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Field trips and other teaching resources in natural and social sciences: educational implications from past experiences in Spanish primary schools*

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ABSTRACT: This paper describes the use of Natural and Social Sciences teaching resources in Spanish primary schools during the second half of the 20th century, based on

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quantitative and qualitative analysis of 250 recollections of retired teachers. Differences were identified between groups of teachers determined by gender, previous teaching context (urban vs rural) and higher education qualifications. Our results show that the academic background had a direct impact on the variety and type of teaching resources used and was a determinant factor to promote experiential learning. The study also highlights the comprehensive use of school field trips in the past as teaching resources to motivate students and develop different inquiry skills. Finally, the importance of mastering different educational resources in the teaching profession is discussed.

EET/TEE KEYWORDS: Natural sciences; Social sciences; Teaching resources; Primary education; School field trips; Spain; XXth Century.

Introduction

Over the last decades, Natural and Social Sciences education has significantly evolved in keeping with society's demands, the education system's requirements and the new educational approaches that have emerged. The latter, alongside the own teachers and the educational resources used within the classroom, play a crucial role in the learning process and in teaching strategies aimed at achieving specific goals. Nowadays, it is widely accepted that student-centred and active learning strategies (e.g., inquiry-based learning, problem- and project-based learning or cooperative learning, among others) are essential to engage students in constructing deep understanding of sciences and developing inquiry skills[1]; accordingly, this point of view was included in several curriculum reforms in many European countries[2]. In such active learning communities, teachers need to select and use effectively accurate tools and materials that can support student thinking in a different way from traditional classrooms.

The term teaching and learning resource, in its full range, would encompass all types of materials, equipment, formats and means that, appropriately integrated, reinforce teacher and student performance in the classroom, enhancing and facilitating the teaching and learning processes. A more elaborate definition describes them as «any resource that teachers may envisage to use in the design or development of the curriculum – by them or by the students – to deliver or facilitate contents, mediate in learning experiences, promote meetings or situations, develop cognitive skills, support their methodological strategies or facilitate and enrich assessment»[3]. Other authors understand teaching resources

[1] R. Arends, *Learning to teach*. New York, McGraw Hill, 2011.

[2] M. Rocard, P. Csermely, D. Jorde, D. Lenzen, H.Y. Walwerg Henriksson, V. Hemmo, *Science Education NOW: A renewed Pedagogy for the Future of Europe*, Brussels: European Commission, <https://ec.europa.eu/research/science-society/document_library/pdf_06/report-rocard-on-science-education_en.pdf> (last access: 25.07.2018).

[3] E.F. Blázquez, *Los Recursos en el currículo*, in O. Saenz (ed.), *Didáctica General. Un enfoque curricular*, Alcoy, Marfil, 1994, pp. 501-527.

as materials that can play different roles according to how they are used, highlighting, among others, those of guiding learning, providing information and procuring simulations that afford contexts for observation, exploration and experimentation[4]. The purpose of teaching and learning resources not only does it consist of making the educational process more attractive and motivating, but it also encourages some other positive things, such as the evoking of prior knowledge, the development of different skills and creativity, the promotion of desirable values and attitudes of students, and the retention of desirable knowledge[5]. From this perspective, high objective quality is not enough for a resource to be used in the classroom and for it to be an effective means to achieve learning goals, but it is also necessary to consider the extent to which its specific characteristics are consistent with certain curricular aspects of the educational context. In the light of these definitions and characteristics, it seems reasonable to assume that teachers' awareness of the wide range of classroom resources available and how each of them is used, can facilitate students' access to effective and active learning, motivating them and arousing their interest, all of which entails improvement in teaching quality based on multiple situations or experiences.

Teaching and learning resources are varied: some are visual, others are based on listening, and others are entirely hands-on. Although their effective use depends on a number of factors, it is strongly conditioned by the teaching model as a whole, the teacher's knowledge and training in itself, the activities proposed and the teaching strategies used. In this regard, for example, there are certain resources whose nature encourages students to adopt a passive approach (e.g., textbook) and others that are more interactive and foster participation (e.g., school field trips). Focusing on their capacity to provide students with learning experiences, resources could be classified as follows[6]:

- Direct experiential resources: real objects that can be used at any time as part of the teaching-learning activity, within or outside the classroom, to expose students to direct experience. Some examples could be animals, plants, rocks and minerals, household objects, school field trips to visit natural places, agricultural or industrial facilities, etc.
- Structural or school context resources: those that are part of the school's own facilities and whose sole and main purpose is to contribute to the teaching process. For example: libraries, laboratories, sports halls, computer rooms, etc.
- Symbolic resources: resources that, while not presenting the real object, can bring reality to students through symbols or images. Examples are: printed material (texts, textbooks, maps, prints, notebooks, etc.), non-projectable fixed material (terrestrial

[4] P. Marqués, *Los medios didácticos*, <http://peremarques.pangea.org/medios.htm> (last access: 20.07.2018).

[5] R. Bušljeta, *Effective use of teaching and learning resources*, «Czech-Polish Historical and Pedagogical Journal», vol. 5, n. 2, 2013, pp. 55-69.

[6] Blázquez, *Los Recursos en el currículo*, cit.

globes, miniatures, models, blackboards, etc.) and material conveyed using technological means (information technology, videos, projectors, etc.).

Nowadays it is difficult to imagine the educational process without the use of different modern digital and symbolic teaching resources. Despite the wealth of resources available, textbooks have always been the central axis of the educational process since the moment they became implemented in the classroom[7]. Indeed, textbooks in Spain have become the regulatory instrument (either in physical or digital format) for the design and development of the actual teaching curriculum[8]. Although theoretical academicism generally rejects it on the grounds of the excessive – and sometimes exclusive and isolated – use of this resource, a large majority of the Spanish teachers works with textbooks on a daily basis, trying to adapt them to their context so that they may be useful for both teachers and students[9]. Their use, though it can be manifold, tends to foster content memorization, so that students are asked to read science when they are supposed to be experiencing it[10]. It should also be noted that «textbooks can hardly be established as the only educational resource or as the only source of information in the classroom»[11]. Hence, there is a clear need for incorporating additional resources with high teaching potential that may improve the teaching-learning process at school and that may generate situations and experiences where students can actively get involved in their own learning.

