TRANSFORMATION OF IT EDUCATION IN SCHOOLS - POLISH EXPERIENCES

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Abstract. It is worth recalling that until the mid-1960s, the term "computer science" did not appear among the concepts of Polish. As claimed by prof. W. Turski, the word "computer science" was first used during a nationwide conference on mathematical machines in 1968 in Zakopane (Łaszczyk, 2008). We recall this fact not out of a passion for presenting historical events but because to show that the discipline we are talking about is only half a century old. Against this background, it is impressive to see that at The Maria Grzegorzewska University in Warsaw[1], studies to prepare future IT teachers have been carried out for almost 30 years. This specialty, changing its name and curriculum several times, currently functions as "pedagogy of giftedness and pedagogy of computer science". Established in 1991 on the initiative of the then head of the Section of Methodology and Pedagogy of Creativity - prof. Andrzej Góralski - was a response to new educational challenges: preparation of teachers capable of educating young people for the needs of the civilization that will come in the future and the education of skillful and motivated educators with competences to work with a talented student. These two parts of the name indicate the scientific and didactic experience of people who were or are associated with the Section of Methodology and Pedagogy of Creativity over the years. These experiences set the perspective of looking at changes in the field of IT education of students at school. The presented article aims to present the changes that IT education of children and adolescents underwent and the related preparation of students for the profession of IT teacher. The culmination of the undertaken topic will be the identification of changes that we must take into account when dealing with computer science didactics.

Keywords: IT education, creativity, IT teacher

Introduction
IT education in Poland - the beginnings

[1]The Maria Grzegorzewska University is the oldest pedagogical university in Poland. It was created in 1922 as a result of the efforts of her current patron - Maria Grzegorzewska. Initially, educators were prepared here to work with people with special educational needs, and now it is a university with a full academic profile.

The first classes in computer science in Poland were conducted in high schools in Wroclaw as early as 1965. These classes included the construction of computers, programming, and solving mathematical tasks using a “mathematical machine” (Sysło, 2005, strony 48-49). Over the decades, the implementation of IT education has been focused on exploring the possibilities of computers and teaching programming. Thus, it was addressed to older students. This state of affairs was conditioned by the properties of the computer hardware used at that time. Although Poland had leading in Europe, and even in the global dimension, scientific staff background capable of effectively creating software products, but technologically our country was not prepared to participate in the production of equipment.

In addition to the ODRA analog computer manufactured by the Elwro company in Wrocław, we had a "hit" - K-202 minicomputer constructed in the early 70s by Jacek Karpiński. Despite the sensational properties at the time (K-202 worked better than personal computers manufactured 10 years later) the production of this minicomputer did not exceed the prototype scale (only about 30 copies were produced). It is obvious that the equipment owned - like in other countries - could not be used to support educational processes.

The first courses for future IT teachers in Poland were organized in the mid-1970s in Warsaw. 300 math teachers who learned how to teach computer science in high school took part in them. Due to the lack of access to computers, the course consisted of a theoretical and practical part. The first sign of an electronic revolution in economics, industry, education, and social life were top-down government resolutions. They played a key role in the centralized political system, as they were followed not only by development programs but also by their financing. The first government program aimed at, among others, popularizing and modernizing the educational system using computers. By 1980, over 1,000 teachers had completed these courses, which allowed them to teach computer science in theory at over 1,000 high schools. In 1981, the Polish Information Processing Society was established, supporting IT education at all stages of education. Computers in Polish schools appeared in the mid-1980s, and together with them through textbooks, educational software, magazines and materials targeted at students and teachers, the computer education market was saturated. Theoretical lessons turned into practical learning of programming in Logo and Pascal. In 1985, the Ministry of National Education approved a computer science curriculum, prepared by S. Waligórski and his team, consisting of 75 lessons lasting 45 minutes each, covering computer use, drawing, programming, graphic creation, text operations, and learning to solve advanced problems. The second government program concerned the digitalization of economics and the development of the electronics industry. For education, the third program was important, concerning IT education in schools (including teacher preparation, providing hardware and software, providing textbooks and conducting research and development) and the fourth, concerning the implementation of computer techniques in high schools and colleges (focusing on educating future specialists and the use of technology at work). This was the foundation of the current IT education system (Sysło, 2014).

