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DIGITAL SKILLS IN SCHOOLS OF THE UNITED KINGDOM: INTEGRATING DIGITAL TECHNOLOGY IN THE SCHOOL CURRICULUM

(Цифрові навички в школах Об'єднаного Королівства: інтеграція цифрових технологій у шкільному курикулумі.)

The author highlights digital skills in schools of the United Kingdom, stating that the sphere of digital education is very important for the development of the students that enables them to participate in the growing digital economy. Given that digital skills are of the highest priority to the future of the UK economy and the future chances of young people. Schools, colleges and universities are including new skills in their teaching plans, like giving students the tools and skills to survive and succeed in a predominantly digital world. Education establishments are updating their curriculums. Governments are updating policies and requirements and teachers are learning new skills and teaching in new ways. It is emphasized that ICT has become a part of many different subjects in the schools of the United Kingdom as well as computing curriculum and STEM. The Department of Education of the UK created the conditions that the impact of digital technology on education standards is varied, reflecting different levels of investment, access to high quality broadband and teacher support. The author also highlights that ICT and Computer Science in the UK schools are supported by such organizations as: Naace (Advancing education through ICT), Computing at School (CAS), The Association for IT in Teacher Education (ITTE). In the article presents differing characteristics which define ICT and Computer Science as separate subjects with their own qualifications. The author of the article also describes the success of the coding clubs around the countries.

Keywords: *ICT, curriculum, digital education, United Kingdom, skills.*

Автор висвітлює цифрові навички в школах Великобританії, заявляючи, що сфера цифрової освіти є дуже важливою для розвитку учнів, що дозволяє їм брати участь у зростаючій цифровій економіці. Зважаючи на те, що цифрові навички є найважливішим пріоритетом майбутнього економіки Великобританії та майбутніх можливостей молоді. Школи, коледжі та університети включають нові навички у свої навчальні плани, як надання студентам інструментів та навичок, щоб вижити та досягти успіху у переважно цифровому світі. Цифрова освіта за допомогою інформативно-комунікаційних технологій у школах Великобританії завжди удосконалюється та розвивається з метою покращення економіки країни та удосконалення та автоматизації навчального процесу у школах. Навчальні заклади оновлюють свої навчальні програми, уряди оновлюють політику та вимоги, а вчителі вивчають нові навички та викладають по-новому. Підкреслюється, що ІКТ стала частиною багатьох різних предметів у школах Сполученого Королівства, а також обчислювальної програми та STEM. Департамент освіти Великобританії створив умови, що вплив цифрових технологій на стандарти освіти різноманітний, відображаючи різні рівні інвестицій, доступ до високоякісних послуг та підтримки викладачів. Автор також підкреслює, що інформаційно-комунікативні технології та комп'ютерні науки в школах Великобританії діють за підтримки таких організацій як: Naace (подальша освіта ІКТ спрямування), Computing in School (CAS), Association

for IT in Education and Teacher Education (ITTE) (ассоціація IT в освіті та викладанні). Всі організації співпрацюють одна з одною та працюють з метою покращення та удосконалення ІКТ освіти. У статті представлені різні характеристики, які визначають ІКТ та інформатику як окремі предмети з власною кваліфікацією. Автор статті також описує успіх клубів кодів у сфері інформативних технологій молоді у різних країнах Великої Британії.
Ключові слова: *ІКТ, навчальний план, цифрова освіта, Великобританія, навички.*

Problem statement. The current stage of development of education in Ukraine is characterized by intensive search for a new theory and practice of learning. Insufficient quality of general education and the awareness of the need for significant transformation of secondary school have become the cause of the massive nature of innovative processes that became the basis of modernization of the education system. Therefore there is an important issue of change in the sphere of digital education as implementation of information and communication technologies (ICTs) practically in all spheres of life, and especially in education in all of its levels are a requirement of time and a condition for successful development of the society. Therefore there is a necessity to learn more about the experience of the UK in the sphere of ICT education of students in secondary education.

Analysis of recent research and publications. The principles of using ICTs in various social sectors were studied by foreign scholars such as D. Candau, D. Doherty, J. Yost,T. Barsky, S. Banderson, T. Ajger, A. Lesgods, G. Kedrovich, J.-L. Martynand, F. Yanushkevich, Steve Luck, P. Schonken and others. Didactic problems and perspectives of application of information and communication technologies in the process of studying individual educational disciplines became the subject of researched works by V. Bezuglogo, T. Dubova, Yu. Zhuk, O. Zanchenko, O. Kaligaeva, O. Kachurovskaya, O. Krasnozhon, N. Morse, I. Semeshchuk, O. Smalko, O. Tchaikovsky. Significant scientific potential has been accumulated in the field of the methodology of using computers in the educational process, which was investigated by N. Balik, R. Williams, O. Gokun, K. McLean, V. Kaymin, Y. Ramsky.

