

Who is the bilingual Science teacher: Literature review



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KEYWORDS

Bilingualism, Identities, Identity, Science teacher, Bilingual Science Teacher.

ABSTRACT

In this review, we seek to identify how the identity of bilingual Science teachers has been conceptualized, theoretically and methodologically. For the analysis we looked for articles in the Francis & Taylor and Scopus databases, selecting 50 articles from different parts of the world which were based on the construction of a search phrase that houses the categories of interest. The found trends were: 1) The invisibility of the science teacher as an individual in bilingualism processes, 2) bilingualism policies and practices that shape the identities of science teachers, and 3) getting, usually, the language teachers in charge of teaching science in bilingual processes. We conclude by noticing that research exploring the identity of the bilingual science teacher is scarce making it necessary to problematize this issue, as well as investigate it in depth, keeping in mind that bilingualism has been normalized around the world and has been understood using English as a Medium of Instruction (EMI) and a Content and Language Integrated Learning (CLIL).

RESUMEN

*En este perfil se busca saber cómo se ha trabajado metodológica y teóricamente la identidad de los profesores de ciencias bilingües. Para el análisis se buscaron artículos en las bases de datos Francis & Taylor y Scopus, seleccionando 50 artículos de diferentes partes del mundo basados en la construcción de una frase de búsqueda que alberga las categorías de interés. Las tendencias encontradas fueron: 1. La invisibilización del profesor de ciencias como individuo en los procesos de bilingüismo, 2. Las políticas y las prácticas de bilingüismo moldean las identidades de los profesores de ciencias, 3. usualmente el profesor de lengua se encarga de la enseñanza de las ciencias en procesos bilingües. Como conclusión se tiene que los trabajos acerca de la identidad del profesor de ciencias bilingüe son escasos; es necesario problematizar este campo dado que se ha normalizado partiendo del hecho de que el bilingüismo en el mundo ha sido entendido desde el uso de *English as Medium of Instruction (EMI) (Inglés como medio de instrucción) y *Content and Language Integrated Learning (CLIL) (Aprendizaje integrado de contenidos y lenguas extranjeras -AICLE-)*

INTRODUCTION

Recently, in Colombia, there has been a powerful trend in private schools to teach Science in English. This is controversial because in the Colombian territory 90% of the population speaks Spanish, and there are other individuals whose indigenous/native languages are spoken as well. The increasing demand of bilingual teachers has overwhelmed programs that train professionals to teach bilingually. This review seeks to examine how bilingual Science teaching has been explored, in order to find research trends that can serve as input to future doctoral research about the identities of bilingual Science teachers.

We did the bibliographic review with a research phrase that encompasses the categories related to the “Bilingual Science teacher identity”. This same phrase was inserted in the Scopus and Taylor & Francis databases. A total of 500 articles were obtained, of which 50 were selected to carry out the work. It is important to clarify that when searching for few articles that address research on the identity of the bilingual Science teacher, it was necessary to acknowledge the importance of knowing how such identity has been conceptualized and approached; the Science teacher identity has been taken as an emerging category and it has been revised under its relation to the use of English as a medium of instruction.

Within this work, we address the category of Bilingualism in Science, therefore, we analyzed how bilingualism is carried out in different countries and how Science teachers are marginalized within the process. Likewise, we advance towards another category where we discuss how Science teachers have been considered, of course, identity here is not explicitly addressed. Finally, we are led to a review of how the identity of science teachers has been worked along the way.

Within this paper we have explored the following trends: the Science teachers do not identify themselves into bilingual teaching, even though the identities of Science teachers are closely linked to bilingualism policies and language teachers are usually the ones used to teach

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Science through CLIL or EMI; In one hand, we might conclude that these trends result from the reading and analysis of the 50 articles and in a second hand, that the relevance of identity studies within bilingualism policies is strongly discussed.

PROFILING IN BILINGUAL SCIENCE TEACHERS' IDENTITIES

In this paper, we carried out a profiling (Porter, Kongthon and Lu, 2002) to examine trends and learn from the authors who have worked on the concept of “bilingual Science teacher identity” worldwide. Our interest stems from the fact that in Colombia, schools are increasingly requiring Science to be taught in a “bilingual” way. Our primary objective enclosed three aims: to understand the scope of theory and research pertaining to “bilingual Science teacher identity,” to identify how this issue has been problematized in recent times, and finally, to understand the reason why the studies have been carried out in this field. To comprehend the previous, we start from inquiring the following:

- 1) How has the concept of identity been approached in studies related to bilingualism in Science?
- 2) Which have been the methodological approaches

- in the studies related to the identity of the bilingual Science teacher?
- 3) Which have been the main findings in the studies related to the identity of the bilingual Science teacher?

