

Perceptions and practices of Science Teachers on language alternation: A Qualitative Study based on semi-structured interviews in the Souss-Massa and Marrakech-Safi regions of Morocco

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ABSTRACT

The main purpose of the present study is to examine teachers' perceptions, practices and experiences concerning the adoption of language alternation in the teaching of science at secondary level. The study was carried out among Moroccan secondary school teachers. To achieve our objective, data were collected through semi-structured interviews. In all, 14 teachers were met and interviewed. The results revealed that science teachers use language alternation in the teaching of science subjects. In addition, they noted an improvement in the level of their learners. However, teachers often resort to their mother tongue to facilitate the transmission of disciplinary knowledge. To overcome this issue, teachers employ pedagogical practices such as the use of educational technologies, supervised discussions and diversified methods such as the experiential method.

Keyword: - Language alternation, science, teaching, foreign languages.

1. INTRODUCTION

Morocco's educational landscape is strongly influenced by its linguistic diversity, which reflects the country's history and cultural diversity. The cohabitation of languages, notably classical Arabic, Amazigh, Moroccan dialect (Darija), French and, progressively, English, represents a context that is both rich and highly requiring for the education system. Rafiq (2017) points out that the linguistic situation in Morocco reflects multiculturalism. As we explore Morocco, we witness a teeming array of national and foreign languages, which coexist and develop in everyday life.

Thus, education is a continuously evolving field, with a constantly developing range of educational approaches. It is frequently regarded as the foundation of any successful society. At the heart of this development stands the CLIL (Content and Language Integrated Learning) approach. This educational approach combines harmoniously the development of language skills with the teaching of academic subjects, notably DNL (Non-Linguistic Disciplines). This approach is similar to language alternation in the Moroccan context, with the same objectives. Ben Hammou et Kesbi (2021a) share the same idea. They consider that a top-down CLIL program, called language alternation, in Moroccan secondary schools focuses on teaching sciences by means of the French language.

Due to its ability to bring together linguistic and cognitive aims, language alternation is an ideal way of remedying the problems posed by teaching science in a second language, while at the same time enhancing students' abilities. This alternation constitutes a pedagogical tool who is selected, within the context of bilingual or multilingual teaching, in order to improve the acquisition of one or more languages through the partial use of these languages in the instruction of some subjects. Language alternation is primarily employed for mastering foreign languages (CSEFRS, 2019).

However, its implementation in Morocco has remained very limited, raising questions about pedagogical methods and teachers' opinions. In the light of these developments, it therefore becomes crucial to know the perceptions and practices of Moroccan teachers involved in the practice of language alternation. Their opinions, which are often indispensable to the implementation of educational policies, provide invaluable insight into the obstacles, achievements and suggestions for the effective integration of language alternation into the Moroccan educational system.

This issue raises the following questions:

- What are science teachers' perceptions of the implementation of language alternation?
- What practices and experiences do science teachers use in this application of language alternation?

Consequently, the aim of this study is to analyze teachers' perceptions in detail, highlighting their points of view in order to clarify their experiences and current teaching practices, and to provide guidelines for the continuing development of language alternation in Morocco.

2. LITERATURE REVIEW

In an educational context where linguistic diversity is increasing, language alternation clearly appears as an innovative solution to the dual need to teach disciplinary content and consolidate language skills. Particularly useful in the field of science, this approach places the teacher at the heart of the educational process, with the sensitive task of reconciling the transmission of scientific knowledge with the mastery of a language. However, the success of this mission depends to a large extent on the teacher's perceptions, pedagogical practices and experience of this approach.

As such, their perceptions and experiences are valid indicators of the feasibility and performance of this approach in a multilingual context. Nevertheless, on a global scale, the deployment of CLIL has raised a number of concerns. According to Ben Hammou & Kesbi (2021b), the use of L1 (mother language) in bilingual programs is mainly due to the difficulties encountered by teachers and students with the vehicular language, particularly in post-colonial contexts. According to their study of teachers' perceptions and experiences of teaching science subjects (mathematics, physics and life and earth sciences) in the French language. Even when the teachers consider themselves to be suitably qualified in the language of instruction, they frequently resort to the mother language of the students, whenever the students are unable to grasp the meaning of the teaching content. Indeed, Probyn (2001) points out that teachers use the mother tongue to achieve a whole variety of goals: to reinforce students' understanding, to underline a few points, to encourage and probe, to sustain or "scaffold" learners' interventions. All of them employed sentences in their mother tongue to find out whether the pupils had followed the lesson, to stay in contact with each other.

