EXPLORING THE TEACHING OF GEOMETRY FOR CHILDREN IN 19TH-CENTURY SPANISH EDUCATIONAL PRESS: THE CASE OF 12-YEAR-OLD CARLITOS TEACHING HIS FRIENDS

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ABSTRACT

Published journals have proven to be a valuable source of information for the history of mathematics and mathematics education. Consequently, this study aims to analyse a geometry section included in a 19th-century Spanish journal targeted at children, *Los niños: revista de educación y recreo*. For this purpose, we carried out a descriptive study using a content analysis technique, which is widely employed in research in the aforementioned field. The results indicate that the author employed an original approach to teach theoretical geometry, incorporating dialogues, materials, and graphical representations.

1 Introduction

In the last few years, different studies have considered the possibilities of analysing journals written in the past to broaden the understanding of how mathematics was disseminated, taught and learnt. For example, Zelbo (2019) analyses the recreational mathematics activities included in two mathematics puzzle columns of nineteenth-century American journals. Madrid et al. (2023) study the contents related to mathematics or mathematics education included in *Semanario de Salamanca,* an 18th-century weekly journal published in the Spanish city of Salamanca. Muñoz-Escolano et al. (2022) examine the mathematics problem section that appeared in the Spanish bulletin *La Escuela. Boletin de la Asociacion Provincial del Magisterio de primera ensenanza* from 1913 through 1916.

Gazeta de los Niños, the first journal designed specifically for children, was published in Spain in 1798 (Chivelet, 2010). Since then, various educational journals targeting children emerged in 19th-century Spain and their

study helps broaden our understanding of mathematics education at that time. One of these journals was *Los Niños: revista de educación y recreo* (Children: journal of education and leisure).

In March 1870, Carlos Frontaura founded this children's journal in Madrid; it was modelled on the Parisian journal *Magasin d'Éducation et Récréation*. This publication enjoyed the public favour, and featured carefully created content with contributions from renowned writers who aimed to produce brief, engaging, and reader-appropriate texts (Martínez Arancón, 2005).

Several issues of this journal included mathematical contents, for example in 1874 the journal included a section titled *Problemas* (Problems). Moreover, among these mathematical contributions are 32 articles published between 1871 and 1872 by Eduardo Thuillier, which focus on geometry for children. The aim of our study is to know more about the teaching of geometry at the time through the analysis of these publications.

2 Methodology

To achieve this, we conducted a descriptive and exploratory study of a historical-mathematical nature, employing content analysis techniques for analysing texts from the past. This research employed the instrument developed by Madrid et al. (2022).

For this purpose, each paragraph within the *Geometría de los niños* section was defined as a unit of analysis. These paragraphs were read, analysed, and subsequently categorized. The issues of the journal were accessed digitally through the Virtual Library of Historical Press, provided by the Spanish Ministry of Culture and Sports.

3 Results

The children's geometry section, signed by Eduardo Thuillier, appeared for the first time in issue 15 of May 1871. The first article is titled Carlitos, and it explains the story of a 12-year-old boy named Carlitos, who teaches geometry to his friends in the garden of one of their houses. The author justifies this by explaining that Carlitos' friends have exams and are falling behind in geometry, whereas Carlitos is more advanced. Consequently, they

agree that rather than playing other games, Carlitos will teach lessons on this subject in the afternoon (Thuillier, 1871a). These are the 32 articles included:

