Representations of Qualifying Secondary Teachers Regarding the Investigative Approach in Morocco

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Abstract: The innovation calls insist on the fact to identify new forms and models of learning and teaching. Actually, the educational approaches that encourage effective learning among student, is the Investigative Approach, which demonstrates more and more its potential in teaching. It is a scientific approach based on questioning and investigation where the learner is placed at the center of the action of learning questions himself, acts in a reasoned manner and communicates to build his learning while by being an actor in scientific activities. In this research, we aim to highlight the representations of secondary school teachers about the concept of investigative approach and determine the constraints and the obstacles to its implementation in the teaching of experimental sciences disciplines (Science of life and earth, Science of physics and chemistry). In order to achieve these objectives, a questionnaire was drawn up and was the subject of an exploratory study among 100 teachers of experimental sciences practicing in different secondary schools in Marrakech city. The results of this survey reveal, firstly, that the teachers questioned seem have confusions and misconceptions about the investigation process and secondly, they highlight the presence of constraints and difficulties that prevent its application in the classroom.

Keywords: Investigative Approach, Misconceptions, Learning, Teaching.

Introduction

Everyone is currently aware that the current science teaching does not yield the expected results. It is no longer a question of training only scientists but also of enabling scientific acculturation of citizens living in a world where science and technology have a preponderant place. This is why, from an institutional point of view, many voices have been raised in recent years to call for a renewal of this teaching.

Actually, the Investigative Approach is among the most popular educational approaches that encourage effective learning. It is a scientific approach based on questioning and investigation where the learner is placed at the center of the act of learning questions himself, acts in a reasoned way and communicates to build his learning being an actor in scientific activities (Darley, 2007).

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This approach is not new (Lebeaume, 2011). Indeed, this scientific method has been integrated for more than a century in science curricula in many countries, particularly English-speaking countries such as England and the United States (Hasni & Bousadra, 2016). In France, situated in the continuity of the approach of the scientific approach and initiated with "La Main à la Pâte" in 1996 (Coquidé et al., 2009). The Investigative Approach have been gradually integrated. Indeed, this approach was adopted at primary school in 2000, at middle school in 2008, at high school in 2009 and in general second classes in 2010 (Grangeat, 2014). The Investigation Procedures have been declined, put into text and implemented in different ways. Thus, for example in the United States with various versions (Inquiry-Based Science Education: IBSE; Inquiry-Based Instruction: IBI; Inquiry-Based Teaching: IBT) and in France, they use the term of Investigative Approach. These varied variations can certainly be related, at least partially, to distinct historical and cultural references (Calmettes & Matheron, 2015). This approach is part of a socio-constructivist perspective, promoting exchanges between students in order to build their own knowledge (Hassouni et al., 2014). Such approach also points to the use of participatory active learning activities for students to foster their higher-order skills such as the use of peer learning, peer feedback, peer argumentation, and problem-solving tasks, (see Latifi & Noroozi, 2021; Latifi et al., 2020, 2021; Noroozi 2018, 2022; Noroozi et al., 2016; 2020; Valero Haro et al., 2019; 2022). In this sense, Morocco has been part of reforms policy since 2003, which aimed essentially the generalization of learning, the improvement of its quality that including the educational content and the restructuring of education cycles. However, several studies in science education have shown the presence of a set of difficulties, which are linked to the knowledge, taught, to the representations of students and teachers on science and to the pedagogical practices of teachers in the classroom (Kouchou et al., 2019).

This study is part of research into the application of the Investigative Approach in science education in Morocco. Through this study we aim to highlight the representations of secondary school teachers qualifying on the concept of Investigative Approach, to see if this approach is adopted or not in the teaching of experimental science disciplines (Life and Earth Sciences, Sciences of physics and chemistry) and finally to determine the constraints and obstacles to its implementation. In order to achieve these objectives, we have adopted the methodology described below.

Method

The basic tool of this study is a survey in the form of a questionnaire followed by semi-structured interviews. The questionnaire was developed in two stages: in the first, the questionnaire consisted of 10 questions, some of which were closed questions and others were multiple-choice questions asking teachers to express themselves on the Investigation Approach. The questions formulated focused on three axes:

1. Teacher's representations about the investigation approach.
2. Adoption or not of the investigative approach by teachers and its implementation in the classroom.
3. The difficulties that hinder the implementation of this approach in the classrooms.