There are very few studies focused on measuring the use of direct experiential resources in real classroom contexts in European countries. In Spain are noteworthy those developed from the views of Faculty of Education students doing their trainee period in different schools of Seville[12]. This analysis of real science teaching practices in schools is crucial, since it could contribute to bridging the growing gap between the Science Teaching research and classroom

7 S.S. Stodolsky. *The subject matters. Classroom Activity in Math and Social Studies*, Chicago, University of Chicago Press, 1988.

8 G. B. Braga, J.L.D. Belver, *El análisis de libros de texto: una estrategia metodológica en la formación de los profesionales de la educación*, «Revista Complutense de Educación», vol. 27, n. 1, 2016, pp. 199-218.

9 J.M.G. Méndez, *El papel de los materiales curriculares en la intervención educativa*, «Revista de Educación», vol. 3, 2001, pp. 221-229.

10 A.E. Friedl, *Enseñar ciencias a los niños*, Barcelona, Gedisa, 2000.

11 M. Occelli, N.E. Valeiras, *Los libros de texto de ciencias como objeto de investigación: una revisión bibliográfica*, «Enseñanza de las Ciencias», vol. 31, n. 2, 2013, pp. 133-152.

12 T. Escobar, J.E. Vílchez, *Percepción de los estudiantes de magisterio durante el prácticum sobre las clases reales de ciencias en Educación Primaria*, in R. Jiménez (ed.), *Actas de los XXIII Encuentros de Didáctica de las Ciencias Experimentales*, Almería, Universidad de Almería, 2008, pp. 583-592; J.E. Vílchez, T. Escobar, *Uso de laboratorio, huerto escolar y visitas a centros de naturaleza en Primaria: Percepción de los futuros maestros durante sus prácticas docentes*, «Revista electrónica de Enseñanza de las Ciencias», vol. 13, n. 2, 2014, pp. 222-241.

practices[13]. Likewise, awareness of the used popular Social and Natural Sciences teaching resources in schools during the last decades can be very helpful to understand and analyse the strengths and weaknesses of these resources, thus favouring teachers' interests and needs, and also the development of tools and materials based in current active pedagogical framework. Furthermore, this direct contact with real educational practice could serve to enhance the use of accurate and effective materials in teachers' early and lifelong training, contributing to a future implementation of active educational methodologies that require greater student engagement.

From this standpoint, this study approaches the use of teaching and learning resources associated with science education in Spanish schools during the last decades, analysing recollections of retired primary teachers. Specifically, the goals of this study are:

a) To examine the different most used resources in Social and Natural Sciences teaching in Spanish primary schools in the period of 1968-2006.

b) To analyse which factors could have influenced their use.

c) To present and discuss the motives that led to their use and how they were employed, elaborating on their educational implications in today's schools and in current student-centred educational framework.

This study is part of a broader research project on the primary teacher profession that is being conducted by the Pedagogical Museum-Centre of the University of Salamanca (CEMUPE) with retired primary teachers. This centre was created in 2010 to protect and study historical-educational heritage and to train future generations of primary teachers.

Historical-educational context

The analysis provided in this study largely covers the period between 1968 and 2006. Hence, there are interviews of teachers who began their career under the Franco dictatorship, following a traditional school model. Such school type included ideological aspects of Francoism that had been established by the Law on Primary Education of 1945 and were rooted in the Moyano Law of 1857. According to this law, teachers embodied the source of knowledge, students were expected to merely memorize mechanically and experimental methodology was very limited.

This situation began to change with the General Education Law (GEL) of 1970 under the impetus of the regime's opening up to the outside world. Since, where the use of teaching resources is concerned, it brought about the decline of

[13] J. M. Oliva, *Sobre el estado actual de la revista «enseñanza de las ciencias» y algunas propuestas de futuro*, «Enseñanza de las Ciencias», vol. 23, n. 1, 2005, pp. 123-132.

encyclopaedias (mainly the Álvarez encyclopaedia) as the only text that gathered the entire knowledge of each stage, giving way to the gradual implementation of textbooks for each subject matter, with their respective activities designed for customized education[14].

From 1970 onwards, education in Spain undergoes a process of universalization, with the gradual introduction of progressive practices inherited from the Second Republic whose basis was an active teaching model[15]. In legal terms, the GEL did not include coeducation among its principles, but neither does it explicitly mention gender segregation in education centres. The methodological paradigm, in turn, also undergoes a change through the gradual implementation of active methodologies that place the child at the centre of the teaching-learning process, an aspect that becomes consolidated with the passing of the Law of General Organization of the Education System (LGOES) of 1990. There is a gradual increase in the availability of resources in the classroom as well as in the building and design of a variety of school facilities, so that, once the period covered in this study comes to its end, Spanish classrooms are already at a level with the rest of the European Union in terms of equipment.

The latter law, the LGOES, definitively imposes coeducation and incorporates the main theoretical approaches used by education academics, fostering the figure of a highly qualified school teacher. Likewise, it should be noted that, with the implementation of this education law, year six became part of Primary Education, while years 7 and 8 were incorporated into the first cycle of Compulsory Secondary Education (CSE).

As for the interviewed teachers' academic qualifications, most of them had taken their teacher training studies in the sixties, when school teachers began a process of transformation and modernization, leaving behind the period described by some authors as «an outmoded approach to teacher training» that went from 1939 to 1967[16]. Such period was characterized by a purge of teachers, a noticeable reduction in the scientific contents provided in their training, special emphasis on making them become disseminators of the National Movement's political ideology and a marked difference in training contents according to gender[17]. With the 1950 Plan (which remained in force until 1967), the only requirement to access Teacher Training studies was to have completed Basic Secondary Education (*Bachiller elemental*), until 14

[14] B. Martín-Fraile, *Testimonios de maestros: modelos y prácticas,* Salamanca, Ediciones Universidad de Salamanca, 2017.