Besides language skills, the issue of preparing teachers to teach in a foreign language also emerges (Ben Hammou & Kesbi, 2023). One point that concerns the majority of teachers is their own training. All of them believe that participating teachers will be required to have a high level of English, which is currently not the case. They argue that teachers need the required training, and are delighted to have language assistants available (Pena Díaz & Porto Requejo, 2008). CLIL teachers generally make a clear distinction between teaching content and teaching language. Their focus is mainly on content, with language taking on a complementary role. Reasons cited include teachers' low self-confidence due to their limited proficiency in the intended language (often English), as well as subjective assumptions that they are poorly able to integrate content and language on the basis of their training and preparation (Karabassova, 2018). According to Ifqiren et al. (2021), the results of their study showed that the teachers surveyed considered the teaching of life and earth sciences in French as a barrier to academic success and classroom interaction. This problem was also found to be associated with a lack of training in teaching the subject in the French language.

This study is therefore situated at the crossroads of didactics and sociolinguistics, since it examines both the pedagogical practices of teachers concerning language alternation within a multilingual context. First, it examines the didactic strategies adopted by teachers to combine science teaching with language learning, and then it analyzes the sociolinguistic aspects associated with the use of several languages (such as Arabic and French) in science teaching. This position offers the opportunity to analyze both pedagogical issues, in terms of teaching methods, and linguistic issues, in particular the management of language alternation. This cross-disciplinary approach provides a comprehensive understanding of the implications of language alternation in a multilingual educational context.

3. RESEARCH METHODOLOGY

3.1 Study design

The present study is based on an exploratory qualitative approach, which is specifically designed to analyze the practices, perceptions and experiences of science subject teachers with regard to language alternation and its potential harmonization with CLIL principles. The qualitative approach, due to its nature, grasps the complexity of educational issues in their concrete environment, collecting rich, detailed and relevant data.

A semi-structured interview guideline was designed to guide discussions, while allowing participants to explore topics in greater detail, in line with their own experiences and perceptions.

3.2 The participants

The sample consisted of 14 science teachers (mathematics, physics-chemistry and life and earth sciences) working in public and private high schools and middle schools in the two regions of Souss-Massa and the Marrakech-Safi.

The selection of participants was made on the basis of a purposive sampling, according to the following criteria:

- Teaching experience: All participants had at least 2 years' experience in teaching science at secondary level, ensuring an adequate level of teaching expertise.
- Use of language alternation: Teachers were asked to indicate the regular use of language alternation in their lessons.
- Contextual diversity: The sample included teachers working in a variety of contexts (public/private, urban/rural) in order to gain a diversity of experience and practice.

Table -1: The participants

Interview identifier	Pseudonym	Age	Subject	Years of experience	School establishment
1	Houria	25	Physics and chemistry	Two years	Rural area
2	Samia	26	life and earth sciences	Two years	Rural area
3	Mohamed	27	life and earth sciences	Four years	Urban area
4	Maryam	34	life and earth sciences	Seven years	Urban area
5	Soumaya	35	Mathematics	Six years	Rural
6	Soukaina	24	life and earth sciences	Two years	Urban area
7	Roqaya	21	Physics and chemistry	Two years	Urban area
8	Touria	24	life and earth sciences	Two years	Urban area
9	Ali	31	Mathematics	Seven years	Urban area
10	Brahim	31	Physics and chemistry	Eight years	Urban area
11	Sara	26	Physics and chemistry	Three years	Urban area
12	Salima	29	Mathematics	Four years	Rural area
13	Naima	32	Physics and chemistry	Six years	Urban area
14	Karima	32	Mathematics	Seven years	Urban area

3.3 Procedure

This study focuses on the experiences and perceptions as well as the pedagogical practices of science teachers. It analyzes how foreign languages are integrated into the teaching of science in Moroccan secondary schools. The data for this research were therefore collected in a unique phase. During this phase, 14 science teachers were interviewed. Data from these interviews were transcribed manually, translated into French and then analyzed to determine codes and themes.

