UDC:37.51.30

REVIEW OF CONCEPTS, FORMS AND DIFFERENT WAYS OF REPRESENTING THE METHODS OF MATHEMATICAL INDUCTION, CHARACTERIZATION OF ITS IDEAS AND PRINCIPLES

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Abstract*: The inductive method plays a significant role in understanding the principle of mathematics. Although, the range of the problems concerning the usage of the mathematical induction method has grown, in school syllabi very little attention is paid to the issue. If mathematical induction teaching methods are improved, more and more students would become interested in it. This is a powerful and sophisticated enough method to be acceptable for the majority. For students the learning process sometimes may seem boring, therefore we can attract their attention with the help of information technologies. It can be done by creating multimedia learning objects. In that way teachers can work easier and faster, paying more attention to practical assignments. The created multimedia learning object "Mathematical induction" serves as successful evidence to that statement.*

Keywords*: Mathematical, elementary school, intellectual skill, speech, calculate development, calculate statement.*

Herbert S. Wilf, Professor of Mathematics from the University of Pennsylvania has said: "Induction makes you feel guilty for getting something out of nothing, and it is artificial, but it is one of the greatest ideas of civilization." (Gunderson, 2011, p. 1).

Mathematical induction is like real life when a little sprout grows and blossoms into a magnificent flower, when a small acorn transforms into a huge oak tree, when two cohabiting people develop a family, when substantial aims are born of a simple thought, when a single drop of water creates a puddle, when great love thrives from a single sight, and when a large house is built by putting together brick by brick.

The method of mathematical induction can be compared with the progress. We start with the lower degree and, as a result of logical judgments; we come to the

general conclusion (result). The man always tries to advance, tries to develop his ideas in a logical way, consequently, nature itself makes the man think in an inductive way.

A natural beginning of how to prove complicated mathematical things is to view simple cases. It helps us to visually understand what is required by the task and gives us essential hints on how to come up to proof.

Many authors compare mathematical induction to dominoes toppling in succession. (Gunderson, 2011, p. 4). Suppose that: 1) We can knock down the first domino; 2) the dominos are so close, that each previous will knock the following one down when falling.

Another analogy for mathematical induction is given by Hugo Steinhaus in Mathematical Snapshots in the 1983 (Steinhaus, 1983, p. 299). Consider a pile of envelopes, as high as one likes. Suppose that each envelope except the bottom one contains the same message "open the next envelope on the pile and follow the instructions contained therein." If someone opens the first (top) envelope, reads the message, and follows its instructions, then that person is compelled to open envelope number two of the pile. If the person decides to follow each instruction, that person then opens all the envelopes in the pile. The last envelope might contain a message "Done". This is the principle of mathematical induction applied to a finite set, perhaps called "finite induction". Of course, if the pile is infinite and each envelope is numbered with consecutive positive integers, anyone following the instructions would (if there were enough time) open all of them; such a situation is analogous to mathematical induction as it is most often used.

To understand the method of mathematical induction, several teachers of mathematics both in Latvia and abroad, make students solve the task about the Towers of Hanoi, invented by the French mathematician Edouard Lucas in 1883. Task 1: three rods and a number of disks of different sizes are given. Only smaller disks may be placed on larger disks.

Many teachers ask their students to create visual models in order to understand

mathematical induction. If there are n people at the party and each person shakes the hand of each other person exactly once, how many handshakes take place?

The figure demonstrates that the number of handshakes for one person equals to 0, two persons have one handshake, three persons - 3 handshakes, four persons - 6 handshakes, five persons - 10 handshakes and six persons - 15 handshakes. Students can further make their own conclusions that for n number of persons the number of handshakes will be. This can be easily checked for several n values by using the options in MS Excel, as shown in Figure 6. The n values n = 1, 2, 3 ... are entered in the first row. But the values of expression (n-1) . n : 2 are calculated in the second row. Besides, the values in Excel spreadsheet can be calculated very quickly by using the sensitive point and dragging it with cursor as far as you wish.

The method of mathematical induction should not be confused with the inductive reasoning, discussed previously. That is, inductive arguments allow us to formulate hypothesis at the end of experiment or observation but they cannot be taken as mathematically correct proof. Whereas the principle of mathematical induction, if correctly applied, is an example of mathematically correct proof. (France, France, Stokenberga, 2011).

The idea of mathematical induction has been with us for ages, certainly since the 16th century, but was made rigorous only in the 19th century by Augustus de Morgan who, incidentally, also introduced the term "mathematical induction". By now, induction is ubiquitous in mathematics and is taken for granted by every mathematician. Nevertheless, those who are getting into mathematics are likely to need much practice before induction is in their blood.

Mathematical induction is a powerful proof technique that is generally used to prove statements involving whole numbers.

There are many forms of mathematical induction - weak, strong, and backward, to name a few. In what follows, n is a variable denoting an integer (usually nonnegative) and S(n) denotes a mathematical statement with one or more occurrences of the variable n. (Gunderson, 2011, p. 35).

The method of mathematical induction can be successfully illustrated. The

assertion S(n) can be depicted with a line of squares:

If S(1) is veritable, then we can color the first square:

But the condition "from every natural k, if S(k) assertion is true, follows the verity of the assertion S(k+1), then the assertion S(n) is true for all the natural n" in geometric way means the following transition:

In that way we get a belt where the first two squares are colored:

By repeating the transition one more time, we get a belt where the first three squares are colored:

At schools, teaching the method of mathematical induction, usually the simplest schemes are covered however more complicated schemes can describe parallel mathematical induction and structural or two-dimensional mathematical induction. (Andювns, Zarітр, 1983, p. 70-99)

Multimedia learning is the process of learning, usually in a classroom or similarly structured environment, through the use of multimedia presentations and teaching methods. This can typically be applied to any subject and generally any sort of learning process can either be achieved or enhanced through a careful application of multimedia materials. Multimedia learning is often closely connected to the use of technology in the classroom, as advances in technology have often made incorporation of multimedia easier and more complete.

In general, the term "multimedia" is used to refer to any type of application or activity that utilizes different types of media or formats in the presentation of ideas.

Multimedia is the combination of various digital media types, such as text, images, sound, and video, into an integrated multisensory interactive application or presentation to convey a message or information to an audience. (Shank, 2005, p. 2).

Multimedia helps people learn more easily because it appeals more readily to diverse learning preferences.

The aim of multimedia learning object is to provide learners with the possibility to understand and learn the method of mathematical induction in a user-friendly manner and speed. It is available for students and teachers in Latvia by attending the classes at Extramural Mathematics School of the University of Latvia.

It can be used by

1) students learning the method of mathematical induction in accordance with the requirements of mathematics curriculum standards,

2) gifted students who study for mathematics competitions and olympiads,

3) teachers wishing to present the nature and potential of the mathematical induction method in an attractive manner,

4) anyone who wants to find out the link between the method of mathematical induction, growth and life processes. Mathematical induction teaches students not only mathematics but also life - in order to develop we need to start with the minimum, take the first rung, the first step.

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