

MATHEMATICS EDUCATION PUBLISHED IN THE “WYCHOWANIE PRZEDSZKOLNE” [IN ENGLISH: PRESCHOOL EDUCATION] JOURNAL (1925–1939)

ABSTRACT

Objectives

In the interwar period, educational magazines played a huge role in popularizing the latest concepts and didactic solutions. In the years 1918-1939, several titles were addressed to pre-school educators. In this group, “Preschool Education” can be considered as one of the most important magazines. His main tasks included improving teachers’ professional competences and disseminating the achievements of Polish and world pedagogical thought. On the pages of the magazine, much attention was paid to the issue of mathematical education of a small child. These publications were substantive support for pre-school educators at the time.

Material and methods

analysis of source texts

Results

On the pages of the “Preschool Education” (1925-1939) magazine, many articles can be found in the field of mathematical education of a small child, constituting significant substantive support for pre-school educators in the interwar period.

Conclusions

The text is a short presentation of articles in the field of mathematics education published in the journal “Preschool Education” (1925-1939).

KEYWORDS: *preschool education, Maria Weryho-Radziwiłłowiczowa, mathematics education, pedagogical journals, interwar period*

INTRODUCTION

The interwar period in Poland was marked by particularly dynamic development of pedagogical journals. In the years 1918–1939, over 300 of such periodicals were published, however most of them on an irregular basis (Sosnowska, 2016, p. 31-55. Compare: Wira-Świątkowska, 2007, p. 91; Żmichrowska, 1992, p. 21). At the same time, a significant increase in the interest in topics related to preschool teaching was observed, and, consequently, first periodicals were created aimed at disseminating new teaching concepts and solutions (Sosnowska, 2016, p. 32-33. In the years 1918–1939, several periodicals were published which target audience were preschool teachers: “Sprawy Przedszkolne”, “Opieka na Dzieckiem”, „Dziecko i Matka”, „Wychowanie Przedszkolne”, „Zagadnienia Przedszkolne”, “Życie Dziecka”, “Zagadnienia Przedszkolne i Wychowawcze”, „Plan Prac w Przedszkolu”, “Moje Dziecko”, and „Przedszkole”). Furthermore, the said journals were intended to raise education-related awareness among the society and participate in the public debate on the reconstruction and model of the Polish education system.

One of such pedagogical periodicals was “Wychowanie Przedszkolne” (“Preschool Education”), issued under the patronage of the Polish Preschool Education Society, which was the first Polish organization dealing with promoting preschool education (Sosnowska, 2016, p. 4-5. See: Weryho-Radziwiłłowiczowa, 1930, p. 22-23). The initiator of the journal, and its editor-in-chief, was Maria Weryho-Radziwiłłowiczowa (Wira-Świątkowska, 2004, p. 151-156). The periodical was divided into two parts: theoretical and methodical one. However, its lay-out and titles of respective sections would be subject to regular modifications (Weryho-Radziwiłłowiczowa, 1925, p. 1). As Maria Weryho-Radziwiłłowiczowa put it: “Wychowanie Przedszkolne” was to *cater to preschool teachers, allowing them for further development and finding thought material as well as providing necessary tips (...)* (Weryho-Radziwiłłowiczowa, 1925, p. 2). Ready-made templates published in the periodical were not to undermine the initiative of preschool teachers though.

CALCULUS EXERCISES

Calculus exercises were the topic of a host of articles published in “Wychowanie Przedszkolne.” They include both theoretical studies, discussions

of the then state of research as well as ready-made sets of exercises regarding the formation of the number concept, or some simple arithmetic calculations.

First publications where calculus exercises are discussed underlined that mathematical concepts are formed in children's minds slowly. Therefore, calculus exercises should start with making children familiar with sets of objects, without quoting any numbers or digits, in the following order:

- *Nothing and something,*
- *Nothing, a bit of something, a lot of something,*
- *One and many (several)*
- *Nothing, one and many (several)* (Ćwiczenia rachunkowe, 1925, p. 20-21; Pierwsze ćwiczenia rachunkowe, 1926, p. 21-22; A. Zakrzewska, 1929, p. 40-41).