[15] Id., *Testimonios de maestros: modelos y prácticas*, cit.

[16] J.M.S Román, R.G. Cano, *La formación de maestros en España (1838-2008): Necesidades sociales, competencias y Planes de estudio*, «Educación XXI», vol. 11, 2008, pp. 73-101.

[17] R. Rodríguez-Iquierdo, *Formación de las maestras desde 1940 a 1970. Un análisis de los Planes de Estudio desde una perspectiva histórico-legislativa y de género*, «Escuela Abierta», vol. 2, 1998, pp. 63-82; J.M.S Román, R.G. Cano, *La formación de maestros en España (1838-2008): Necesidades sociales, competencias y Planes de estudio*, cit.

years old, although some students also took the studies of Higher Secondary Education (*Bachiller superior*). There were Teacher Training Schools for males and for females in each province, as well as private and church-owned Teacher Training Schools[18]. Studies in those «Normal Schools» had 3 years of duration and ended with an exam called *Reválida*. The curriculum included a teacher training proposal whose profile was more technical than in previous reforms and where there was a predominance of special didactics[19]. Altogether, it could be said that the nature of teacher training was political-doctrinal, culturally poor, lacking in scientific preparation and professionally very weak or non-existent[20].

Materials and Methods

This research is based on the analysis of 250 written and oral testimonies of retired primary teachers expressed in a series of booklets that are part of the «School life testimonies» of the Pedagogical Museum-Centre of the University of Salamanca (CEMUPE). They were selected at random from an initial sample of 522 testimonies. 59% of the teachers are women and the average date of birth of the sample is 1944 (n= 236, SD= 7.2), with ages between 65 and 90 years old. They were mainly from provinces belonging to the central-western area of Spain, very close to Portugal; specifically, 39% were from Zamora, 31% from Salamanca, 6% from León and 6% from Cáceres. The mean starting date of their working life is 1968 (n= 105, SD= 6.7) and the mean date of retirement is 2006 (n= 99, SD= 6.9); therefore, the average number of teaching years is 38. Apart from a degree in Education or similar, 10% of the respondent teachers also held other higher education qualifications, such as degrees in Geography and History, Spanish Philology or Pedagogy. Of all of them, 117 pursued most of their professional career in rural settings, while 112 did so in schools located in province capitals.

Accounts were gathered by means of an exhaustive questionnaire whose design, preparation and validation are described in other research papers[21].

[18] Rodríguez-Iquierdo, *Formación de las maestras desde 1940 a 1970. Un análisis de los Planes de Estudio desde una perspectiva histórico-legislativa y de género*, cit.

[19] M.M. Beas, *Formación del Magisterio y reformas educativas en España: 1960-1970*, «Profesorado: revista de currículum y formación del profesorado», vol. 14, n. 1, 2010, pp. 397-414.

[20] Román, Cano, *La formación de maestros en España (1838-2008): Necesidades sociales, competencias y Planes de estudio*, cit.

[21] B. Martín-Fraile, *Teorías educativas que subyacen en la práctica docente*, «Teoría de la Educación. Revista interuniversitaria», vol. 23, 2011, pp. 45-70; Id., *Testimonios de maestros: modelos y prácticas*, cit.

When the time came to complete the questionnaires, several individual interviews were conducted and the questions were orally explained to each teacher so that they could then collect their answers in booklets that had been given to them. Questionnaire contents are arranged into main sections, which are in turn subdivided into hierarchical and structured questions. To carry out this research, a selection was made of two open-ended questions asking specifically about: a) the teaching resources they regularly used in their everyday practice for Social and Natural Sciences lessons; and b) if any type of activities were conducted outside the classroom for the teaching of the subject. Despite the fact that most of the data gathered are focused on the analysis of such questions, additional information was retrieved after a thorough reading the booklets, collecting interesting data from other parts of the accounts.

The methodology followed was based on the use of quantitative methods, grouping answers into different categories or typologies, and qualitative methods, taking into account the interviewed teachers' individual life accounts and professional profile. In this regard, the special interest of the fact that the information source is the recollections of retired teachers should be noted, since they are professionals who have devoted their entire lives to teaching.

During the first stage of research, 24 resource categories or typologies were established, which were later grouped into 16 final categories or typologies during the second stage (Pic. 1). The "other" category gathers resources that were mentioned by less than 2% of the sample, such as models or miniatures, games, dramatizations, songs, museums and a variety of consumables. Seventeen out of the 250 teachers did not provide an answer to the question on resources in their accounts (non-response rate= 6.8%).

The degree of variety of the resources used by the teachers was calculated by allocating each teacher one point per resource named, bearing in mind that the maximum score they could achieve was 24 (number of initial typologies); such result was weighted with a value between zero and one. Thus, teachers who used a wide range of resources would score close to one, while those who used few resources achieved lower values (near zero). Teachers who failed to answer the questions were excluded from the variety of use analysis.

To find out the factors that influenced the use of resources, these were analysed taking into account teachers' gender, whether their professional career was pursued in rural or urban areas, and whether or not they had any other higher education qualifications apart from their Education degree. After quantifying each resource according to the three variables under study, the conversion to percentages was carried out according to the partial sums of each variable. Based on the characteristics of the sample, Pearson chi-squared ($\chi 2$) statistical tests with a significance level below 0.05 were conducted, with Z-tests ($\alpha = 0.05$) for the analysis of teaching resources according to each variable; this was first conducted globally and, subsequently, partially.

To calculate reliability of the categories designed for each of the items that made up the questionnaire, answers were categorized by external researchers and, after reaching an agreement with the researchers of the study itself, acceptability was established at a Cohen's Kappa above 0.80.

The different accounts were identified using the CEMUPE deposit's classification system, where each teacher is allocated a four-digit numerical code. Besides, to facilitate identification of the teacher's profile, three letters were added to each numerical code: 1st) M= male, F= female; 2nd) R= rural area, U= urban area; y 3rd) T= teacher training, A= additional training. Thus, for example, FUT0000 would be a female teacher who has worked mainly in a province capital, who only studied higher education teacher training and whose numerical identification code in the museum is 0000.