In order to carry out this work, we decided to use a set of keywords and phrases, that would allow us to cover the search categories related to our interest, such as: Bilingualism in Science, use of English as a Medium of Instruction (EMI) and, Bilingual Science teacher identity. These categories are closely related to one another deriving from them the following search phrase: “TITLE-ABS-KEY ((Bilingual Science teacher identity) OR (English as medium of instruction In science) OR (Bilingualism in science class) OR (CLIL in Science) AND (LIMIT-TO (OA, “all”)))”. We read in titles, abstracts and Keywords. With this phrase, we made the search in two databases: Scopus and Taylor & Francis. These databases gather works of different journals worldwide, which has allowed us to have a broad overview regarding the selection of articles.

In our first search, we did not manage to identify academic works that explicitly address bilingualism and Science teaching, driving us to re aim our search for academic works related to Science teacher identity



in order to understand how the identity of the Science teacher has been studied in a broader spectrum, that allowed us to analyze how this category intersects with the teaching of Science. From English, therefore, the research phrase changed to “TITLE-ABS-KEY ((Bilingual science teacher identity) OR (English as medium of instruction In science) OR (Bilingualism in science class) OR (CLIL in Science) OR AND (Science Teacher Identity)) (LIMIT-TO (OA, “all”)) that, taking into account the category of Science teacher identity. After passing the search phrase in these databases, we found 248 articles in Taylor & Francis and 252 in Scopus, of which 50 articles were selected taking into account that the categories of the phrase were crossed through the titles, abstracts, and keywords.

Within this work, we consider it important to understand how the identity of the Science teacher has been explored in different parts of the world, since it allows us to understand which are the scenarios similar to Colombia (scenarios in which there is a use of a foreign language for science teaching). The next step was to look for investigations examining the Science teacher as an individual, including the characteristics of their identity in studies that look at bilingualism in Science, and to analyze how the identity of Science teachers has been studied.

THE SCIENCE TEACHER: THE BIG ABSENTEE IN THE BILINGUAL SCIENCE CLASS

Many studies cover the subject of bilingualism in Science teaching, evaluating the success of bilingual methodological processes, however, they have made the Science teacher invisible as an active individual within the in and out class development. Regarding this category, we found the articles that examine the subject of bilingualism in Science, but that take for granted the identity of the bilingual Science teacher, or do not problematize the issue at all. The interest in this type of study lies in understanding how the Science teacher is involved in teaching-learning practices from the use of a foreign language, and glimpses how their identity is configured in the practices of invisibility. Therefore, the trend in these studies is in the way they “address the teaching of Science from bilingualism, an invisibility of the teacher as an individual within the process is evidenced.” The reviewed articles give an account of how the processes of bilingualism in Science are carried out in different countries, nonetheless, their methodologies are aimed at understanding the process without taking people into account.

Cheng (2020), for instance, shows that in Hong Kong, English as a Medium of Instruction (EMI) is used through Content and Language Integrated Learning (CLIL). The

author reviews public policies and justifies the use of EMI. Garzón-Díaz (2021) similarly, shows concern for understanding how students’ appropriate science content in English, without reviewing how teachers prepare themselves to face this challenge, like Cheng (2020), he reviews public policies on bilingualism to support their arguments in its favor. The article is similar to Garzón-Díaz (2021) given that the approach is linked to the result of the bilingualism process in the students. Likewise, Hughes, and Madrid (2020) with their work *The effects of CLIL on content knowledge in monolingual contexts*, seek to understand how the processes of bilingualism affect or not the Science learning in different Spanish contexts, the mention that the use of CLIL does not impair Science learning. In these articles, the main concern is the use of CLIL, and EMI in monolingual contexts and their success in terms of Science learning, but they do not wonder about the training, beliefs, or other elements of the Science teachers identity who, in fact, carry out the processes. This is one of the reasons why it is important for us to bear in mind the main concerns of these works, establishing then, that individuals are not the protagonists within the studies but should be.

