Teaching of mathematics
in educational journals of Turin (1849-1894)

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Abstract

Since the first half of the 19th century, the most renowned intellectuals in the Savoyard Kingdom put effort into facing up the backwardness of the educational system and in particular into enhancing technical-scientific studies. Educational journals were one of the ways to achieve these aims (Chiosso, 2013). *From 1849 to 1894 in Piedmont the* Società d'Istruzione e di Educazione, *a Turinese association of politicians, professors and teachers, which represented a unique case in all of Italy, published the first successful educational journals of the country. Since the first periodicals dedicated solely to the teaching of mathematics flourished just in the 1870s, our purpose is to investigate the role of the teaching of mathematics in the journals of this association, by showing the knowledge and working habits between primary, technical and secondary schools.*

We examine how Savoyard Kingdom stood out for its educational journals, which were free from the censorship contrary to other Italian territories and which payed attention towards the elementary and secondary scientific teaching. We also analyse the situation after the Italian Unification, when a conspicuous number of 'practical educational journals' for elementary schools, which provided weekly articles about the teaching of mathematics, were published in Turin. This situation changed when in the 1880s the mathematical journals for teaching blossomed.

Introduction

Studies concerning the first half of the 19th century in Savoyard Kingdom[1] have already underlined the role of intellectuals and professors of the University of Turin in promoting technical-scientific education (Pepe, 2012; Roero, 2013). Since the promulgation of Boncompagni (1848) and Casati (1859) laws, the educational system underwent deep changes, adopted in all of Italy after the Unification (1861). Specific programs were offered for every school level and grade, which

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[1] After the Vienna Congress (1815) the Savoyard Kingdom included Savoy, Piedmont, Liguria, county of Nice, and Sardinia. It was the core of the process of the creation of the new Italian state.

included a heavy focus on scientific disciplines concerning both the contents and the methodological approach.[2]

Nevertheless all these improvements weren't at first effective, because of the underdevelopment of the country (Chiosso, 2013). Before 1848 the 69% of the citizen in Piedmont was illiterate (Morandini, 2003, pp. 52-63) and most of the literates attended schools steeped in humanistic disciplines and rote learning. Teachers were mostly unprepared. The first teacher training schools were established in 1844 in Turin and, even if they were at the forefront of education methodologies in Italy and admired by many intellectuals, they were not able to overcome the need of all the territory.

Mathematics teaching in primary schools was restricted to elementary arithmetic operations and in secondary schools to basic notions of arithmetic, algebra, and plane and solid geometry. Four years after the Boncompagni law, the educationist Domenico Berti (1820-1897) stated that "in many of our secondary schools teaching is the same as in 1772" (1852, p. 318). Schoolbooks that circulated at that time in the territory were in many cases not updated and often full of mistakes (Giacardi & Scoth, 2014, p. 210, 212). To contrast these issues, educational journals proved worthy (Chiosso, 2013).

In this paper we analyze three journals published in the second half of the 19th century in Turin, dedicated to primary, secondary and university teaching. Firstly, we show the comparison with the other Italian Kingdoms as regards educational periodicals. Secondly, we investigate the role of mathematics teaching in these journals.

The Italian context: the first educational journals in the 1840s

Since the 1830s journals addressed to elementary teachers and "family men" started to circulate in different Kingdoms of Italy. One of the first Italian educational journal, the *Guida dell'Educatore* (1836-1845), was published in Florence (Grand Duchy of Tuscany). It spread the educational ideas of the renowned educationist Raffaele Lambruschini (1788-1873), and continued in the successful journal *Letture di famiglia* (1849-1883). At the same time in Venice a similar journal, *L'Istitutore* (1836-1837, 1851-1866), was published for the elementary and technical teaching.

These journals promoted the improvement of elementary teaching, by illustrating new methods in theoretical and practical articles, and by describing favour-

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[2] On the mathematics curricula for primary, secondary and technical schools between the Boncompagni and the Casati laws see (Pizzarelli, 2013); on the following period see (Giacardi, 2006); (Pepe, 2013); (Giacardi & Scoth, 2014), (Pepe, 2016).

able examples of foreign educational systems. The teaching of arithmetic and plane geometry had the same space as the one of reading, writing and religion.

These were the main characteristics of the educational journals, which spread since the 1840s firstly in Tuscany and then also in the Papal State and in the Savoyard Kingdom. The political context in other Kingdoms of the Italian territory was less favorable: in the Kingdom of Lombardy-Venetia, despite an intense debate on education among intellectuals, and the birth of a considerable number of periodicals, until the 1850s there weren't educational journals, because of the censorship of the Austrian Empire. Likewise in the Kingdom of the Two Sicilies, even though advanced ideas circulated for long time, in 1843 education was under control of the church and the press was censored by the government, especially after the revolutions of 1848 (Chiosso, 1989).

