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Volume 2

Editors | Berinderjeet Kaur, Weng Kin Ho, Tin Lam Toh, Ban Heng Choy



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PARENTS' AND TEACHERS' VIEWS ON THE DISTINCT ROLE OF MATHEMATICS AS A SCHOOL SUBJECT

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In this research we aimed to investigate the mathematical views of two different groups that both may have enormous impact on students' mathematical achievement and attitudes, and on their future well-being as well. Elementary school teachers (N = 74) and parents (N = 955) filled in two analogous questionnaires concerning different aspects of learning mathematics. Data collection was done in a multilingual region of Europe. The results indicate that both in parents' and teachers' views Mathematics as a school subject has a distinct role in the system of school subjects. Differences between the two language-groups (Hungarian and Serbian) have been revealed in judging the pragmatic role of mathematics in several fields of future well-being.

INTRODUCTION

In the Western world, Mathematics as a school subject has always been an integral part of the curriculum since 1599. Baba, Iwasaki, Ueda and Date (2012) describe how the Western mathematical ideas changed even Japanese math education. During the 20th century, due to the IEA studies (FIMS, SISM and then the TIMSS-series), and especially with the advent of PISA-studies, its leading role has been reassured both by policy makers and educational researchers. The special role Mathematics fulfils in the system of school subjects can be described from several aspects. Kolloosche (2014) claims that the mechanisms how mathematics teaching and learning take place in the classroom give power to those who are able to do mathematics. Similarly, Valero (2012) points to the role Mathematics and other STEM subjects may play when causing a gap between the two forms of subjectification (a Foucauldian term): in the mathematics classroom, the processes of subjectification are rather different that of other subjectification in other areas of social life.

A study with 3rd grade students' parents was conducted by Rätty, Kasanen and Kärkkäinen (2006), and they revealed the special role Mathematics and Finnish (mother tongue) as two school subjects play in elementary schools. There is still much empirical research needed to reveal how Mathematics as a school subject is different from other subjects *in the system of school subjects*.

Parents' and teachers' views on mathematics

Why parents' views should be explored and taken into account by policy makers is justified by the need of winning parental support when introducing new approaches in mathematics teaching and learning. This is especially true in educational systems (like in the region where the current research has been conducted) where parents are free to

choose the school where their children may receive mathematics education that fulfils parental expectations.

According to Albersman and Rolka (2013), the topic of investigating parental mathematical beliefs is rather neglected (e.g., the seminal work by Pehkonen and Torner, 1996, deals with students' and teachers' beliefs and not with that of parents'). Recently Csíkos and Dohány (2013) explored parental beliefs about secondary school parents' pragmatic values of mathematics and music, and Albersman (2015) conducted a research among the parents of 5th grade students about the pragmatic role of mathematics.

Teachers' mathematical beliefs have been more extensively explored in the last decades. Research ranges from case studies on philosophical values of mathematics education to large sample validation studies of questionnaires. E.g., FitzSimons, Bishop, Seah and Clarkson (2001) revealed that mathematics teachers are aware of rather different values mathematics teaching may explicitly or implicitly develop. Whereas Platas (2015) developed a questionnaire (MDBS, Mathematical Development Beliefs Survey) for pre-school teachers about early mathematics.

Our current research intends to investigate both parents' and teachers' mathematical views with the same questionnaire, and within the same sampling procedure. According to Dede (2013, p. 703.), "institutional values play an important role in mathematics teachers' decisions on classroom practices", consequently the institution-based sampling procedure seems to be an important novelty.

Cross-cultural considerations

The extent to which the results of the current investigations may be generalizable calls forth the question of cross-cultural (or cross-linguistic) differences. Although there may be relevant differences between teachers' explicit beliefs (see e.g., Andrews, 2007), studies on students' implicit mathematical beliefs (for a brief summary, see Csíkos, Kelemen, & Verschaffel, 2011) show a greater level of culture-independency. In the current study, parents and teachers from two ethnic groups within the same school system comprise our sample; consequently, our research design allows for exploring a level of cross-cultural differences or similarities.

Aims and hypotheses

In line with the literature review we proposed the following hypotheses.

(H1) In the system of school subjects, mathematics is considered as having a distinct role in both parents' and elementary teachers' views. This role may be indicated by the fact that parents often ask their children about school marks (especially in mathematics) and teachers frequently talk to parents about students' achievement in Mathematics.

(H2) Mathematics as a school subject is considered very important with regards to getting a job and earning high salary, but other aspects of well-being like sense of beauty and creativeness are less tightly associated with mathematics.

(H3) There are no relevant differences in mathematics-related views between the two language groups.

