



Knowing Much to Teach Little

The Teaching of Botany by Pius Font i Quer in the Selection and Training Course for Secondary Education Teachers in 1933

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Abstract

This paper reports new data on the courses held in 1933 in Spain for the selection and training of secondary education teachers that constituted an alternative to the traditional format of competitive examinations. These courses took place during the Spanish Second Republic (1931–1939), a political period characterised by various initiatives directed towards modernising and internationalising education and science teaching in Spain. Here, we focus on the botany course held in Barcelona given by the prestigious professor of botany Pius Font i Quer (Lérida, 1888–Barcelona, 1964). The programme of the course and its teacher encouraged a methodology based on scientific research by means of observation, description, drawing, the creation of herbariums, laboratory practice and excursions. In addition, the course incorporated democratic values, dialogue and cooperation between the aspirants, all of which were in keeping with the educational ideas of the republicans. The courses for natural science teachers were thus a novel approach that clearly linked teacher training to the recruitment process and achieved pedagogical goals beyond those of the discipline itself.

Keywords History of science teaching · Botany teaching · Pius Font i Quer · Second Spanish Republic · History of secondary education

1 Introduction

As a field that combines elements of the history of education and the history of science, the history of science education provides context for understanding current science education, pedagogy and policy, as well as new approaches to science teaching (Simón, 2013). As Michael R. Matthews (2017) states, when core disciplines such as history are ignored or used at an uncritical or superficial level, the field of science education as a whole is weakened. In the case of Spain, this exercise of reviewing the past takes on special relevance

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when considering events during the Second Republic (1931–1939), a brief period rich in proposals for the modernisation of education and science.

This article examines an experiment in Spanish education during the Republican period that has been described as “singular” by the education historian Juan Mainer (2009) and is concerned with a subject of permanent debate: the pedagogical training of secondary school teachers.¹ Secondary education at that time comprised 6 years (from 11 to 16 years of age), in which the natural sciences (geology, botany, zoology and physiology) were taught in the first and sixth years of the syllabus. The “singular” nature of this experiment refers to the departure from classical competitive examinations as a means to select secondary school teachers and their substitution by courses that included pedagogical training and a subsequent assessment of the teaching capacity of the candidates. With the exception of the Instituto-Escuela,² no procedure for the pedagogical training of secondary school teachers existed prior to 1933 (Mainer, 2009).

The experiment involved the organisation of courses by the Ministry of Public Instruction and Fine Arts in 1933 for the selection and training of secondary education teachers,³ a format that had already been applied for the selection of primary school teachers (Pérez Serrano, 1990; Simón Martín & Jové Monclús, 2024). Whilst accepting competitive examination as a valid means to evaluate scientific competence, the decree issued by the Ministry recognised that the latter should not be the only factor to be taken into account for the selection of teachers. Aspirants should possess professional competence, and that “can only be demonstrated by teaching”.⁴

In this paper, we examine this model of teacher selection, a sparsely explored chapter in the history of Spanish secondary education. Specifically, we focus on the botany course that was held in Barcelona in the summer of 1933 for the selection and training of secondary school teachers in the field of natural sciences. This course was taught by the prestigious Catalan botanist Pius Font i Quer (Lérida, 1888–Barcelona, 1964), a renowned figure in the history of Spanish science. Based in large measure on the analysis of the written works used for the evaluation of the attending aspirants, we have studied the methodology used in this course as an example of the activities and pedagogical approach of this form of natural science teacher selection.

2 Theoretical Framework

The courses for the selection and training of secondary school teachers formed part of the educational reforms undertaken during the Republican period to extricate Spain from its social and cultural backwardness after the nation’s economic and moral decline following

¹ Until the 1960s, secondary teachers did not receive pedagogical training. Subsequently, during the period of democracy, Organic Law 1/1990 of 3 October 1990 on the General Organisation of the Education System (LOGSE) made it a requirement for graduates, engineers and architects to obtain the Certificate of Pedagogical Aptitude in order to work in secondary education. With the entry into force of the Bologna Process in 2009/2010, this was replaced by the Master’s degree in teacher training for teachers of compulsory secondary education, Baccalaureate, vocational training and language teaching.

² The Instituto-Escuela in Madrid was founded in 1918, followed by the founding of other Instituto-Escuela in Barcelona (1932), Valencia (1932–1939), Seville (1932–1936) and Malaga (1933).

³ Equivalent to today’s Ministry of Education.

⁴ *Gaceta de Madrid*, 27 June 1933, n° 178, p. 2259. This type of course was held again in 1936: *Gaceta de Madrid*, 17 June 1936, n° 169, p. 2416.

the definitive loss of its colonial empire in 1898. Wider access to education as well as secularism in schools were core ideological fundamentals fostered by the first government of the Second Republic, and the Constitution of the Republic (1931) stated that secular education should be inspired by “human solidarity”.⁵ The Constitution also recognised for the first time the right of women to vote, and women were incorporated into public life and in particular into science and education. Indeed, co-education was one of the characteristics of the Second Republic.⁶

In the context of the reforms, the Institución Libre de Enseñanza (ILE) (1876–1939)⁷ played a decisive role in the changes that were undertaken in education, developing a pedagogical model based on the comprehensive education of students that was two decades ahead of the New School (Guijarro, 2018; Molero, 2000). The intuitive method they advocated considered the acquisition of knowledge to be based on direct perception of reality through the senses, observation and experience. The school should teach the student to “see”, which would encourage him to ask questions, to doubt and to verify. The personal effort required for all these actions, together with the personal freedom to direct their learning, would result in motivation to learn. Importance was also given by the ILE to orality: dialogue, discussion and contact between teacher and student were key to learning and coexistence in school (Molero, 2000).

In this sense, instructional excursions—among which those in the natural environment stood out—were the preferred activity of the ILE that found in nature “a new meeting point for understanding the essence of human activity in its relationship with the environment” (Molero, 2000, p. 102). “Reading” the landscape promoted reflection on objective and subjective aspects: understanding the effects of human actions on the environment, working on aesthetic education through the contemplation and admiration of natural beauty and, ultimately, facilitating the integration of the student into the social environment. As part of this contact with reality and experience, the ILE considered the use of the laboratory, the handling of instruments, the direct study of plants and animals and manual work to be essential for the student’s training (Molero, 2000). The study of science through contact with nature in field trips and consideration of the countryside as a cultural heritage constituted one of its pedagogical pillars (Ortega Cantero, 2022).