Formulation of the purposes of the article. The author has a goal to highlight and describe the digital education of secondary education in the UK.

Main body. The development of digital skills of students in the schools of the UK is the task of the two main subjects in the school curriculum: ICT and Computer Science. ICT and Computer Science are considered as a forming part of a broad and balanced curriculum, which every young person has the opportunity to learn from early years and primary school onwards. The schools in the UK have the freedom to organise this curriculum to best meet the needs of their learners and context.

ICT and Computer Science in UK schools are supported by such organizations as: Naace (Advancing education through ICT), Computing at School (CAS), The Association for IT in Teacher Education (ITTE).

Naace is a professional membership association of educators, technologists, policy makers, school leaders and teachers who represent the role of technology in advancing education. Naace is recognised as the Information and Communication Technology (ICT) subject association for teachers and schools. Computing at School (CAS) is a grassroots organisation for Computer Science teachers in UK schools. Membership includes teachers, parents, governors, exam boards, industry, professional societies, and universities. CAS is a collaborative partner with the BCS through the BCS Academy of Computing. CAS is recognised as the subject association for Computer Science. The Association for IT in Teacher Education (ITTE) is the professional association for IT teacher training across the UK. Its members are involved in initial teacher training of primary teachers, subject specialist ICT and computer science teachers in secondary and post-16, Technology Enhanced Learning (TEL) across all subjects and research into ICT/computer science/TEL pedagogy [1].

Naace, CAS and ITTE have complementary roles, and are committed to working together to reform and develop the curriculum and pedagogy in Computer Science and ICT in British schools. The three organisations work

together to prepare future teachers effectively and to support existing teachers with good CPD.

There are differing characteristics which define ICT and Computer Science as separate subjects with their own qualifications. ICT includes:

- The study of computer systems and how they are used
- Human need is central to the subject
- Concerned with the design, development and evaluation of systems, with particular emphasis on the data, functional and usability requirements of end users
- Focuses on building or programming a solution by using a combination of currently available devices and software
- Emphasis on selecting, evaluating, designing and configuring appropriate software and devices. Programming is one method of creating desired outcomes
- ICT supports, enhances and empowers human activity and informs future developments
- Tending towards the higher level study and application of ICT in a range of contexts, from academic to vocational

Computer Science includes:

- The study of how computer systems are built and work
- Computation is central to the subject
- Concerned with algorithmic thinking, and the ways in which a real-world problem can be decomposed in order to construct a working solution
- Solves problems and develops new systems by writing new software and developing innovative computational approaches
- Emphasis on principles and techniques for building new software and designing new hardware. Programming and coding is a central technique to create outcomes

- Tending towards higher level academic study of Computing and Computer Science [7].

In the report of the current provision of education in Computing in UK schools The Royal Society of the UK identified the central importance of education as the engine of a more digitally skilled workforce: “if the workforce is to be future-proofed, education systems in the UK must be designed to equip everyone with strong literacy and numeracy skills, information literacy and a mind-set that is flexible, creative and adaptive. This will be crucial to preparing today’s young learners for a future economy in which the skills needed are not only unpredictable now, but will continue to change throughout their careers; a future in which workers must have the ability and confidence to continue to learn and adapt long after leaving formal education” [4].

According to the report over the last two decades, there has been a gradual shift to embed digital technology, with pupils being more active participants in the classroom, for example through the use of interactive whiteboards and tablets. Research has shown that digital technology can be effective in teaching mathematics and science as well as increasing attainment levels in numeracy and literacy. But as David Morris, the professor in London University, stated: “Technology can make a positive contribution to the lives of all learners, but attempts to use IT to improve learning outcomes may not always be effective, especially if students become over-dependent on the technology. Students using technology in the classroom is not enough in itself—they only translate this experience into key digital skills through good teaching and following good role models” [2].

Despite Government initiatives in this area, however, Ofsted has concluded that the impact of digital technology on education standards has been varied, reflecting different levels of investment, access to high quality broadband and teacher support.

The new computing curriculum was first launched in September 2014, focusing on the basics of how computers work, digital literacy and information

technology. The curriculum was designed by industry experts and academia. Computing is now a statutory national curriculum subject at all four Key Stages (alongside english, mathematics, science and physical education). 'Computer science' GCSE is also now included in the English Baccalaureate as a 'science'. ICT is still available to 14–16 year olds, but only at vocational level [3].

Google, Microsoft, BBC and many other witnesses welcomed the new computing curriculum, seeing this as a "world leading" step in equipping children and young people with fundamental skills for the UK's digital economy. However, it is a significant step up in what teachers are being asked to teach and, therefore, implementing the curriculum continues to be a challenge for some schools due to lack of qualified teachers and IT resources.

According to the UK government policy every student must have access to education that enables them to participate in the growing digital economy. Given that digital skills are of the highest priority to the future of the UK economy and the future chances of young people. Teaching methods vary greatly between Primary and Secondary Schools and initial teacher training courses emphasise different skill sets. Cross-curricular and the embedding of ICT is a key element of much of the training as well as discrete delivery of ICT skills.