The data collected was very minimal because the teachers showed resistance which they justified by the length of the questionnaire. However, through the interviews, we were able to deduce that they did not want to engage in the responses because the Investigative Approach terminology seems unfamiliar to them and they are not familiar with this term. After a discussion on the topic with a group of teachers, the questionnaire was reformulated and the number of questions was limited to six to simplify their formulation.

The study was carried out in several public high schools in the city of Marrakech (Morocco), during the 2020-2021 school year. Our target population consists of 100 qualified secondary school teachers. To test the internal consistency and reliability of the questions, Cronbach's Alpha values were calculated. The Cronbach's alpha of our questionnaire is equal to 0.85. Our Cronbach's alpha falls between 0.73 and 0.94 the range of Cronbach's alphas reported in previous studies (Manis & Choi, 2019; Peterson, 1994), indicating discriminant validity of our questionnaire. To continue the validation of our questionnaire we started with a pilot study for a sample of 50 teachers to modify and restore our questionnaire. Knowing that we administered 300 and we were able to have only 100 completed questionnaires.

Results

Q1. Give the appropriate definition of the Investigative Approach

In this question (Q1), teachers were asked to choose the correct answer concerning the definition of Investigative Approach; we found a heterogeneity of answers. In fact, 36% of teachers opted for the answer stipulating that Investigative Approach is an approach based on investigation concerning students' learning obstacles (a) and 14% of teachers affirm that the investigative approach is a process of learning of scientific content (b). On the other hand, 50% of teachers chose the most correct answer, namely the scientific approach to questioning and investigation, which constitute scientific disciplines. Students question themselves, act in a reasoned way and communicate to build their learning by being actors in scientific activities (c) (see Figure 1).

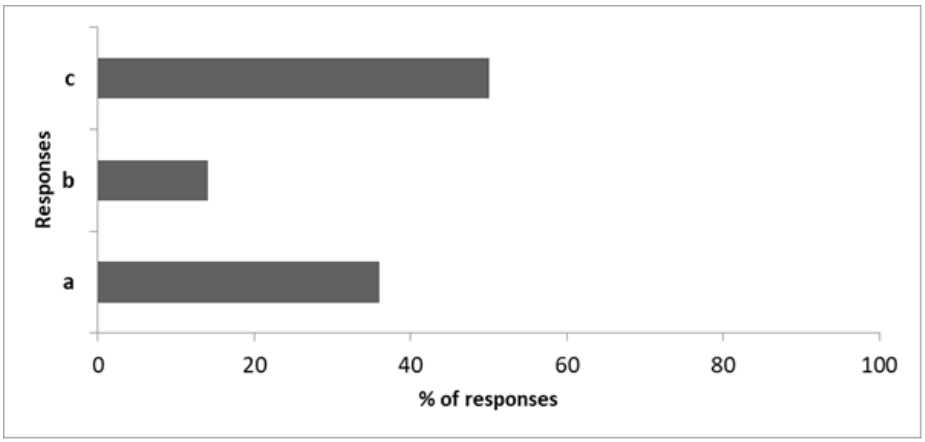

Figure 1. Investigative Approach Definition

a: Approach based on investigation concerning students' learning obstacles.

b: Investigative approach is a process of learning of scientific content.

c: The scientific approach to questioning and investigation, which constitute scientific disciplines. Students question themselves, act in a reasoned way and communicate to build their learning by being actors in scientific activities.

Q2. Is there a difference between Investigative Approach and Experimental Approach?

For this question (Q2), we found that 54% of teachers affirm that there is no difference between the investigative approach and the experimental approach and say that the investigative approach is the experimental approach. . On the other hand, 36% of teachers say that there is a difference between two approaches and this difference is linked to the steps of each approach, which differs from the other (see Figure 2).