Ismail et al. (2011) seek to understand how the process of bilingualism is carried out in Malaysia in higher education, they do not delve into the identity of Science teachers nor about their perceptions in the process. Connected to this, it is relevant to mention Izquierdo et al. (2016) who in their work *SciencePro Project: Towards Excellence in Bilingual Teaching evaluate the importance of the SciencePro project in Spain*, which consists on teaching Science through the use of the English language, at the university level, recognize the importance of evaluating these projects to make them visible in Science teaching training programs, but do not inquire deeply enough into the Science teacher identity. Likewise, Kiraz (2010) shows how the bilingualism project is implemented in the schools of Cyprus, assessing the level of success of students towards the natural sciences, but leaves out a fundamental actor in the teaching of Science in English: the Science teacher.

Now, we have analyzed works regarding bilingualism focused on students and their appropriations either of Science or language, in the work of Rahman (2010) *Examining the role of language on students achievement: a study on the use of second language As a medium of instruction in teaching Science subject in Malaysia*, it is possible to understand that access to Science in English also depends on the socio-economic level of students, suggesting that students whose parents have a higher income have greater confidence in learning Science and the use of English unlike students whose parents have

fewer economic resources; the author explains that this has a strong relationship in how English plays or not play an important role in the daily lives of the students. This work has a strong relationship with the paper of Liu (2019) *Exploring bilingual learners' desires in English-medium studies: evidence from a Thai private bilingual school*. who exposes how the identities of the students are immersed by the culture of the countries that speak English. Although the author proposes to implement critical multilingualism to prevent the hegemony of the white native English, giving space to an identity of Asia and the Pacific, these works allow us to understand how students' identities are developed regarding the use of EMI, then again, we reiterate that they do not show concerns about the training of Science teachers, or how they have become bilingual teachers.

Although these articles do not mention the identity of the bilingual Science teacher, or the identity of the Science teacher, they allow us to understand what the research trend has been in terms of bilingualism, it should be noted that articles of this nature were the majority within the results in the databases. In the following sections, we will study how the teacher has been taken into account as an individual in bilingual education and then analyze how the identity of the Science teacher has been studied, and which relationships it may have with the use of English in Science classes.

SCRUTINIZING THE IDENTITY OF THE BILINGUAL SCIENCE TEACHER

In this section, we focused on the reviewed articles that have to do with bilingualism, and that focus on the Science teacher including their perceptions, opinions, training and/or struggles. The review dug into how Science is considered within bilingualism research. The category includes 19 studies of the 50 selected articles, from which the trends evidenced that “the Science teacher does not identify him/herself with bilingual teaching” “the identities of the teachers of Science are closely linked to bilingualism policies” and “the language teacher is usually used to teach Science through CLIL or EMI”.

Barragan and Moreno (2014), in their work *El bilingüismo en la Universidad Pedagógica Nacional, Colombia: experiencias pioneras en la clase de ciencias con estudiantes de pregrado* argue that Physics teachers must have skills in a second language, they propose bilingualism not only from individuals, but also from objects (books, magazines, etc.) that are written in another language. The work is developed with students of the *Universidad Pedagógica de Colombia* of the Bachelor of Physics, there is a discussion

on training in bilingualism not aimed to teaching, but as an element of teacher training, where the management of this ability allows teachers to be trained internationally. It is interesting that the reflections are not made in pedagogical terms but in terms of training and appropriation of the concept, unlike Aiello et al. (2017) in *Preparing teachers in Italy for CLIL: reflections on assessment, language proficiency and willingness to communicate*, who carried out a study on how to prepare teachers to work with CLIL in Italy, the article focuses on the challenges faced by that teachers who intend to teach with CLIL. Within the paper, the authors show how the CLIL process is carried out in some European countries, where knowledge of the target language is required, they do not mention that it is English nor the knowledge in the area to be taught, they do not mention if there are requirements in the development of skills, training or knowledge in pedagogy and education; researchers have postulated that the success of CLIL courses depends on the linguistic competence of their teachers; for Hudson (2009) in his research *Learning to Teach Science Using English As The Medium of Instruction ? a CLIL teacher must learn the contents in English or in the target language*, this provides them with appropriations and elements at the time of teaching the contents from bilingualism; in addition, Escobar (2013) in *Learning to become a CLIL teacher: teaching, reflection and professional development*, finds that the developed constructs in the field of Applied Linguistics allow Science teachers to generate best practices in teaching content in multilingual contexts. Martin and Herrero (2018) with their paper *Evaluación formativa de la lengua de los profesores de Science: un estudio de caso*, also propose that the bilingual Science teacher should have a constant reflection of his/her doing since this allows him/her to appropriate the way of teaching and learning. The study ensures that the speed with which CLIL has been implemented has exceeded the rate of teacher training, which is why the identity of bilingual Science teachers has had to be formed during the development of the process, this generates practices where the same teachers are the ones who have to find the tools to be able to teach Science through a foreign language.