Concern for teacher training was a constant in the history of the ILE (Molero, 2000). With the creation of the Museo Pedagógico Nacional in 1882 (facilitated by the former), experimental science courses were organised for teachers and the importance that science should have in schools began to be emphasised (Bernal, 2001). The ILE also promoted the creation of the Junta para la Ampliación de Estudios (JAE) (1907–1939)⁸ with the aim of connecting Spain with the most scientifically advanced countries of the day. The JAE awarded a large number of grants to enable periods of study abroad covering all fields of knowledge, amongst which was pedagogy in what is known as “the silver age” of Spanish science (García Velasco & Sánchez Ron, 2010; Marín Eced, 1990).⁹

⁵ Constitution of the Republic, 1931, articles 48, 49 and 50.

⁶ Many works have been published on the incorporation of women into the teaching profession during the Second Republic. See (Lemus López, 2022; Ortiz García, 2023).

⁷ Free Teaching Institution.

⁸ Board for the Extension of Studies.

⁹ From 1936 to 1940, Spain was immersed in a civil war, the winners of which imposed a forty-year fascist dictatorship that completely erased the achievements of the republicans and a brilliant generation of Spanish intellectuals, educators and scientists. Some were assassinated; others were forced to leave their country. Those who remained in Spain were subjected to review of their personal and professional lives to assess their adherence to Franco’s regime.

Thanks to the strengthening of the Spanish scientific system fostered by the JAE, in 1920 the country was able to participate in international organisations such as the League of Nations (LN) (Grandjean, 2018; Neila, 1997). Republican ideals of a new citizenship and the construction of a social model of co-existence based on democracy and peace through scientific development and education were in tune with the values of the LN. In the context of pedagogy, Spain participated in the International League for New Education from its foundation in 1929, and the first government of the Second Republic adopted and disseminated the pedagogy of the New School (Del Pozo Andrés, 2003). The main idea shared by the new schools was that the individual should be the centre of the learning process and that the teacher should play a supporting role, guiding and facilitating learning rather than being the transmitter of knowledge. In this sense, it was considered that the student should learn by actions, hence the denomination “active school” (Tiana, 2008). Another of its fundamental objectives was the holistic education of the individual, that is, education should be addressed to all the dimensions of the individual. The *Escuela Nueva* was opposed to procedures of memorisation and instead emphasised “the value of intellectual methods of work (observation, hypothesis, verification, law), direct recourse to facts of nature or culture in order to describe, classify and elaborate them” (Marín, 1976, p. 35). As Bernal (2001) has stated, “the methodological proposals [...] around the concepts of the new school and active school will create a favourable pedagogical framework for the development of science didactics” (p. 208).¹⁰

Another of the pedagogical movements that influenced the renewal of science teaching in Spain was that of Nature Study which was introduced through the work of Margarita Comas after her stay in England in 1920 thanks to a grant awarded by the JAE (Bernal, 2001; Delgado Martínez, 2009). Nature Study was oriented towards “the pupil’s knowledge of the natural environment, the importance of experimental activities in science teaching and the active role of the pupil in the performance of school tasks” (Comas, 2001, p. 48). Nature Study in the USA was expounded by authors such as L. H. Bailey (1909) with the aim of opening the pupil’s mind by direct observation of nature and to make investigators and specialists.

One of the reforms undertaken was directed specifically at secondary education. The Constitution of the Spanish Republic (1931) and the Law on Religious Denominations and Congregations (1933) prohibited the clergy from teaching which, together with the republicans’ desire to facilitate access to education for all social classes, created an urgent need for new educational centres and secondary school teachers.¹¹ The model of secondary education established by the Moyano Law (1857) was focused towards access to university for the elite and a traditional teaching methodology: learning the theory of subjects as contained in textbooks and taught in lecture-based classes, with knowledge ultimately being assessed by examinations.¹²

In order to transform this, the ILE began its first pedagogical experiment in secondary education with the foundation in 1918 of the Instituto-Escuela in Madrid, which for the first time in Spain considered secondary education to be a formative period in its own right and not just a stepping stone to university. The teaching of science featured prominently in

¹⁰ Bernal uses the term active school instead of new school and explains that both terms are valid (Bernal, 2001, p. 211–212).

¹¹ The number of national secondary schools increased from 69 in 1930 to 106 in 1933, and 6 new secondary schools were created on the model of the Instituto-Escuela in Madrid (Sánchez Sarto, 1936).

¹² On overcoming the elitist character of secondary education, see (López-Ocón, 2021; Viñao Frago, 2011).

the Instituto-Escuela which organised numerous excursions as well as practical and laboratory work (Guijarro & González de la Lastra, 2021; López Martínez, 2012; López Martínez & Delgado Martínez, 2023; Martínez Alfaro, 2023; Martínez et al., 2018).

A new vision of children and adolescents that emerged in Spanish society in the first third of the twentieth century influenced the new pedagogical trends (Kendrick, 2020). The relationship between pupils and teachers became close, with students being encouraged to think and use their initiative. To put into practice the pedagogical principles of the educational reforms, the ILE used the school notebook as an alternative to textbooks in the daily practice of the Instituto-Escuela. As pointed out by Leticia Sánchez (2007), these were not merely notebooks in which the teacher's lectures were taken down. They provided a means for the child to record in writing and through diagrams and drawings his/her observations, reflections and conclusions, in a manner akin to the methodology of scientific research.

Four institutions were subsequently created in Barcelona that focused on pedagogical renewal in primary, secondary, university and teacher education: the Patronat Escolar de Barcelona (1922), the Institut-Escola de la Generalitat de Catalunya (1932), the Seminari de Pedagogia de la Universitat de Barcelona (1930) and the Escola Normal de la Generalitat de Catalunya (1931), respectively (Cañellas & Torán, 2020). These institutions worked together to foster a pedagogical model that placed the child at the centre of education and in which the teaching of science was based on experimentation and direct contact with nature (Corell Doménech, 2023).

Spanish publishing houses, mainly located in Madrid and Barcelona, also contributed greatly to the dissemination of the new pedagogy by translating foreign works on the teaching of natural science.¹³ In addition, teaching guides covering the new methodologies for teaching science subjects were also produced that, along with many other science books for secondary education, were recommended to be incorporated into school libraries by the Ministry of Public Instruction during the Republican period (López-Ocón, 2023).¹⁴ In 1936, Labor published a work of considerable size and relevance, namely the *Diccionario de pedagogía* that compiled the new pedagogy and innovative international methodologies for the teaching of science (Corell Doménech, 2021a, 2021b, 2022b).