The first educational journal in Rome was *L'Artigianello* (1845-1848), devoted to elementary teachers and young artisans. It achieved success in many schools, where in some cases it replaced textbooks. A long series of lessons about plane geometry for practical use was published for three years (1845-1847), providing topics written in a more simple language than that of the common textbooks, and full of examples and illustrations. But the journal lasted for short time, because of the return of the censorship after the 1848.

In the Savoyard Kingdom a favorable environment was set since the 1830s, thanks to new reform policies and the social commitment of many intellectuals and scientists. The first successful educational journals from Turin were the *Letture Popolari* (1836-1842), *Letture di Famiglia* (1842-1847) and *L'Educatore Primario* (*EP*, 1845-1848) for primary teaching. They contributed to spread the new educational ideas by Heinrich Pestalozzi (1746-1827), which became the basis of the advanced teacher training schools held in 1844 in Turin.

In particular, as regards mathematics education, the editors of these journals focused on the mission of changing the custom of teaching from a dogmatic, superficial and parrot-like approach, into one more linked to everyday life, to intuition and to reasoning. Besides theoretical articles by educationists, teachers provided examples from their practices in classroom. Some of them dealt with elementary arithmetic (e.g. mental calculations, fractions, the use of the abacus) to be used in everyday teaching in primary schools.

The decimal metric system for weights and measures was a topic particularly important. It was introduced in the Kingdom in 1845 and became compulsory in 1850. The journals of this period contributed to popularize the new system and to spread the conversion tables, through educational articles and favorable reviews of recent updated textbooks.

The journals tried to differ from the schoolbooks, by applying new methodological ideas and by proposing topics of arithmetic and geometry in the form of 'maieutic dialogues' between teacher and pupils. They also focused on promoting observations, practical problems and the use of everyday objects, in order to bring

step by step to the discovery of mathematical properties and to the abstract reasoning (Berti, 1849). Some of the ideas were particularly innovative. In 1845 a teacher promoted the use of colored strips of different size to introduce the operations with fractions (*EP*, 1, pp. 527-536, 546-550).

Mathematics teaching topics for secondary schools and universities were rarely available in the educational journals. An example is an article on the physics applications of the inverse-square law, published in 1845 by *L'Educatore Primario* (pp. 417-424).

The journals of the first teachers' association in Piedmont

After the Albertine Statute in 1848, the government of the Savoyard Kingdom extended and granted the freedom of the press and of association, in contrast to the majority of the other Italian Kingdoms. In 1849 this brought to the birth of the first teachers' association in Italy, which represented the entire scholastic system in Piedmont, called *Società d'Istruzione e di Educazione* (*SIE*, 1849-1893) (Morandini, 2003, pp. 210-230; Pizzarelli, 2013).

Its success was testified by the increasing number of members (from 1250 in 1850 to 4019 in 1923), which were the two seventh of all the teachers in the Kingdom in 1855 (Pizzarelli, 2013, p. 32). The peculiarity of the society was the presence of representatives from every educational level and grade (teachers and professors of Turin University from different Faculties, both scientific and humanistic; principals and deans of public and private schools; university students, etc.) and of politicians (past ministers of Public Education, functionaries of ministerial scholastic councils, etc.). There were members of institutions, like the Turin Military Academy and the Academy of Sciences, churchmen, lawyers, engineers, architects, etc. For our purpose it's interesting to notice that the honorary president was the mathematician Carlo Ignazio Giulio (1803-1859), professor of rational mechanics and dean of the University (1844 to 1848), who put effort into modernizing the scientific education in Piedmont and in 1845 founded the first technical schools for workers in Turin (Roero, 2013).

The association organized yearly general conventions in different cities of Piedmont, which involved most of the local population. There were sections for every level (primary, technical, secondary, university), dealing with common problems: programs, textbooks, teaching methods, materials, salaries, etc. The meeting's reports were published in the *SIE*'s journals: the bi-weekly *Giornale della Società d'Istruzione e di Educazione* (*GSIE*, 1849-1852), and the weekly *Rivista delle Università e dei Collegii* (*RUC*, 1853-1854) and *L'Istitutore* (1852-1894).

The *GSIE*, which involved the collaborators of the previous journals of the 1840s, is considered the most distinguished educational periodical at that time in

the Kingdom (Chiosso, 2013, p. 293) and it was addressed to every educational level. The board members changed every year and were equally chosen among primary and secondary teachers, and professors coming from the five Faculties of the University (Medicine, Law, Philosophy, Mathematical and Physical Sciences and Theology). The *RUC* and *L'Istitutore* were founded after the *GSIE* ended and followed specific topics: the former was devoted to secondary and academic teaching and the latter to primary and technical teaching.