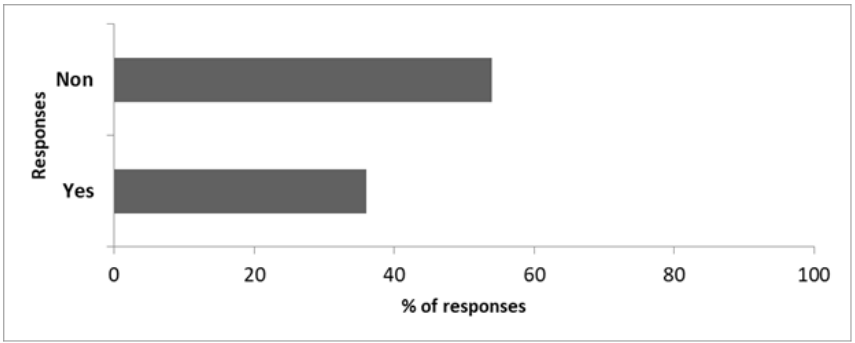

Figure 2. Teacher's Responses Regarding Difference between the Investigative Approach and The Experimental Approach

Q3. Have you ever benefited from a continuous training concerning the Investigative Approach?

For this question (Q3), we found that 67% of teachers had no training in the inquiry process. The proportion of teachers who claimed to have already received training in this regard does not exceed 33% (see Figure 3).

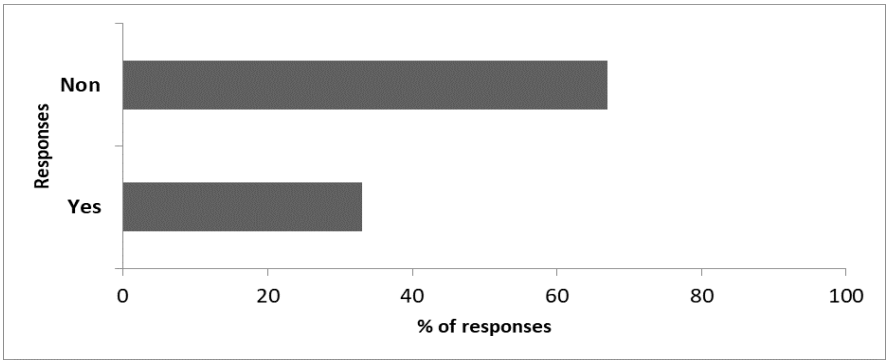

Figure 3. Teacher's Responses regarding Continuous Training on the Investigative Approach

Q4. Do you adopt the Investigative Approach in your teaching?

According to the data collected for this question (Q4), 52% of teachers affirm that they do not adopt the Investigative Approach in their teaching. In contrast to 48% of teachers questioned who admit having used this approach. Unfortunately, this gives us no indication of the actual practice of this approach in the classroom (see Figure 4).

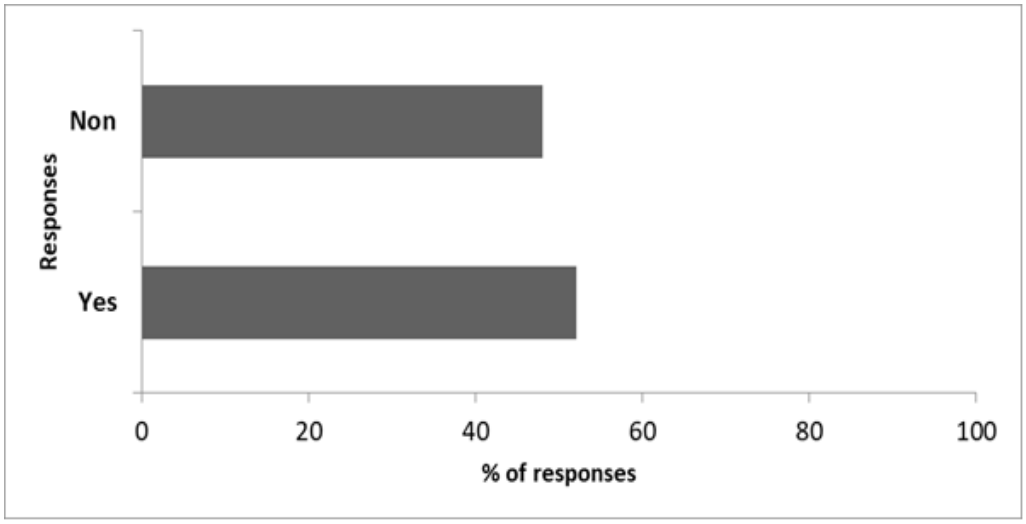

Figure 4. The Adoption or Non-Adoption of the Investigative Approach in Classroom

Q5. If yes, do you adopt it for all scientific contents?

