

## Co-existence of History of Mathematics and Modern Mathematics

Banihashemi, Saied Seyed Agha

Department of Science & Technology, MFA-Iran, Tehran, Iran;

Email: Ihusaied2001@yahoo.com

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Both history of mathematics and education of mathematics is old subject. The question arises whether can these two important subjects can help each other or not. Unfortunately this idea made mathematics society into two groups; one has idea that history of mathematics can help education of mathematics and other group has idea that not only history of mathematics can not help education of mathematics but also it makes some confusion.

In this article the author is going to do some comparison and take some conclusion that history of mathematics can make education of mathematics so active and interesting.

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*MESC Classification:* A30

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### 1. INTRODUCTION

We know that history of mathematics and education of mathematics both are two branches of mathematics science. A lot of research scholars in the world are working and doing research in these two branches of mathematics. Question is here whether these two groups of researcher can help each other? Reality is that in society of mathematics two idea are there on group which had idea that history of mathematics can help teacher of mathematics a lot and in next section we give some example to prove this idea and in other group people have idea that history of mathematics can not help education of mathematics and we give some points of their view. In the end in comparison of this idea the author gives conclusion (*cf.* Banihashemi, 2003)

## ON APPLICATION OF HISTORY OF MATHEMATICS IN EDUCATION OF MATHEMATICS

### 1-1. Application of history of mathematics

What is application of history of mathematics? We know that researcher's duty in history of mathematics is to read mathematical manuscript, understand those things and rewrite them in new mathematics so that these work need expert people which know old language and mathematics and some idea about society of that time. For that reason society of historian of mathematics in every where is small in number when compared to other branches of mathematics). And in this small society few people teach mathematics or thinking about education of mathematics now and usually 25% of papers in international conference of education of mathematics are about history of mathematics or its application.

So, a joint work of historian of mathematics and education of mathematics can prepare material for teacher of mathematics in high schools and universities. So when teacher came to know that in appropriate time they can explain about history of geometry, algebra, analysis, graph theory, and so on spicily when students feel tired in classes and still they have time to end of classes. By explaining of history of number student not only dose not feel tired but also wait for next classes to know more about numbers.

By knowing life history of Pythagoras (572–494 BC), Thales (c. 639–c. 546 BC), Arya-Bhatta (c. 476–c. 550), Ramarujan (1887–1920), Kharazmi (?–?), Kashani (?–?), Taragellia (?–?), and others, students who come to know that science is works of all civilization and have respect for other nation's young people of each civilization by history of mathematics will also come to know their old generation made contribution to construction of science as well that will find confidence.

One of the goals of education of mathematics is to teach better and better. In some mathematical manuscripts we can find methods on mathematical operation s which if we teach in this manner student can do faster and understand better two examples are as follows:

#### *a) Doing multiplication by Kashani method*

Sutdents with Kashani method are more comfortable (Ghorbani, 1998).

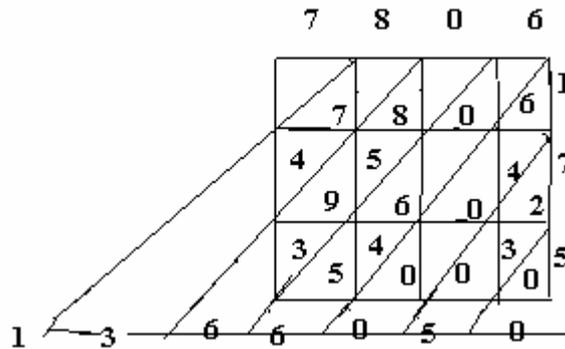


Figure 1.

*b) Solving equations Islamic mathematicians use visualization*

For better understanding of solving equations Islamic mathematicians use visualization; for example Kharazmi used geometry for explanation of procedure. He wants to solve  $x^2 + c = bx$ . He explained the system of solving in this manner (Berggren, 1986).

Let the side of square  $ABCD$  is answer of equation. In direction of  $AB$  and  $BC$  we choose  $D', C'$  since  $AD' = BC' = bx$ . The points  $E, F$  is middle of. Then we make square  $GFIH$  on  $GF$ , so we have:

$$GF = GE - FE = \frac{b}{2} - x$$

1) 
$$S_{GFIH} = |GF|^2 = \left(\frac{b}{2} - x\right)^2$$

So if we can calculate area of this square on basis of  $b, c$  with squaring we have value of  $x$  from figure it is clear that

2) 
$$S_{GFIH} = S_{GEC'J} - (S_{FEC'D'} + S_{HID'J})$$

From other side

$$HI = FD = CF, \quad HJ = DC = x$$

3) 
$$[(HI = FD = GF) \wedge (HJ = DC = x)] \Rightarrow S_{HID'J} = S_{DCEF}$$

From other side

$$S_{GFIH} = S_{GEC'D} - (S_{FEC'D'} + S_{DCEF}) = S_{GEC'J} - S_{DCC'D'}$$

$$4) \quad S_{GEC'J} = |GE|^2 = \left(\frac{b}{2}\right)^2$$

$$5) \quad S_{GEC'J} = S_{ABC'D'} - S_{ABCD} = \overline{AD'} \cdot \overline{AB} - |AB|^2 = bx - x^2 = c$$

