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Students' Views of Science Education Challenges in Morocco: A Focus Group Study

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Abstract

Students' perspectives of science education are of critical importance as they constitute one of the major stakeholders whose views are necessary for any enhancement of science education. The main objective of the present paper is to identify the extent of the effect of the change in the medium of instruction from Arabic to French at tertiary level on students' learning of science and thus on the quality of science education. To this end, the study employed focus group interview to explore students' experience and perspective of science education. The main focus was on the linguistic and educational factors that negatively influence learning science. The results show that the most dominant factors that influence students' understanding of scientific concepts relate to proficiency in French, translation from and to Arabic, learning through practical work, and communication. The findings have important implications for science education, language policy, and science curriculum design in Morocco in particular, and in other non-western contexts in general.

Keywords: science education, medium of instruction, proficiency, translation, quality

Introduction

In many non-western countries like Morocco, where science is taught in the local language at school level and western language at university level, students face tremendous challenges. First, most of them have a limited command of the second language. Second, translation from western languages to non-western languages is not highly successful because several senses of words may change in the translation process (e.g., Cobern, 1996; Kawasaki, 1996; Aikenhead & Ogawa, 2007, Lahlou & Hajar, 2016; Lahlou, in press). Third, there is a considerable gap between the meaning of a word in everyday speech and scientific language, the ignorance of which may impede learning scientific concepts and ideas (e.g., Duit & Kesidou, 1988; Strömdahl, 2007). As Logan (1981) says, the conceptual background of a student is constructed in their language, which is dissimilar to the scientific background. First of all, a student may study in his or her local language or pidgin. Second, they gradually learn in a different language, like English. The next stage is to study science in English. This causes students' science concepts to be kept along with their traditional concepts, creating confusion between the students' culture and "science culture" (Logan, 1981).

In the Moroccan context, all the above-mentioned challenges reach a climax when Arabic is replaced by French at tertiary level, increasing the burden of the transition from school to university and causing real problems for students' learning of science as well as quality of science education. Thus far, the literature on the issue of medium of instruction in teaching science to Moroccan students has been centred on language policy, system and attitude. However, studies on the linguistic and educational factors influencing a student's learning of science are still lacking, especially from the perspective of students.

Problem Statement

Morocco, like many other newly independent countries, has adopted bilingualism in science education. Thus, Arabic is employed at the school level while French is used at the tertiary level, especially to teach science. Despite the definite advantages of this language policy, the change in the medium of instruction adds to the problems faced by students in learning science, which in turn adds to the challenges for science education quality. A model for quality in higher education must characterize the common views of the stakeholders to thrive (Srikanthan & Dalrymple, 2003). Considering the different views of stakeholders, namely funding bodies and community at large, students, employers of graduates, and staff (academics and administrators), about quality in higher education is vital (Srikanthan & Dalrymple, 2003). Harvey & Green (1993) assert that the perspectives of every stakeholder ought to be taken into consideration in assessing quality given that quality is 'stakeholder-relative', to use Harvey & Green's (1993) expression. For instance, students and lecturers may emphasize the process of education, whereas employers may emphasize the outputs of higher education (Harvey & Green, 1993).

The current paper focuses on the perspective of students for two reasons. First, it is not possible to investigate all the stakeholders' competing perspectives in one study. Second, students' views of science education are pivotal as they are one of the main consumers of educational services (e.g., Hill, 1995; Ulewicz, 2017). Their views are crucial in showing their satisfaction, one of the main factors which contribute to the success of higher education industry.

Research Questions

The present study investigates students' views about the aforementioned change in the medium of instruction in terms of linguistic and educational aspects and thus identifies the actual and potential difficulties they face in learning science in general and physics in particular. This will provide a practical insight into science education challenges and quality from the perspective of students, one of the key internal stakeholders.

Given the above, the questions that the present study aims to address are:

- What linguistic difficulties does change in the medium of instruction pose for students?

- What educational difficulties does change in the medium of instruction pose for students?

Methodology

The current paper employs a qualitative method, that is, focus group interview, to explore students' views and experience of science education because it is one of the best research methods to approach humans' attitudes and perceptions (Krueger, 1994). Focus groups work well in research whose main goal is to describe participants' perceptions, feelings, manner of thinking and so forth. In addition, compared to other methods of collecting data like surveys and individual interviews, focus group interviews normally provide moderators with opportunities to observe how group members respond to others' perspectives and defend their own (Barbour & Schostak, 2005).