Results

Available resources

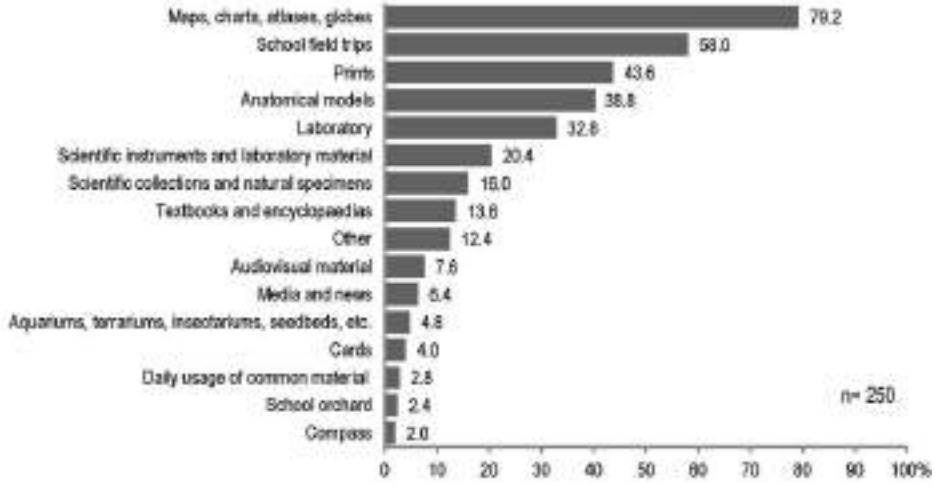
As mentioned above, this study covers a period that ranges roughly from 1968 to 2006, so that the teaching scene during its first years was characterized by a widespread lack of school equipment, which was mostly solved after the gradual implementation of the GEL of 1970[22]. This situation is clearly apparent in most of the analysed accounts, especially those from school teachers who worked in rural areas. For example, some teachers claim that «classroom material was very poor when I was a child and during my first years working at rural schools – at some of them I had to make blackboards out of walls» (FRT0576) and «in Natural Sciences lessons we would go out into the street to explain nature, since there were no other resources» (FRT1217). In such areas, some teachers even tell how students themselves contributed to increase the teaching materials available at the school by gathering natural collections. For example, teacher FRT0309 mentions that «students added to the material by gathering leaves, flowers and rocks from their surroundings». Thus, quite often, «the rural surroundings would supply the lack of material, since the environment is a good school for the study of nature» (FRT0291). On the other hand, many other teachers whose career developed in province capitals state that they always had the necessary resources. For example, teacher MUT681 claims that «at the centres where I have been, there was a rich and varied collection of teaching material. How and when it was used is a different matter».

[22] Martín-Fraile, *Testimonios de maestros: modelos y prácticas*, cit.

Resource types and frequency of use

As illustrated in Picture n. 1, maps were the resource that teachers mentioned the most for Natural and Social Sciences education (referred to by 79% of the respondents, n=250), followed by school field trips (58%), prints (44%) and anatomical models (39%) of the human body (including those of internal organs, the muscular and the skeletal systems). Other resources that should be underlined are scientific instruments and natural collections (leaves, flowers, rocks and minerals, etc.) with percentages of 20.4% and 16%, respectively.

On the other hand, the least used resources (named by less than 5% of the respondent schoolteachers) were aquariums, terrariums and insectariums, cards, compasses, commonly used materials (e.g. lemon, vinegar, baking soda, etc.) and school orchards. Likewise, the category of other encompasses all the resources that were quoted by less than 2%, such as models or miniatures, games, dramatizations, songs, school museums and a variety of consumables (e.g. cut-outs).



Besides commonly used resources of a symbolic nature, such as maps, prints or world globes, there is a considerable number of teachers who used school field trips to explain different aspects of the subjects they taught. For example, some teachers reported that «*when I* taught Geography and Natural Sciences, I used a different methodology outside school hours: we'd go on field trips at different times of the year to observe changes in the trees, the landscape»(FUT0268); «Real animals, real plants, rocks, soils, one need only know how to go for a walk and we had the shepherd with his dogs, his sheep, his ram and his lambs. Or the shearer cutting off its fleece, which once the spinner went to our school and showed us how she spun it and later knitted it and made a sock» (MRT0311); «Contact with nature was used to make children understand what

I was explaining, for example, we would go on a trip to the countryside so that they could see and understand the different types of rocks and plants there were» (MUA0896).

Within school field trips, the most frequent type is outings to the school's immediate surroundings, which is mentioned by 53% of the teachers (n= 77) who had reported that they regularly organized school trips (n= 145). As a general rule, this practice was far more widespread in rural areas, where several teachers state that «Natural Sciences could be taught outside» (MRT0311); or «in villages they were walks across the countryside, to see nature, its fruits, holm oaks, pines, fruit trees, insects, the sky, climb hills and contemplate what can be seen. Anything could be used to explain stuff to the children» (MRT1342). In this regard, some teachers suggest that the very fact of living in rural areas favoured knowledge acquisition: «in Natural Sciences, there were few resources, but children 'knew a great deal' because they lived in contact with nature» (FRT1352).

School trips were usually aimed at working on different concepts related to: a) Natural Sciences (for example, teacher FRT1005 reports that they would carry out «activities near the school where they could study a river, a mountain or any other natural landscape, farming, animals or sunsets"; or "we would go to the countryside to explain on-site what was in the curriculum, especially about nature, animals and plants» (FUA0467); b) Social Sciences («we would go on trips to learn about the city's monumental reality», FRT0749); and c) on other occasions teachers describe how they approached different processes associated with scientific activity: «we would go to the country, they would watch nature, gather flowers, leaves, minerals, with which they made collections. Older students would learn how to measure trees, and their names» (FUT1219); «they performed calculations using the village's biggest pine tree: estimated height, measure perimeter, calculate the radius, total estimated weight» (MUT0456). Other teachers recall how they would use nature itself to motivate and awaken students' interest «[…] One could begin with an easy experiment, a trip to the countryside, the life and discoveries of a scientist to introduce a new subject. This would spark curiosity» (FUT1019).