Within this category lies the following trend: the identities of Science teachers are closely linked to bilingualism policies that discuss the way Science teachers have been forced to teach their content in English without having a relevant preparation or training in the foreign language. Here, it is necessary to highlight the paper called *Revisiting English as medium of instruction in rural African classrooms* by Early and Norton (2014) where the authors studied how in a province of Uganda people work with English as a medium of instruction. The research analyzes the precarious conditions in the schools of the province,



how teachers navigate in these conditions, and it takes into account Science teachers and their perspectives on the use of English. The Biology teacher argues that there is no visual aid or equipment to carry out teaching, finding that a crucial problem in the application of English as a medium of Instruction. This is related to the fact that different languages are spoken in the country and many teachers do not speak English. It is important to note that the policy of EMI has shaped the teachers' practices in the classroom, granting low marks if the students do not write the answers in proper English usage, even if the answer in terms of Science is correct. In addition, teachers are punished if they speak their native languages when explaining specific concepts, they are even recognized as incompetent. In the same way Lodge (2020) in *What's in a name? The power of the English language in secondary school science education* addresses the relationship between two languages: Jamaican Standard English (JSE) and Jamaican Creole (JC). In general, JSE is positioned as superior to JC, Science teachers, therefore, consider JC as a "bastardized" language. In conclusion, it is emphasized that the teaching of Science through English has instrumentalized scientific knowledge in favor of achieving improved linguistic skills in the English language. We see in these two studies how the bilingual Science teacher and his/her doing is closely linked to bilingualism policies and the cultural consequences that this brings.

Likewise, Karabassova (2020) in his work *Is top-down CLIL justified? A grounded theory exploration of secondary school Science teachers' experiences* shows us some experiences that Science teachers had when implementing a bilingual project using the CLIL methodology. It works around the teachers' efforts to understand how to teach Science from a bilingual methodology. One of the problems they have to face is that they do not handle the English language appropriately, which is why they are forced to turn to students who have a higher level of English; Mahan (2020) in her study *The comprehending teacher: scaffolding in content and language integrated learning (CLIL)* observes CLIL teachers of natural sciences and social sciences and, recognizes that teachers make efforts to make the topics understood but, having no experience in teaching languages, they do not resort to strategies to improve this scope in students, identifying the importance of the use of visual aids in the bilingual Science class is also recognized. On the other hand, Klu and Demana (2020) in *The Impact of Using Code Alternation in Teaching Life Science to English First Additional Language learners in South African schools* recognizes that teachers and students have a very low level of English, despite having a wide diversity of languages, the subjects are always given in English as the medium of instruction. Teachers, not having command of English, go to code switching to be able to explain the Science content in an adequate way.

In *Investigating the coexistence of the mother tongue and the foreign language through teacher collaboration in CLIL contexts: perceptions and practice of the teachers involved in the plurilingual program in Andalusia*, Mendez and Pavon (2012) explore the level of collaboration between teachers of language and content teachers in a monolingual context, they recognize that Science teachers are not trained to visualize the benefits of teaching from the use of CLIL; this work has a strong relationship with the work of Campillo-Ferrer (2020) (*CLIL teachers' views on cognitive development in primary education*) who shows how CLIL teachers do not develop complex cognitive processes in their students other than the repetition of vocabulary, which makes the process of bilingualism totally precarious; likewise there is a tendency to hold the teacher responsible for the cognitive processes of the students but their identity is not questioned. Similarly, Morton (2012) in his work entitled *Classroom talk, conceptual change and teacher reflection in bilingual science teaching* criticizes that the use of transmission methodologies generates problems for *Classroom Talk*, since it inhibits communication in the bilingual program, however, the author clarifies that more research should be done in this regard. Once again, in these studies, it is possible to understand how Science teachers carry out EMI or CLIL methodology but their Science training does not include linguistic aspects of the English Learning Teaching (ELT) field.