The *GSIE* was born after the Boncompagni law. The editors tried to keep teachers, professors and also parents updated on the new rules and programs, by editing laws and official newsletters by the Ministry of Public Education. At the same time they published many critical articles about the local educational system. The main topics were about the reorganization of the curricula for each discipline, the comparison between primary and secondary programs, the need for high quality textbooks and innovative teaching methods. They were often supported by statistical and historical news and by reports on European educational systems, overall France and Prussia. Thanks to the presence of politicians among the members, the *SIE* succeeded into influencing some of the scholastic laws that constituted the basis of the Casati law (Pizzarelli, 2013).

As regards mathematics in the secondary level, editors privileged an action of monitoring and denouncing on the educational system shortcomings (e.g. rote learning, imbalance between humanistic and scientific disciplines, inadequate textbooks), instead of opting for a more practical educational support. In particular the journal stressed the need for scientific textbooks written in Italian and not in Latin and for a link between primary and secondary level.

The *GSIE* was particularly interested to promote technical-scientific studies, which were introduced in the educational system in 1848. The new schools provided a deeper scientific teaching than that provided by schools of humanities. They addressed to artisans, traders, managers and engineers, which were professions very important for the recent industrial developing of the country. The editors underlined the importance of these schools, overall during congress' debate, and promoted the use of the *Elémens de Géometrie* by Alexis Claude Clairaut (1713-1765), whose translation by Giulio in 1850 was officially approved for technical schools by the Ministry and had different reprints.

Moreover the journal applied pressures on the government to establish a polytechnic school in Turin, following the French and German examples. The goal was accomplished in 1852, when the *Regio Istituto Tecnico di Torino*, later *Regio Politecnico* (1906), was created.

Most of the educational articles for elementary school aimed at applying the new educational programs in class and supporting teachers with the day-by-day routine. There were some proposals of dialogues on mathematics, regarding overall the operations with integer numbers and fractions, and the metric system. We remark a particular commitment of the editors in the teaching of the nomenclature

of the first elements of plane and solid geometry, which was considered marginal by comparison with arithmetic in the previous years. A new textbook about elementary geometry, written in form of maieutic dialogues by a member of the *SIE* (Rayneri, 1851), was published in several issues by the *GSIE* in 1852 and it had many reprints in the following years. Thanks to this innovative form of presenting mathematics topics, the journal provided something different from the textbooks and immediately usable for unprepared teachers.

What emerged from the journal was also a need to consider new teaching methods, based on intuition and observation. The accurate descriptions of solid and plane figures, compared with common objects, were preferred to abstract and mnemonic definitions. Different educational materials were promoted, like the abacus and the wooden and cardboard scale models of geometric solids, also little stones and dices to learn counting.

They put attention to elementary mathematics textbooks too, by underling the importance of a gradual approach and clarity, and of guidebooks for teachers, which were rare at that time. It emerged also the need for a books' list selected by the government in order to make uniform the Kingdom's education and to contrast the overflow of low quality books. It's interesting to notice that in 1853 the government, inspired by the *SIE*'s initiative, created award contests for the best textbooks.

The *SIE* was known and admired in the North-Central Italian territories. Intellectuals and educationists from these countries were in the *SIE*'s list of members. In particular the Kingdom of Lombardy-Venetia had a strict relationship. In 1861, after the liberation from the Austrian Empire, the *SIE* established a twinning with a similar association of primary teachers from Milan, the *Pio Istituto dei Maestri di Lombardia*, which published the periodical *L'Educatore Lombardo* (1857-1860), then *L'Educatore italiano* (1861-1885). In the previous years in Milan similar educational journals were born, like *L'Educatore* (1850-1853), for elementary and technical schools, and the *Rivista Ginnasiale* (1854-1859), which defended and promoted the humanistic secondary studies.

Journals for secondary and university teaching in the 1850s

The experience of the *RUC*, even though short-lived,[3] is particularly important, because it was the very first Italian educational journal devoted to secondary and university teaching of humanistic and scientific disciplines, where wide space was given to scientific topics and advanced mathematics.

No specific journals addressed to mathematics teaching existed at that time in Italy. In 1850 in Rome Barnaba Tortolini (1808-1874) published the mathematical

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[3] The journal ceased in 1854, because of the inconstancy of many authors.

journal *Annali di Scienze Matematiche e Fisiche* (1850-1858), continued as *Annali di Matematica Pura ed Applicata* (1858-).[4] This journal was focused mainly on research in pure and applied mathematics, rather than on teaching.