According to the data collected for this question (Q5), 76% of the teachers affirm that they adopt the Investigative Approach in many scientific contents and that with the opposition of 24% of the questioned teachers who affirm having resorted to this approach in the all-scientific contents (see Figure 5).

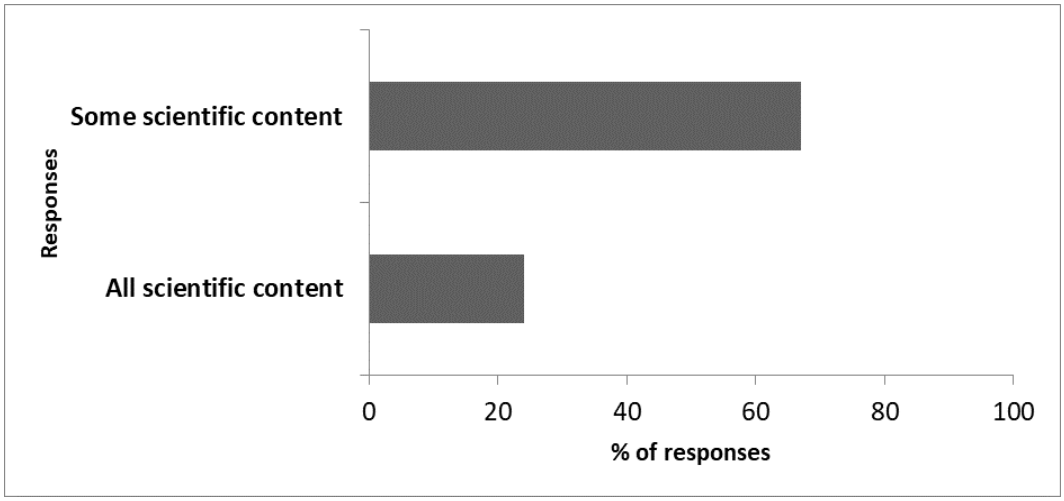

Figure 5. Teacher's Responses Regarding Adoption of The Investigative Approach in The Scientific Contents

Q6. What are the constraints that prevent the adoption of Investigative Approach?

In order to have some answers on the constraints that prevent the adoption of this approach in secondary school classes (see Figure 6), we formulated the question (Q6) which consists of 4 items: the overloaded program (a), the lack of the student's autonomy (b), the overload of the student's number (c) and the lack of continuous training for teachers (d).

Relying on the answers obtained, we notified that 49% of the teachers questioned affirm that the constraints limiting the adoption of this approach in the classes are multiple: the overloaded program (a), the lack of the student's autonomy (b) and the overload of the number of student's (c). 20% of teachers say that the lack of continuous training (d) about this approach could limit the adoption of this approach by teachers in secondary classes. A percentage of 18% of teachers affirm that the overload of the number of student's (c) is the main cause limiting the adoption of the Investigative Approach in learning and finally 13% of teachers affirm that it is due to the overloaded program (a) (see Figure 6).

