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Soroban – a road sign for future education

Introduction

Perspicacious observers of contemporary reality keep repeating that we do not only live in 'the epoch of changes' but that we are participating in a true 'change of epochs'. This transformation does not make it possible to perceive clearly the future of our world, the community in which contemporary children and youth will have to live. The situation of accelerated and continuous changes makes the task of passing on knowledge, skills and educational attitudes to new generations extremely complicated. The development of modern technologies offers every inhabitant of cyberspace a wide access to information (information is commonly available yet it is not equivalent to knowledge). The contemporary teacher is no longer the only source of information for the student and school is not just a place for acquiring knowledge any more (students do not come to school just to acquire knowledge). The status of communications models has also been transformed. In view of the excess of information the communication of scientific issues is becoming a very complex question. The attitude to school curricula is also changing. Instead of the approach from the teacher, a more and more frequently suggested one is that from the student (Wołkiewicz, 2019). There appear certain road signs on the road aiming at searching for future models of education. They can hardly be seen from the perspective of formal education. They are much more visible from the level of informal or incidental education.

Alternative education in the 21st century

Alternative education brings about numerous dilemmas both in theory and in practice. The reasons for such a situation can be found in many areas. Beginning with educational and pedagogical ones, through social and cultural ones and finishing with the politics. For some people it will be a struggle for the basic human right to be themselves in any situation, to be an individual. For others, it may be screaming for the return to the sources and tradition of education.

For methodology reasons we should quote a sentence by Zbyszko Melosik and Bogusław Śliwerski: "alternative education signifies such a type of education or upbringing which is different in some way from the one that is commonly offered by educational institutions. Alternative schools are also known as free, open, independent, nontraditional, private, innovative, experimental or reform schools…" (Melosik, Śliwerski, 2010). It is worth mentioning that today's student more and

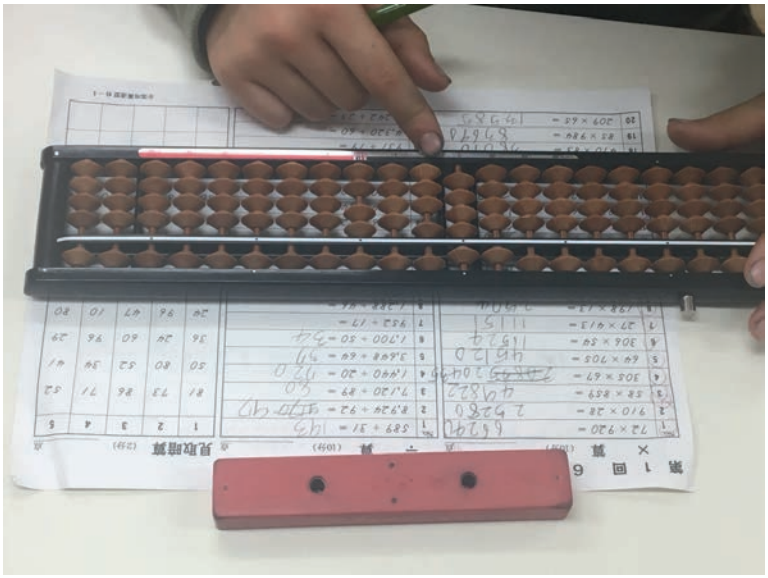

Photo 1. The Japanese abacus – "Soroban"

more often uses not only the state-run, traditional educational offer but they also take advantage of numerous forms of non-formal education. Living in constant online contact with peers and the Internet reality, they also frequently undergo the processes of incidental education unconsciously. There appears a question if a contemporary student still needs the teacher – master and if so, what kind of teacher and what for? Soroban is a still little popular form of effective teaching and education in Europe. It seems that theoretical scientific reflection on this phenomenon could make the encounter with this medium a more creative one.

Soroban – old media

Although the contemporary human does not imagine life without the use of new media, the rediscovery of ancient methods of transferring information and knowledge popularization may turn out to be creative even for a digital user.