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During this period, program teaching was also popularized, which was to "automate" the learning process, while adapting the speed of knowledge acquisition by the student to his individual capabilities. This American idea primarily functioned in Poland at the conceptual level and did not affect the shape of the educational practice. It is worth recalling that Polish pedagogues have significantly modified the cited method. Based on the behavioral theory of positive reinforcements, in accordance with the S-R scheme, the program teaching method procedure, the senior of Polish didactics Cz. Kupisiewicz supplemented with an important element in the form of a problem block. Thanks to this, the modified method has gained much value in relation to its American original. However, the initial idea of the method, close to the student's programming, just like computer programming, evolved over time to prepare children to be able to program the computer (Papert, 1996).

The 1990s - computers are needed!

The 1990s brought increased interest in the educational scope of using computers. In many general and technical high schools, the number of profiled classes increased, which aimed to create the elementary foundations necessary for the effective education of future IT specialists.

The popularity of commercial adult computer courses was also evident so that they could use computers in their work. The automation of various areas of life (cash registers, accounting and warehouse programs, the transition in offices from traditional typewriters to computers with office software) meant that high school graduates were expected to have basic skills in the use of computer software.

New educational needs - the computer as a tool for work and education

The beginning of the twentieth century brought the conviction of the need for "computer literacy", including the use of new technologies in various fields and leading to "proficiency in the use of information technologies" (Sysło, 2005, str. 35). Thus, IT education was to equip the student with the ability to use the computer in studying various subjects. It was to enable him or her to understand acquired knowledge better, to provide greater freedom in the choice of good sources of information, competence in using a computer to write, calculate, present, or manage data. IT subjects, called variously: from information technologies, through computer science, IT or computer classes, focused on handling application programs, especially from the Microsoft Office suite, which dominated the Polish education market. The purpose of IT education was to prepare students for efficient computer use in various situations. This was due to the fact that it was recognized that more and more professions must use computer office or specialized software. It should be emphasized that this was a period when computer classrooms were very poorly equipped. In one classroom there were computers of very different standards, which

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made it difficult to conduct a uniform lesson for everyone. The need to introduce computer science classes already in primary school, although not from the first stage of education (from grade 4, between the age of 10-11), forced schools to seek teachers - specialists in this field. Although the use of office software was mainly taught, there were also elements of programming in the higher classes. These skills were taught in elementary school in the Logo Comenius environment, while older students learned programming in Pascal. The more talented could take part in competitions in this field. The spreading Internet and its wide possibilities also forced the implementation of tasks in the field of searching, organizing, and critical selection of information.

In the junior school classes and even in kindergartens, computer classes were conducted only in some establishments that had sufficient technological facilities. At the same time, it has become apparent to many educators that for children of this age, IT education is important because, on the one hand, it prevents digital exclusion by acquiring skills in this area early, and on the other, it prepares students for valuable use of information technology resources by which equips them with the ability to use tools that improve both their efficiency and the efficiency of collective action (Wenta, 2013).

During this period there was also an increased demand for extracurricular activities in the field of information technology. The Polish Information Processing Society has made it possible to take examinations for the so-called European Computer Driving License and many teenagers have successfully taken up this challenge. Programming or computer classes for children and youth were conducted in community centers and other out-of-school education institutions.

The focus on the choice of IT profession was emphasized by education in profiled classes at the secondary school (less often) or high school. By choosing an IT or mathematics-IT class profile, students received an increased number of hours in mathematics and computer science, which gave them a good basis for a further choice of computer science studies. Computer Olympics were also available for junior high school and high school students.

It has also become noticeable that students should be equipped with competences related to the conscious use of media. That is why there have also been proposals to combine IT and media education into one subject (Siemieniecki, 2003).