Data were collected through face-to-face and telephone interviews. The interviews were recorded. The majority of teachers were interviewed face-to-face, while 2 others were interviewed by telephone. Although the questions were almost identical for all interviews, those conducted by telephone lasted 10 minutes longer than those conducted face-to-face. Semi-structured interviews were adopted. The majority of questions asked were open-ended and concerned teachers' perceptions and experiences of teaching science subjects in French.

3.4 Ethical considerations

Participants were given full information about the research and the various study procedures. They gave oral permission to participate in the study and to be recorded for research purposes. Participants were identified by pseudonyms.

4. RESULTS

Four themes were identified: (a)- Application of language alternation and preferred language of instruction. (b)- Teachers' perceptions of language alternation. (c)- Pedagogical practices used during language alternation. (d)- The impact of the French language of instruction on the acquisition of disciplinary skills.

4.1 Application of language alternation and the preferred language of instruction

The increasing recognition of language alternation as an effective pedagogical strategy seems to be influencing teachers' perceptions of its incorporation into science teaching as a means of improving bilingual competence in Moroccan classrooms. The majority of teachers employ this alternation in their teaching sessions, either partially or completely.

Extract 1 : “To implement language alternation, I proceed with linguistic immersion: the entire session is conducted in French, but I sometimes resort, and if necessary, to Arabic dialect to facilitate understanding for all students. For example, when I'm explaining a scientific phenomenon, I sometimes use Arabic to transmit knowledge. If the students' level of French is satisfactory, I use French only to transfer scientific knowledge. On the other hand, if some of the pupils have linguistic deficiencies, I teach in French and sometimes translate into dialectal Arabic, but only partially” (Samia, teacher of life and earth sciences).

Nevertheless. The introduction of alternating language teaching in Moroccan schools is the result of a strategic ministerial decision. Admittedly, some teachers feel that this alternation is imposed, and that neither they nor their pupils are prepared for teaching/learning these scientific disciplines in a foreign language.

Extract 2 : “We had the feeling that we weren't ready, as if this alternation had been imposed, whereas at the beginning it was applied gradually, since only typical classes benefited from this alternation (brilliant/excellent students), and it wasn't generalized at the beginning, each institution having, for example, only one class that benefited from this section of the BIOF (international baccalaureate French option)” (Soumaya, Teacher of mathematics).

Extract 3: “It's the Ministry of National Education that opts for this educational choice of integrating the teaching of scientific subjects in foreign languages, so I use it as a physics teacher to convey the disciplinary concepts of physics” (Houriya, physics-chemistry teacher).

However, teachers prefer English more than French as a teaching language, arguing that English is the language of globalization and scientific research. The fact that teachers increasingly prefer English than French reflects the perception of English as a global language offering more academic and professional opportunities, and wider access to modern sources of science and technology.

Excerpt 4: “I prefer English even though my level of English is not excellent, but I prefer this language because it's the language of scientific research. French is also a good language, but sometimes you can't find what you're looking for in French” (Soukaina, teacher of life and earth sciences).

And let's not forget that many students are reticent to learn in French, preferring Arabic, notably for cultural reasons and their poor mastery of the language, as opposed to English, seen as the language of the future, opening up wider academic and professional prospects with an international dimension.

Extract 5: “Pupils prefer Arabic, because most of them don't master French, even though they've been learning it since elementary school, but they only use it in the hours specific to this language, they don't practice it outside the classroom. On the other hand, compared to the private sector, which uses French most of the time” (Houriya, physics and chemistry teacher).

However, mastery of foreign languages is influenced by a number of factors, not least social status: most pupils from advantaged families who attend private schools have a better mastery of foreign languages than those who attend public schools.

Extract 6: “There are pupils who prefer French and understand nothing in Arabic, yet they don't speak this language, their daily discussions with their colleagues are in French, their exchanges with their parents are in French, they study in big private schools or missions and come from a high social level” (Mohamed, life and earth sciences teacher).

Extract 7: “The social factor also plays a very important role. For example, a person from a family whose parents work and use French on a daily basis is different from someone living in a house where their parents have not been to school and do not use the French language, so this learner has no chance of hearing French outside the classroom” (maryam, life and earth science teacher).

4.2 Teachers' perceptions of language alternation

Although some teachers consider that they are not ready for this alternation, the majority of them are in full agreement with its implementation, as it will establish fluid continuity given that higher education is already in French, and will resolve the linguistic gap between the two cycles (secondary and higher education).