For instance:

1. *A child receives a picture presenting a boy calculating his baskets with apples. Not all of the baskets are full, and one should leave the empty baskets unpainted, whereas paint in red only those which are full of apples (Pierwsze ćwiczenia rachunkowe, 1926, p. 22).*
2. Children receive identical boxes; however the content thereof is different. Without looking into the boxes, children compare their weight, and can figure out which boxes contain more objects and which fewer, whereas some of the boxes are empty. uch a game will allow them to learn the concepts of "nothing", "one" and "several" (Z. Ch., 1926, p. 23; A. L., 1930, p. 16).

During early childhood and preschool age, the concept of a number develops in stages, which was presented extensively in "Wychowanie Przedszkolne" by Z. Żukiewiczowa (Żukiewiczowa, 1925, p. 7-10). The author claimed that it is of great pedagogical importance to determine how the process of forming the number concept unfolds. Supporting her claims with research, she emphasized that one should take into consideration the fact that children aged from 3 to 5 gradually become aware of the numbers 2, 3, 4, 5, which they recognize as sets, without designating them with names. An essential part of forming the number concept should be exercises

stimulating perceptivity, consisting in comparison and sorting of objects. In the beginning, these should be homogenous objects, and with time, heterogenous ones should be included. In the mind of the child, the following concepts are subsequently formed:

- one/ a lot of

As part of a simple exercise, a child receives mixed objects such as buttons, beans, and sticks that are supposed to be grouped into separate boxes (Żukiewiczowa, 1925, p. 7). Maria Szaadowa suggests a similar type of exercise, or a game, where children are to look for identical vase patterns (Szaadowa, 1938, p. 64; Girtlerowa, 1926, p. 20, suggested a game where a stripe of cardboard is used with drawings of 7 animals and 6 cardboard frames, each of which allows for seeing a different number of drawings. Compare: *Ćwiczenia rachunkowe. Liczba 4*, 1930, p. 41). Moreover, when observing their surroundings, children can notice that there is “one ceiling” in the classroom, whereas there are “a lot of walls and windows” etc. (Groslikowa, 1925, p. 7).

- equally/as much

Next, Żukiewiczowa claims, children should be engaged in exercises on recognizing the same number of objects (initially of representations of identical objects, and then of diverse ones), which, grouped, may be referred to as “as much” or “equally”. For example, a child can be asked to align *as many sticks, as buttons* (Żukiewiczowa, 1925, p. 8). Also, one may simulate repetitive sounds with children (the number of hand claps, sounding of a bell, knocks on a table) as well as activities such as jumps (A. L., 1930, p. 16; *Ćwiczenie rachunkowe*, 1933, p. 28).

- fewer/more (Żukiewiczowa, 1925, p. 7).

Upon the introduction of different sets, also the concepts of “fewer” and “more” are first presented. This is the beginning of a thought process related to mathematical operations such as adding and subtracting (Żukiewiczowa, 1925, p. 7; Groslikowa, 1925, p. 7). Even though a child will compare and equalize the number of elements in two sets, i.e. will unconsciously add or subtract, one should not name these operations at this point. Instead,

phrases comprehensible to the child should be used, such as "place it next to it", "push it closer", "move it away", "put it aside". One should gradually raise the level of difficulty of tasks regarding comparing and mapping objects or geometric shapes.

Additionally, Żukiewiczowa suggests shifting from mapping to exercises dealing with measurements. Basic games could consist in sorting children by their height, i.e. from the tallest to the shortest and the other way round (Groszlikowa, 1925, p. 5). Similar outcomes can be achieved by distributing sticks, stripes of paper or strings of different length (Żukiewiczowa, 1925, p. 9; Oderfeldowa, 1927, p. 21; Oderfeldowa, 1925, p. 21-22). Younger children can be taught how to make comparisons and grade the length, whereas older ones can be made familiar with terms such as "meter" or "decimeter". When tipping sand or stones to containers, children will realize the relationship between different volume units by themselves (Żukiewiczowa, 1925, p. 9). To practice making measurements, one may also demonstrate how the scales operate (Groszlikowa, 1925, p. 8).