Alongside outings to the immediate environment, other very frequently mentioned trips are visits to factories, handicraft centres, agricultural and livestock holdings, museums and municipal facilities. To a lesser extent, teachers mention visits to planetariums, more remote natural "landmarks" (e.g., Sanabria Lake, in Zamora province), farm schools and zoos.

Table n. 1 shows the teaching resources used according to teacher gender, previous teaching context (urban vs rural) provenance and teacher academic background.

Teaching resource	Teacher gender M (n= 88); F (n= 145) MV= 17 [$\chi2$ (15, 350)= 9.173; p= 0.868 > 0.05]	*Teaching context (urban vs rural) R (n= 117); U (n= 112) MV= 21 [$\chi2$ (15, 694) = 700.213; p = 0.000 < 0.05]	*Teacher academic training T (n= 203); A (n= 22) MV= 25 [$\chi2$ (15, 695) = 701.788; p = 0.000 < 0.05]
Maps, atlases, globes	M= 79.8%; F= 78.2%	R= 78.6%; U= 78.6%	T= 79.8%; A= 76.9%
School field trips	M= 58.5%; F= 56.1%	R= 59.8%; U= 54.4%	T= 56.3%; A= 73.1%
Prints	M= 45.7%; F= 41.9%	R= 37.6%; U= 48.2%	T= 44.2%; A= 38.5%
Anatomical models	M= 36.2%; F= 39.2%	R= 35.9%; U= 40.2%	*T= 40.6%; A= 23.1%
Laboratory	M= 40.4%; F= 25.7%	R= 27.1%; U= 37.5%	*T= 34.4%; A= 19.2%
Scientific instruments	M= 26.6%; F= 16.2%	R= 23.1%; U= 20.5%	T= 20.1%; A= 23.1%
Natural collections	M= 16%; F= 15.5%	R= 16.2%; U= 16.1%	T= 14.7%; A= 26.9%
Textbooks and encyclopd.	M= 12.8%; F= 12.8%	R= 12.8%; U= 14.3%	T= 12.9%; A= 11.5%
Others	M= 15.9%; F= 10.8%	R= 11.1%; U= 16.1%	T= 15.6%; A= 7.7%
Audiovisual material	M= 9.6%; F= 6.8%	R= 7.7%; U= 8.0%	T= 8.0%; A= 3.8%
Media and news	M= 7.4%; F= 5.4%	R= 6.0%; U= 7.1%	T= 5.8%; A= 11.5%
Aquariums, terrariums, etc.	M= 5.3%; F= 4.7%	R= 6.0%; U= 3.6%	T= 4.9%; A= 3.8%
Cards	M= 5.3%; F= 2.7%	R= 4.3%; U= 3.6%	*T= 3.1%; A= 11.5%
Daily usage material	M= 2.1%; F= 3.4%	R= 2.6%; U= 3.6%	T= 2.7%; A= 3.8%
School orchard	M= 3.2%; F= 2.0%	R= 2.6%; U= 2.7%	T= 2.2%; A= 3.8%
Compass	M= 5.3%; F= 0.0%	R= 0.9%; U= 3.6%	*T= 1.3%; A= 7.7%

Table 1.
* Differences between the groups are significant (p<0.05). M= male, F= female; R= rural area, U= urban area; T= teacher training, A= additional training, MV= missing-values.

The global statistical analysis indicates that the use of educational resources was unrelated to teacher gender and non-significant difference has been found [$\chi2$ (15, 350) = 9.173; p = 0.868 > 0.05]; further analyses were conducted for each educational resource, but significance was once again non-existent (with significance values between 0.059 and 1.000).

The global statistical analysis, taking into account the place where each teacher had taught the longest (urban vs rural areas), shows that existing differences were significant [$\chi 2$ (15, 694) = 700.213; p = 0.000 < 0.05]; that is, the analysis shows how the use of different teaching resources did depend on the area where the teacher concerned worked. However, the individual analysis of each educational resource yielded non-significant results (with significance values between 0.172 and 1.000). In such context, as could be expected, the percentage use – and existence – of many of the resources, whether experiential, structural or symbolic, is slightly higher in province capitals. Nevertheless, school field trips were the most used resource in rural areas, surpassing urban areas by six points.

Considering the academic background of the teachers, the statistical analysis yields significant differences between the two teacher groups [$\chi 2$ (15, 695) = 701.788; p = 0.000 < 0.05]. On the one hand, we have selected teachers whose only qualification was a Degree in Education and on the other and we have selected others who had additional qualifications, such as Degrees in Geography and History, Hispanic Philology or Pedagogy, among others. This means that they had completed supplementary higher education training that was not necessarily scientific. Further analyses of each educational resource were conducted to identify where these differences were more dormant and the results indicated resources such as compasses and cards ([$\chi 2$ (1, 9) = 5.444; p = 0.020 < 0.05] and [$\chi 2$ (1, 155) = 5.400; p = 0.020 < 0.05, respectively], in favour of teachers with additional qualifications and such as the use of the laboratory and anatomical models ([$\chi 2$ (1, 53) = 4.245; p = 0.039 < 0.05] and [$\chi 2$ (1, 64) = 5.063; p = 0.024 < 0.05, respectively], in favour of teachers with no additional qualifications. Hence, this result indicates that the use of educational resources depends on teachers' additional qualifications. As well as the mentioned statistics, there are other very noticeable percentage differences, such as in the use of school field trips, which were used by 73% of the teachers with additional qualifications (n= 26) against only 56% of those whose only had a Degree in Education (n= 224). Another resource where there are marked differences is the use of natural collections and samples, used by 27% of the teachers with additional training against 14% of those with no supplementary academic qualifications.

Therefore, it could be concluded that when there are significant or noticeable percentage differences regarding teachers' qualifications, those whose only degree was in Education used more structural resources (such as the school laboratory) and symbolic ones (such as anatomical models), while those with additional qualifications preferred direct experiential resources (such as nature itself or natural collections).