Some scholarships unpack the struggles of Science teachers to carry out bilingualism processes at school. Within this discussion we found Fernández-Barrera's (2019) in *Doing CLIL in the Science Classroom: a Critical Sociolinguistic Ethnography in La Mancha Secondary Schools*, where we see how CLIL methodology is developed in La Mancha, Spain. He refers to the struggles that teachers have when adapting their subjects contents to a new language, for Science teachers it is a challenge to have to deal with the linguistic element and the Science content at the same time, pointing out an instrumentalization of English by reducing it only to the memorization of vocabulary; likewise Block and Moncada-Comas (2019) in their work *English-medium instruction in higher education and the ELT gaze: STEM lecturers' self-positioning as NOT English language teachers*, shows us how teachers place themselves against the use of English as a Medium of Instruction, it shows that teachers do not feel identified as language teachers, which is why they do not dare to correct mistakes made by their students, teachers explicitly state that they have no grounds to correct their students in the use of the English, in this study the three teachers are allocated as Science teachers more than English teachers. Since they understand that they do not have the linguistic

elements to achieve improvement in their students in terms of the use of English, the teachers have disciplinary identities and these are closely linked to their tastes and preferences, which is why they do not feel identified with the field of ELT. In this regard, Alonso-Belmonte and Fernández-Agüero (2020) with their work *Teachers' narratives of resistance to Madrid's bilingual program: An exploratory study in secondary education*, carried out a study in schools in Madrid about the perceptions that Science teachers have about bilingualism policy in their country, in general, they show resistance to the program because they consider it an element of marketing and a race between schools in Madrid. Teachers recognize that they are not doing true bilingualism, since bilingualism carries characteristics of more complex communication, some of them state that they know colleagues who do not speak the language and yet, are in the process of bilingualism.

In some studies, we see how Science teachers are displaced by language teachers or foreign teachers as seen in Evnitskaya and Morton (2011) who develop a review in their work entitled *Knowledge construction, meaning-making and interaction in CLIL science classroom communities of practice* in the use of CLIL in two different contexts within Spain (Barcelona-Madrid). The article proposes the communication processes within CLIL classrooms as communities of practice where there is a negotiation of meaning and identity, the study displaced as better teachers to the native English language ones and proposes better preparation in CLIL for non-native teachers. Similarly, Fernández-Sanjurjo et al (2019), in their study *Analyzing students' content-learning in science in CLIL vs. non-CLIL programs: empirical evidence from Spain*, evaluate how CLIL practices are effective, or not, in Science classes in primary school. Regarding the identity of bilingual Science teachers, they only ensure that teachers who teach Science through CLIL are usually language teachers, likewise it ensures that Science teachers do not receive an adequate preparation for the use of the CLIL methodology, additionally, Graham et al. (2021) in their work *A critique of Taiwan's bilingual education policy through a ROAD-MAPPING of teacher experiences*, criticize the hiring of foreign teachers who are unaware of the context and, despite that, teach content in English, proposing a local vision to make Taiwan a truly bilingual territory, where the two languages could be balanced.

In these papers we see a constant struggle of teachers to grab their identity as Science teachers, while negotiating with the identity of bilingualism, it is interesting to see how the practices and policies of bilingualism exert a

certain violence against Science teachers.

IDENTITY OF THE SCIENCE TEACHER

Although in the selected works the concept of identity is implicitly worked, we decided to look for papers that address the Science Teacher Identity category, with the aim of delving into the search for trends on the use of the concept and methodologies related to it.