As part of the specialization at The Maria Grzegorzewska University, there was an increase in interest in IT. Highly motivated students came to us, convinced that the acquired competences would help them find a good job. They often expressed the willingness and belief that the profession of IT teacher is consistent with their professional interests. Graduates of the specialization graduated with a thorough knowledge of application programs, the basics of logic, algorithms, and programming in educational environments, the ability to create own teaching materials using ICT tools, and flexibility in using available tools. They easily found a job as an IT teacher at schools at various levels (they taught both young children and teenagers in general and vocational schools), but also joined other institutions that dealt with IT education for children and youth.

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However, a certain breakthrough was Poland's accession to the European Union, the consequence of which was, inter alia, opening new labor markets. Among graduates, for a few years after joining the EU - a huge percentage of young people immediately left for Western Europe in search of a better life. Unfortunately, many of the graduates prepared to work at school undertook simple work on plantations (fruit and vegetable collections, processing plants) or other services that were inadequate to their education, which, however, provided them with a higher income than teachers' salaries. Interest in the country and the desire to get a good preparation to work as an IT teacher decreased.

The consequence of the popularization of computers has also become the progressive bureaucratization of the school, the need to write reports and descriptions instead of teaching. Computer science teachers also reported another difficulty - they were assigned not only a didactic but also a technical role. Their tasks included taking care of computer classrooms, school networks, running the school website, as well as servicing and repairing equipment located anywhere in the school, including the headmaster's office and the secretary's office.

Changes in the curriculum - we already educate future IT specialists at school

Since 2017, we have been working with a new core curriculum, which introduction was preceded by a social discussion about the directions that IT education should take. In the new basis, the main focus shifted to the algorithmic and programming skills of students. This is due to the growing demand for specialists who are able to deal with both computer hardware and create a variety of software for it at various levels. And at the same time, among high school graduates, interest in science decreased, including mathematics and computer science, which even led to the closure of these fields of study. Thus, IT education must also meet social needs, and enable children from the earliest years to learn the secrets of computers, understood here as teaching algorithms and programming in place of using information technology tools.

As indicated by M.M. Sysło, the current basics of computer science teaching are:

- shaping a proper hierarchy of general goals, in which the most important are those concerning logical, abstract and algorithmic thinking;
- spiral, allowing you to return to the same goals throughout your education; an example of a topic that has been repeated many times in IT education is ordering and searching;
- computational thinking - as an important goal of IT education; this thinking refers to the formulation of the problem and its solution so that the computer - a human or a machine - can successfully implement them; this thinking is the basis for an IT approach to problems;
- programming, which is a dialogue with a computer, maintaining the principle that the goal of programming is an abstraction, not programs - the program should be a solution to a problem that the student solves;

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- applications of information technology, enabling the use of computers in various fields, and
- using the project method as the one that teaches cooperation and reaching into various fields of science and life (Sysło, 2019, str. 96).

Sysło emphasizes that the use of IT resources should be associated with giving purpose to your activities. Therefore, students should not be instructed to do anything they have done, but to create opportunities to undertake activities that are justified and motivated and serve the actual development of competences.

Currently, the school does not only has the task of providing computer literacy, but to lead students to proficiency in the use of software, the use of technology in life and education, and to motivate educational choices focused on IT specialties. These current challenges also require the use of non-classical education methods. Hence the use of the flipped classroom method, the use of digital versions of textbooks, the use of mobile devices owned by students during classes, encouraging students to creativity using the media, creating cross-curricular educational projects or field games based on ICT elements, work in innovation laboratories (i-Lab), participating in webinars and interactive classes, etc.

The education system in Poland is struggling with difficulties. Underfunding and the decreasing social status of teachers mean that more and more people are leaving this profession. Those who stay are either getting older, and therefore often less ready to learn and implement technological innovations, or become less motivated. In addition, students are often better prepared to use the resources of the digital world than their IT teachers (Plebańska, Sieńczewska i Szyller, 2017).