Variety of resources used

Table n. 2 shows the data obtained for the degree of variety of resources used by the respondent teachers. The average rate for all the teachers is only 0.17 (SD= 0.08), which equates to 4 frequently used resource typologies or categories (out of a total of 24). The highest value obtained (teacher MUT0213) is 0.46, which is the equivalent of the regular use of 11 types of resources. The demographic data and academic qualifications data analyses yielded no marked differences. Nevertheless, men scored a slightly higher average, as well as teachers who had worked in province capitals and those with additional qualifications, the mean being in all cases just 0.02 points higher. In fact, teacher MUT0213 (rate= 0.46), was male, had worked during his entire career in a province capital and, apart from a Degree in Education, he held a Degree in Social Sciences.

Variety of resources used in Natural and Social Sciences education			
Total sample= 250	Male (n= 88)	Rural area (n= 117)	Degree in Education (n= 203)
Rate (R)= 0.17 (0.08)	R= 0.17 (0.09)	R= 0.15 (0.08)	R= 0.16 (0.08)
	Female (n= 145)	Urban area (n=112)	Additional qualifications (n= 22)
	R= 0.15 (0.08)	R= 0.17 (0.08)	R= 0.18 (0.09)
Missing-values= 17	Missing-values= 17	Missing-values= 21	Missing-values= 25

Table 2.

Discussion

School field trips

One of the most relevant data yielded by this study is the confirmation of the great prominence of the field itself as a resource for teaching Natural and Social Sciences during the period under research. This is not surprising, since the first school field trip documented in Spain dates back to 1883 and was organized by Francisco Giner de los Ríos and Manuel Bartolomé Cossío with the *Institución Libre de Enseñanza* (Free Educational Institution) through the Sierra de Guadarrama (Madrid)[23]. From then on, guided school trips settled gradually into Spanish schools due to their remarkable educational potential as part of the teaching and learning process[24].

[23] A. Jiménez-Landi, *Las excursiones de la Institución*, «Estudios turísticos», vol. 83, 1984, pp. 101-108.

[24] A. Vilarrasa, *Salir del aula. Reapropiarse del contexto*, «Iber: Didáctica de las ciencias sociales, geografía e historia», vol. 9, n. 36, 2003, pp. 13-25.

The term school field trip refers to the set of activities carried out outside the classroom with the intention of connecting students and reality through experience. The key point is that they may learn from it in an active, participatory and meaningful way, generating educational situations that would be hard to procure in the classroom[25] or promoting an extension or improvement of classroom teaching[26].

The general consensus suggests that school field trips have a positive impact on learning processes[27]. The evidence generally suggests that under certain favourable circumstances, cognitive gains from school field trips are very important, but there are also other improvements related with social and affective outcomes, such as, for example, increasing curiosity[28].

From the perspective of Social and Natural Sciences, field trips are educational resources that encourage students' understanding of the environment, consolidating concepts and ideas, in a context other than everyday school routine. Field activities favour the acquisition of long-term content knowledge, have positive effect on communicative, inquiry and problem-solving skills, and promote meaningful learning from an holistic and interdisciplinary approach[29]. Furthermore, fieldwork stimulates high levels of student interest and motivation, leads to significant effects in the affective domain and is a powerful tool for social integration[30]. As mentioned by teacher MRT0311 «in Social and Natural

[25] A. Gómez, D. Corrochano, G. Parra, *Itinerarios didáctico-naturales en educación primaria: el noroeste de Zamora*, «Didáctica Geográfica», vol. 18, 2017, pp. 111-131.

[26] N. Orion, A. Hofstein, *Factors that influence learning during a scientific field trip in a natural environment*, «Journal of Research in Science Teaching», vol. 31, 1994, pp. 1097-1119; A. Hofstein, S. Rosenfeld, *Bridging the gap between formal and informal science learning*, «Studies in Science Education», vol. 28, 1996, pp. 87-112; M. Storksdieck, *Field trips in environmental education*, Berlin, Germany, Berliner-Wissenschafts-Verlag, 2006.

[27] J. DeWitt, M. Storksdieck, *A Short Review of School Field Trips: Key Findings from the Past and Implications for the Future*, «Visitor Studies», vol. 11, n. 2, 2008, pp. 181-197.

[28] M. Csikszentmihalyi, K. Hermanson. *Intrinsic motivation in museums: Why does one want to learn?*, in J. H. Falk, L.D. Dierking (edd.), *Public institutions for personal learning*, Washington, DC, American Association of Museum, 1995, pp. 67-77; J. E. Meredith, R.W. Fortner, G.W. Mullins, *Model of affective learning for nonformal science education facilities*, «Journal of Research in Science Teaching», vol. 34, 1997, pp. 805-818; C. Rix, J. McSorley, *An investigation into the role that school-based interactive science centres may play in the education of primary-aged children*, «International Journal of Science Education», vol. 21, 1999, pp. 577-593.

[29] N. Lonergan, L. W. Andresen, *Field-Based Education: Some Theoretical Considerations*, «Higher Education Research & Development», vol. 7, n. 1, 1988, pp. 63-77; J.T. Elkins, N. Elkins, *Teaching Geology in the Field: Significant Geoscience Concept Gains in Entirely Field-based Introductory Geology Courses*, «Journal of Geoscience Education», vol. 55, n. 2, 2007, pp. 126-132; J. Farmer, D. Knapp, G. M. Benton, *An Elementary School Environmental Education Field Trip: Long-Term Effects on Ecological and Environmental Knowledge and Attitude Development*, «The Journal of Environmental Education», vol. 38, n. 3, 2007, pp. 33-42; T. L. Fleischner, R. E. Espinoza, G. Harry, G., Robin, W. Kimmerer, E. A. Lacey, S. Pace, S. *et al.*. *Teaching Biology in the Field: Importance, Challenges, and Solutions, «BioScience»*, vol. 67, n. 6, 2017, pp. 558-567.