Soroban is an old Japanese abacus for performing mathematical calculations (photo 1).

According to Ewa Puchalska and Zbigniew Semedeni the abacus is any device allowing us to represent numbers using stones in the form of spheres, knobs, beads or pawns which enables us to add and subtract numbers through appropriate manipulation of the stones. (Puchalska, Samedeni, 1985). They allow performing many activities which facilitate the formation of mathematical notions, offer the opportunity for a great number of simple memory-based counting, which make calculations simpler and also, by enabling a more comprehensive consideration of arithmetical problems, deepen their comprehension. They were already used in ancient Rome. They also got to Asia. In China during the Ming dynasty abacuses became popular under the name of suanpan (photos 2 and 3). Via Korea, they reached Japan in

Photo 2. Old Chinese abacus (1)

Photo 3. Old Chinese abacus (2)

the 15th century. Inhabitants of the country of Cherry Blossom improved the invention and called it soroban. In the Edo period (1603–1868), despite the fact that Japan was a closed country (sakoku), traditional system of education allowed the application of soroban. At that time, particular hans, that is provinces governed by feudal lords, kept their own schools where mostly samurais' children were educated. Private schools and academies had a major participation in education (Hałasa, 2004). The most important educational center was Edo, as Tokyo was called back

then. During the rule of Emperor Meiji (1868–1912) there occurred a rapid change resulting from the violent process of modernization and absorbing Western notions (Pałasz-Rutkowska, 2019). It also regarded the ways of educating. It turned out that soroban was still useful and students still had to learn to master it. In 1938 calculation techniques using the abacus were included in the Mathematics textbooks developed by Ministry of Education (Cusick, 2010). After World War II, the fast process of development in Japan, as well as general computerization led to giving up traditional values including the soroban calculations. The problems resulting from that decision made the Japanese aware of the imminent dangers and in recent decades there occurred a return to teaching the rudiments in all the fields. In 1989 Ministry of Education recognized the necessity of broadening the education by teaching students to use soroban as the basis for Mathematics teaching in elementary schools (Soroban in Education and Modern Japanese Society, 2014).

At present in Japan soroban is used not only in public elementary schools but also in many so-called afternoon schools. One of the most perfect techniques of using this abacus is called ISHIDO-SHIKI and was developed in 1973 by master Kenichi Ishido, the President of Soroban Foudation of Japan (photo 4). The organization comprises of various schools in Japan, working with the ISHIDO method (photo 5). Leading promotional activities, it points out the importance and advantages of learning to count on soroban. At present in Poland there are two private schools educating children, youth and adults according to the ISHIDO method. Completing particular stages of learning is followed by an examination, and in the event of passing it, the Japanese certificate is awarded. There have been organized Championships of Poland in Soroban Counting (Championships 2014, 2014). The first teacher in Poland who passed the examination successfully and was awarded the certificate of the Japanese Soroban Association authorizing to teach this method is Karol Sieńkowski, the founder of the Soroban Academy in Siedlce.

Photo 4. Mr Kenichi Ishido, The President of Soroban Foundation of Japan

Photo 5. A student at ISHIDO-SHIKI school in Shiroi (Japan)

Soroban – how does it work?

The construction of soroban is slightly different from the construction of rod abacus used in Europe. The European version of abacus usually has ten horizontally oriented rods with ten beads on each of them. Soroban is built in the following way: all the rods are divided into two parts. In the upper part, called in Japan 'heaven', there is one bead, whereas in the lower one, called 'the earth', there are four beads. Each lower bead has the values of 1, the upper bead equals 5. The Japanese solution is much more advanced than the European version as any number can be represented in one way only.

With the use of soroban all the basic calculations can be done: addition, subtraction, multiplication, division, square rooting of integers, negative numbers and fractions (Mączka, 2012). The calculations are done with the help of moving the beads with one's fingers. The aim of such training is leading to performing all the calculations in your mind, due to the visualization of soroban. It is the so-called anzan method (Bernazzani, 2005; Markarian, 2011). In the ISHIDO method the degrees of students' skills have been developed from 10 kyu to 1 kyu and from 1 dan to 10 dan at the master's level.