Regarding technical-scientific studies, the Milanese journals *Il Politecnico: Repertorio Mensile di Studj Applicati alla Prosperità e Cultura Sociale* (1839-1844, 1859-1869) by Carlo Cattaneo (1801-1869) and since 1865 by Brioschi, and *Il Giornale dell'Ingegnere Architetto Civile e Agronomo* (1853-1868) by Raffaele Pareto (1812-1882) should be mentioned. Their goal was to spread the recent results of the scientific research applied to different technical fields, and only since 1869, when they merged into *Il Politecnico* (1869-1927), secondary and superior technical education became the main topic (Lacaita, 2012).

Therefore the *RUC* was an innovation among the educational periodicals of that time in Italy. Its main goal was to monitor the level of the university students and of secondary teachers in Piedmont and to offer updates upon the most relevant local, national and international news in the scientific fields.

The editor board was directed by Carlo Cadorna (1809-1891), past minister of public education, and the members were secondary teachers and professors, who took on scientific and humanistic sections according to their competences. For example, *Mathematics and mechanics* section had as compilers a professor of technical schools in Turin, and Genocchi, professor of algebra e geometry at the University of Turin since 1856.

The periodical reported weekly news about the current educational situation and scientific academies in Italy and in many foreign countries in the world (France, England, Austria, Russia, etc), and bibliographic reviews. But the true innovation, that set it apart from the previous educational journals, was the remarkable number of sections dedicated to sciences. A monthly review, entitled *Scientific publications*, provided news on scientific discoveries, related to mathematics, astronomy and scientific instruments. There were reports on ancient measurements of lands, on the astronomical calendar of the Egyptians, and on the discovery of an Arabic translation of the Commentary upon the X Book of Euclid's *Elements* made in 1850 by Franz Woepcke (1826-1864). Readers could also find summaries of memoirs published in local, national and international scientific academies, institutes and societies, pertaining mathematics, astronomy, chemistry, geography, meteorology, industry, etc.

One of the most interesting sections of the journal concerns the weekly meetings of the *Società delle Conferenze sull'Istruzione Tecnica* (*SCIT*), an association born in 1853 in Turin to promote advancement in technical-scientific education at all levels. Many members of the association were actually professors, among whom the mathematician Genocchi. He was among the promoters in the *SCIT* of mathematics programs

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[4] Angelo Genocchi (1817-1889), Enrico Betti (1823-1892) and Francesco Brioschi (1824-1897) joined Tortolini in the editorial board (Bottazzini, 2000, pp. 71-84).

for primary, secondary and technical schools, in which topics and methods were deeply specified (*RUC*, 1853, pp. 113-115). They were particularly advanced and innovative. For example for technical schools they proposed to introduce combinatorial analysis, algebra's applications to geometry for the graphical representation of the laws of size variations, and the theory of orthogonal projections applied to building and machinery used in factories (pp. 168-169).

Genocchi's collaboration with the *RUC*, during the most prolific period of his activity on number theory, gave many important contributions to the periodical concerning recent mathematical innovations. In his opinion some of his works, published between 1853 and 1854, were apt for secondary and academic mathematics teaching, thus their summaries found their place on the journal. An example is the memoir about the transformations of multiple integrals (1853b), which he decided to publish for the clarity of the language used. Also Genocchi's notes on the convergence of Binet's series (1853a) and on Euler's theorem (1854a), published by the *Bulletin of the Brussels Academy*, and an educational article on numerical approximations (1854b) appeared among the reviews of the *RUC*. According to the author, the simplicity of the contained demonstrations was accessible to secondary students and also suitable for textbooks. Among the other mathematics topics at an academic level, the *RUC* published the recaps of some memoirs on Calculus and Geometry, like the proprieties of the gamma function and the minimal surface bounded by a skew quadrangle.

The *RUC* was a precursory initiative that, concerning the aims, the audience and the link with both the national and international scientific community, resembled the successful mathematical periodical *Giornale di Matematiche: ad Uso degli Studenti delle Università Italiane* (Naples, 1863-1967), edited by Giuseppe Battaglini (1826-1894) until 1894. In fact its goal was to offer news and tools, which could be useful both to academic courses and advanced research, on national and international ground. Nevertheless the mathematics contents and the structure of the two journals were absolutely different: the *RUC* was mostly linked to the educational journals, the *Giornale di Matematiche* to the mathematical ones.

'Practical educational periodicals' for elementary schools after the Italian unification

Despite the loss of political importance due to the government being moved in 1864 to Florence, Turin played a leading role in the Italian educational publishing industry after the Unification. This was due to the successful experiences of the previous decades and to a substantial presence of dynamic protagonists in the educational field. Among them, we find renowned writers of textbooks for elementary classes,

like Giuseppe Borgogno (1820-1879) and Vincenzo Scarpa (1836-1912), who penned books on arithmetic, geometry and the decimal metric system, which had a great circulation in Italy (Chiosso & Sani, 2014). After the 1870s other Italian cities, overall Milan and Rome (the new capital city), Palermo and Naples (Chiosso, 1997, pp. 7-8), took on a notable role in the educational periodicals' field.