Computing at School has developed a network of 'Master Teachers' to support the implementation of the computing curriculum. A study by Sheffield Hallam University showed that the Master Teacher programme was well regarded by teachers. There were still schools, however, which have not yet engaged with the computing curriculum. Beyond the computing curriculum, digital technology can enable teachers to be more creative in the classroom where it can be used to teach many subjects, including literacy, maths, art and design. However, research from the University of Cambridge showed that some teachers may lack the confidence and skills needed effectively to integrate the use of ICT across the school curriculum in a way that would

motivate students or create an interest in digital technology. Andrew Seager, head teacher of Stratford School Academy, noted that the Government's focus should be on retraining and incentivising recent computer science graduates to become teachers. The shortage of qualified and experienced teachers has become an issue for some schools competing with an industry that inevitably pays much more. Although initiatives such as Teach First and bursaries have attracted computer science graduates into teaching, retention rates have not been high, with 50% returning to industry. Simon Humphreys from Computing at School expressed his concerns: "The challenge that the new curriculum has presented cannot be underestimated. We are introducing a brand new subject in the school curriculum. The key people in that process will be the teachers. It is absolutely vital that we ensure they feel sufficiently equipped and confident to teach the new subject. Many will lack the required subject knowledge and pedagogical knowledge they need to teach the subject, so highest on the agenda should be: What can we do to support that workforce as best as we can be given the pace of technological advances, it will always be a challenge for schools to keep up with the latest innovations. As digital skills are increasingly becoming essential for industrial sectors, schools will need to invest in offering high quality computer science courses and upskilling teachers so that digital skills can become more mainstream rather than as a standalone subject." [11]

Outside the curriculum, informal learning is also being used by schools to increase digital skills. Coding clubs, such as Code Club, are typically free volunteer-led after-school networks, usually for children aged 9–11. Since 2012, there have been 4,900 Code Clubs registered in the UK, teaching over 57,000 children. Their activities include making computer games, animations and websites. This provides an excellent opportunity for Year 7 students to experiment with a pocket-sized codeable computer and develop skills in science, technology and engineering as well as digital creativity.

While coding clubs have been a success, their accessibility across schools around the countries has been patchy, being dependent on commitment

from teachers, parents and industry. Amy Solder from Nesta believed that while clubs were successful in getting both boys and girls interested in computing, there was a geographical divide. She told that “areas that are more rural and less urban-centred have many fewer opportunities”. While video games and gaming have often been perceived as a distraction from learning, they have recently been shown to have cognitive benefits such as improved perception, attention, memory and decision-making. Educational video games can complement formal learning, increasing levels of literacy as well as teaching mathematics, biology and computer programming. Research by BESA found that many schools see games consoles and smartphones playing an important role in primary school education. Gaming has also helped to stimulate children’s interest in digital technology, with many children wanting to design and develop games themselves in after-school clubs are given the pace of technology change and the challenge it presents for teachers trying to keep up with it, it is right for schools to take up the opportunity to offer coding clubs [5].

Research by Nominet Trust has shown that parents’ perception of IT can significantly influence a child’s level of digital skills. Parents who are familiar with IT and regularly use it are able to play a crucial role in their children’s internet and IT use in a way that it does not distract from learning. A proportion of parents are not aware of the range of career opportunities that exist in the IT industry, and encourage their children towards traditional careers. There is also a lack of home support for technology use among lower income families, where it is easier to purchase a tablet or smart phone than a functional computer, limiting a child’s digital skills [6].

In a school setting, individual teachers’ pedagogies can also have a significant impact on a pupil’s level of attainment as well as stimulating interest in digital technology. There has been an increased emphasis on teaching coding since the introduction of the computing curriculum. This can

help develop problem-solving and logical thinking skills that can be used across a wide range of disciplines and careers

Conclusion. ICT skills and competence include confident, critical and responsible use and interaction with digital technology for learning, work interaction in society. It includes information literacy, communication and collaboration, the creation of digital content (including programming), security (including digital welfare and cybersecurity related competences) and problem solving. The Department of Education is ensuring the computing curriculum and its teaching stay up to date, and helps to ensure that other school subject qualifications provide a foundation for a broader range of digital careers. Though we should note that there is continuing concern over the lack of diversity among computer science/IT graduates and in wider Science, Technology, Engineering and Maths (STEM) careers. Role models are an effective way of inspiring confidence to pursue a career path, but FDM Group highlighted that children and young people are more likely to identify with Bill Gates (Microsoft), Steve Jobs (Apple) and Mark Zuckerberg (Facebook) as technology role models than Baroness Lane-Fox, Sheryl Sandberg (CEO of Facebook) or Marissa Mayer (president and CEO of Yahoo).

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