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Examination of Studies on History of Mathematics in Pre-Service, After Service and Graduate Education

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Abstract: This research is a document analysis that investigates the studies on history of mathematics in pre service, after service and graduate education. 39 studies were examined during the research. These studies analyzed according to the findings gained from the language used, study sample, type of study, research method, research design, title of research and results of studies and the data gathered is presented via tables. When collected data were examined generally, it was seen that most of the studies were conducted with teacher candidate samples and qualitative studies made in article format and written in English. When results of the study are examined, there can be seen an important lack of studies made for teachers and graduate students after the service and graduate education. Results show that there must be done more studies about history of mathematics after the service and graduate education, and there is a need to develop teaching materials and example giving practices for guidance.

Keywords: History of mathematics, mathematics education, document analysis.

History of Mathematics (HM) which is a subject that is known by a limited number of researchers, can be thought as an organic part of history of science that is also known by a less number of intellectuals too (Dosay Gökdoğan, 2004). HM is important for taking it out of abstract and showing that mathematics is a human made science and which phases it passed through up to now (Tözluyurt, 2008). According to Kronfellner (1997) HM presents development of mathematics as a human activity (as cited in Gulikers & Blom, 2001). This has an alert effect on students and teachers (Taşkın, Yıldız & Arslan, 2010). Knowledge learnt must be meaningful and deep to remain. Knowing the relation of mathematics with history may make teachers gain a deep understanding more than transferring the knowledge superficially to the student (Ellington, 1998). According to Sfard (1994) HM helps teachers to understand some misunderstandings and faults in certain subjects and so it can help to find what today's students find difficult. Also according to Fried (2007) HM makes mathematics more reachable and intriguing for students. HM helps to understand interior side of mathematical problems, techniques and concepts too (Fried, 2007).

As a result of benefits HM provides written above, researchers did many studies about HM in pre service, after service and graduate periods. Examining research trends of researchers interested in HM continuously is important to see the situation of national and international HM researches. Also it mustn't be forgotten that examining trends of researches about HM in mathematics give a light to researchers, educationists, teacher candidates and teachers for the scientific discussions and investigations (Baki & Yıldız, 2010). So within this study national and international studies about HM in pre service, after service and graduate periods are examined in different dimensions and future studies are tried to give directions by evaluating the situation of researches.

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Method

Document analysis method is used in this study. Document analysis includes analysis of written materials including knowledge about phenomenon and phenomenons aimed during researches (Yıldırım & Şimşek, 2005).

Population and sample

Studied universe of this research is all the studies about searched subject till 2012. Three studies before 2000 and 36 studies after year 2000 that thought to represent the universe and be reachable form sampling of the research.

Data collection and analysis

Because developing a common language is important in classifying education researches, firstly the studies done before related to the subject were examined (Aydoğdu & Yenilmez, 2012; Kayhan & Koca, 2004; Lubiensky & Bowen, 2000; Ulutaş & Ubuz, 2008) and titles similar to the titles used before were used. So researches about HM of pre service, after service and graduate periods are examined under six titles (language used, study sample, study type, research method, research design, research title) and results of the examined studies are qualitatively analysed. To provide the coding reliability, data were coded by the researchers independently. Reliability is calculated by the formula; Consensus of Opinions / (Consensus of Opinions + Separation of Opinions) and reliability coefficient is calculated as 0.92 (Miles & Huberman, 1994). Secondly researches about HM in pre service, after service and graduate periods were searched in internet too. 39 studies were reached as a result of this research. Thirdly these studies were converted to tables according to the properties examined. At this stage data that forms the outline of research findings were started to be gathered. Numerical data were gained about the studies converted to tables. Fourthly data were analysed and findings were interpreted.

Results

In this part findings of the research are presented. Distribution of examined studies according to the language used is given in Table I.

Table I
Distribution of examined studies according to the language used

Language Used	Turkish	English
Pre Service Period	6	18
After Service Period	1	12
Graduate Period	1	1
Sum	8	31

It is seen that studies about HM are done mostly in pre service period and least in graduate period in Table I. Also it is identified that most of the studies about HM done in pre service and after service periods are in English.

Information about study sample of studies is given in Table II.

Table II
Distribution of studies examined according to the sample of study

Sample of Study	Graduate Student	Teacher	Teacher Candidate
Pre Service Period	-	-	24
After Service Period	-	13	-
Graduate Period	2	-	-
Sum	2	13	24

According to Table II, it is seen that researchers made most of the studies in pre service period and

conducted these researches mostly with teacher candidates. Also there seems there are very few studies done with graduate students.

Information of examined studies about study type is given in Table III.

Table III
Distribution of examined studies according to their study types

Type of Study	Doctorate Thesis	Post Graduate Thesis	Paper	Article
Pre Service Period	-	4	5	15
After Service Period	2	-	4	7
Graduate Period	-	-	2	-
Sum	2	4	11	22

From Table III it can be seen that most of the studies in pre service and after service periods are as articles and all the studies in graduate period are as papers.

Information of examined studies about their study methods are given in Table IV.

Table IV
Distribution of study sample according to research method

Research Method	Mixed Method	Quantitative Method	Qualitative Method
Pre Service Period	-	10	14
After Service Period	1	4	8
Graduate Period	-	-	2
Sum	1	14	24

As seen in Table IV in the researches examined during the study, researchers mostly use qualitative method in pre service, after service and graduate periods.

Information about research design of examined studies are given in Table V.