The implantation of the selection and training courses by the Ministry of Public Instruction and Fine Arts sought to introduce pedagogical innovations in the various specialities of secondary education. To this end, teacher trainers recognised for their teaching abilities were recruited such as Pius Font i Quer, an experienced university lecturer, researcher and

¹³ Some examples are *Nociones de historia natural* (1926) by the German botanist Otto Schmeil, published by Gustavo Gili, and *El estudio de la naturaleza en la escuela* (1933) by the Danish pedagogue Vilhelm Rasmussen, published by Labor, both editorials being located in Barcelona (Corell Doménech, 2022a).

¹⁴ Some of the teaching guides published are *Cómo se enseñan las ciencias naturales* (1924) by the teacher and naturalist Enrique Rioja Lo Bianco and *Metodología de las ciencias naturales* (1932) by the primary school inspector Vicente Valls by Publicaciones de la Revista de Pedagogía. Both provided practical botanical activities for students based on excursions, experimentation and the handling of fresh plants. Likewise, the teacher trainer Modesto Bargalló authored *La vida de las plantas: Experiencias sencillas de fisiología vegetal* (1932), *Cien lecciones prácticas de ciencias naturales para la escuela primaria* (1933) and *Paseos y excursiones escolares: Estudio de la naturaleza* (1934). On Bargalló, see (Moreno Martínez, 2021). Another significant contribution to the teaching of botany was made by Margarita Comas, one of the first female Doctor of Science in Spain, with her book *Contribución a la metodología de las ciencias naturales* (1937). On Comas, see (Delgado Martínez, 2009). Espasa-Calpe published botany books addressed to secondary education such as *La vida de las plantas* (1922), *Las plantas cultivadas* (1929), *La vida de las flores* (1930) and *Historia de la Tierra* (1933) by the teacher and geographer Juan Dantín Cereceda (López-Ocón, 2020).

public communicator who collaborated with the pedagogical institutions of Barcelona and well-known teachers and pedagogues including Rosa Sensat and Alexandre Galí, as well as Josep Estalella, an innovative secondary school teacher of physics and the director of the Institut-Escola. Font i Quer also participated in the public instruction of botany in the Museu de Ciències Naturals and the Junta de Ciències Naturals, as well as in the Centre Excursionista.¹⁵

Pius Font i Quer graduated in pharmacy from the University of Barcelona, the only degree course in which botany was taught at that university. In 1911, he joined the military health service where he reached the rank of lieutenant colonel pharmacist. From 1917, he lectured in the Department of Descriptive Botany at the Pharmacy Faculty of the University of Barcelona, and in 1923 he obtained a permanent position at the Escola Superior de Agricultura de Barcelona through competitive examination. Ten years later he was appointed full professor (Chair) of Pharmaceutical Botany. During his career, he described more than 200 taxa, authored around 250 publications on botany and was instrumental in the creation of the Institut Botànic de Barcelona of which he was director in 1935.¹⁶ Font i Quer also stood out for his defence of nature and, in particular, of the Montseny massif in the province of Barcelona. Together with Francesc Galí, he drew up “the first historical antecedent of the current Montseny Natural Park” (Font Civit, 1988, p. 25–26).

Font i Quer was considered to be a rigorous teacher who gave clear, practical and intelligible classes and encouraged student participation through his active teaching methodology that avoided learning by rote. Unlike the traditional classes common at the time, he proposed the study of fresh plants in the lecture theatre, the laboratory and on excursions. He also incorporated modern European trends that associated plant systematics with phytogeography, a discipline he introduced into Spain through his own work (Font Civit, 1988, p. 55).¹⁷

The arrival of Font i Quer at the University represented “an important moment for the development of botany in Catalonia and for the renewal of science teaching methods in Spanish universities” (Cuatrecasas, 1988, p. 61). In this regard, the Catalan botanist Creu Casas i Sicart (1988), who was one of his students and became professor at the Autonomous University of Barcelona, refers to Font i Quer’s teaching as “the fruit of an innovation, which unfortunately did not have continuity”. She emphasises “the effort involved in organizing a teaching system different to that which had been followed until then” (p. 103). Casas explains that Font i Quer was always involved with his students, observing their work, asking questions and clarifying doubts. In his classes, “the work consisted of observing the morphology of the plant very carefully and making a description as carefully and detailed as our knowledge allowed, accompanied by drawings of the most essential parts for their differentiation and understanding” (Casas, 1988, p. 104). When the student had completed the morphological study and had made a graphic reproduction, classification could then be tackled. The methodology used for teaching theoretical aspects was also based on active work undertaken by the students. In agreement with all the classmates, the students could choose which lesson from the course programme they would present. “Our

¹⁵ Font i Quer’s correspondence shows these connections. Institut Botànic de Barcelona, IBB File (AIBB/PFQ/8).

¹⁶ The Institut Botànic is currently a joint research centre of the Consejo Superior de Investigaciones Científicas (CSIC) and Barcelona City Council. <https://www.ibb.csic.es/ca/>

¹⁷ For Font i Quer’s teaching activity in different scientific and educational institutions, see (Font Civit, 1988, pp. 15–58).

explanations were often confusing and difficult to understand, a consequence of our inexperience and lack of broad vision. At the end, Dr. Font clarified and pointed out the important concepts and answered our questions” (Casas, 1988, p. 106). Excursions were also frequent in his course. Font i Quer’s teaching method “eliminated rote study and brought us closer to nature and living plants to make it easier for us to understand plant life and appreciate it” recalls Casas (1988, p. 107), who described Font i Quer as a firm, affable and understanding man who always listened to his students. Ángeles Ferrer i Sensat, who worked with Font i Quer in 1931 on a natural science training project for teachers whilst he was director of the Museu de Ciències Naturals de Barcelona, noted that “he also felt deeply the pedagogical sense of the project because he was a great teacher” (Ferrer, 1988, p. 127).