Extract 8: “I fully agree with this alternation, I value it, because for me this alternation will improve the level of students, it will enable students to acquire a solid base from secondary school onwards, so that they can integrate higher education easily, since the language of instruction for science at this level in Morocco is French” (Samia, Life and Earth Sciences teacher).

Learning science in French is essential for learners, as this language is widely used in Moroccan higher education. Such an approach ensures a harmonious transition to higher education, consolidating their ability to acquire mastery of scientific language and benefit from access to available academic resources.

Excerpt 9: “I totally agree, in the sense that it's compulsory for students to learn French, and there's no point in learning science in Arabic, since the books are in French, higher education is in French, so teaching science in Arabic is an obstacle for them, because it doesn't give them continuity in the future” (maryam, life and earth science teacher).

4.3 Pedagogical practices used during language alternation

Although The majority of teachers participating in the study adopt a variety of pedagogical practices designed to promote learning of both the subject content and the target language. One of these practices is the experimental method, which appears to be an indispensable tool in science teaching. The experimental method occupies a primordial place in science teaching by incorporating learning through direct experience.

Extract 10: “I make experiments, since the material is available, I try to involve the students so that they support me by doing experiments together... I apply the investigative approach with my students, starting with a problem situation, launching an unsolved problem, but whose solution exists in the experimental or documentary activity I do afterwards, after which the student responds step by step” (roqaya, physics and chemistry teacher).

Through this practice, learners have the opportunity to collaborate actively in scientific experiments, providing a real-world framework for acquiring both disciplinary knowledge and language skills. By simulating objects, following instructions and analyzing results, students are able to master scientific concepts while practicing the target language in a concrete and relevant way.

However, the use of educational technologies in the application of language alternation, including videos, audiovisual supports and interactive digital devices, is an indispensable practice to facilitate learning. These resources provide visual and auditory support, enabling students to gain a better understanding of subject concepts and strengthen their proficiency in the target language. Videos help to demonstrate complicated phenomenon, while

visual supports such as diagrams, pictures or simulations make the content more accessible and attractive. By placing learning in a real or simulated context, these digital tools also encourage active participation and memorization, contributing to the richness of the educational experience within a bilingual environment.

Extract 11: “I use educational videos and diagrams as well as graphics to perfect the assimilation of the course and scientific terms, as well as to stimulate my learners to make presentations using only French” (Mohamed, life and earth sciences teacher).

Indeed, guided discussions and exchanges, organized in the form of open questions, debates and even problem-solving, encourage learners to make intensive use of the target language to express their opinions, formulate questions and present arguments. The creation of an interactive and cooperative environment facilitates the learning of precise vocabulary, while developing critical thinking and communication skills.

Extract 12: “I use guided and supervised discussions: In my classroom, I allow and facilitate animated discussions on scientific topics, promoting the immersive use of the French language, while asking open-ended questions to encourage reflection, contribution as well as cooperation” (Houriya, physics and chemistry teacher).

4.4 The impact of French as a language of instruction on the acquisition of disciplinary skills

The simultaneous use of innovative practices such as the experiential method, educational technologies and directed exchanges within the context of language alternation makes an effective contribution to the progression of learners' disciplinary and language skills. Exposure to the target language, whether partial or complete, places learning in an immersive context, consolidating mastery of scientific concepts and fostering the acquisition of language skills by students.

Excerpt 13: “I have noticed an improvement in the level of the students, both in terms of language and subject matter. Indeed, the baccalaureate class, as an example, has a perfect mastery of description, explanation and deduction, all of which are important concepts in the subject.” (samia, life and earth sciences teacher).

These immersive approaches, based on exposure to the target language, encourage active language practice in concrete situations, while fostering the acquisition of subject-specific knowledge. In this way, they offer a double advantage: a better appropriation of the target language and an improved grasp of the content specific to the subject.

Extract 14: “For my part, I have noticed an improvement in the level of the students, since they have accepted the reality that French is necessary and compulsory for them, which pushes them to master the language. On the other hand, by practicing in class and hearing French in each scientific discipline, the students acquire 3 words a day, for example, which enables them to build up a knowledge base. Then, as time goes by, students will be able to formulate sentences and express themselves” (Mohamed, life and earth sciences teacher).

5. DISCUSSION

The present study examines the implementation of language alternation in Moroccan secondary schools in the two regions of Souss-Massa and Marrakech-Safi, based on the teaching of science subjects in French, English. Based on a qualitative approach, the study explores the perceptions, practices and experiences of Moroccan science teachers towards the implementation of this pedagogical approach.