From 3, 4, 5 we have

$$6) \quad S_{GFIH} = S_{GEC'J} - S_{DCC'D'} = \left(\frac{b}{2}\right)^2 - c$$

From 1 and 6 we have

$$7) \quad \left(\frac{b}{2} - x\right)^2 = \left(\frac{b}{2}\right)^2 - c \Rightarrow \frac{b}{2} - x = \sqrt{\left(\frac{b}{2}\right)^2 - c}$$

$$\Rightarrow x = \frac{b}{2} - \sqrt{\left(\frac{b}{2}\right)^2 - c}$$

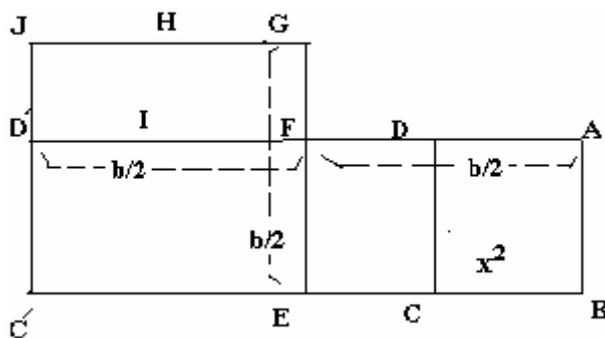


Figure 2.

Another application of history of mathematics is using correct name for correct formula in the below you can see a list of formula which named incorrect.

Correct  
Ghyathedin Kashany (8 Hejry)

$$\sqrt[n]{T^n + r} \approx T + \frac{r}{(T+r)^n + T^n}$$

**Mahvira (900 A.D)**

$$C_r^n = \frac{n!}{(n-r)!r!}$$

**Aryabatai (499 A.D)**

$$Nx^2 + 1 = y^2$$

Rung  
Febunaji

$$\sqrt{a^2 + r} \approx a + \frac{r}{2}$$

$$\sqrt[3]{a^3 + r} \approx a + \frac{r}{(a+1)^3 + a^3}$$

**Herigeone (1634)**

**Pell (1685)**

And so on (Balchandra, 1994; Bunt, Jones & Bedient, 1976).

In history of mathematics we have a lot of problems in different level which can improve mathematical thinking of students' considering to following example.

**Example 1.** Abolvafa Bozjani one of the famous mathematician of 328 of Hejry (940 AD) who had very nice books which all translated in English and French. In his book with the name of geometry operation there is very beautiful problem which can make student interested and better think as follows:

“How we can make with three equal squares a new square”

Let the student thinks for few minutes and compare their work with Bozjani method.

**Solution:** Let a, b, c three equal squares we divide two of them into two parts by diameter as follows:

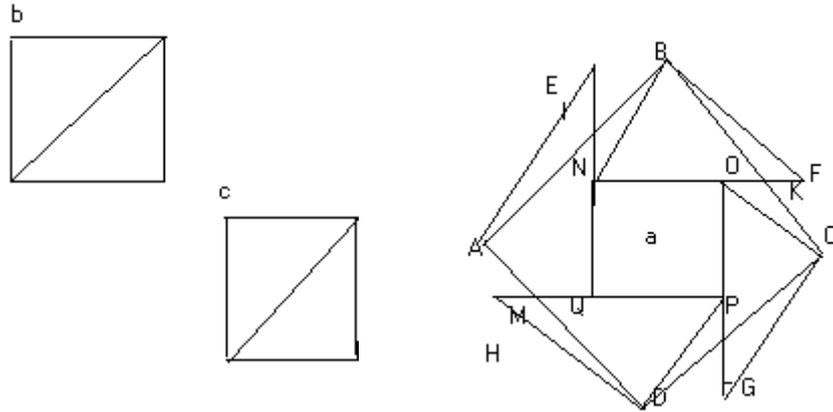


Figure 3.

**Example 2.** Now the mathematicians who are not agreeing with history of mathematics claim that mathematical text for usage of teachers are not enough and even if some history of mathematics books are there, they do not know how to use them.

Some problems in history of mathematics make confusion for student such as squaring the circle:

**Example 3.** Squaring circle by Ramarujan method: Squaring the circle is another problem which different civilization was interested.

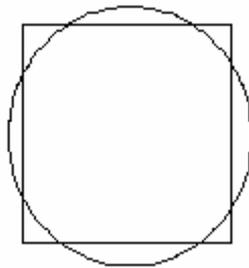


Figure 4.

It seems very simple according to the idea of students but when they start to calculate they will see it is not possible because

$$A = \pi R^2 \text{ if } R = 1 \Rightarrow A = \pi$$

Area of a circle with diameter 1 is equal to

$$A = x^2 \Rightarrow \pi = x^2 \Rightarrow x = \sqrt{\pi}$$

Since  $\pi$  is unknown never we can find  $x$ . But different mathematician from different civilization tried to find a system to solve this problem (Balchandra, 1994)

In comparison of these waves we can conclude that positive points for co-existence of history of mathematics and education of mathematics are so much than negative point I will suggest that all those studying mathematics to be teacher must pass a course on history of mathematics.

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