L'Istitutore, which became the *SIE* house organ, has been considered "the first true educational periodical with a national reaching" (Chiosso, 1997, p. 366) and "one of the most renowned journals for schools since 1850, not only in Piedmont, but in all of Italy" (Romano, 1925, p. 761). It became a model in Italy for 'practical educational periodicals', which aimed at improving teachers' knowledge and providing materials to be used directly in class, such as exercises, exams' themes and also homework. This type of journals spread in Italy starting from the 1870s. In Piedmont there were: *La Guida del Maestro Elementare Italiano* (1864-1897, 3000 copies) by Giovanni Parato (1816-1874), and *L'Osservatore Scolastico* (*OS*, 1865-1899, 1500 copies) by Borgogno, which had the same style and aims as *L'Istitutore*, and in many cases also the same collaborators. They referenced each other and they had a strong national circulation. In 1873 these three journals from Turin were among the first four Italian educational weeklies per number of copies (Ottino, 1875, pp. 23-40).

L'Istitutore picked up the legacy of the *GSIE*, by keeping up the tradition of being – as said by one of the editors – "a training ground where to discuss everything useful for elementary education".[5] In fact *L'Istitutore* diminished the political critique sections, in respect to those of the *GSIE*, and devoted itself more on helping elementary teachers with their day-by-day practice, offering advices on single disciplines, equally divided between humanistic and scientific.

The inspiration was offered by French educational periodicals, such as *L'Instituteur: Journal des Écoles Primaires* (1833-1840) and the *Manuel Général de l'Instruction Primaire* (1832-1940), which underwent a great surge after the promulgation of the Guizot law in 1833 (Chiosso, 2013, p. 301).

Mathematics teaching in the educational journals in Turin

Despite a diminished participation of scientists and university professors among the collaborators, by comparison with the experience of the *GSIE*, many articles of the journals for elementary schools were about the teaching of mathematics. They tended mainly to focus on methodological issues, for example by promoting the use of educational tools (abaci, dices, geometric solids, …), and on how to overcome the common difficulties, such as to explain the operations with fractions. Long articles about arithmetic were written, looking like supplements to textbooks. Some educational articles had a more ambitious scope, dealing with

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[5] Museo Naz. Risorg. Italiano di Torino, *Fondo Berti*, F. Paoli to D. Berti, 30th August 1853.

geometric progressions, shadows theory, unit of measurement and the monetary system of the Japanese empire.

They promoted the history of sciences too. From 1853 to 1855 *L'Istitutore* devoted a weekly section, entitled *Historical conversations*, to articles on the lives and works of mathematicians and physicists from the past, like Nicolò Tartaglia, Evangelista Torricelli, Giambattista Beccaria, Giuseppe Luigi Lagrange, etc.

The reviews of textbooks tended to almost exclusively promote the books written by the editors and produced by the typography of the very same periodicals. An emblematic example is the *OS*, which was free for all teachers who asserted to choose for their classes the textbooks written by the director Borgogno.

Notably, *L'Istitutore* didn't took part in the fierce debate on the so-called "return to Euclid" (Giacardi, 2006, pp. 1-8; Pepe, 2013, pp. 149-151) that raged in the mathematics community around the 1870s. Among the mathematics textbooks reviews just the *Elementi di Geometria proiettiva: ad uso degli istituti tecnici del Regno d'Italia* (1873) by Luigi Cremona (1830-1903) was mentioned. This detachment of the educational journals from the debates on the teaching of mathematics was due to their major interest towards elementary education and also to the absence of a reference editor linked to the Faculty of Physical and Mathematical Sciences in these years.

L'Istitutore offered news and opinions on textbooks approved by foreign ministries, mainly the French ones. For example they suggested texts by Jean-François-Adolphe Dumouchel (1804-1870) for elementary schools, like *Problèmes et exercices de calcul sur les quatre opérations fondamentales, les nombres décimaux, les fractions, etc., appliqués à l'arithmétique élémentaire* (1844), especially recommended for the variety of problems.

The Italian translations of French works were quoted too, such as the ones of the *Traité elementaire de trigonometrie rectiligne et spherique et d'application de l'algebre à la geometrie* (1798) by Sylvestre François Lacroix (1765-1843), whose different translations circulated in Italy since 1813. Moreover in 1883 *L'Istitutore* published in many issues the Italian translation of the first book, and part of the second one, of *La Langue du Calcul* (1798) by Etienne Bonnot de Condillac (1714-1780).

Mathematics exercises: the questions and answers' section

The most important news as regards educational journals in this period in Piedmont was the renovated educational section, devoted to practical exercises, which was the favorite by the audience, as emerged from the correspondence published at the end of each issue.

