course. The results of situation 1 underline a specialized training profile of the candidates reflected by compartmentalised teaching in different fields of study and in different disciplinary modules.

The results of situation 2 showed that classroom teaching is based on lectures with linear pedagogy. The skills targeted by this type of traditional teaching focus on the restitution of singular knowledge which does not allow these students to group knowledge in different disciplinary fields.

The results of situation 3 highlight a lack of training for students in the interdisciplinary approach. In this sense, students are unable to inventory the set of disciplines to be mobilized to treat two synthetic subjects belonging to the fields of biology and geology.

The findings that emerged from the analysis of data from the three previous situations show that the interdisciplinary approach is not adopted in the teaching curriculum of life and earth sciences at the faculty of science of Tetouan.

As for the results of situation 4, they underline the need for students to include the interdisciplinary approach in their university curriculum. According to these students, the said approach would allow them: an overview of the disciplines of the same field of study; to pass the competition for access to teaching and the development of attitude and group work.

However, recourse to the interdisciplinary approach should not neglect the disciplines themselves, insofar as they constitute the basic cognitive capital. In this sense, the disciplines reflect the fundamental aspect of teaching, while interdisciplinarity reflects the epistemological and didactic aspect of learning. A break in the dichotomy between these two aspects, with very complementary aspects of study, is necessary for optimal learning of the lessons.

It should be noted that the results of this research, which targeted 50 students from the faculty of science of Tetouan, can be generalized to the Moroccan student population, since the training program is national and is taught everywhere, in the same way in a few differences.

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