In such exploration, we found a rather striking work by Avraamidou (2014) entitled *Studying science teacher identity: Current insights and future research directions*. The author seeks to understand how the identity of Science teachers has been studied around the world, it makes a theorization around the ways in which the authors have approached the concept of identity, where this can be seen as a social construction or a told story. The author finds that identity has been studied to understand learning in Science, in the way the training of Science teachers occurs, likewise, it shows that in many studies only the subject is taken into account and not the context. Now, the author finds that there are studies that anchor identity with disciplinary knowledge on the subject. It makes an interesting reflection of identity seen from postmodernity, where the subject is identified and analyzed from positions of power. Avramidou is one of the most cited authors in terms of Science teacher identity. In her study entitled *Stories we live, identities we build: how are elementary teachers' science identities shaped by their lived experiences?* (2019), one of her most important findings was to take the concept of identity as life experiences, concludes with the following characteristics of identity:

(a) *Science teacher identity is multidimensional and it extends beyond cognitive domains of becoming to include affective dimensions;*

(b) *Science teacher identity is relational, linked and shaped by various other constructs or sub-identities;*

(c) *Place and time, defined as a space with meaning created by experiences, and the Science teacher's identity are inextricably bound to one another.*

On the other hand, some authors have dealt with understanding the identity from the professional development of Science teachers, authors such as Molander and Hamza (2018) with their work *Transformation of Professional Identities From Scientist to Teacher in a Short-Track Science Teacher Education Program* who discuss the concept of teachers' professional identity, in their study, they

find that many stages in the training and professional experience of in-training teachers are in some way similar; following the same line are Chung-Parsons and Bailey (2019) in *The hierarchical (not fluid) nature of preservice secondary science teachers' perceptions of their science teacher identity*, who explore three identities of primary Science teachers taking into account two concepts: Science teachers' identity and Science Identity, it is proposed to see teachers in the central axis of scientific literacy and the concern of the government to encourage students to pursue Science careers. The authors find a complex relationship between science identity and identity as a Science teacher, where the Science identity is part of the "core" of the individual one, while the latter is socially recognized, so there is a daily use of Science for the participants while teaching and learning practices which are only put into play in school. Similarly, Forbes and Davis (2008) in their study *The Development of Pre-service Elementary Teachers' Curricular Role Identity for Science Teaching*, study how pre-service teachers use curricular tools for teaching Science, and propose that the characteristics of identity guide teachers practice at the time of teaching.

Additionally, we explore articles where the identity of Science teachers depends extremely on the context, as the work of Drewes (2020) *Personal, professional, political: an exploration of science teacher identity development for teaching climate change*. Where he explores the identity of teachers of Science as climate change educators, then, recognizes 4 constructions of identity: Passionate Environmentalist, Student Interest Engager, Content First Educator, and Civic and Epistemic Skills Promoter. Most frequently teachers exhibited combinations of identities and often created a unique amalgam of multiple dimensions of identities in action, hand in hand with El-Deghaidy et al (2015) in *A framework for designing effective professional development: Science teachers' perspectives in a context of reform*, who explores the ways in which Science teachers promote their professional development, contrary to Villena-Agreda (2020) in his study *Negotiating and Defining "Self" as Science Teachers: A Narrative-Case Study among Non-Science Education Major Teachers*, who worked with a multiple case study, on the identity of Science teachers who are not specialists in the subject matter, teachers are forced to teach Science, there is evidence of negotiated and recognized identities, which means that despite the fact that the Individuals who are not science specialists have negotiated their identity in institutions as Science teachers.

In his study *Science Teachers' Indigenous Knowledge Identities*, Mhakure (2014) proposes the inclusion of *indigenous knowledge* in Science classes, this inclusion is proposed in terms of interaction with the concepts of traditional natural sciences, for him, the role of teachers' identity plays an important role since the authors acknowledge that Science teachers do not have the training to work on this interaction within their classes. Some teachers consider that *indigenous knowledge* is backward and they do not feel identified with it, the reason why they do not understand the relationship with traditional knowledge. Teachers show a dynamism in their identity with regards to *indigenous knowledge* after carrying out activities in communities of practice, after this exercise, the teachers see the ancestral knowledge valuable. Another work that seeks to recognize differential identities and their relationship with knowledge is that of Sjöström (2018), in his work *Science teacher identity and eco-transformation of science education: comparing Western modernism with Confucianism and reflexive Bildung*, he analyzes the tension between the values of the Confucianism and the traditional teaching of Science, proposing in the center of this tension, the Science teacher and his identity, he speaks of the concept of Eco-identity that proposes a holistic look between nature and the human, eliminating the

instrumentalization of traditional knowledge; similarly, Huang and Anila (2018) in *Science education reform in Confucian learning cultures: teachers' perspectives on policy and practice in Taiwan* seek to understand the perspectives of Science teachers in Taiwan, conducting some interviews with Science teachers. The results show that the Confucian tradition has a great impact on the identity of Science teachers, the study emphasizes the struggles of Science teachers and how identity is built.