L'Istitutore, for example, offered educational materials both inside the journal and in its supplement *Didattica per le Scuole Elementari* (1855-1894). Readers had a weekly column to take inspiration from, in which there were exercises, problems and homework, especially arithmetical ones, bespoke for every elementary school

year level, as well as the text of the exams being taken in various schools. The algebraic exercises for secondary and technical schools were in compliance with the official programs. Solutions were generally enriched by detailed explanations on how to face the problems, sometimes including also different methods and considerations on how to treat the most difficult issues in class.

Influenced by the positivist ideals spreading in Italy at that time (Roero, 2013, p. 354-359), editors tried to stimulate the reasoning, the use of educational tools and the application of mathematics in everyday life. For example, in 1873 the *OS* proposed the "inventive problems", i.e. data-less arithmetical exercises on programming and foretelling revenues for a commercial enterprise.

The editors of the educational sections pretty frequently promoted their textbooks too and inserted problems related to them. This happened for example for *L'Istitutore*, where the editor of the exercises section from 1866 and the director of the journal itself from 1871 to 1873 was Eugenio Comba (1841-1874), teacher of mathematics in technical schools in Turin and author of successful arithmetic books for elementary and secondary schools (Chiosso & Sani, 2014, n. 646). He decided to add something more difficult to the exercises proposed by the periodical, by including problems involving fractions and the rule of three (for secondary schools), and theorems on triangles and simple algebraic equations (for technical ones).

Some of the exercises were taken from French journals too, like the *Bulletin de l'Instruction Primaire* (Paris, 1854-1858), and from textbooks like the *Leçons d'algèbre* (1833) by Louis Lefébure de Fourcy (1787-1869), professor of differential and integral calculus in Paris, thus underlining the liaisons with France.

Starting from 1854, *L'Istitutore* and then the *OS*, began to host also the "questions and answers" section: easy questions about arithmetic, algebra and geometry for elementary and secondary schools, proposed to the audience as competitions or short enigmas. In the following issues the journals used to publish the best answers by the readers. They were mostly teachers and students of teacher training schools and, even though the majority came from Piedmont, some of them came from other Northern and Central Italian cities, thus proving the national circulation of these periodicals.

The educational journals didn't proposed innovative and advanced mathematics exercises and methods, meaning they never quite reached the advancements in the teaching of mathematics that grew ever-important in the 1880s (Giacardi, 2006).

New educational needs: the birth of the mathematical journals for teaching in the 1870s

Between the 1870s and the 1880s the educational context changed and improved. The 'practical educational periodicals' of the previous decades no longer met the needs of teachers, who went from asking for ready-to-use materials to more intellectually stimulating contents (*La Scuola Italiana*, 1880, pp. 86-87). Periodicals for secondary education got powered up: teachers' associations' bulletins and journals for the teaching of specific disciplines started to flourish. Mathematics, in particular, was one of the most involved disciplines during this period.

It is well documented that since the beginning of the Unification of Italy the mathematicians' community payed attention to the issues concerning education and teaching, by actively getting involved in politics, in associations and in the educational publishing house.

The debate on Euclid's *Elements* for the secondary schools, which involved well-known mathematicians, set the stage for a general rethink on the mathematics teaching, pertaining programs and textbooks, which had to comply with the innovations in the mathematics research, and more rigorous methods. The effects of these changes reflected in the journals of the 1880s.

The first mathematical journal for teaching published in Italy was the *Rivista di Matematica Elementare* (Alba, Novara, 1874-1885). Many similar journals were issued in the following years, mainly devoted to secondary teaching (Candido, 1903; Furinghetti, 2017 to appear; Furinghetti & Somaglia, 1992 and 2005; Salmeri, 2013). One of the most successful was the *Periodico di Matematica* (Rome, 1886-1916, 1921-1943, 1946-), which promoted the creation of the first association of mathematics teachers in Italy, the *Mathesis* in 1895 in Turin (Giacardi, 2005).

The collaborators of these journals were mainly secondary teachers and professors. In this period professors taught in secondary schools at the beginning of their academic career, like Cremona, but it also happened that secondary teachers run an academic course, like Rodolfo Bettazzi (1861-1941).

The new mathematical journals for teaching aimed at making uniform the mathematics teaching in the Italian territories and at overcoming the inadequacy of the majority of the textbooks, circulating in the schools. They also tried to introduce the recent advancement of the research in the teaching, pertaining overall Calculus and Geometry, and also the Foundations of mathematics. They fostered the comparison among methodological ideas and experiences, and provided solved exercises, riddles and historical curiosities too.

The educational journals applied themselves just into the elementary teaching, by restricting the mathematics issues to weekly elementary arithmetic and geometry exercises. Few mathematical journals were devoted to elementary schools, like *Il Bollettino di Matematiche e di Scienze Fisiche e Naturali* (Bologna, 1900-1917) by Alberto Conti (1873-1940).

