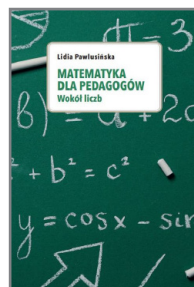**Emilia Agnieszka Mazurek**
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Teachers' Struggle with Math, Or the Reconstruction of Mathematical Knowledge

Lidia Pawlusińska, *Matematyka dla pedagogów. Wokół liczb* [*Maths for Pedagogues: Around Numbers*], Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin 2023, pp. 186

Mathematics and mathematical education seem to be a hot topic currently. Year after year, exam results show worrying data on the decline in mathematical competence among children and adolescents, as Polish researchers have been arguing for years (Nowicka 2013; Klus-Stańska 2014). Moreover, students taking up pedagogy with a specialization in teaching, or even graduates of such studies, often complain about the lack of proper preparation for teaching math or choose degree programs in which they can avoid contact with math (Pawlusińska 2019: 38). Taking into account these problems, Lidia Pawlusińska[1] wrote a monograph that, in a simple

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1 Dr. Lidia Pawlusińska is employed at the Department of Early Education at the Institute of Pedagogy of the University of Szczecin. She has a math degree. She wrote her doctoral dissertation, *Egzamin zewnętrzny w gimnazjum – edukacyjne możliwości i ograniczenia* [*External Exam in Junior High*

and understandable manner, familiarizes students, teachers, and pedagogues with issues concerning mathematical education and math in general (the monograph may also help them order the knowledge they acquired at university). The book *Matematyka dla pedagogów. Wokół liczb* [*Math for Pedagogues: On Numbers*] was published in 2023 by Wydawnictwo Naukowe Uniwersytetu Szczecińskiego [Szczecin University Press]. This publication discusses the didactics of teaching mathematics, especially at the initial stage of formal education, i.e. in kindergarten and especially in grades 1–3. The book is dedicated particularly to students of preschool and early school education, as well as teacher-practitioners.

The monograph is the first of three volumes the author intends to publish.[2] It consists of seven chapters. In the first one, the author introduces the readers to the elements of mathematical logic, pointing out the peculiar priority of logic and the need to deal with this branch of mathematics, the need to introduce the reader to the grammar of mathematical language, and the need for clear expression. The subsequent chapters of the book deal with sets and algebra (pp. 41–82), set assignment (pp. 83–120), natural numbers (pp. 121–150), non-decimal positional systems (pp. 151–157), numbers used in ancient civilizations (pp. 158–167), and Hilbert's paradox (pp. 168–170). The first four chapters are treated as the main chapters, while the remaining three are supplementary. The author justifies the order of these contents with the possibility to cumulatively construct and apply knowledge of mathematical concepts or to discover relationships between the topics (p. 8). The book also contains an introduction, a bibliographic list, and a list of answers to some of the tasks suggested in the book.

In the monograph, the reader will find descriptions and explanations concerning many mathematical concepts, their application, and the history of their introduction. While reading the book, people may learn about interesting nuances connected with math,

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School: Educational Opportunities and Threats], under the supervision of Prof. Henryka Kwiatkowska. She has worked as a math teacher for many years and served as a headmaster in a junior high school.

2   The second of the planned publications is to be entitled *Kształty* [*Shapes*], and the third *O matematyce i jej niektórych zastosowaniach* [*On Math and Some of Its Applications*] (Pawlusińska 2023: 8).

arguments related to concepts and their definition, and the necessary examples. The author uses a number of strategies, for example, suggesting that the numerous questions in the text be answered and arranging tasks to be solved with the use of drawings, tables, and diagrams. Pawlusińska encourages the use of what children understand, such as playing cards to introduce the issue of sets (p. 76), children's drawings to introduce issues of mathematical logic (p. 34), blocks and figures to code (pp. 20–21), as well as other teaching aids for mathematical education, such as Dienes blocks (pp. 71–72), mathematical trees (p. 128), Cuisenaire rods (p. 140), and the sieve of Eratosthenes for identifying prime numbers (pp. 131–132). Information in this monograph on introducing issues in mathematics lessons at a higher educational level is also valuable. For example, the author proposes making mathematical functions easier for younger children to understand not only by referring to graphs of functions, but also—in an accessible way—by using graphs, a number axis, or two number axes (pp. 108–109). An interesting theme taken up in the publication is the ways that ancient civilizations wrote numbers (e.g., Egypt, Rome, Sumer, or Babylon). Showing children the ancient ways of writing numbers and performing calculations certainly satisfies their curiosity and shows the conventionality of the notation we use in mathematics today (p. 158). The final chapter on Hilbert's paradox of the Grand Hotel allows readers to feel a kind of difficulty arising from grasping the concept of infinity, but it can also be an interesting logic task for pupils.

In her "non-handbook" of mathematics, the author refers to many other authors (of the past or more contemporary ones) who dealt with math education. Pawlusińska recommends their books to her readers (e.g., those by Semadeni, Kaczmarczyk, Nowecki, or Rasiowa). Also, references to math theoreticians are included (Ciesielski or Pogoda). Nevertheless, the book is mainly based on the author's mathematical knowledge.

Although the author herself points out that her publication is not a mathematics textbook, it also does not fit into the category of a methodological guide for teachers (it lacks specific lesson scenarios or methodological indications). The publication refers to "basic work," or confronting the reader with whether and how they understand the mathematical issues in question. The author avoids

infantilization in the way information is presented.[3] Reading the book carefully requires effort from the reader.

Lidia Pawlusińska's monograph proves that mathematical issues assigned for secondary and tertiary education should be supported even in early education through didactic situations of a propaedeutic nature. The mathematical language of the publication, while maintaining formal correctness, presents the issues in a manner that is accessible to the readers. What deserves to be emphasized is the multitude and variety of examples which, with slight modification, can be used in the mathematical education of a child. This work belongs to the canon of publications concerning mathematical education in kindergarten and elementary education classes and constitutes a valuable source of information and inspiration that can be used during lessons.

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3 The author indicates issues such as de Morgan's laws, Cartesian products, Peano axioms, π, etc.