Font i Quer’s colleagues frequently asked him about his teaching method. In correspondence with Salvador Teyà, professor at the Autonomous University of Barcelona, Font i Quer explained that in teaching botany he gave “full importance to practice”, and he was also convinced that it was “anti-pedagogical to learn by heart [...] and to neglect the practice of direct observation of specimens”. As a complement to his teaching, students went on excursions and had “started a herbarium, which the department lacked”. In his letter, Font i Quer also considered that possible teaching improvements could be made by reducing the number of students and noted that they also lacked “laboratory material, microscopes and binocular magnifying glasses”.¹⁸ Antonio Ponce de León, professor at the University of Havana, also wrote to Font i Quer to request his “programme and methods developed” as he was “very eager to give the most modern orientations to the teaching of botany” at his university.¹⁹

Little has been published regarding the selection and training courses due to the dispersion and destruction of archival documentation during the Spanish Civil War and Franco’s dictatorship.²⁰ In addition, the history of secondary education has tended to be regarded as the “poor relation” in the history of education in Spain largely as a consequence of the emphasis placed on the study of primary education and primary school teacher training (López Ocón, 2021).²¹ In his description of the geography and history courses, Mainer (2009) considered that those directed to primary teachers were more focused on pedagogy than those for secondary teachers²²; however, no additional archival documentation beyond

¹⁸ Letter to Salvador Teyà on the importance of practice in the teaching of botany, signed on 11 March 1935. Institut Botànic de Barcelona, IBB File (AIBB/PFQ/9).

¹⁹ Letters from Antonio Ponce de León, University of Havana. Request for programme and methods of teaching botany developed by Pius Font i Quer at the university. Institut Botànic de Barcelona, IBB File (AIBB/PFQ/7).

²⁰ Joan Vallès wrote an article about one of the aspiring trainees of the Barcelona course, José M^a Álvarez, who was his secondary school teacher (Vallès Xirau, 2013).

²¹ López-Ocón has made the work of Spanish secondary school teachers in science classrooms more visible. See the issue co-ordinated by this author on the relations between secondary education and universities (López-Ocón & Ribagorda, 2023) and also (López-Ocón et al., 2018).

²² The selection boards for the primary teacher courses comprised individuals with pedagogical training and knowledge of school practice. Classes on methodology, school organisation, model lessons and teaching practice were held for 30 days at a teacher training college. The training included a further 30 days of practical work in a school during which time candidates were observed by the board of examiners. Finally, the aspiring primary school teachers had to submit a detailed diary recording the events of the course (Mainer Baqué, 2009, p. 414, note 63).

that available in the *Gaceta de Madrid* was commented.²³ Mainer points out that the selection courses for secondary school teachers held in 1933 were dominated by the *habitus*²⁴ of the body of secondary school teachers that disregarded the scientific foundations of pedagogy and education, and he concluded that the courses “were aimed more at demonstrating the scientific capacities of the candidates rather than orienting their didactic instincts and perfecting their professional attitude” (Mainer, 2009, p. 417). Despite this, he considered that the courses nevertheless reflected a concern for teaching methodologies and pedagogical training in secondary education which began to emerge during the Second Republic.

Bearing in mind the above, our research aims to examine the programme of the natural science course and the notebooks of the aspiring natural science secondary school teachers to address the following questions. What was the purpose of the courses: to select and train applicants based on their knowledge of their specialty, or did they also include pedagogy and republican values? What were the teaching resources and methodologies proposed by the course?

3 Methodology

In recent years, the historiography of education has focused on empirical culture which deals with oral culture (memories of students and teachers), material culture (didactic and school material, furniture, photographs) and written culture (school textbooks and notebooks). School notebooks constitute a primary source for reconstructing school history, illustrating diverse aspects of daily life in the classroom. Analysis of these didactic instruments can furnish information of various types, including ideologies and positions on gender at the time (Martín Fraile & Ramos Ruiz, 2020; Parra Nieto et al., 2020).

Although student notebooks and written works are of great value, their subjectivity makes them intrinsically complex sources (Sanchidrián Blanco & Gallego García, 2009). Our analysis of the programme of the botany course and the written works by the 15 trainees—summaries of Font i Quer’s lecture, reports on the excursion to the Pyrenees, summaries of two laboratory practicals and presentations of natural science lessons for the first and sixth years of secondary school proposed by the applicants—revealed complete coherence between them.²⁵ Hence, we have used them as a primary source for understanding the contents, details, values and pedagogical approach adopted in the course, together with Font i Quer’s methodology for teaching botany.

²³ Mainer’s description was based on the decrees published by the Ministry of Public Instruction and Fine Arts in the *Gaceta de Madrid* (Mainer, 1990, p. 415–16).

²⁴ The *habitus* is one of the main concepts of sociology theories by the sociologist Pierre Bourdieu and has been used to describe the body of secondary education teachers in Spain (Cuesta Fernández & Mainer Baqué, 2015; Mainer Baqué, 2020).

²⁵ *Cursets de selecció i perfeccionament de 2on ensenyament*. [Courses for the selection and training of secondary education teachers] ES-02–5806-01. Archive of the University of Barcelona (AUB). The notebooks of the aspiring teachers figure under the names: Summary of Font i Quer’s lecture, Excursion report, Laboratory practicals and botany lesson. All can be found under the reference number indicated.

4 Results

4.1 The Course for the Selection of Science Teachers

Access to the selection courses was dependent on achieving a favourable assessment in two written exercises—undertaken in Madrid—on the content of the teaching specialty of each aspirant: philosophy, Spanish literature, Latin, geography and history, French, drawing and sciences that included agriculture, mathematics, natural sciences and physics and chemistry. Three hundred and twenty-one science teachers passed the first exercises and were subsequently permitted to attend selection courses that were held simultaneously in Madrid, Barcelona, Valencia and Zaragoza.²⁶

The directors of the science courses in Madrid were the renown secondary education teachers Enrique Rioja Lo Bianco who was head of the board for natural sciences and Marcelino Martín González del Arco who headed the physical/chemical sciences board.²⁷ Pere Bosch Gimpera was responsible for the selection courses in Barcelona²⁸ where the physical/chemical sciences panel was headed by Antonio García Banús of the Organic Chemistry Laboratory at the University of Barcelona and included Miguel Masriera, lecturer at the aforementioned laboratory, and Josep Estalella. The natural sciences panel in Barcelona was headed by Salustio Alvarado Fernández (Casado, *n.d.*) professor of Animal Organography and Physiology in the Faculty of Sciences of the University of Madrid and included Font i Quer and the geologist and secondary education teacher Bartolomé Darder Pericas.²⁹