To collect a wide range of data, four focus groups with 7 to 12 participants were designed, which was thought to be satisfactory as two groups were in their first year of university studies and two groups were in their second year of university studies. The participants in each group were homogeneous in terms of academic discipline, country of origin and age. Homogeneous groups in background and viewpoints require a smaller number of groups provided that it is more than 1 focus group (Freitas, Oliveira, Jenkins, & Popjoy, 1998). Participants were recruited from a public university in Morocco, namely National School of Applied Sciences and Faculty of Sciences. Participants were recruited using convenience sampling because only a few learners were available as it was the very beginning of the academic year, and therefore they were volunteers (Creswell, 2009). The participants are multilingual. They all speak Standard Arabic, French and English. Nevertheless, their proficiency in Standard Arabic ranges from moderate to very high, in French from moderate to very high, and in English from low to very high. The groups included both male and female respondents.

The author, as a moderator, conducted all four focus group interviews. Regarding science education, the respondents were asked, "What do you think of the change in the medium of instruction from Arabic at primary and secondary levels to French at university level?" The moderator communicated the topic of discussion to the participants, raising clarifying questions, and using probing questions to elicit additional knowledge (Brotherson, 1994). Each focus group interview lasted 1 hour to 2 hours, following the normal duration range of a focus group, that is, from one to two hours (Patton, 2002).

After the focus group interview guide was written in English and forward-translated into Arabic, two Arabic-English bilingual speakers back-translated it into English. This is to compare the original version with the translated one and to verify precision and equivalence (Brislin, 1970). The focus group interviews were recorded, with the permission of all respondents, and then they were transcribed word for word, verbatim (Crabtree & Miller 1999). The same translation model was used in translating the transcripts of the interviews conducted

to repeatedly compare the original transcripts with the translated ones during analysis as well as synthesis (e.g., Lyons & Coyle, 2007; Regmi et al., 2010).

Findings and Discussion

The main challenges for science education raised by participants are linguistic and educational in nature. In other words, the most predominant themes that emerged in connection with science education were proficiency in French, translation from Arabic to French and vice versa, learning concepts through practical experience, and communication.

Proficiency in French

Participants showed their interest in being multilingual, "learning French and English by graduation;" however, most of them raised concerns about making progress in science as they do not have a good command of French. This is because students mostly learn sciences in Arabic at primary and secondary levels. French is not equally integrated at these levels. A respondent, for example, commented, "I've been weak in French since the primary school, and the problem kept on accumulating until the baccalaureate. Here [in the university], I find French not as a subject but as the language whereby I will understand science". Another participant said:

> We have been studying science in Arabic since the beginning. Terms had rarely been used in French until we reached the baccalaureate level as we were informed that we would need them later. If we had studied in French from the beginning, it would have been easier.

Translation From and To Arabic

Translation is an indispensable tool for understanding scientific terms given the change in the medium of instruction at tertiary level; however, it is not without problems. Translating scientific terms from French to Arabic, according to some participants, is not helpful. As an alternative, a respondent stated that they "have to check the meanings in French dictionaries, which in turn needs checking the translation in French-Arabic dictionaries." All respondents agreed that dictionaries help in understanding physics terms, especially if "they consist of pictures". In addition, the scientific books translated "into Arabic are mostly literal and so cause problems to our understanding and to lecturers' explanations." This made some participants assert that scientific texts in French are much easier to understand than those in Arabic. A participant, for instance, said:

> Philosophical texts, like Descartes', are better understood in French than in Arabic because French is close to Greek. The original meanings are lost in Arabic because there may be some mistakes in translating a text from Greek to French and then from French to Arabic.

Learning Concepts through Practical Work

No one denies the significance of practical and laboratory work in learning scientific concepts and ideas. A respondent, for example, said, "the more we carry out experiments, the more we understand the concepts." In cases where practical work is insufficient, these concepts will remain abstract as students will not be able to observe or manipulate materials and so will only study science theoretically. One of the respondents stated:

> Chemistry … [is] concrete; one must experience it to understand it, but we, most of the time, study it theoretically rather than tangibly. I do not mean always, but things often remain abstract; anything we study seems abstract to us. We try to imagine it in our setting which is informal (dialectal), but we do not see it in the physics setting.