[30] A. Boyle, S. Maguire, A. Marti, C. Milsom, R. Nash, S. Rawlinson, A. Turner, S.

Sciences, children got very involved and liked when the lessons took place in the middle of nature, since they became much more motivated. Also visiting factories, going on trips, visiting farms, zoos…»). All of these aspects, together with the high accessibility of nature itself, especially in rural areas, and the little or no expense involved in these outings to the immediate surroundings, probably explain why these educational resources were so widespread during the period under research (around 60% of the respondent teachers used them regularly).

Textbooks and encyclopaedias

Another interesting finding in this study was the scarce prominence acquired by certain symbolic resources such as encyclopaedias and textbooks. Despite this, based on exhaustive reading of the booklets and on the overall analysis of the testimonies, the conclusion reached is that the percentage datum presented here is, to a certain extent, biased. Textbooks were probably much more common in everyday teaching of the socio-natural environment than what the teachers themselves acknowledge. In fact, there is a teacher who admits that «the subjects that I taught during my first year as a teacher, were those of the Álvarez encyclopaedia» (FRT1604). It seems that many others take the use of textbooks and encyclopedias for granted, which would be the reason why they fail to mention them, while many others note in other parts of their recollections that they were widely used, although they do not mention any specific subjects. For example, teacher FRT0950 says that «at the start of my career what we had were encyclopaedias [Álvarez] with which we taught every subject, exploiting and using any other resources available to us»; teacher MRT0315 mentions «the typical and only encyclopaedia that belonged to the centre, and it covered all the subjects». In this context, an example of giving for granted and failing to mention common resources is the blackboard, a resource that was not invoked by any of the teachers, even though most of them, beyond any doubt, used it on a daily basis in their Social and Natural Sciences lessons.

Likewise, after a thorough reading of the booklets, the general trend seems to be that, at first, only teachers had an encyclopaedia that they used for guidance and support, these manuals were gradually acquired by students until the arrival of textbooks with the implementation of the GEL of 1970, when they were finally imposed in the primary education classroom. Thus, certain teachers, like MUT0204, claim that «students have always had their textbook». Hence, it seems that since its implementation, this resource, first in paper format and

Wurthmann, S. Conchie, *Fieldwork is good: the student perception and the affective domain*, «Journal of Geography in Higher Education», vol. 31, n. 2, 2007, pp. 299-317.

nowadays also in digital form, has gradually become the backbone of teaching at our schools. In fact, textbooks are used by almost all the students (99.1%) in Spain[31]. Other studies in the same context have contributed very similar data, concluding that textbooks are the reference material (used by 97.9% and a priority in 91.5% of the cases[32]), or that activities associated with the textbook as main information source to work on environmental understanding prevail in primary education lessons[33]. In this vein, other authors have revealed a predominance of traditional teaching to deliver science lessons, where reading the textbook and doing its exercises, alongside the teacher's explanation, are the predominant tasks in everyday Spanish school practice[34]. Therefore, although a same resource can be used in different ways, they sometimes favour or facilitate certain teaching methodologies to the extent of conditioning the type of education that is delivered.

Educational implications

After the pedagogical renewal of the last decades, the science teaching pattern for scientific literacy demands that students be inquisitive and play an active role. In other words, the teaching-learning process is no longer reduced to the straightforward transmission and reception of prepared knowledge, but its aim is to encourage students to construct their own ideas, limiting teachers' role to that of guides in the educational process. Many authors have suggested that inquiry-based learning is one of the strategies that most motivates students and most favours effective training in sciences at school[35]. In such learning communities, teachers need to select and use accurate tools and materials that can support student thinking in ways qualitatively different from teacher-centered classrooms.

[31] Instituto de Evaluación del Ministerio de Educación (IEME), *Sistema estatal de indicadores de la educación*, Madrid, Catálogo de Publicaciones del Ministerio, 2009.

[32] Escobar, Vílchez, *Percepción de los estudiantes de magisterio durante el prácticum sobre las clases reales de ciencias en Educación Primaria*, cit.

[33] P. Cañal, A.M Criado, A. García-Carmona, G. Muñoz, *La enseñanza relativa al medio en las aulas españolas de educación infantil y primaria: concepciones didácticas y práctica docente*, «Investigación en la escuela», vol. 81, 2013, pp. 21-42.

[34] S. García, C. Martínez, *Qué actividades y qué procedimientos utiliza y valora el profesorado de Educación Primaria*, «Enseñanza de las Ciencias», vol. 19, n. 3, 2001, 433-452.

[35] J. Osborne, J. Dillon, *Science education in Europe: critical reflexions*, 13. London: The Nuffield Foundation, 2008; R.D. Anderson, *Reforming science teaching: what research says about inquiry?*, «Journal of Science Teacher Education», vol. 13, n. 1, 2002, pp. 1-2; National Research Council, *Inquiry and the National Science Education Standards*, Washington, DC: National Academy Press, 2000.

Despite successive education reforms and according to different national and international reports, new theoretical teaching trends have not brought any effective changes to the expected results in Spanish schools. Furthermore, active learning strategies and student-centred processes are not used by the teachers in many European countries as much as expected by the policymakers[36]. The reason why remains unclear, although it could be due to the fact that teachers tend to reproduce the form of teaching that they received as students, or because of the extension of current curricula, or because teachers have actually not acquired new knowledge, skills or experiences required to teach sciences following an inquiry-based approach[37]. Other authors[38] even question whether the inquiry-based teaching model is something any teacher can assume or whether it can only be undertaken by exceptional teachers, since teaching science through guided-inquiry requires thorough training and sound scientific knowledge, something that is often not met[39].

