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**Innovative Digital Technologies
in Education and Business
at the Third Annual Silesian Science Festival 2019**

The Silesian Science Festival is an annual event organised by the University of Silesia in Katowice in cooperation with the Silesian University of Technology, Medical University of Silesia, the Jan Długosz University in Częstochowa, Academy of Fine Arts in Katowice, and The Jerzy Kukuczka Academy of Physical Education in Katowice. At the festival, specialists from almost all scientific/academic fields meet in one place. They are grouped into the following areas:

- literature, culture, and society;
- technology and development of exact sciences;
- medicine and health;
- art, design, and architecture;
- environmental protection and climate change;
- IT and game design.

It is worth noting that the Silesian Science Festival is a member of the European Science Engagement Association, which provides an opportunity for international reach, which is confirmed by the participation of attendees from various countries. As the organisers put it, “the mission of the festival is

to contribute to the development of knowledge society. By inspiring cognitive curiosity in people of all ages, we want to stimulate broad interest in science, respect for researchers and their achievements. We want to develop awareness of the benefits that society derives from scientific research and, in particular, to confirm and strengthen the Silesian region residents' sense of pride and benefit from having in the voivodeship excellent academic centres and their contribution to global science.” (Media materials available at the festival's website https://admin.slaskifestiwalnauki.pl/sites/default/files/downloads/informacje_o_3._sfn.pdf?_ga=2.216842770.522796379.1548798900-1311627597.1544201688). General director and coordinator of the entire project is Professor Ryszard Koziółek, the Rector of the University of Silesia in Katowice. In addition, a team of scientists and volunteers from all the host universities is helping to organise this event.

The Silesian Science Festival is a fairly new feature on the map of cultural events in Katowice. In 2019, the third edition took place. It seems, however, that it is worth setting aside some time to attend such an event. On January 12–14, 2019, hundreds of children, adolescents, and adults had the opportunity to choose, according to their interests, from among several hundred scientific attractions, such as:

- workshops run by specialists in specific fields of science, addressing, for example: the question of “What is there in the desert and wilderness?; Chinese for beginners, 3D workshops; LEGO robots; science in your hands – physical and chemical workshops; using games in didactics and glottodidactics; Lund University Physics & Lasershow and many more (the festival schedule is available on URL: <https://www.slaskifestiwalnauki.pl/harmonogram-festiwalu>);
- talks given by specialists and well-known people who often make the headlines, for example, a NASA astronaut Nicole Stott; a famous German physicist, the 1987 Nobel Prize winner Johannes Georg Bednorz; a British traveller, adventurer, alpinist and a populariser of survival skills, Edward Michael Grylls, better known as Bear Grylls;
- experimental stands presented particular areas of knowledge: exact sciences, natural sciences, technical sciences, the humanities and social sciences, medicine and health, and art. At each of these stands, visitors had the opportunity not only to view exhibits of prehistoric geological formations but also to experience the physical and chemical experiments involved, learn how to speak Yiddish or Chinese languages, take a walk in virtual reality or experience weightlessness, or even taste local preserves, made according to traditional recipes;
- other zones, such as: an e-sport point, a learning stop, off science – garage inventions, science cinema, and a children's zone.

One of the demonstration venues in the humanities and social sciences was the stand of the Department of Humanistic Education and Auxiliary Sciences of Pedagogy of the Faculty of Ethnology and Educational Sciences (University of

Silesia in Katowice). The stand, labelled as the Innovative Digital Technologies in Education and Business, was supervised by Professor Eugenia Smyrnova-Trybulska, with the active participation of PhD students of the Department, Dominika Zegzuła, MSc, and Dawid Staniek, MSc.

Apart from many other activities, the faculty is engaged in the promotion of new technologies in education, e-learning, multimedia education, and robotics in education. At the festival, the representatives of the faculty (Professor Eugenia Smyrnova-Trybulska, dr. hab.; PhD students Dominika Zegzuła, MSc, and Dawid Staniek, MSc (see Photos 1 and 2) promoted the idea of new solutions in education through conversations with the visitors, both pupils and teachers, as well as secondary school students about the programmes offered by the University of Silesia, including “E-learning in Cultural Diversity.” Digital technologies in education and business are becoming a reality and even a necessity in the modern world which is transmuting into an augmented reality and cyberspace. The aim of the presentation was to encourage and inspire young people to develop their digital abilities and competencies and to engage the youth in the creation of a virtual information and education space, and to help them select future innovative university courses and professions related to IT.