METHODS

Sample

The primary choice of sample units in our research were towns in Vojvodina (autonomous province of Serbia) where the language of instruction in primary schools is not only Serbian but Hungarian as well. Data on these schools is accessible in the database of the Vojvodina Methodology Center and can be found on the Hungarian Education Map of Vojvodina (<http://vmoktatas.org.rs>). There are 27 such towns in the province. The towns where the majority of the population is Hungarian are concentrated in the North Central regions of Vojvodina. We have chosen twelve of them, and nine school principals have permitted us to do the survey. We have asked Serbian and Hungarian teachers in grades one to four to hand out and to collect parental questionnaires, and also to fill out the teacher questionnaires. Participation was voluntary. This way, we received 1111 parental questionnaires. We left out 156 parental questionnaires from the research as we could not match them with any teacher questionnaires. Eventually, 955 parental and 74 teacher questionnaires were analyzed. 607 parents have filled out the form in Hungarian and 348 in Serbian. Out of the 47 teachers whose first language is Hungarian and the 27 whose first language is Serbian, 14 teach in grade one and 19-19 in grade two, three and four. One of them works in a composite class, teaching all grade levels. Out of the 74 teachers, only two are men, the rest of them are women.

Questionnaires

Two questionnaires were used in this investigation entitled “Parental questionnaire about learning” and “Teacher questionnaire about learning”. Both questionnaires have the same structure and items with the exception of the background items and some grammatical and syntactical adjustments. The questionnaires have the following sections:

- (1) General beliefs on learning – five-point Likert-scale on the level of agreement.
- (2) Importance of learning targets – five-level Likert-scale on the level of importance.
- (3) Importance of school subjects – five-level Likert-scale on the level of importance.
- (4) Frequency of discussion on school marks in different school subject – five-point scale on the frequency (not at all, monthly, weekly, several times per week, daily)
- (5) Frequency of discussion on the content of learning in different school subjects – the same five-point scale as in part (4).

(6) The importance of mathematics with regard to students' future well-being – five-point Likert-scale on the level of agreement

Background questions covered demographic variables like age, level of schooling, type of settlement.

Both questionnaires have two versions: Hungarian and Serbian. Respondents could choose any of them, so another background variable of this investigation is the language.

Procedure and analysis

The data have been coded as quantitative data in the SPSS software. Except for part (4) of the questionnaire, the Likert-scale variables are considered as interval scale variables, whereas part (4) variables were treated as of ordinal scale level.

In the current phase of data analysis teachers' and parents' questionnaires are analysed separately. Nevertheless the data will enable for analysing connections between them, since parents' data can be connected to the teacher's data, and those parental questionnaires that cannot be matched to a teacher questionnaire have already been filtered out from the sample.

RESULTS

The place for mathematics in the system of school subjects (H1)

Teachers' and parents' judgments on the importance of “developing mathematical thinking” showed an average of 4.86 (SD=.45) on the five-point Likert-scale which clearly shows to what extent parents agree upon the utmost importance of mathematics. The highest average went to the development of first language skills (4.96), while other areas were all considered rather important (all mean values were above 4.24).

Part (3) of the questionnaire contained a list of all compulsory school subjects, and parents and teachers indicated how important each subject is in their opinion and in their child's opinion. The subjects were listed alphabetically. Table 1 shows the Mean and SD values for each item for both samples.

Comparing the mean values in each row, paired-samples t-tests indicated that teachers considered the school subjects significantly more important than – in their opinion – the students. There are only two exception: Information Technology and Physical Education. Parents, on the contrary, judge several school subjects less important than – in their opinion – their child does. Due to the large sample size, only the Technology and Lifestyles values are non-significantly different. As for mathematics, both parents and teachers considered it the second most important subject of the primary school, and according to their opinion, students may consider mathematics as even more important.

School subject	Parents		Teachers	
	Own	Child's	Own	Child's
Singing and Music	3.83 (1.03)	4.04 (1.00)	4.34 (.69)	3.62 (.94)
Religious Education	3.90 (1.17)	4.00 (1.11)	3.68 (1.27)	3.27 (1.06)
Second Language	4.84 (.51)	4.62 (.68)	4.66 (.58)	4.27 (.77)
Information Technology	4.65 (.72)	4.60 (.75)	4.54 (.74)	4.47 (.66)
Environmental Studies	4.75 (.54)	4.61 (.68)	4.78 (.45)	4.01 (.74)
Hungarian/Serbian Language	4.89 (.42)	4.74 (.58)	4.97 (.16)	4.48 (.67)
<i>Mathematics</i>	4.87 (.42)	4.79 (.54)	4.96 (.20)	4.63 (.61)
Drawing and Visual Education	4.05 (.93)	4.29 (.92)	4.41 (.66)	3.93 (.92)
Technology and Lifestyle	4.31 (.84)	4.30 (.85)	4.30 (.84)	3.76 (.95)
Physical Education	4.77 (.55)	4.72 (.63)	4.81 (.39)	4.66 (.69)

Table 1: Mean (and SD in parentheses) values on the importance of school subjects as judged by parents and teachers.

