

Mathematics in programs of pre-school teachers' professional education

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Abstract. Mathematics is inherent part of culture. It can be found in works of culture (especially in architecture and art) and everyday life. Although, some results speak in favor of negative or neutral attitudes towards mathematics, people still use it on everyday basis. Phoning, paying bills, measuring etc. are some of many everyday activities which require mathematical knowledge. Functional use of mathematics is exactly the one that obtains great deal of attention in pre-school education. National curriculum for pre-school, obligatory primary and secondary education cite necessity of acquisition of mathematical competencies due to resolving everyday problems. In case of pre-school education, carrier (precisely designer and organizer) is pre-school teacher. Presuming that pre-school teachers' professional education is characterized by pragmatism, that mathematical knowledge is needed for everyday life and that early childhood is period of intensive learning about immediately environment and acquirement of tools of culture (language, symbols...), the question of mathematics in pre-school teacher professional education is arising. To gain an insight into the presence of mathematics in programs of pre-school teachers' professional education, programs from 5 Croatian universities have been analyzed. Results showed low presence of mathematics and reduction of mathematics onto professional tool. Regarding the fact that only two Croatian universities has launched new, five-years university class for pre-school teachers, this results can be used as frame for further inquiring of importance of mathematics in pre-school teachers' professional education and its place in institutional pre-school education.

Keywords: mathematics, programs of professional education, pre-school teachers, pragmatism, functionality

Introduction

Mathematics is inherent part of culture. It can be found in works of culture (especially in architecture and art) and everyday life. Although, some results speak in favor of negative or neutral attitudes towards mathematics (Witmann, 2006) people

still use it on everyday basis. Presence of functional use of numbers and mathematics can be found in early childhood. Importance of mathematics is described in many educational policies and documents of European Union and Republic of Croatia. So European Commission (2004) cited key competences for lifelong learning: communication in the mother tongue and in foreign languages, mathematical competence and basic competences in science and technology, information and communication technology (ICT) and digital competences, learning to learn, social and civic competences, sense of initiative and entrepreneurship, cultural awareness and expression. Croatia's frame for National curriculum for preschool education and obligatory primary and secondary education (MZOŠ, 2010) cites necessity of acquiring mathematical competences essential for solving everyday problems. In case of pre-school education, bearer (precisely, designer and organizer) of these activities is pre-school teacher. Future pre-school teachers in Republic of Croatia are educated upon professional three- and five-years educational studies to ensure successful (in terms of effectiveness) of pedagogical work. "Equipping" future pre-school teachers with adequate competences is main goal of these educational studies. During professional education, pre-school teachers "built their own value-system, based upon individual experience of socialization, personal participation in educational process and knowledge about "vocation" "(Irović, Romstein, 2007, 229). Analyzing pre-school teachers' effectiveness, Colker (2008) claims that effectiveness is under direct influence of pre-school teachers' knowledge, skills and personal characteristics. As important factor of pre-school teachers' professional success, students – future pre-school teachers cite professional education (Irović, Romstein, 2007). Regarding competences cited in international documents, and expected by Republic of Croatia, Lepičnik-Vodopivec (2007) after research conclude: the most significant competences (from the perspective of students – future pre-school teachers) are knowledge about developmental characteristics of children, differences and needs among children, knowledge about cognitive-developmental theories which are followed by competences from the field of methodology of performance. As it was already said before, presence of mathematics can be found in early childhood and on everyday basis.

Implementation of Bologna gave universities in Republic of Croatia an opportunity for conceptualizing education in regard of pre-school teachers' professional demands. To gain an insight into presence of mathematics and mathematical contents, 5 (three years) pre-school teachers' educational programs have been analyzed: Faculty of Teacher Education in Zagreb (proposal for three year graduated study for preschool teachers); Faculty of Teacher Education in Osijek (three year graduated study program for preschool teachers); Faculty of Teacher Education in Rijeka (three year graduated study program for preschool teachers); Department for education of preschool teachers and primary school teachers at University of Zadar (graduated study program for preschool teachers); and Faculty of Philosophy in Split (study program for preschool teachers).

Analyzed programs were from academic year 2004/ 2005, the 1st year of Bologna implementation. Presence of course (syllabus), goals and contents of the course and expected competencies were encompassed by analyses.

Analysis showed absence of course Mathematics and low representation of mathematical contents in educational programs, i.e. its reduction in direction of professional tool, which especially can be seen in courses such as Methodology of pedagogical research, Statistics and Informatics.

Presence of course Mathematics in preschool teachers' educational programs

Mathematical learning is possible in early childhood. The research results about mathematical learning in early childhood shows: mathematical learning with simple operation such as classification and conjoining has direct influence on success of mathematical learning during primary education (Bodrovski & Farkas, 2007), preschool children, very early, even before 5th year of life, have ability of understanding spatial relations, numbers, quantity and geometry which can be facilitated through construction games, especially building bricks (Sarama & Clements, 2004). Regarding mathematics can be learned in early childhood, its value enclosed in recent educational policies at international and national level, and importance of competences (from students' perspective) in field of performance, it is deservingly to make an insight into "offer" of mathematics in preschool teachers' educational programs.