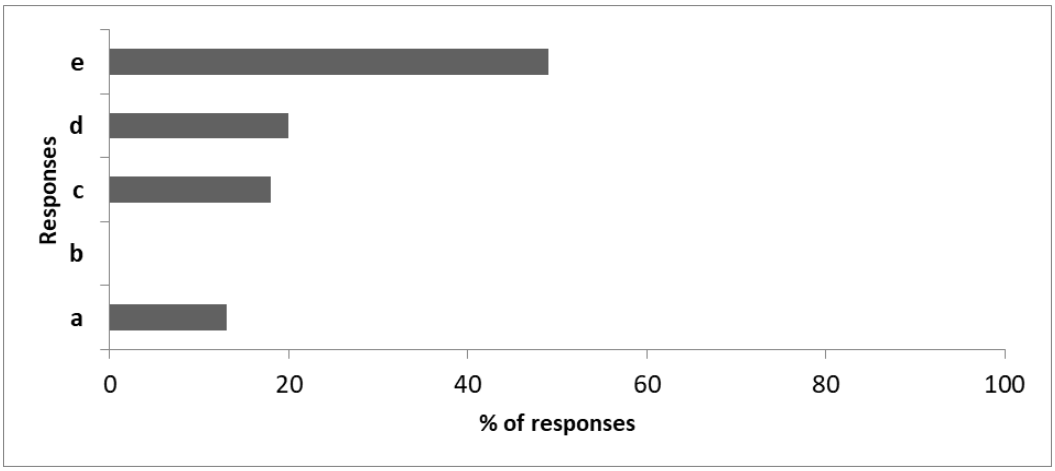

Figure 6. Constraints that limit the adoption of the Investigative Approach

a: Overloaded program
b: Lack of the student's autonomy
c: Overload of the number of students.
d: Lack of continuous training
e: All choices

Discussion

According to the question (Q1) related to the representations of the teachers interviewed on the Investigative Approach, it seems that the latter have erroneous representations and confusion concerning the correct definition of the Investigative Approach. Indeed, almost half of the population questioned opted for the incorrect

formulations, namely that this approach is an approach based on the investigation of the learning obstacles of students, and a process of learning scientific content. This is despite the fact that these teachers affirmed during the semi-directed interviews that they had already heard of this approach. These data show that a priori, teachers' representations can hinder the implementation of this approach in the classroom. These data are corroborated with a study conducted by Kouchou et al. (2017) who highlighted the presence of erroneous representations among teachers regarding the investigative approach.

In question (Q2), almost half of the teachers affirm that there is no difference between the investigative approach and the experimental approach. They say that the investigative approach is the experimental process. These results correlate with those obtained in research at the national level (Kouchou et al., 2017) and in other international education systems (Coupaud, 2014; Boilevin, 2013; Boilevin and Brandt-Pomares, 2011), which show that Teachers of different disciplines (Life and Earth Sciences, Physical and Chemical Sciences, Technology) sometimes perceive differently the notion of the Investigative Approach.

The data for question (Q3) show that the majority of teachers have not received a continuous training on Investigative Approach. Indeed, the lack of continuous training on new pedagogical approaches, and in particular on Investigative Approach, can be at the origin of the erroneous representations identified among the teachers surveyed. This finding is consistent with a study by Boilevin et al. (2016) which underlined that training on this approach is a necessity and a declared need by teachers. The results obtained from the question (Q4) shows that the teachers surveyed do not adopt this approach, it seems that these teachers are reluctant to change their working methods. Resistance to change and refusal of new pedagogical methods has already been reported by researchers in other contexts such as Boilevin et al (2012) and Kouchou et al (2017), who revealed that teachers are not interested in changing their teaching method and therefore do not adopt the Investigative Approach.

The answers of the teachers to questions (Q5) and (Q6) show a multiplicity of difficulties and constraints that can limit the implementation of the Investigative Approach in classes, namely: the overloaded program, the lack of the student's autonomy, the overload of the student's number and the lack of continuous training for teachers. These results are consistent with data from the literature which reveal that teachers face multiple difficulties (time and overloaded schedule; lack of student autonomy) to implement this practice (Kouchou et al., 2017 ; Boilevin et al., 2012 ; Venturini & Tiberghien, 2012 ; Jameau, 2012 ; Gyllenpalm et al., 2010 ; Calmettes, 2007, 2008, 2009;Vlassis et al., 2002).

Conclusion

The analysis of the results of this survey revealed the presence of the erroneous representations among teachers concerning the definition of the Investigative Approach. Indeed, the reason behind these erroneous representations is the fact that teachers find it difficult to implement it, especially since they have received little

or no training on this new approach. On the other hand, the presence of a set of constraints and difficulties hindering the implementation of this approach in class by teachers. These constraints are linked to the overload of the number of students, the lack of student's autonomy, the overloaded program and the lack of continuous training.

The erroneous representations as well as the constraints stated throughout this study underline the importance of the continuous training for the teachers on the new approaches in particular the Investigative Approach. Accordingly, training allows them to go beyond their initial representations to become aware and train in new pedagogical approaches to adopt them correctly in the teaching of scientific content.

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