As an alternative, students make use of some audio-visual tools like videos to understand some scientific ideas. For example, they "refer to sources online like *YouTube* to understand scientific concepts" and to watch "experiments" in particular. Despite the benefit of this source to learning scientific ideas through stimulating students' sensory experiences, "they do not solve the problem," as one of the participants asserted. Another respondent further explained, "the problem with videos is that an experiment remains intangible as it only gives you an idea, but you should be involved in an experiment and participate by mixing substances and so on". Overall, students prefer to participate in doing an experiment rather than watching it on *YouTube* to better understand as well as remember the concepts learnt. However, they stated that they mainly "refer to videos when … [they are] under stress of passing the exam."

Communication

Several students enter university with insufficient command of French, and so they need to work on their language proficiency as well as understand scientific subjects. A lecturer's awareness of this situation requires him or her to inform students in a language they can understand and to listen to them. Respondents showed much appreciation of their lecturers' support. For example, educators may "compare the concept in everyday language and science", "use pictures" and switch to "the dialect", which helps [them] understand." Nevertheless, "the predominant use of French terminology is unintelligible." "[Scientific] concepts are easier when a lecturer clarifies them in simple ways," and provides illustrative examples. A participant's statement summarizes the importance of a good lecturer's facilitation of learning, "we had some misconceptions about terminology in the beginning, but after we studied it and it was explained to us in physics classes we have understood it correctly, and physics ideas have become clear".

However, this can only be achieved if a lecturer is knowledgeable about scientific terminology in Arabic and has the ability to compare it with French scientific terminology. A participant, for instance, said, "a teacher who taught us science in Arabic sometimes gave wrong information because he had studied science in French and had little knowledge about Arabic scientific terminology." Lecturers' interaction with students can also be negatively affected by overcrowded classes. To quote one of the participants, "at a tutorial, a lecturer is

usually relaxed, interacts with us and we understand him or her, but in a lecture he or she is under pressure given the short period of time and high number of students ranging from 100 to 200, and so they speak fast to finish the lecture."

Conclusions and Recommendations

The data elicited from the participants confirms the impact of the transition of the medium of instruction from Arabic to French at the tertiary level on students' learning of scientific subjects. The most recurring themes it highlights, namely proficiency in French, translation from and to Arabic, learning through practical work and communication, stress the linguistic and educational factors affecting science students.

Mastering Arabic, the primary medium of instruction at the primary and secondary levels, and a language of western science like French and English facilitates learning science with minimal "conceptual confusion" to use Kawasaki's (2007) expression. This helps students reconcile their linguistic and cultural view of science with the western view of science and achieve both learning western science and promoting students' national identity (Kawasaki, 2007). Despite the enthusiasm for bilingualism and favourite chosen subjects that students showed, insufficient command of French remains a major obstacle to learning science concepts in general and physics concepts in particular. Low proficiency in French may cause students to have low self-confidence in learning, a potential problem that has to be avoided to achieve a sustainable science education (Kaptan & Timurlenk, 2012). Thus, to alleviate the effect of the hard transition of the medium of instruction from Arabic to French at the tertiary level, French should be equally incorporated into the curriculum of science so that French can be used along with Arabic in the science classroom at primary and secondary levels. This will help students master French terminology of science and be cognizant of the differences between Arabic and French terminologies of science early on in their learning. It will also reduce students' dependence on literal translation to understand scientific terms. Students should also be offered pre-orientation and on-going orientation courses at the tertiary level to make sure the transitional linguistic gap between secondary level and tertiary level is bridged.

Overcrowded classes and insufficient number of laboratories result in lack of adequate practical work and laboratory experience opportunities. A large number of students in the class further impact the teaching time allocated for the intensive fixed curriculum. It is suggested that universities work on enhancing their infrastructure, especially laboratories. Adequate teaching time should also be allocated to cover course material to avoid lecturers' concern with completing the curriculum and to enable them to provide more practical work experiences, particularly class demonstrations and experiments, and to tailor lessons to all students.

The findings of the current study offer valuable insights into the perceptions of Moroccan students on higher science education. However, they are based on a sample drawn from a population of first-year and second-year students in one Moroccan university only.

Thus, future research on higher science education is required to extend their sampling to other universities in Morocco to help achieve a more exhaustive research data.

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