Soroban – it is something more than just an abacus

The soroban abacus allows the child to undergo the difficult stage of getting rid of the physical interpretation of a number as a number of items in a stressless way. Through visual representation of a number in a specific system of beads, after years of practice, numbers stop being an abstract notion and appear as a specific image generated in the right hemisphere. The beginners, playing and moving the beads are not aware of the fact that they are learning Mathematics in this way. Students using soroban understand the structure of the decimal system as well as the numbers'

values, they have a possibility to perform difficult arithmetical operations 'step by step' which is conducive to better understanding of the calculations.

The abacus is one of the most effective methods making work more efficient. It turns out that during performing the operations on soroban the activity of the brain's right hemisphere increases significantly, the neural connections between both hemispheres are strengthened and the new ones are built. It has significant influence not only on Mathematics teaching but on teaching any other subject as well. A strong connection between the finger movement while performing the calculation on soroban and the development of the brain was confirmed as a result of neurological research. Soroban requires from the user visual observation, thinking and providing the answer through moving the beads. Therefore calculation is not the only skill which is acquired by the student due to the efficient use of the abacus. The capacity for concentration, memory and the ability to assess the situation are clearly improved (Miur, 2018). Soroban stimulates the willingness for development in children while positively shaping their psyche and improving the sense of self-confidence.

As Karol Sieńkowski points out "The child focused on calculation forgets about the whole world, he or she only sees the abacus and the beads. It is a therapeutic effect hard to overestimate, leading to calming down of the mind attacked by numerous stimuli. Hence the person practicing the soroban calculations learns self-discipline, concentration, patience and being systematic. They grasp that the success can be achieved through hard work only. And at the same time – they develop their minds" (Mazurek, 2018). The foregoing theses are confirmed by the results of the research carried out by Shizuko Amaiwa from Shinshu University (Amaiwa, 1987; Amaiwa, Hatano, 1989). Using soroban on a regular basis improves memory span of the users, improves problem solving skills and understanding spatial systems.

The mind that acts efficiently carries out quick analysis and correct synthesis is creative and helps to function in the society creatively. The children who carry out calculations on soroban achieve success at school more easily during other scientific activities than just Mathematics. Yet it is not only about children. Calculations on soroban decrease the risk of the occurrence of dementia and Alzheimer's decease. That is why in Japan many centers for the elderly organize soroban calculation activities. It not only trains the memory considerably but it stimulates the brain operations in elderly people (Takahashi, 2018).

There has also been noticed a certain danger connected with using soroban, especially by children. The unchangeability of the methods in the performed calculations may bring about lack of flexibility in behavior, which may cause little innovativeness in problem solving, in particular those mathematical ones. A similar threat is also noticed by Karol Sieńkowski who remarked that after reaching a certain proficiency, soroban stops being a tool for mathematical development and becomes "a machine for calculating, not requiring almost any intellectual effort on my part" (Sieńkowski, 2011). The solution to this problem is still an open perspective both in the practical and scientific aspect. However, measurable benefits resulting from fluent use of the abacus outweigh significantly the perceived danger.

Summary

Soroban is an educational road sign for those who take the future education seriously. It is an effective tool for knowledge popularization, not only Mathematics. It develops the awareness of numbers and arithmetical skills. It is a good means for developing the ability to perform quick memory calculations. It strengthens and builds neural connections between the brain hemispheres. It develops manual skills and hand-eye coordination. It teaches self-discipline and concentration. It plays the motivating role in the process of teaching at every stage. In adults it helps prevent senile dementia and Alzheimer's decease.

References

Amaiwa S., (1987), *Transfer of subtraction procedures from abacus to paper and pencil computation*, The Japanese Journal of Educational Psychology, 35, 1.

Amaiwa S., Hatano G., (1989), *Effects of abacus learning on 3rd-grades' performance in paper-and-pencil tests of calculation*, Japanese Psychological Research, 31, 4.