LIMITATIONS

This paper review is limited by several factors. We consider that like all review articles, the scope of the proposed analysis is limited by the objective that is linked to the interest in knowing how the identity of the bilingual Science teacher has been studied. Revised documents could provide more elements to understand how bilingual education in Science is given, how bilingual education policies have been structured, how bilingualism works in different contexts, among others, nonetheless, these are not our objectives, we are interested in the individual and its identity. Another limitation has to do with the chosen databases, these databases collect articles from very important journals in education, but they may have omitted the results of



related research, conferences and / or publications of more discreet journals, which could also contribute in an important way.

CONCLUSION

In this review, we found research trends linked to the concept of identity and its relationship with the bilingual Science teacher. These trends allow us to establish that the studies regarding the identity of the Science teacher are new and it is a very fertile field to explore. In many countries, English is used as a medium of instruction but it is done in order to reinforce the learning of English, which is why Science teachers are displaced by their peer English teachers, the identity problem arises in between the relationship of Science teaching and foreign language teaching.

It seems that there are few countries in the world that have university programs for the training of bilingual teachers. This results in bilingual Science teachers having to learn and grow during their professional career. Although many countries organize EMI training, it is clear that many Science teachers feel instrumentalized, they perceive their classes no longer as Science classes instead, they become language classes. This brings problems in terms of identity since teachers must look for tools to be able to develop the pedagogical processes. Now, it is a surprise to find that in many jobs, Science teachers do not feel identified with bilingual Science teaching, either because they find it instrumentalized, because they do not have the linguistic tools to carry out the subject instruction or because they consider that it gives priority to the teaching of the language over the teaching of the content in which only a level of proficiency in English is required to carry out the teaching-learning process from bilingualism.

Another great conclusion is closely linked to the training of Science teachers and their training. Some authors assure that the implementation of CLIL or EMI in Science has exceeded the speed at which the teacher training processes are changing, having a problem, since, from the universities, there has been no epistemological discussion about the relevance, or lack of it, of Science teaching through a foreign language, neither the relationship between language and content, and much less there has not been pedagogical explorations of bilingualism in Science. This makes the Science teachers who carry out the process, or often language teachers, or even native speakers who are neither Science teachers nor language teachers. In these processes, it is necessary

the dialogue between the conceptual bodies of Science didactics and the field of ELT, since the discussion could be enriched from there.

In this review we found three major trends. One of them is related to the invisibility of the subject that is closely connected to studies that speak of bilingualism in Science, but that do not address characteristics of individuals, these studies aim to evaluate the processes of bilingualism in Science, but they do not allow to read the teacher or his identity. Another trend is linked to bilingualism policies that in one way or another, shape the identities of teachers, since they indicate what characteristics they must have in order to teach from EMI or CLIL; regardless of the fact that there are no bilingual training programs in the countries where these projects are being developed. In the case of Science teacher identity studies, the concept has been worked from different perspectives, with the narrated identities being the most used, but the methodologies speak of the case study and the narratives.

Another conclusion is that bilingualism is being considered in different parts of the world through CLIL and EMI, with English at the center of conversations/ studies regarding bilingualism. In many of the papers presented, bilingualism is explored as a phenomenon within countries in which policies are evaluated, but there is a tendency to make Science teachers invisible/ overlooked. In most studies, it is reviewed whether the bilingualism processes are successful in terms of learning for students, but they do not address the Science teacher as a category of study.

Regarding our main concern, the Science teacher identity, we conclude that there are many studies that cover this category with very interesting findings such as the relationship between Science identity and Science Teacher identity, where the first is closely linked to knowledge and specific practices of Science, while the second is put into play in the teaching-learning process. Likewise, the findings in terms of how to cover the study of identity from life stories allow us to understand from a much broader perspective how science teachers construct their identity.

Finally, we consider that the studies of the Bilingual Science Teachers are necessary, understanding that the processes of bilingualism in Science are already being carried out, we consider that it is a very fertile field that allows us enriching the discussion in terms of teaching-learning of Science and English as a foreign language.

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