The natural sciences course in Barcelona took place from the 27th of July to the 9th of September 1933 and was attended by 15 aspirants: 3 women, Encarnación Sánchez Herrero, Ángeles Ferrer i Sensat and Enriqueta Ortega i Feliu, and 12 men, Ricardo Aldana Herrero, José V. Alpuerto, Daniel Bescansa Aler, Timoteo Botey Mateu, José María Font i Tullot, Eduardo García Rodríguez, Jorge Ribera Ferré, Uldarico del Olmo, José M^a Álvarez Ribera, Jerónimo Roig Binimelis, Prudencio Seró Navás and Celso Sánchez-Crespo y Gómez. The first part of the course was devoted to five lectures given by the teacher trainers presenting the aims and problems related to the teaching of their discipline in secondary education: two on geology (the teacher was Darder), two on zoology and physiology (Alvarado) and one on botany (Font i Quer). The day after each lecture 2-h discussion periods took place with the students.³⁰

²⁶ There were three categories of aspirants depending the grade obtained in the first exercise. The first call selected only aspirants in the first and second categories. See *Gaceta de Madrid*, 16 September, 1933, n° 259, p. 1752 y *Gaceta de Madrid*, 1 November, 1933, n° 305, p. 792. 159 aspirants (49.5%) passed the selection course and could choose a placement in a secondary school.

²⁷ Rioja is considered one of the renovators of science teaching in Spain and was also an outstanding specialist in marine biology. He published the first textbooks on the teaching of natural sciences from an ecological perspective and through direct contact with nature. Martín González del Arco was also a renowned professor who participated in the preparation of the study plans for secondary education in 1934 and was also the director of the Instituto Obrero (Worker's Institute) in Madrid, in which Rioja also taught (Moreno Martínez, *n.d.*).

²⁸ Bosch Gimpera was dean of the Faculty of Philosophy and Letters from 1931 to 1933 and rector of the University of Barcelona from December 1933 to 1939.

²⁹ See the panel of the courses in *Gaceta de Madrid*, 24 July, 1933, n° 205, p. 534.

³⁰ *Natural sciences course programme*, July 1933. AIBB/PFQ/8. B151. Archive of the Institut Botànic.

The programme of the courses placed emphasis on undertaking practical work for which at least 1 h a day was dedicated, in addition to that required for excursions and visits. The course in Barcelona included two excursions to the Catalan Pyrenees to study botany and geology, each of which lasted 7 days. Classes, excursions and practical work in botany, geology, zoology and physiology were followed by discussion periods.

A second element of the course consisted of the “pedagogical training” of the aspirants and their introduction to practical work. Each trainee had to present at least one 40-min secondary education lesson on a topic proposed 24 h before by the teacher trainer, accompanied by a summary and a bibliography. Together with the teacher, the other candidates had to make critical observations on the lesson. Assessment of the trainees was based on written reports on the lectures, practical work and excursions, in addition to the oral lessons prepared by the aspirants.³¹

4.2 The Botany Course of Barcelona

The botany course in Barcelona started with a lecture given by Professor Pius Font i Quer titled “Methodology in the teaching of botany in secondary education” on the 29th of July. The notes taken by the various aspirants during the conference show a high level of coherence indicating that they reflect the words of Pius Font i Quer. Aldana explains in his summary of the lecture that in the first year, “the aim should be for students, more than anything else, to develop a working habit, to know how to observe and describe what they observe”.³² Álvarez summed it up as follows: “A solid base of elementary knowledge, clear ideas, a habit of work [...] following in the acquisition of knowledge the same phases through which humanity has passed in acquiring such knowledge”.³³ He added that “The professor, especially in the first years, must not forget that his mission is educational, not informative. The teacher must educate, lead the child, using for this purpose everything that is capable of arousing and keeping the child’s interest alive”.³⁴

Prudencio Seró noted that.

We have to follow different methods in the first and sixth years. Dr. Font believes that in the 1st year, geology and botany should be studied more extensively than zoology (so that children do not see how animals have to suffer), while in the 6th year, more importance can be given to zoology and physiology.³⁵

Font i Quer explained that the study of botany should start with the examination of external morphology, followed by internal morphology, physiology, geobotany and systematics. Thus, Aldana wrote, pupils were to be introduced to botany through their production of monographs on plants, the best of which would be read out in class to serve as an example.³⁶

Font i Quer recommended doing practical work on plant organs—for example, the study of leaves would help the student to appreciate their shape, consistency, the colour of both

³¹ *Programme of the selection courses for secondary education teachers*, p. 1. ES-02–5903-03. Archive of the University of Barcelona (AUB).

³² Aldana, R. (1933). *Summary of Font i Quer’s lecture*, p. 1. AUB.

³³ Álvarez, J. M. (1933). *Summary of Font i Quer’s lecture*, p. 1. AUB.

³⁴ Álvarez, J. M. (1933). *Summary of Font i Quer’s lecture*, p. 1–2. AUB.

³⁵ Seró, P. (1933). *Summary of Font i Quer’s lecture*, p. 2. AUB.

³⁶ Aldana, R. (1933). *Summary of Font i Quer’s lecture*, p. 2. AUB.

sides, the appearance of the edges, the existence or not of hairs and petioles and similarities with other objects. Such series of observations could be presented as drawings on the blackboard which could then be used to stimulate pupils to describe different parts of plants in writing. “We must not resort to the technical nomenclature of species”, explained Ferrer,³⁷ but pupils should know the different organs of plants, not only because their youth made it easier to memorise them, but also because the etymology of the names themselves helped in understanding the meaning of words such as pistil, petal and stamen. In addition, and taking advantage of children’s eagerness to collect things, herbaria of roots, stems, leaves and flowers should be made in order to complete and consolidate the knowledge acquired. Study materials such as fresh fruits, flowers and seeds had to be abundant in the classroom, preferably having been collected by the pupils themselves, before resorting to collections, plates or books, except in special cases. “As a rule for the first year, the collection of eye-catching plants that attract the child’s attention should be done”, added Bescansa.³⁸

Font i Quer considered that interest in knowing the internal structure of plants was already innate in children. The teacher’s task was to convey the idea that plants are cellular complexes through observations of plant sections under the microscope, a “subject that always pleases children”. For example, observing one of the hairs that make up the segments of oranges and “making them understand [...] that they are giant cells”, as Aldana wrote in his summary.³⁹ Physiology would be approached in a simple way in the first year, experimenting with germination, plant growth, plant tropisms, the need for water for life, etc. Reproductive organs should be studied in detail in order to give pupils a clear idea of plant reproduction.