Interest in school marks

School subject	Parents		Teachers	
	Mark	Content	Mark	Content
Singing and Music	3	3	3	3
Religious Education	3	3	3	3
Second Language	4	4	3	3
Information Technology	4	4	3	3
Environmental Studies	4	4	4	3
Hungarian/Serbian Language	5	5	4	3
<i>Mathematics</i>	5	5	4	3
Drawing and Visual Education	3	3	3	3
Technology and Lifestyle	4	3	3	3
Physical Education	4	4	3	3

Table 2: Median values of the frequency of discussing school marks and content issues in each school subjects. (1 = not at all, 2 = monthly, 3 = weekly, 4 = several times per week, 5 = daily)

We hypothesized that parents discuss with their children their school marks and the content they learn in school frequently, and this might be especially true for Mathematics. The results are shown in Table 2. In the teacher questionnaire, the

analogous items concerned the frequency of how often they discuss the school marks and the content issues with parents.

There is no tendency revealed that school marks are more often discussed than content issues (neither in parents-child nor in teacher-parents relations). Nevertheless, a clear picture is seen in Table 2, i.e. Mathematics as a school subject is among the top two subjects where both school achievement and the content to be learnt are fairly frequently discussed.

Why is mathematics important? (H2)

The questionnaire offered eight aspects from which Mathematics as a school subject might be judged important for well-being in adulthood. Table 3 shows the Mean (SD) values of each item in the two questionnaires.

Aspect of well-being	Parents	Teachers
Getting to work	4.23 (1.05)	3.59 (1.18)
Participation in social life	3.92 (1.15)	3.45 (1.09)
High salary	3.70 (1.28)	3.31 (1.13)
Balanced private life	3.21 (1.43)	2.92 (1.17)
Openness in social interactions	3.14 (1.38)	2.96 (1.07)
Creativity in work	3.97 (1.20)	3.84 (1.17)
Successful problem solving	4.10 (1.20)	4.39 (0.96)
Sense of beauty	2.29 (1.43)	2.41 (1.25)

Table 3: Mean (and SD in parentheses) values on the importance of different aspects from which Mathematics is important as judged by parents and teachers.

Table 3 indicates that with the exception of the aspect of problem solving and sense of beauty, parents generally overvalue mathematics as compared to elementary school teachers.

As for the third hypothesis (H3), the possible differences between the two language groups have been checked for the mathematics-related items of each preceding analyses. In the teachers' sample the only significant difference between the two language groups were found on the item about the role of mathematics in fostering creativity ($t(72) = 2.25, p = .03$). In the parents' sample, due to the large sample size, several differences proved to be significant. The pragmatic role of mathematics is seen differently in "high salary", "creativity in work" and "successful problem solving" items ($p < .05$). Similarly to the teachers' questionnaire, Serbian questionees judged the role of mathematics in problem solving much higher; furthermore the Hungarian parents gave higher scores to the role of mathematics in creativity and in earning a high salary.

DISCUSSION AND IMPLICATIONS

Main points

Our research partly reassured our hypotheses. Parents and teachers seem to agree on the utmost importance of mathematics as a school subject. Mathematics is among the most frequently discussed school subjects both in parent-child and teacher-parent relations. Several aspects of well-being were unexpectedly undervalued (e.g. sense of beauty and balanced private life may and should be explicitly claimed as important aspects of making mathematics). In this respect it would be salutary to explore the opinion of another important group of stakeholders, namely, mathematicians.

Novelty

We would like to highlight two possible novelties of our research. First, we claim that investigating mathematical views in the framework of a systemic approach, i.e. mathematics is explored with an eye on the system of all school subjects, may bring new insights about the distinct role mathematics plays in the school. Second, the scarcity of research on parental views, and especially on a simultaneous enquiry on parents' and teachers' views indicates the need for such investigations.

Limitations

The usual limitations any similar study may face are to be mentioned here. One major point can be the issue of sampling and the selection of a multicultural region in Europe. We do not have enough information as to what extent our results might be generalizable concerning language and cultural boundaries. Another limitation factor is the typical indirect nature of the data collection when using questionnaires. In order to get the most possibly honest and objective answers, we aimed to use simple, straightforward items in closed-question format.

Practical considerations

Getting information on two key stakeholder groups concerning mathematics education provide a more comprehensible picture on the opportunity to meet with refusal when introducing new curriculum or instructional approaches in mathematics.

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