This study drew a number of conclusions. Firstly, the study revealed that all teachers were in full agreement with the introduction of language alternation in science teaching in Morocco. Admittedly, most of them prefer English as the language of instruction rather than French. In a study carried out by Ben Hammou et Kesbi (2021b), the teachers interviewed criticized the priority given to the colonial language over the various common foreign languages, and called for the colonial language to be replaced by English, believing that French is one of the factors causing underdevelopment Moroccan education and the economy. Indeed, French is currently used in all levels of pre-university education, and is now the main language of teaching for scientific disciplines in secondary and higher education. The status of English, on the other hand, has stayed virtually unchanged, with the notable exception of a few secondary schools that provide classes in English for pupils whose level of English is satisfactory for instruction in that language (Ben Hammou & Kesbi, 2023).

However, the use of the mother tongue, even if exceptional, is an essential pedagogical tool. It offers teachers the opportunity to clarify complicated concepts or specify essential information, particularly when students' proficiency in the target language is still limited. This practice is actually recognized as being naturally associated with the linguistic characteristics of bilinguals (ER-RADI & BOUALI, 2020). This practice, known as code-switching, refers to a sociolinguistic phenomenon resulting from linguistic contact, corresponding to the coexistence of two or more varieties in a verbal exchange by a bi-plurilingual speaker (Ismaili Alaoui & Chalfi, 2024). This practice has always

been the subject of controversy. Indeed, while some researchers believe that its appearance in the discourse of teachers or learners is proof of a lack of linguistic competence, others consider it a useful resource for pedagogical communication, and even call for its didactization (ASKOUR, 2023). Certainly, despite the fact that teachers see code-switching as a “bad” practice, they permit pupils to employ their native language when they are experiencing difficulties during discussions, since they are in a hurry to complete the subject content in the allotted time (Karabassova, 2019). However, the use of Arabic also appears to teachers as a useful pedagogical tool for linguistic clarification, to support and consolidate the learning of French, based on a language that students master well, given that teachers consider the global level of students' mastery of French is low (Ismaili et al., 2024).

Indeed, the use of pedagogical practices such as experiential activities, visual tools, educational videos and guided discussions significantly reduces mother-tongue dependency in science lessons. These strategies involve learners in interactive and immersive activities that encourage foreign language acquisition while ensuring a good understanding of the subject content. By reinforcing the practical and stimulating character of learning, they decrease dependence on explanations provided in the mother tongue. This process consolidates language immersion and ensures the successful implementation of language alternation, providing an optimal balance between content and language learning. According to Grimaldi and Iengo (2015), several previous studies have shown that the use of ICT as part of the teaching/learning process is likely to generate various favorable impacts on student motivation, which is indispensable in CLIL classes because of their dual purpose.

As a result, language alternation has a beneficial effect on the teaching of science, as it simultaneously promotes the acquisition of a second language and the understanding of scientific concepts. By learning in a foreign language, learners improve their technical vocabulary and communication skills, while their motivation is stimulated by the concrete, authentic nature of the activities. This dual focus on content and language enhances motivation to learn, reinforces learner competence and makes them more capable to integrate into multilingual school or work environments.

One of the strengths of this study resides in its use of concrete, spontaneous field data, enabling it to reflect the vision of language alternation in Morocco in the two regions of Souss-Massa and Marrakech-Safi as it really is. However, like many previous studies, the present study has its limitations. In particular, the group of teachers interviewed is small and therefore cannot be qualified as representative of the totality of science teachers in Morocco.

6. CONCLUSION

To conclude, it appears that language alternation is much more than a simple pedagogical approach: it is a veritable instrument for promoting learning as an enriching, captivating and multidimensional experience. By combining the acquisition of a second language with the teaching of scientific disciplines, language alternation overcomes disciplinary barriers, while preparing students to overcome the constraints associated with multilingualism. This link between language and content trains learners to think and act in multicultural and multilingual contexts.

The conclusions of this research on language alternation highlight the need to train teachers in both subject and language skills, providing them with appropriate and varied resources to achieve the aims of language alternation. To maximize the effects of language alternation, it is recommended that specialized initial and ongoing training programs be implemented, and that cooperation between language and science teachers be encouraged.

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