Conclusion

From the 1840s to the 1870s in Italy the teaching of mathematics found its place only in educational journals devoted to different disciplines, mostly for elementary schools. They aimed at overcoming the backwardness of teaching methods and textbooks, by promoting foreign educational systems, and by providing practical hints and new methodological ideas.

In this context the Savoyard Kingdom stood out from the rest of Italy, thanks to the freedom of the press and the local educational publishing houses' involvement. In the 1850s journals from Turin didn't hinge on the ideas of a single educationist, as in the Grand Duchy of Tuscany, but on a heterogeneous and politically influential teachers' association, the *SIE*. Its educational journals, the *GSIE* and then *L'Istitutore*, had a social and political role: they contributed to level out the education in the Kingdom, by promoting the innovations of the Boncompagni law, and to involve a great part of the population in the education's problems. They also helped spreading the debate on education circulating among teachers, professors and politicians, which led to the Casati law, the basis for the Italian educational system until 1923. We have to remark that in 1861 the number of illiterates in Piedmont and Liguria diminished to 54,2%, contrary to the national average of 78%.

Educational journals contributed to make aware the audience of the lacks of the educational publishing industry: they stressed the need for better textbooks and presented themselves as a sort of schoolbooks' supplement. They also contributed to provide immediately usable materials for teachers, who were mostly unprepared, due to the lack of teacher training schools in all the territory.

They focused on the reevaluation of the scientific studies and the technical ones, traditionally subordinated to the humanistic ones. As regards mathematics teaching for elementary schools, journals contributed to promote the decimal metric system, which was newly introduced and so few textbooks were updated. They provided theoretical and practical articles on the geometry teaching too, thus promoting a discipline often overlooked in the elementary schools before 1848. In the following years more challenging topics were introduced, like geometric progressions and the shadows theory.

The elementary educational journals from Turin influenced the birth of similar journals in all of Italy, which contributed to make uniform the education and to compensate the still rampant illiteracy and the differences between territories. But after the Italian Unification their role in mathematics teaching was restricted to advertise for textbooks and to weekly provide arithmetic exercises, and also geometric problems and algebraic equations for secondary and technical schools.

The experience of the *RUC* tried to bridge the gap of scientific journals for secondary teaching, which were not present until the 1870s in the rest of Italy.

The journal attempted to be on the crossroad between teaching and research and had as a collaborator one of the biggest mathematicians of that period in Turin, Genocchi. As regards mathematics teaching the *RUC* was innovative, because it proposed advanced mathematics secondary programs, which included the combinatorial analysis and analytic geometry, and because it presented research issues, like the multiple integers. Due to its short life, the *RUC* didn't really play a role in the local and national mathematics teaching of the following years.

The context was renewed after the involvement of Italian mathematicians towards the teaching's problems. Mathematical journals for teaching, especially for secondary school, spread across Italy. Their advanced purposes and the presence of mathematicians as collaborators linked them to the mathematical journals for research.

References

Berti, Domenico (1849). *Del metodo applicato all'insegnamento elementare*. Torino: Paravia.

Bottazzini, Umberto (2000). Brioschi e gli Annali di Matematica. In C.G. Lacaita & A. Silvestri (Eds.), *Francesco Brioschi e il suo tempo (1824-1897)* (Vol. 1, pp. 71-84). Milano: F. Angeli.

Candido Giacomo (1903). Il giornalismo matematico in Italia. Comunicazione letta al Congresso di Napoli (settembre 1903). *Il Bollettino di Matematica, 2*, 203-212.

Chiosso, Giorgio (Ed.) (1989). *Scuola e stampa nel Risorgimento. Giornali e riviste per l'educazione prima dell'Unità*. Milano: F. Angeli.

Chiosso, Giorgio (Ed.) (1997). *La stampa pedagogica e scolastica in Italia, 1820-1943*. Brescia: La Scuola.

Chiosso, Giorgio (2013). Mercato librario e vita scolastica nel Piemonte preunitario. In C.S. Roero (Ed.), *Dall'Università di Torino all'Italia Unita. Contributi dei docenti al Risorgimento e all'Unità* (pp. 273-306). Torino: Deputazione Subalpina di Storia Patria.

Chiosso, Giorgio, & Sani, Roberto (Eds.) (2014). *Dizionario Biografico dell'Educazione 1800-2000* (2 Vols.). Milano: Editrice Biografica.

Furinghetti, Fulvia (2017 to appear). Shaping the identity of mathematics teacher: the journals addressed to mathematics teaching published in Italy after the unification of the nation. In K. Bjarnadóttir, F. Furinghetti, M. Menghini, J. Prytz, & G. Schubring, (Eds.), *"Dig where you stand" 4. Proceedings of the fourth International Conference on the History of Mathematics Education*. Rome: Edizioni Nuova Cultura.