Also, Żukiewiczowa underlines that one mustn't *teach children how to "name" numbers as long as we are not convinced that they fully comprehend the concept of a given set or number, and if they do not manifest the need to name numbers by themselves* (Żukiewiczowa, 1925, p. 9).

In "Wychowanie Przedszkolne", Barbara Groszlikowa considered the issue of teaching calculations in preschool from the viewpoint of preparing a child to school. She claims that in preschool children should feel that they are having fun (although at the same time they are developing), whereas at school, a child is supposed to feel that they are learning. The same view was presented by Stanisława Girtlerowa, who emphasized that modern mathematics education in preschool should be of a playful nature, develop independent thinking and be based on new methods of teaching (e.g. Duillard's methods) (Girtlerowa, 1926, p. 20). Moreover, Barbara Groszlikowa is of the opinion that *from the viewpoint of a school teacher, it does not make a difference whether a child can count to 5 or even to 10, or they do not count at all but can feel quantities, values and the mutual link between them* (Groszlikowa, 1925, p. 4). Groszlikowa believed also that it is too often the case that teaching calculations in preschool *is transformed into something which in fact is part*

of school education (Groszlikowa, 1925, p. 4). Moreover, she suggested the following cycle of calculus exercises to be adapted by preschool teachers, divided into the following groups:

- during the first year of preschool:
 - a) taller/shorter, behind/in front of, higher/lower, above/under
 - b) shorter/longer, close/far
 - c) left/right
 - d) one/many
 - e) less/more/equally
 - f) mapping (of identical objects and shapes, different objects and shapes as well as objects and shapes in a row)
 - g) measuring (in steps, using hand or arm), presenting scales and time
 - h) presenting number 2

- during the second year of preschool:
 - a) repetition of concepts acquired during the first year and expanding their scope in the case of mapping above five
 - a) introduction of numbers: 3, 4 and 5
 - b) presentation of the square and the sphere
 - c) once first five numbers have been perfectly mastered, we can start, very slowly, introducing numbers from 5 to 10, remembering about mapping them (Groszlikowa, 1925, p. 4-12).

To sum up, Barbara Groszlikowa recommended that in the first year of preschool mathematical education should end with teaching number 2 (Groszlikowa, 1925, p. 9). At the next stage of preschool education, she particularly encouraged conducting calculus exercises involving numbers from 2 to 5, using toys, drawings on a board and animals cut from paper (A. Zakrzewska, 1929, p. 40-41; Z. B., 1933, p. 155-156; *Ćwiczenie rachunkowe (liczba 5)*, 1935, p. 24). She emphasized as well that first five numbers constitute the basis to understand the decimal system, and only after it has been fully mastered by children, may one start introducing numbers from 6 to 10. She stressed that a lot of time should be devoted to each new number (Groszlikowa, 1925, p. 4-12).

Another scholar who covered teaching calculus in “Wychowanie Przedszkolne” was Jan Hellmann. In order to determine guidelines for teaching calculus, he recommended referring to the history of the development of arithmetic, and, on the other hand, *considering natural life conditions and needs that contribute to the formation of number concepts, and finally, investigating the psychological aspect of how the number concepts are formed in a child* (Hellmann, 1928, p. 169). According to the author, for the creation of number concepts in a child, four basic conditions need to be met in the beginning; that is a child has to become aware of the following:

- *boundary and end of each activity* (this constitutes the basis for subsequent calculating and measuring activities)
- *energy economics* (e.g. when you walk, you do not use as much energy as you would while running)
- *selection of adequate means necessary to achieve a given goal* (e.g. when a child wants to build a house of blocks, it should take as many blocks as necessary)
- *regularly occurring phenomena* (such as a day or a night) (Hellmann, 1928, p. 169).