Photo 1. Participants of the third Annual Silesian Science Festival 2019 (photo by Tomasz Trybulski)



Photo 2. Participants of the third Annual Silesian Science Festival 2019 (photo by Tomasz Trybulski)

In particular, the following research categories, technologies, methods, and forms were presented and discussed:

- virtual educational environment/virtual classroom;
- e-learning;
- personalized learning;
- computer stories (digital storytelling);
- teaching/learning information;
- e-books;
- gamification;
- teaching/learning in cooperation;
- mobile learning/m-learning;
- cyberspace;
- SMART technologies;
- STEM education;
- teaching in the cloud/cloud computing;
- MOOC;
- self-generated content (APPShed);
- competence approach;

Innovative Digital Technologies in Education and Business...

- flipped classroom;
- LMS (Learning Management System), Moodle;
- CMS (Content Management System);
- teaching/learning in asynchronous synchronous mode;
- iconographics;
- robotics;
- neural networks;
- social media.

The Photon robots aroused considerable curiosity, especially among children. What also drew much attention was the possibility to learn programming the Photon robots (see Photos 3 and 5) as well as an artificial hand controlled by forearm muscles.

As part of the Silesian Science Festival, in addition to the exhibitors' stands in the main hall, various workshops were held for visitors. They were designed to popularise science to wide audiences in a very attractive and friendly form. One of such activities was a workshop CyberFun prepared by a PhD student at the Faculty of Arts and Educational Sciences, Dawid Staniek. His research interests, combining modern technology, electronics, and social sciences (pedagogics) helped



Photo 3. Participants of the workshop conducted during the third Annual Silesian Science Festival 2019 (photo by Eugenia Smyrnova-Trybulska)

him to develop a workshop which presented the possibilities of combining biology, 3D printing technology and programming. The workshop participants had the opportunity to learn how the human body generates electrical impulses and how they can be used after digital processing (see Photo 4).



Photo 4. Participants of the workshop conducted by Dawid Staniek during the third Annual Silesian Science Festival 2019 (photo by Eugenia Smyrnova-Trybulska)

For the purposes of the activities, a hand prosthesis had been printed, then fitted with an electronic controller and a mechanical actuating part. After numerous volunteers had been connected to EMG apparatus (an electromyograph) – they had the opportunity to drive the movement of the fingers in the test prosthesis with their own muscles. This seemingly simple experience both provided an opportunity for numerous discussions (with parents who were interested in how the prototype had been made), and delighted and surprised children testing the hand (see Photos 3 and 5). Such a simple experiment showed that in order to prepare a functional prototype, a minimum of knowledge and resources is sufficient – the development and popularisation of 3D printers, reduction in the prices of consumables – gives hope for implementing these solutions in everyday life of persons with amputation.

Another experiment also drew positive reaction from the children participating in the workshop. This time, they had the opportunity, using their nervous system, to control devices connected directly to the power grid (galvanic separation).



Photo 5. Participants of the workshop, conducted during the third Annual Silesian Science Festival 2019 (photo by Eugenia Smyrnova-Trybulska)

A complementary part of the workshop was a parallel demonstration of the capabilities of Photon robots. Courtesy of the Information Society Development Foundation and its Mobile Advisors network, an opportunity was provided to borrow robots and present them as part of the Silesian Science Festival. This extremely well thought-out project of Polish specialists, engineers, designers proves its worth in the initial phases of teaching robotics. Thanks to a dedicated application that allows grading the level of difficulty (from basic control of a robot's movements to writing source code), teaching programming to early school-aged children is at your fingertips. In addition, the manufacturer took care of the visual aspect of its device and its reliability. As a result, a great deal of attendees wanted to establish contact with Photons.

The workshops were conducted on an open basis, and the participants, after the completion of the workshop, were allowed to ask questions, which they eagerly did. Summing up the workshop part, it can be concluded that the formula for

popularising science through active forms of presenting its achievements is and will continue to be the best way to stimulate young people to develop their interests and passions, which should make educators stop and think, and further improve their daily teaching activities.

As an additional attraction, teachers attending the event were shown examples of educational activities utilising popular apps for the school's day-to-day didactics. As research activity, a survey was conducted of selected 69 school-age students who visited the Photon robot stand.

Particular attention was paid to the availability of this robot or a similar one in the children's school environment, which was motivated by the desire to have such a device at home and awareness of the robot's usefulness in development and learning.

Summing up, it can be emphasised that the third edition of the Silesian Science Festival achieved its goals related to the promotion of science, the popularisation of new digital technologies among younger users, future students, scientists, engineers, and new generation specialists. Many young people fascinated by the scientific event discovered their new passions and were inspired by science.