Furinghetti, Fulvia, & Somaglia, Annamaria (1992). Giornalismo matematico "a carattere elementare" nella seconda metà dell'Ottocento. *L'Insegnamento della Matematica e delle Scienze Integrate, 15*, 815-852.

Furinghetti, Fulvia, & Somaglia, Annamaria (2005). Emergenza della didattica della matematica nei primi giornali matematici italiani. In D. Moreira & J. M. Matos (Eds.), *História do ensino da Matemática em Portugal* (pp. 59-78). Porto: SPCE.

Genocchi, Angelo (1853a). Démonstration élémentaire d'une formule logarithmique de M. Binet. *Bulletins de l'Académie Royale de Belgique*, *20*, 392-397 – *Annali di Matematica*, *5* (1854), 150-160.

Genocchi, Angelo (1853b). Intorno ad alcune trasformazioni d'integrali multipli. *Annali di Scienze matematiche e fisiche*, *4*, 401-456.

Genocchi, Angelo (1854a). Sur quelques particularités des formules d'analyse mathématique (Lettre de M. Genocchi à M. Quetelet). *Bulletins de l'Académie Royale de Belgique*, *21*, 84-95.

Genocchi, Angelo (1854b). Sopra certe approssimazioni numeriche. *Rivista delle Università e dei Collegii*, *6*, 130-131.

Giacardi, Livia (2005). L'insegnamento della matematica in Italia dal 1895 al 1923. Il ruolo della Mathesis. In G. Bruno & A. Trotta (Eds.), *Conoscere attraverso la matematica: linguaggio, applicazioni e connessioni interdisciplinari. Atti del Congresso Nazionale Mathesis, Anzio-Nettuno, 18-21.11.2004* (pp. 303-344). Roma: Sogin.

Giacardi, Livia (2006). L'insegnamento della matematica in Italia dall'Unità al Fascismo. In L. Giacardi (Ed.), *Da Casati a Gentile. Momenti di Storia dell'Insegnamento secondario della Matematica in Italia* (pp. 1-63). La Spezia: Agorà Edizioni.

Giacardi, Livia, & Scoth, Roberto (2014). Secondary mathematics teaching from the early nineteenth century to the mid-twentieth century in Italy. In A. Karp & G. Schubring (Eds.), *Handbook of the History of Mathematics Education* (pp. 201-228). New York: Springer.

Lacaita, Carlo G. (2012). Scienza e modernità nelle riviste milanesi dell'800: "Il Politecnico" e gli "Annali di fisica, chimica e matematiche". In L. Pepe (Ed.), *Europa matematica e Risorgimento italiano* (pp. 267-282). Bologna: CLUEB.

Morandini, Maria Cristina (2003). *Scuola e nazione: maestri e istruzione popolare nella costruzione dello Stato unitario (1848-1861).* Milano: Vita e Pensiero.

Ottino, Giuseppe (1875). *La stampa periodica, il commercio dei libri e la tipografia in Italia.* Milano: G. Brigola.

Pepe, Luigi (2012). *Europa matematica e Risorgimento italiano.* Bologna: CLUEB.

Pepe, Luigi (2013). Insegnamenti matematici nell'Italia unita. In C.G. Lacaita, & M. Fugazza (Eds.). *L'istruzione secondaria nell'Italia unita. 1861-1901* (pp. 147-156). Milano: F. Angeli.

Pepe, Luigi (2016). *Insegnare matematica. Storia degli insegnamenti matematici in Italia.* Bologna: CLUEB.

Pizzarelli, Chiara (2013). L'istruzione matematica secondaria e tecnica da Boncompagni a Casati 1848-1859: il ruolo della Società d'Istruzione e di Educazione. *Rivista di Storia dell'Università di Torino*, *2*(2) 23-60.

Rayneri, Giovanni Antonio (1851). *Lezioni di nomenclatura geometrica.* Torino: Paravia.

Roero, Clara Silvia (Ed.) (2013). *Dall'Università di Torino all'Italia unita. Contributi dei docenti al Risorgimento e all'Unità.* Torino: Deputazione Subalpina di Storia Patria.

Romano, Margherita (1925). Il giornalismo pedagogico nel Risorgimento in Torino dal 1837 alla Legge Casati (13-11-1859). *Rivista Pedagogica*, *18*, 738-766.

Salmeri, Antonio (2013). I giornali di matematica per i giovani. *Periodico di Matematiche, 5,* 51-64.

Schiaparelli, Luigi (1849). Considerazioni critiche e statistiche sull'istruzione secondaria pubblica e privata del Piemonte. *Giornale della Società d'Istruzione e di Educazione*, *1*, 465-522.