Table V
Distribution of study sample according to research design

Design Name	Ethnographic	Experimental	Case Study	Survey	Design Name is not Specified
Pre Service Period	-	5	2	5	12
After Service Period	-	1	4	3	6
Graduate Period	1	-	1	-	-
Sum	1	6	7	8	18

Researchers seem to use various designs in the studies searched during the research as seen in Table V. There are more research designs than number of studies examined in after service period. Usage of more than one design in mixed method is the reason of this.

Information about research titles of examined studies is given in Table VI.

Table VI
Distribution of study sample according to research titles

Title of Researches	Effect of HM to Professional Development	Effect of HM to Learning of a Concept or Subject	Effect of HM in Meaning Mathematics	Directly Teaching of HM	Effect of HM on Mathematics View	Usage of HM in Classrooms	Effect of HM to Beliefs and Atitudes
Pre Service Period	-	-	1	3	4	5	11
After Service Period	1	1	1	1	-	7	2
Graduate Period	-	-	-	-	-	1	1
Sum	1	1	2	4	4	13	14

According to Table VI in pre service period most of the studies are done about effect of HM to the

attitudes and beliefs, in after service period most of the studies are done about usage of HM on classrooms.

Results researchers obtained in the studies examined during the research are shortly referred too. Results researchers found about HM in terms of graduate students, teacher candidates and teachers are collected and given in three categories.

Some results about HM in terms of *graduate students* are given as the following:

-Lessons of graduate students about HM make students gain knowledge about historical development of many concepts and historical events and make students develop positive attitudes to usage of HM in mathematics teaching. Also these lessons make them gain different points of view.

Some results about HM in terms of *teacher candidates* are as the following:

-Lessons of teacher candidates about HM provide teacher candidates rich experiences about historical development of many subjects and have positive effect on attitudes of teacher candidates about mathematics and usage of HM in mathematics teaching.

-Lessons of teacher candidates about HM do not enrich beliefs of elementary mathematics teacher candidates about how HM can be used on lessons but they have effect on their beliefs about why they have to use it.

-Teacher candidates who have HM lessons seem motivated and notice benefits of HM.

-It is seen that teacher candidates use experiences they got about HM on classrooms.

-Knowledge / understandings of teacher candidates about HM seem stereotype and superficial.

-Teacher candidates seem to have hesitations about when, where and how they use usage ways of HM on classes.

-HM helps teacher candidates to understand how the historical development of mathematics effected by social and cultural factors.

-Average points of HM knowledge, attitudes and beliefs of elementary mathematics teacher candidates about usage of HM in mathematics teaching increase as the level of their classes increase.

Some results about HM in terms of *teachers* are as the following:

-HM is seen as a source that can be used to enrich their lessons by teachers.

-HM seems to change beliefs of teachers about nature of mathematics positively.

-Teachers give importance to HM but they don't use HM on lessons much.

-Teachers believe that HM must be used in mathematics teaching.

-There is a meaningful relationship between HM knowledge of teachers and their views about mathematics.

-The basic reason teachers state why they can use HM on lessons is to motivate students in learning mathematics.

-It is seen that while application of Turkish teachers about HM is giving biographical information about mathematicians in history, applications of Portuguese, Spanish and French teachers are presenting historical problems to students before the lessons and make students solve problems and share these solutions with their friends.

Conclusion and recommendation

31 study written in English and 8 Turkish of 39 studies about HM in pre service, after service and graduate periods are examined in this study and results of these studies are analyzed qualitatively. Studies about HM are done in graduate period at most. The reason of this is thought to be that teacher candidates are easily reachable for university teaching staff. Besides, studies about teachers and graduate students are seen not enough. That's why increasing number of studies with teachers and graduate students is recommended.

Studies about HM in pre service and after service are mostly articles, all the studies in graduate period are in paper form. Also it is found that there are post graduate and doctorate thesis about HM too. But number of these thesis is very few. In many studies it is emphasized that HM enriched mathematics instructional program, gives opportunities to students and teachers to talk and think about mathematics, forces students to think critically and discover things and show students that mathematics is human made (Barry, 2000; Karakuş, 2009; Marshall & Rich, 2000; Tillema, 2005). When these benefits of HM are thought, there may be given more place to post graduate and doctorate thesis studies about HM.

It is found that researchers give more place to qualitative methods in researches about HM and number of quantitative studies is not enough when compared to number of qualitative studies. That's why number of quantitative researches may be increased.

When research titles are examined, it was determined that most of the studies are done about usage of HM on lessons and effect of HM to the attitudes and beliefs. There can be done more studies with different samples about effect of HM to make mathematics more meaningful, view of mathematics, a concept or subject learning and professional development of teachers. Also there can be given more place to studies about direct teaching of HM, effect of teaching applications about HM and experiences of teachers using HM too.

In terms of graduate students; lessons of HM make graduate students develop positive thoughts about usage of HM in mathematics teaching and gain different knowledge about historical events and historical development of many concepts. When these results are considered, number of studies about HM in graduate period may be increased.

In terms of teacher candidates; there can be find such results as HM lessons of teacher candidates provide rich experiences to them about history of many subjects, positively effect attitudes of teacher candidates about mathematics and using HM in mathematics teaching and not enrich their beliefs and thoughts about how HM can be used on lessons. When these results are considered, there can be given more detailed information to the teacher candidates about how HM can be used on lessons.

In terms of teachers; such results as teachers see HM as a source they can use to enrich their lessons, they give importance to HM but do not use it much on lessons, HM changes beliefs of teachers about nature of mathematics positively were reached. When these results are considered, teachers are advised to be informed with in service training activities organized by Ministry of Education about how they can take advantage of HM on lessons.

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