Shaping number concepts in preschool should be based on specific objects. Furthermore, it should refer to personal experiences of children, what they went through, and what they are interested in; also, it should consider the scope of concepts a child has already acquired. It is undeniable that children enter preschool with some knowledge, including in the area of numbers, time and space. The type and level of familiarity with these concepts is based on individual characteristics of a child as well as its environmental conditions. Hellmann underlined that one of major pedagogical postulates is that one should get to know the current level of knowledge and skills as well as environmental conditionalities impacting the development of a child. For that end, it is worthwhile performing some examinations, for instance the tests of Decroly–Degaud; admittedly, they require some preparation on the part of the teacher, but what they ensure is information for the teacher on:

- *what type of child he/she is working with* (auditory, visual or kinesthetic learner)

- *current level of calculus-related knowledge of the child*
- *what the child's environment is like, what preferences and interests it has* (Hellmann, 1931, p. 136-138).

Hellmann also claimed that the period between 4th and 7th year of age should be utilized for developing children's senses, which are central at a later point when concepts of numbers and space are shaped. Using the sight, the child learns the presence of objects in its surroundings, with their shapes, colors and sizes. Hearing gives the child the opportunity to determine the length of a sound (long versus short) as well as the rhythm (quick or slow), whereas the sense of touch – the type of surface (smooth, coarse), temperature as well as properties of an object (stiff, flexible) (Hellmann, 1931, p. 136-137).

Also Jadwiga Zawirska discussed the necessity of getting to know the child as well as its development process in a comprehensive manner. She followed John Locke in the belief that one should study nature, gifts and inclinations of children so as to form their new knowledge in line with them. Similarly to most authors who published papers on calculus exercises in “Wychowanie Przedszkolne”, she claimed that it is of particular importance to determine the process of developing the concept of a number in a child. Referring to a monograph by a German psychologist Herman Beckman “O rozwoju sprawności liczbowej u dzieci w wieku od lat 2 do 6” [On the development of number proficiency in children aged from 2 to 6], she underlined that children will benefit most from *classes which are of value and significance at their current moment of development* (Zawirska, 1926, p. 2). In her paper, Zawirska pointed out that before Beckman commenced his actual research on number proficiency in pre-school children, he had been reflecting on *what this proficiency in fact consists in, which factors drive the process of learning numbers by children* (Zawirska, 1926, p. 2). Following some initial studies, Beckmann concluded that learning numbers by children may be divided into 6 moments. First two occur in early childhood, when the child hears numbers and tries to repeat them (e.g. “one| or “two”). Beckman called it *hearing and pronouncing a number*. According to the scholar, starting from the third year of age, subsequent four number-related cognitive moments are observed, namely:

- *reproduction*
- *distinction (e.g. are there two or three cubes?)*,
- *location (e.g. place 3 cubes on the table)*.
- *naming a number*.

Upon reproducing a number in response to an instruction, such as “take 3 cubes”, children, as Beckman claimed, may show 4 reactions:

- 1) total lack of understanding of a number heard – a child instinctively extends a handful of cubes, and then hesitates, takes or adds cubes one by one.
- 2) passes one object at a time, trying to guess from the face of the interviewer, when a proper number of cubes has been passed.
- 3) passes the requested number of objects straight away.
- 4) at the request to pass three objects, a child first passes two objects, and then one etc. Such reactions were characteristic of most developed children in the opinion of Beckman (Zawirska, 1926, p. 4).

On the basis of his research proper, Beckman arrived at a conclusion that it is only from the third year of age that children acquire full proficiency in using numbers 2 and 3 as well as are able to partly reproduce number 4. Using greater numbers is an artificial and incomprehensible activity for small children (Zawirska, 1926, p. 3 and the following pages). Moreover, Beckman used the term number proficiency in children *only with respect to knowledge which a child independently gains via its own experience and observations during games and activities* (Zawirska, 1926, p. 2).

In summary, methodical guidelines as regards exercises dealing with numbers for children in pre-school age published in the “Wychowanie Przedszkolne” journal are closely related to the development of children as well as their independent striving for distinguishing and identifying objects. In this context, personal experiences and activities undertaken by children are of particular significance as they lead to the creation of an appropriate state of consciousness in children (Hellmann, 1928, p. 170). Also, teaching should be combined with playful activities (*Ćwiczenia rachunkowe* (Zabawa na dworze), 1930, p. 141). A similar game can be organized also in a room, see V. W. C. A., 1937, p. 60).

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