Bernazzani D., (2005), *Soroban abacus handbook*, http://www.zetatalk3.com/docs/Education/Ancient_Calculators/Abacus_Handbook_2004.pdf

Cusick J., (2010), *The Japanese Soroban: A brief history and comments on its educational role*, Osaka Abacus Organization, Osaka.

Hałasa D., (2004), Życie codzienne w Tokio 1990-2004, Wydawnictwo Akademickie Dialog, Warszawa.

Markarian K., (2011), *Soroban: The Japanese abacus*, http://www.japan24.org.uk/downloads/resources/soroban/soroban_1.pdf

Mazurek M., (2018), *Rozwój osobisty nie ma końca*, Prestiż. Magazyn lokalny, 2(64), 10–11.

Mączka M., (2012), *Soroban – japońskie liczydło w edukacji matematycznej XXI wieku*, „Chowanna" 2, Biblioteka Uniwersytetu Śląskiego, 205–213.

Melosik Z., Śliwerski B., (2010), *Wstęp*, [In:] Z. Melosik, B. Śliwerski (eds.), *Edukacja alternatywna w XXI wieku*, Oficyna Wydawnicza „Impuls", Kraków, 12–13.

Mistrzostwa 2014, (2014), https://akademiasorobanu.pl/mistrzostwa-2014/

Miur K., (2018), *Ministerstwo Edukacji w Japonii zauważ efekty nauczania sorobanu*, http://www.chunichi.co.jp/article/living/life/CK2018041302000004.html

Pałasz-Rutkowska E., (2019), *Otwarcie i modernizacja*, Polityka. Pomocnik historyczny. Dzieje Japonii, 4/2019, 87–90.

Puchalska E., Semedeni Z., (1985), *Przegląd pomocy naukowych*, [In:] Z. Semedeni (ed.), *Nauczanie początkowe matematyki*, Wydawnictwa Szkolne i Pedagogiczne, Warszawa, 81–111.

Sieńkowski K., (2011), *Moje spotkanie z sorobanem*, Matematyka. Czasopismo dla nauczycieli, 5/2011, 26–29.

Soroban in Education and Modern Japanese Society, 2014, http://www.shuzan.jp/english/education/

Takahashi J., (2018), *Japoński przepis na stuletnie życie*, Wydawnictwo Czarna Owca, Warszawa.

Wołkiewicz A., (2019), *Relacje mistrz-uczeń a programy nauczania. Poszukiwania modelu idealnego*, [In:] J.R. Paśko (ed.), *Nauczyciel i uczeń we współczesnej szkole*, Wydawnictwo Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie, Tarnów, 81–92.

Soroban – a road sign for future education

Abstract

At the time of dynamic development of new technologies and easy access to varied tools facilitating the solving of complex mathematical and IT problems, one may notice a discreet and timid comeback to old and often forgotten educational tools. The author, asking about the shape of the future education remarks that formal education is often replaced by new examples of non-formal and incidental education. This manner of learning, different from the one commonly offered by educational institutions, turns out not to be less effective.

A perfect example here is the skill of using soroban – a Japanese abacus. At the beginning the author presents history of abacus which dates back to Ancient Rome. In 15th century it travels from China, via Korea to Japan. In modern times, when computational technique using soroban was permanently included in Mathematics textbooks, developed by Ministry of Education in Japan, it is constantly being improved. This technique and culture arrived in Poland where the Polish Championships in Sorban Calculations have been held since 2014.

The author defends his thesis that soroban is something more than just an abacus. Basing on research results he point out to the relationship between the finger movement during the calculations on soroban and brain development in students. A considerable increase in the activity of the right hemisphere and new connections between both hemispheres affect the improvement of concentration, memory and evaluation of the situation. The capacity for solving complex problems and understanding spatial systems is improved. Skillful soroban use decreases the risk of dementia and Alzheimer's disease.

Keywords: abacus, soroban, education for tomorrow, mathematical education

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