The IT teacher profession is rarely chosen by people who have a high level of IT competence, e.g. after completing IT studies. This is understandable - there is a great demand on the market for such specialists and in other industries they can earn 2-5 times more than at school. While this is not a serious difficulty in the early stages of education, high substantive competence is expected in secondary schools. And teachers who have completed postgraduate studies in computer science education sometimes just does not have them. It is particularly difficult for them to master programming and technical skills (e.g. regarding computer hardware). In these situations, computer science is a full-time supplement for these people - and it happens that computer science is taught by historians, biologists or geography teachers

Also within our specialty at The Maria Grzegorzewska University, we have been observing for years decreasing levels of both motivation and cognitive abilities of students who take up our specialty (Romaniuk, 2015). Within one year, in a short time (most often after the first internships at school or after programming classes) there are doubts whether our students will cope with the challenge posed to the future teacher of computer science. After graduating after three years of studying, they only sporadically say that they will teach at a computer science school. If they choose school, they more often do it at the level of early school education. More often, however, they go to other educational institutions, or even to professions completely unrelated to education.

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Instead of summary

Although elements of remote education were taken into account in the previous preparation of students for the profession of a computer science teacher, the epidemic situation in the world, which we are all participants, forced the universality of this form of knowledge transfer. It turned out that remote education can be implemented in many different ways. Students who joined remote education received an accelerated course in dealing with software related to various areas of education. Although at the same time the problem of technological exclusion has increased - a large proportion of students have used and continue to use this form of education to a limited extent or have been excluded from education for many months. Will the situation which we are witnessing lead to de-schooling, which already in 2005 was considered by prof. Sysło? Voices can be heard in academic discussions that compulsory remote education, which has been shared by all students and teachers, is the beginning of the end of the school as we know it so far. The intensification of informal teaching and learning methods by using new technologies clearly changes the role of the teacher. Traditional didactics, based on the teacher's direct contact with students, has been suspended. Its place was taken by didactics of distance education, with all its advantages and shortcomings. We are dealing with a "network society" in which individualized learning is becoming "widespread, in small groups, at home", in which there "the disappearance of school as a place of education and a teacher as a professional in education" can be seen, where "the distinction between teacher and student, parent and teacher, education and the community blurs or disappears" (Sysło, 2005, str. 45).

In this context, however, attention should be paid to the growing social inequalities associated with the computerization of society. The digital exclusion, already recognized in the 1990s, is intensifying. Children and adolescents who do not have computer equipment at home, or do not have access to the Internet (or have only limited access), whose parents do not have IT competence, and do not even feel the need for their children to acquire such competence, are doomed to "lag behind" for their more technologically expert peers. In their adulthood they can suffer insurmountable losses.

Remote education is also associated with the need to find solutions in the methodology of individual subjects (Romaniuk, 2015). Here, an IT teacher can become a counselor at school, from which other educators will learn what ICT resources to use in the implementation of their subjects. A special place should also be devoted to students with special educational needs. In a recent conversation during training for teachers of various subjects, the question was asked about how teachers deal with this new reality. It was particularly interesting to inquire about the place and time in this forced distance education to work with talented students. Out of 16 people participating in this conversation, only one teacher dealing with early school education spoke up. She indicated that now she has more opportunities to work with mathematical and IT-talented students. By meeting them during online

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sessions, they jointly solve advanced mathematical and programming tasks in the visual environment. The transition from the traditional to the remote system has intensified work with students with higher potential. In turn, we also receive signals from teachers of arts subjects, for which remote education, carried out during individual meetings with students is very comfortable, allowing even faster progress than in the traditional approach (Łaszczyk, 2019).

We will probably return to the traditional form of education soon - students will sit in classrooms, teachers will sit at their desks. However, it seems that the share of information technology in the education process will increase. This situation - in the context of preparing an IT teacher for the profession - forces a constant increase in the level of competence of graduates and their readiness for lifelong learning.

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