From 5 analyzed non offered course Mathematics. But, there are courses with mathematical elements: at Faculty of Teacher Education in Zagreb courses are Methodology of preschool education 1 and 2; at Faculty of Teacher Education in Osijek students can encounter mathematics in courses Tabular calculator, Methodology of preschool education 4 and Methodology of pedagogical research; at Faculty of Teacher Education in Rijeka in courses Basic pedagogical methodology and Basic statistics; at Department for education of preschool teachers and primary school teachers at University of Zadar in courses Methodology of educational work 3 and Informatics 2; at Faculty of Philosophy in Split in courses Basic informatics, Methodology of preschool education 2 and Basic methodology of pedagogical research.

Analysis of courses with mathematical contents

Taking into an account that in preschool teachers' educational programs not even one course called Mathematics existed, we have focused our attention on analyzing courses with mathematical contents. Courses that, among others, offered mathematical contents are: Methodology of preschool education 1 and 2 (Faculty of Teacher Education in Zagreb); Tabular calculator, Methodology of preschool education 4 and Methodology of pedagogical research (Faculty of Teacher Education in Osijek); Basic pedagogical methodology and Basic statistics (Faculty of Teacher Education in Rijeka); Methodology of educational work 3 and Informatics 2 (Department for education of preschool teachers and primary school teachers at

University of Zadar); Basic informatics, Methodology of preschool education 2 and Basic methodology of pedagogical research (Faculty of Philosophy in Split).

Content analysis showed that offered mathematical elements within educational programs were not in function of pedagogical work. Mathematical contents in mentioned courses are focusing on research competences which are just one aspect of pedagogical work. This kind reduction of mathematics shows understandings of its everyday presence and importance insufficient. At the other hand, courses focused on statistics presume high level of students' mathematical knowledge, but covariance, correlation etc. preschool teachers' rarely use in their pedagogical practice. Although raising quality of pedagogical work presume preschool teachers' possession of "science competences" within field of methodology, statistics and pedagogical research (Matijević, 2007, 304) which facilitate designing developmentally appropriate practice, understanding of elemental mathematical concepts for higher mathematical operation is needed. Manifestly, there is parallel presence of reduction and high level demands towards students' knowledge. So, it is important to synchronize levels of demands towards students' achievement and to question contents relevance in applicability in their later professional work.

Analysis of particular courses showed anticoincidence and inconsistency. Goals (as starting points in course design) in particular courses (for example Methodology of preschool education 1 and 2, Methodology of educational work 3, Informatics) are absent (not known) so the question about evaluation is raised.

Due competences, two faculties did not offered competences at all, so the students' profits are vague. In fact, competences on international level are common principles in preschool teachers' professional education. Competences have function of "resolving actual and future global requests and anticipations" (Babić, 2007, 33) which is presumption of Bologna studying. But, certain courses (for example, Methodology of educational work 3) went one step further and offered students contents and competences about play, which is held as polygon for testing owns' mathematical competences (for example, "Play as fundamental method in field of development primary mathematical concepts") which require meta-competence in field of mathematics.

Ditto, it can be concluded that mathematical contents are not synchronized and information- insufficient due mathematics implementation in everyday pedagogical work. Additionally, mathematics is perceived as tool for successful research work which is, actually, just one narrow aspect of preschool teachers' professional work. Taking into account that mathematics is present in everyday life and that pragmatic value is one of most mentioned (Wittmann, 2006), it is important to think about possibilities of its' implementation into new, MA, preschool teachers' educational programs.

Analysis of preschool teachers' educational programs showed absence of course named Mathematics. Mathematical contents/ elements are comprised within other courses such as Statistics, Methodology and Informatics, which points

on low level of value perception for direct pedagogical work with preschool children.

Analysis of courses revealed low level of representation of mathematics and its reduction in direction of professional tool, especially within courses methodology of pedagogical research, statistics and Informatics. Although, competences of autonomous research are important aspect of preschool teachers' work, actually, they are props in developmentally appropriate practice design. Many authors (Liebeck, 1994; Wittmann, 2006; Bodrovski i Farkas, 2007) remind that mathematics in early childhood is often taken into account solely as "measure" for school readiness, but practical use of mathematics is its main value which can be marked in early childhood.

Actually in Republic of Croatia preschool teachers' educational programs are converting into MA level, which is unique opportunity for questioning actual programs and competences. Entry data shows that only Faculty of Teacher Education in Osijek offered mathematics for students – Mathematical culture and communication and Mathematics in play and amusement. That kind of courses able student wider diapason of mathematical contents and acquisition of relevant competences needed for later successful professional work.

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