In the sixth year of secondary education, the subjects studied in the first year were to be consolidated and integrated, focusing especially on the ability to observe and describe. In this regard, Aldana wrote that “There should be no lack of material, and if it is collected by the pupil, so much the better. If necessary, make use of collections, plates, drawings [...]. Of course, all these observations should be summarised by the pupil in a notebook”.⁴⁰

The study of plant anatomy, physiology and systematics would be extended, as well as botanical terminology, phytogeography and geobotany in the form of numerous excursions in the vicinity of the school so that pupils could see how plants are distributed and study their “relation with the environment and the struggle for life”.⁴¹ Regarding plant physiology, pupils were to learn about the function of chlorophyll, starch synthesis, carbon assimilation, plant transpiration, respiration, water absorption, the effects of drought, growth and vegetative and seed multiplication. As a practical exercise, Font i Quer proposed putting a plant in saline water and demonstrating that, as a result of the opposite osmotic current, the plant would suffer the same effect as if it lacked water.

On their excursions, pupils should summarise their observations in a notebook and include sketches and diagrams as well as a terrain profile recording the different species occurring in shady and sunny regions. Font i Quer gave the following examples:

³⁷ Ferrer, M. A. (1933). *Summary of Font i Quer’s lecture*, p. 4. AUB.

³⁸ Bescansa, D. (1933). *Summary of Font i Quer’s lecture*, p. 4. AUB.

³⁹ Aldana, R. (1933). *Summary of Font i Quer’s lecture*, p. 2. AUB.

⁴⁰ Aldana, R. (1933). *Summary of Font i Quer’s lecture*, p. 2. AUB.

⁴¹ Ortega, E. (1933). *Summary of Font i Quer’s lecture*, p. 2. AUB.

- Identify the three factors influencing plant dispersal: water, nature of the soil and temperature. Observe the different water needs of each plant and the distribution of xerophytic and hydrophilic plants in sunny and shaded regions and at the base and top of a mountain.
- Explain the concept of association between plants, and group plants into those present on the same bank, slope, summit or dune.
- Make lists of the most abundant and the rarest plants, giving their technical or common names.

Although plant systematics was not to be tackled until the sixth year, the concept of species, a word that was in everyday usage, could be dealt with in the first year. Font i Quer suggested explaining it in a very simple manner: as a species, rosemary is a plant that does not vary. The concept of the genus could also be dealt with by reference once again to plants already familiar to children, such as the different types of pine trees: stone, maritime, black etc. As regards plant variability, he recommended not tackling this and that students would thus finish their secondary education with the Linnaean concept of species. He considered that it would be possible to mention evolution, that is that plants can change, but in his opinion it was preferable to complete secondary education with the idea that species are “fixed and immutable”.⁴² Encarnación Sánchez noted that only when pupils began “to study the great biological truths would they be told about the theory of evolution, and that the student would then be able to deduce what is most appropriate regarding these questions”.⁴³ She also added that care should be taken to focus only on general phenomena without going into complexities, and specifically avoid exceptions to general laws. Botey wrote that “maybe just tell them [the students] that there is a scale from lesser to greater complexity”.⁴⁴ In his summary of the lecture, Roig Binimelis stated that students should be given an understanding of the phenomena and cases of evolution in a morphological sense and concluded that “the teacher will have done a fruitful work if he has enough skill to awaken in the pupil’s mind [...] a curiosity and interest for the [botanical] discipline”.

Font i Quer finished his conference providing a bibliography on Botany which, according to the summaries of the applicants, he himself considered to be extremely sparse. All the references were on botany and none addressed science teaching methodology.

As mentioned above, the course included extensive periods of discussion and dialogue between teacher and trainees. To the summary of Font i Quer’s lecture, Aldana added a couple of pages with his own “criteria concerning the methodology of botany”, explicitly stating that he had had the opportunity to expound it during the discussion after the lecture. Aldana offered his opinion on each of the points made by the lecturer. For example, he considered that the transition from secondary school to university should be “gradual and slow for the first year, following the path and method that is most accessible to the student, encouraging his spirit of observation which he has had since school [...]”. He also commented that it was necessary to add “experimentation” to the methodology of botany, and suggested “leaving the children alone with their own judgement, without the help of any book”. In this way, he considered that “they [the children] would be able to self-improve little by little and complete their ideas with purposeful experiments”. The child would:

⁴² Aldana, R. (1933). *Summary of Font i Quer’s lecture*, p. 6. AUB.

⁴³ Sánchez, E. (1933). *Summary of Font i Quer’s lecture*, p. 7. AUB.

⁴⁴ Botey, T. (1933). *Summary of Font i Quer’s lecture*, p. 6. AUB.

fix concepts [...] and relate facts to each other, [so that] his imagination will be formed [...] and give his brain sufficient flexibility to work autonomously, without being subordinated to a book or a teacher, and to be able to be, in time, useful to science, art or literature.⁴⁵

4.3 The Excursion to the Pyrenees of L rida

In his lecture, Font i Quer explained that a teacher should adapt his classes to the season of the year and also be familiar with the resources of a locality in order to be able take pupils to places well known to him and encourage their sense of curiosity and observation. In this regard, a highlight of the course was a botanical excursion to the Pyrenees in the region of L rida undertaken from the 3rd to the 9th of August 1933. The group had to imagine that they were also accompanied by secondary school pupils with the aim of contemplating the challenges that could arise teaching botany in the field. The written works of several trainees included photographs of the route that were shared amongst the participants and also sketches and maps of the area.

“So we set off for the excursion by van, the 15 trainees, Mr. Font our teacher, and the botanist Mr. Fabregas as his assistant. After 15 h of driving, we arrived (exhausted) at Esterri d’Aneu, a small village in the Catalan Pyrenees nestled in the first foothills of the Pyrenees”, wrote Celso S nchez-Crespo. Over 7 days, they carried out excursions on foot that were physically hard for those aspirants who were not accustomed to countryside activity as revealed in the reports of Encarnaci n S nchez and S nchez-Crespo.