ISSUE	TITLE
Volume III Issue 15 - 1871 May	1. Carlitos
Volume III Issue 16 - 1871 June	2. Extension
Volume III Issue 17 - 1871 June	3. Lines
Volume III Issue 18 - 1871 June	4. Two lines
Volume IV Issue 1 - 1871 July	5. Angles
Volume IV Issue 3 - 1871 July	6. Angles continued
Volume IV Issue 4 - 1871 August	7. Two new students
Volume IV Issue 5 - 1871 August	8. Triangles
Volume IV Issue 7 - 1871 September	9. Triangles continued
Volume IV Issue 8 - 1871 September	10. Polygons
Volume IV Issue 9 - 1871 September	11. Quadrilaterals
Volume IV Issue 11 - 1871 October	12. Parallelograms
Volume IV Issue 12 - 1871 October	13. Parallelograms continued
Volume IV Issue 13 - 1871 November	14. Displeasure caused by the geometers
Volume IV Issue 14 - 1871 November	15. Quadrilaterals final
Volume IV Issue 15 - 1871 November	16. Polygons
Volume IV Issue 16 - 1871 December	17. Polygons final
Volume IV Issue 17 - 1871 December	18. Circumference and its lines
Volume IV Issue 18 - 1871 December	19. The previous lesson continues
Volume V Issue 1 - 1872 January	20. Circle
Volume V Issue 2 - 1872 January	21. Finishing the interrupted lesson
Volume V Issue 3 - 1872 January	22. Areas of polygons
Volume V Issue 5 - 1872 February	23. This and that
Volume V Issue 8 - 1872 March	24. Plane and straight line
Volume V Issue 9 - 1872 March	25. Two planes and one plane
Volume V Issue 12 - 1872 April	26. New angles

Volume V Issue 13 - 1872 May	27. New angles continued
Volume V Issue 15 - 1872 May	28. Polyhedra
Volume V Issue 17 - 1872 June	29. Pyramid and prism
Volume VI Issue 1 - 1872 July	30. Round bodies
Volume VI Issue 2 - 1872 July	31. Volume of bodies
Volume VI Issue 3 - 1872 July	32. Results of the lesson

Table 1. The section Children's geometry in the journal.

As shown in Table 1, in each lesson, Carlitos explains various geometrical concepts, both in two-dimensional and three-dimensional space, including: length, lines, straight lines, angles, triangles, polygons, quadrilaterals, parallelograms, circumferences, circles, areas of polygons, planes, polyhedra, prisms, pyramids, cones, cylinders, spheres, or volumes.

Throughout the articles, the different concepts are presented as dialogues among Carlitos and his friends. For example, in article 29, they speak about types of prisms, and to explain oblique prisms they engage in this dialogue:

- Then, cried little Esteban, the lateral faces of the oblique prism will be oblique to the bases.
- Yes, and that is the property that distinguishes them – Carlitos.
- It seems incredible that they don't fall, said Ricardo.
- They would fall, replied Carlos, […] (Thuillier, 1872).

An interesting aspect is Carlitos' use of tangible materials such as pieces of rope, paper, wood, rods, sticks, or rings to explain concepts. For example, Carlitos uses rods to represent lines as shown in Figure 1.

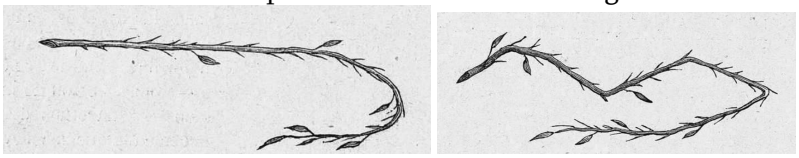

Figure 1. Examples illustrating types of lines (Thuillier, 1871b, p.262).

Additionally, Carlitos provides graphical representations as can be seen for example in Figure 2 when he talks about adjacent and opposite angles.

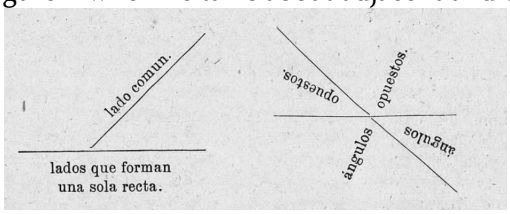

Figure 2. Graphical representation of angles (Thuillier, 1871c, p.43).

4 Conclusions

Published journals allow us to approach the history of mathematics and mathematics education in a non-formal context, showing how it was taught to different target groups, as shown in Madrid et al. (2023) or Muñoz-Escolano et al. (2022). In this case, we focused on the dissemination of geometry in an informal context aimed specifically at children in 19th-century Spain.

The analysis of these 32 articles shows that the author focused on theoretical geometric content, using a variety of materials, and including graphical representations. Future studies will compare this section with similar ones that could be found in the press of the past, thereby expanding our understanding of mathematics dissemination through historical press.

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