Digital Technologies and Science Education: Reflections from the Royal College of Art's Graduation Showcase.

Kleyfton Soares, a PhD student from the University of São Paulo (Brazil) and a visiting postgraduate researcher at the University of Surrey, attended this year's Royal College of Art's graduation showcase, which took place from 13th July to 16th July, and has shared his experience in the blog below.

This summer, students at the Royal College of Art hosted RCA2023, featuring a series of exhibitions at the Truman Brewery in East London. More than 1,000 students showcased their final year projects, encompassing a wide array of areas of expertise: Animation, Architecture, Design Products, Fashion, ICL/RCA Global Innovation Design, ICL/RCA Innovation Design Engineering, Information Experience Design, Interior Design, and others.

The diverse artistic expressions displayed at the event were fascinating. The vast physical space turned into a showcase of artistic elements that piqued my curiosity and creativity. From simple compositions to modern digital tools, the products presented enriched the event with a lot of history, literature, innovation, and technology.

As a science teacher interested in educational digital technologies and their impacts on spatial skills development, I focused on the private exhibitions of the Innovation Design Engineering section, in search of ideas that could enhance my teaching and research experience.

Two exhibitions caught my attention. The first presented a technological alternative that uses the laptop's camera to recognize physical objects manipulated by students and interact immersively with a digital game. The second exhibition presented an augmented reality technology that allows students to draw objects on cardboard cubes, assemble them, and point the mobile phone camera at the drawings to obtain dynamic virtual 3D objects.

SPATIAL game by Steph Jump

The educational product envisioned and presented by the master's student Steph Jump consists of a visuospatial training game for Key Stage 2 students. According to Steph, the game called SPATIAL "optimizes learning by combining physical and digital elements. It uses the camera on students' laptops to track physical objects, which serve as game controllers and correspond to objects on the screen." It is noteworthy to emphasize the developer's effort to contextualize the importance of increasing women's interest in Science, Technology, Engineering, and Mathematics (STEM) careers. Steph pointed out the need to implement educational resources that allow the training of visuospatial skills from the early stages of learning,

with significant participation from girls, so that they become interested and do not give up on scientific careers.

LineLab by Xin Wen, and JJ AGcaoili

The educational product with augmented reality technology called LineLab was exhibited by master's students Xin Wen and JJ AGcaoili. According to the creators, the educational tool allows you to "design animated robots with little more than cardboard, ink, and a mobile device." The student draws predefined symbols on cardboard cubes, creates different combinations, and views 3D objects in augmented reality. The authors argue that the application helps develop iterative thinking, which involves a problem-solving and development approach that includes repeating a process in successive and incremental steps to achieve a goal or solution.

The displayed educational technologies made me reflect on specific adaptations and applications in science, at different levels of education. For chemistry learning, for example, a computer application could be developed to recognize physical targets representing laboratory glassware and reagents, showing the result of different combinations in the form of chemical reaction simulations. In biology, students could draw simple cell and molecule structures on a piece of paper, point the mobile phone camera, and obtain dynamic 3D structures in augmented reality.

It is important to highlight that the implications for the classroom need to be based on scientific evidence, as the use of technological resources does not necessarily increase academic performance. Understanding the pedagogical and instructional aspects is essential to avoid disorientation and cognitive overload. Additionally, it is interesting to investigate the different types of spatial reasoning promoted by digital technological resources and their relationship with other disciplinary contents in terms of skill transfer.

In conclusion, both products share the aim of addressing the need for developing spatial skills through digital technologies, always valuing the interaction between the individual and physical and virtual objects. An open question is, considering the role of physical and increasingly immersive interaction in technological contexts, how do body movements, especially hand movements, relate to spatial reasoning?

One valuable lesson I learned at the event, which I will certainly take into my teaching practice, is that we must value the concept of design in our productions. Often, our concern focuses on theoretical and methodological aspects, and we overlook aesthetics, marketing, and product presentation. I appreciate the opportunity to learn about innovative applications and congratulate Steph, Xin Wen, and JJ AGcaoili for their professionalism and contribution to education.