The trainees worked in groups and their reports reflect the relevance given by Font i Quer to the preparation of herbaria which had to be of similar dimensions to those in the university (40–45 cm × 20–25 cm). Font i Quer insisted that pupils should be taught the need to include a label for each plant that named its genus and species, the initials of the collector, the place where it was collected along with the environmental condition (dune, shady spot, etc.) and finally the locality. The participants’ herbaria must have been very complete. By way of example, Eduardo Garc a’s comprised more than 200 plants.

In addition, the method by which the first observer has priority in naming a plant could be explained to pupils so they understand the right of priority in botany. Several specimens of the same plant were to be taken, and detailed observations and descriptions were to be made. In his notes, Ricardo Aldana highlighted that the description by the pupils would be undertaken without reference to a book and that subsequently the plant would be taxonomically classified.

As a consequence of Font i Quer’s teaching and the experience of the excursion, various attendees formulated their own ideas on didactical activities related to botany. Based on the observation of the countryside during the excursion, Ortega proposed teaching her pupils about carnivorous, succulent and xerophytic plants.⁴⁶ For his part,  lvarez suggested that each pupil could prepare a monograph on one of the plants collected so that they could learn how to use classification tables.⁴⁷ Botey comments in his excursion report that he “would try to instil in pupils love and respect for forests, telling them of the enormous damage caused by the destruction of forests not only for the present generation but also

⁴⁵ Aldana, R. (1933). *Summary of Font i Quer’s lecture*, p. 7. AUB.

⁴⁶ Ortega, E. (1933). *Excursion report*, p. 8. AUB.

⁴⁷  lvarez, J. M. (1933). *Excursion report*, p. 17. AUB.

for the generations to come". He would also have explained that the areas of Balaguer and Tremp would have been populated by a forest "if it were not that wars, greed and the ignorance of men had destroyed the primitive forest that covered them".⁴⁸ Ortega and Ferrer also considered that teachers should transmit the admiration they felt for the countryside.⁴⁹

There was an atmosphere of camaraderie and cooperation during the excursion. According to Del Olmo, the excursion took place "without any selfishness or thought given to the teaching position being sought, but with the common desire of acquiring science [...]. I call that nobility, work and cooperation".⁵⁰ Aldana considered that the excursion "could not have been more interesting, more evocative, more enjoyable and more effective";⁵¹ and Ortega noted that "seven days of coexistence between the Professor and the trainees served to strengthen the ties of friendship [...]. That is why our brotherhood has been something real and absolute that has been able to be maintained during the trip and later through the course [...]".⁵² Álvarez ends his summary thanking Font i Quer "for having introduced me to a region of Catalonia that was completely unknown to me, as well as for the knowledge acquired".⁵³

4.4 Laboratory Practicals

The first practical botany exercise of the course was held on the 11th of August. The trainees were asked to write down what they would have their pupils do to observe fresh specimens of a plant. Álvarez suggested that pupils should observe the stem, leaf, flower and fruit in detail and also remove a small piece of epidermis for examination under the microscope in order to appreciate the hexagonal nature of the cells as well as the presence and structure of the stomata. The students would also be asked to make a sketch which was not required to be perfect—if it was too well done it could indicate that it had been copied from a book. Surprisingly, the plant chosen for this exercise was *Datura stramonium*, a plant of medicinal interest yet poisonous!

The second practical, "The study of microscopic plants in an aquarium", was held on the 12th of August. It consisted of examining a sample of aquarium water, once again with fictitious first- and sixth-year secondary school pupils. Aldana recorded in his notebook the question posed to the aspirants: "What would you tell my students when faced with a microscopic preparation in which a bit of fresh water has been collected with a certain amount of verdigris?"⁵⁴ Álvarez proposed teaching the students how a microscope works: how to focus the sample at higher and lower magnifications, cleaning the lenses and handling the sample. During the lesson, the trainees observed both diatoms and green filamentous algae, along with rotifers and infusoria. Following the indications of Font i Quer, Álvarez would have his students draw these organisms and record them in their notebooks after careful observation. He would not burden first-year children with technical details or names but would take the opportunity to awaken their interest by observing diverse microorganisms and differentiating animals from plants. Ferrer explained in her report that

⁴⁸ Botey, T. (1933). *Excursion report*, p.10. AUB.

⁴⁹ Ortega, E. (1933). *Excursion report*, p.3; Ferrer, M. A. (1933). *Excursion report*, p. 6. AUB.

⁵⁰ Del Olmo, U. (1933). *Excursion report*, p. 4. AUB.

⁵¹ Aldana, R. (1933). *Excursion report*, p. 2. AUB.

⁵² Ortega, E. (1933). *Excursion report*, p.1.

⁵³ Álvarez, J. M. (1933). *Excursion report*, p. 17. AUB.

⁵⁴ Aldana, R. (1933). *Second laboratory practice*, p. 1. AUB.

“The most interesting thing about this exercise is to expose the children to the small world, something that always produces a great sense of wonder”.⁵⁵ In this respect, Sánchez considered that in observations of filamentous algae “rather than explaining it, it is better to have the child see it, interpret it and draw it on the blackboard [...] and to have them write it down in their notebooks with everything that occurs to them after having observed the preparation and drawn pictures”.⁵⁶ This way pupils would be encouraged to take note of detail under the microscope whilst leaving aside technical terms.

4.5 Presentation of Botany Lessons

On the 22nd of August, the trainees carried out a final practical exercise which consisted of an oral presentation and a written summary of a botany lesson for sixth-year secondary school pupils. The topics were randomly distributed among the trainees and were as follows: Algae, Mosses, Fungi, Roots, Leaves, Pollination, the Compositae, the Labiatae, the Cork oak, Maize, Mediterranean vegetation, How do plants survive winter, What are the Spanish steppes and What is the nature of mountain vegetation.

In her lesson (What are the Spanish steppes), Ortega considered that the Spanish steppe was the result of human activity rather than a progression of natural events as in the case of the Russian steppe. To demonstrate this to her pupils, she proposed projecting in the classroom two images of the same region of central Spain taken 4 years apart—the first showing the presence of forests and the second showing the steppe. She would then suggest the possibility of transforming the steppe and returning it to its primitive form with a view to “awaken this desire in my students”.⁵⁷ If the school where the lesson was to be given were close to a steppe, she would organise an excursion and would also bring steppe plants such as thyme, rosemary, rockroses and esparto grass into the classroom so that her pupils could investigate their characteristics.