According to the data yielded by this study, it seems clear that teachers' knowledge and academic qualifications have a direct impact on the variety and type of teaching and learning resources they use. Therefore, they also have a direct impact on their contemplating activities that can increase (or at least, could help to improve) student participation and, in some way, foster their inquisitiveness. In 2007, the European Union drew up the so-called «Rocard report»[40], where it was made clear that teachers, in their everyday practice, are key players in improving education. This could be achieved by providing teachers with solid training in the subject and in how it should be taught, in how to formulate intriguing problems, activities and questions, all with the use of appropriate teaching resources. Thus, the context of this study gives rise to a series of questions such as whether direct experiential resources to foster students' active role are still being included in regular teaching practice. In fact, has their use increased, as could be expected, with current teaching trends? Are teachers and teacher training students sufficiently qualified to undertake

[36] D.K. Capps, B. A. Crawford, *Inquiry-based professional development: What does it take to support teachers in learning about inquiry and nature of science?,* «International Journal of Science Education», vol. 35, n. 12, 2013, pp. 1947-1978.

[37] H. Borko, R.T. Putnam, *Learning to teach*, in R.C. Calfee, D.C. Berliner (edd.), *Handbook of educational psychology*, New York, Macmillan Library, 1996, pp. 673-708; B.A. Crawford, *Embracing the essence of inquiry: New roles for science Teachers*, «*Journal of Research in Science Teaching*», vol. *37,* 2000, pp. 916-937; N.G. Lederman, M.L. Niess, *Problem solving and solving problems: Inquiry about inquiry*, «*School Science and Mathematics*», vol. *100, 2000, pp.* 113-116.

[38] Anderson, *Reforming science teaching: what research says about inquiry?*, cit.

[39] C. Murphy, P. Neil, J. Beggs, *Primary science teacher confidence revisited: ten years on.* «Educational Research», vol. 49, n. 4, 2007, 415-430.

[40] Rocard, Csermely, Jorde; Lenzen, Walwerg Henriksson, Hemmo, *Science Education NOW: A renewed Pedagogy for the Future of Europe*, cit.

active methodologies and implement, for instance, inquiry-based educational sequences or visits to out-of-school settings?

In today's schools, where Information and Communication Technologies (ICT) seems to impose their presence at all levels, it is essential to defend direct environmental involvement that brings the opportunity for direct hands-on experience. As already noted, school field trips are resources that favour students' active learning and could be excellent tools to foster observation, discussion and inquiry at school[41]. However, recent studies reveal that this is currently not commonplace in regular teaching practice in Spain[42]. The reasons for this could be one of the followings: a) some teachers' idea that school trips cause academic schedule delays; b) overcrowded classes; c) higher teacher responsibilities; d) textbooks' prevalence in the classroom; or e) teachers' lack of awareness of – or poor training in – the natural environment[43]. In the light of this, there are studies that express how many future school teachers show scarce confidence in their natural scientific knowledge and demand more thorough training in these disciplines[44]. Besides, they remarked that the implementation of inquiry-based methodology in the classroom is very difficult, mostly invoking reasons such as precariousness in the context of primary education classrooms or even the lack of resources available. All this, added to the fact that any activity outside the classroom requires greater effort, responsibilities and dedication, and usually involves paperwork and economic aspects, ultimately leads to teachers' reluctance to make this resource part of their regular practice.

Consequently, it seems that over the last 75 years, an active experiential resource such as school trips to the immediate surroundings, has been gradually replaced by a symbolic one, namely, the textbook (either in physical or digital format), that favours a more passive learning model. Textbook-supported teacher explanations therefore become the general rule in the teaching of sciences in Spanish schools[45]. In this regard, certain authors have stated that for a teacher to foster active inquiry at school it is necessary to leave aside «commitment to textbooks», which requires solid scientific training and knowledge to be able

41 Lonergan, Andresen, *Field-Based Education: Some Theoretical Considerations*, cit.; R. Del Toro, J.G. Morcillo, *Las actividades de campo en educación secundaria. Un estudio comparativo entre Dinamarca y España. «Enseñanza de las Ciencias de la Tierra», vol.* 19, n. 1, 2011, pp. 39-47.

42 E. Pedrinaci, *Trabajo de campo y aprendizaje de las ciencias*, «*Alambique*», vol. 71, 2012, pp. 81-89; D. Aguilera, *Field trip as a didactic resource to teach sciences. A systematic review*, «Revista Eureka sobre Enseñanza y Divulgación de las Ciencias», vol. 15, n. 3, 2018, p. 3103.

43 J.A. López, *Las salidas de campo: mucho más que una excursión*, «Educar en el 2000: revista de formación del profesorado», vol. 11, 2007, pp. 100-103.

44 A. Cortés, M. De la Gándara, J.M. Calvo, M. Gil, B. Martínez, J. Ibarra, *¿Qué opinan los futuros maestros sobre el aprendizaje de las ciencias a través de la indagación y sobre sus necesidades formativas?*, «Enseñanza de las Ciencias», num. extr, 2009, pp. 3536-3541.

45 Vílchez, Escobar, *Uso de laboratorio, huerto escolar y visitas a centros de naturaleza en Primaria: Percepción de los futuros maestros durante sus prácticas docentes*, cit.

to provide students with adequate guidance[46]. In fact, the data gathered in this study show how those teachers whose qualifications was more comprehensive were the ones who most often used this resource (73% against 56%) or others experiential ones, such as natural collections (27% against 15%) (Table n. 1).

Limitations, future work and concluding remarks

Finally, it should be noted that there are certain limitations to this study with regard to the interpretation of the results obtained. First, the sample used is not representative of the entire Spanish reality, since the bulk of the accounts comes from teachers who worked in the western regions of the country, which prevents the drawing of general conclusions for the entire Spanish territory. Future work should seek to replicate our findings in eastern regions and in other southern European countries. Likewise, it is a study on schoolteachers' assessments of their professional career, and their views on teaching practice, although highly valuable, may vary over time. In this regard, the use of educational resources in the classroom is not attached to a specific date, but refers to extended periods of time that are difficult to mark. It would have been interesting to have accurate chronological information or to know the exact time frames of usage during their teaching life. However, and despite these limitations, this research, together with the available references, provides insight into the understanding of primary education teaching, attempting to contribute an analysis of how Social and Natural Sciences education has been approached over the last seventy-five years.

[46] Anderson, *Reforming science teaching: what research says about inquiry?*, cit.