Ferrer considered that the topic of her lesson (What is the nature of mountain vegetation) could only be taught through observations made on excursions in spring and autumn to the Montseny mountain. This would permit her students to observe the changes in the colour of the foliage and record the appearance of flowers and fruits. The study of plants found at different levels of the mountain could be done in the laboratory. For first-year students, interest would be focussed on the complex biological environment, the animals and plants, the climate, and enjoying the countryside. “I would read them great writers’ descriptions and poems”, she added.⁵⁸

5 Discussion

The study of school notebooks as a primary source of information for researching the history of science education provides a novel perspective for investigating the teaching and learning processes of a particular historical moment (Sánchez, 2007). Analysis of the written works of the participants in the botany course has been used to gain insight into

⁵⁵ Ferrer, M. A. (1933). *Second laboratory practice*, p. 4. AUB.

⁵⁶ Sánchez, E. (1933). *Second laboratory practice*, p. 2. AUB.

⁵⁷ Ortega, E. (1933). *Botany lesson*, p. 8. AUB.

⁵⁸ Ferrer, M. A. (1933). *Botany lesson*, p. 1. AUB.

how one of the courses for the selection and training of secondary education teachers was organised and the different activities that were carried out by Font i Quer, as well as the opinions and emotions that this training aroused in the attendees.

The various activities of the course were designed to train future teachers in the ability to promote the development of scientific habits, in particular to investigate, observe, record and capture information in drawings, whilst always taking into account the stages of maturity of students; the course also encouraged the use of spaces alternative to the lecture theatre such as excursions and the laboratory. The activities proposed involved the active participation of the aspirants both physically and intellectually. In this sense, we find coincidence with both the intuitive method proposed by the ILE that considered observation, experience and contact with reality essential for the acquisition of knowledge (Molero, 2000) and the fundamental ideas and intellectual methods of the New School (Marín, 1976; Tiana, 2008). In this task, Font i Quer put into practice the teaching methodology that he had developed at the university and that Font Civit (1988) and Casas (1988) have qualified as innovative for that time. The participation of the Universitat de Barcelona in the selection courses also demonstrates its involvement in the pedagogical renovation of secondary education (Corell Doménech, 2023).

The botany course advocated that the teaching of natural sciences should be based on direct observation of life processes rather than via textbooks, an idea that was in tune with the objectives of the Nature Study movement. As Bernal (2001) and Comas (2001) have explained, Nature Study ideas influenced the renewal of science education in Spain. Excursions in the natural environment and the appreciation of the countryside were notable pedagogical pillars of the ILE (Molero, 2000; Ortega Cantero, 2022), and, as regards the laboratory, the provision of scientific instrumentation to new institutes was one of the projects pursued by the republicans (González de la Lastra, 2022). Outstanding science teachers of the Republican period such as Enrique Rioja and Josep Estalella, both of whom were members of the natural sciences board of the selection courses, also favoured research-based science teaching.

The course programme, which devoted ample time to dialogue and discussion of the activities carried out, along with the comments in the students' own notebooks that recorded their personal reflections on the didactic activities proposed and the teaching style, are evidence of the values of cooperation and democracy that were promoted and that were aligned with the pedagogical and moral ideals of the republicans. The friendly and direct relationship between student and teacher advocated in the botany course was also a central tenet of both the Instituto-Escuela of Madrid (Martínez Alfaro, 2023) and the Institut-Escola of Barcelona (Doménech, 1998; Corell Doménech, 2023). During the excursion, one of participants (Botey) linked the condition of the countryside to the consequences of human activities and commented in his notes that he would transmit this to his pupils. Interestingly, it has recently been suggested that ethical reflections such as this should form part of science education (Matthews, 2017).

The teacher training undertaken during the botany course of 1933 was very rigorous as evidenced by the practical lessons, the requirement to create extensive herbaria and the physically demanding excursions. As pointed out by Mainer (2009) in reference to the training and selection courses in general, academic content also had a prominent place in the botany course. With regard to the latter, an interesting case concerns the teaching of the evolution of species. Whilst some Spanish textbooks had been tackling the theory of evolution since the end of the nineteenth century (Hernández Laille, 2014), Font i Quer's caution regarding the teaching of evolution in secondary education could have been related to the social and political instability of the 1930s. At that time, evolution continued to be a

controversial subject in Spain because of its conflict with religious beliefs, and defenders of evolutionary theories could suffer reprisals. By way of example, when Franco's fascist regime reviewed the records of Spanish teachers to assess whether or not they were favourable to the values of the dictatorship, Jerónimo Roig Binimelis—one of the participants in the botany course—was denounced by his students for having organised lectures and debates at a secondary school in Gerona between 1934 and 1936 “on the origin of man from the monkey” as part of a Physiology and Natural History course. One of the witnesses called to testify stated that Roig Binimelis revealed himself to be “completely Darwinist” and deny “the existence of God—explaining the creation of the world, not by creation according to Catholic dogma, but by evolution from uncreated matter”. The ensuing debates divided the student body into two groups, the ultra-Catholics and the supporters of evolutionary theories, and provoked discussions in the corridors of the school. Roig Binimelis was also defined as “one hundred percent anti-fascist” which resulted in his expulsion from teaching.⁵⁹

6 Conclusions

Analysis of the programme of the botany course in Barcelona and the notebooks of the participants show that the course reflected the pedagogical principles and activities of the ILE—the pedagogy of intuition (based on practice and active work), Socratic teaching, cooperation between pupils and teacher, the aesthetic ideal (admiration of nature and the countryside in the case of the natural sciences), manual work (preparation of herbaria) and the use of the class notebook and drawing, along with the formation of character through excursions as well as the rejection of textbooks and memorisation.

In addition to the academic level of the course content, considerable focus was placed on the didactic training and professional practice of the aspirants, a novel approach to the preparation and selection of secondary education teachers at that time and coherent with the pedagogical proposals of the republicans for the modernisation of Spanish secondary education. The involvement of the participants in the botany course was highly demanding as perhaps could be expected given Font i Quer's military background, and this could have inspired the observation by Enriqueta Ortega that a “secondary school teacher had to know a lot to teach a little”.

The botany course thus constituted a singular element in an innovative experiment in the history of science teaching in secondary education in Spain, the pedagogy of which is still relevant today.

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⁵⁹ Report by the student Arturo Domínguez. “Cleansing” report on Jerónimo Roig Binimelis. 018526–0064. General Archive of the Administration.

Data Availability All the data cited is publicly available.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

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