DEMOKRITOS

CODESKILLS 4ROBOTICS

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CODESKILLS4ROBOTICS

Opening statement 4 Panel discussion

Can educational robotics teach our students how to think?

International Conference

Monday 22 March 2021

Athanasios Drigas PhD, Eng & Psychologist

Research Director @NCSR Demokritos

Scientific Coordinator of the Project

In order to open the panel discussion I will try to present some thoughts and research results of how the Educational Robotics can be used as an Intervention within various Educational Domains and for various Student Groups

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Robotics in Autism Intervention

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Abstract—Autism Spectrum Disorders is a group of lifelong disabilities that affect people's communication and underlying social messages. The state of the art is an indication of how technology, and in particular robotics, can offer promising tools to enhance research and treatment in ASD. This review represents an attempt to investigate how robot-assistive therapy strategies help children with autism increase social interaction and to imitate, recognize and express feelings. One of the major questions of this paper was if the robots appear to be effective means in assistive therapies. The research team of this paper concluded that robots are discovered to be a predictable and secure environment for ASD children and to be quite efficient in the intervention process. In addition to the above-mentioned, this project also broaches ethical issues that should be taken into consideration by the researchers and therapists during human-robot interplay.

Keywords—Robots, autism, intervention

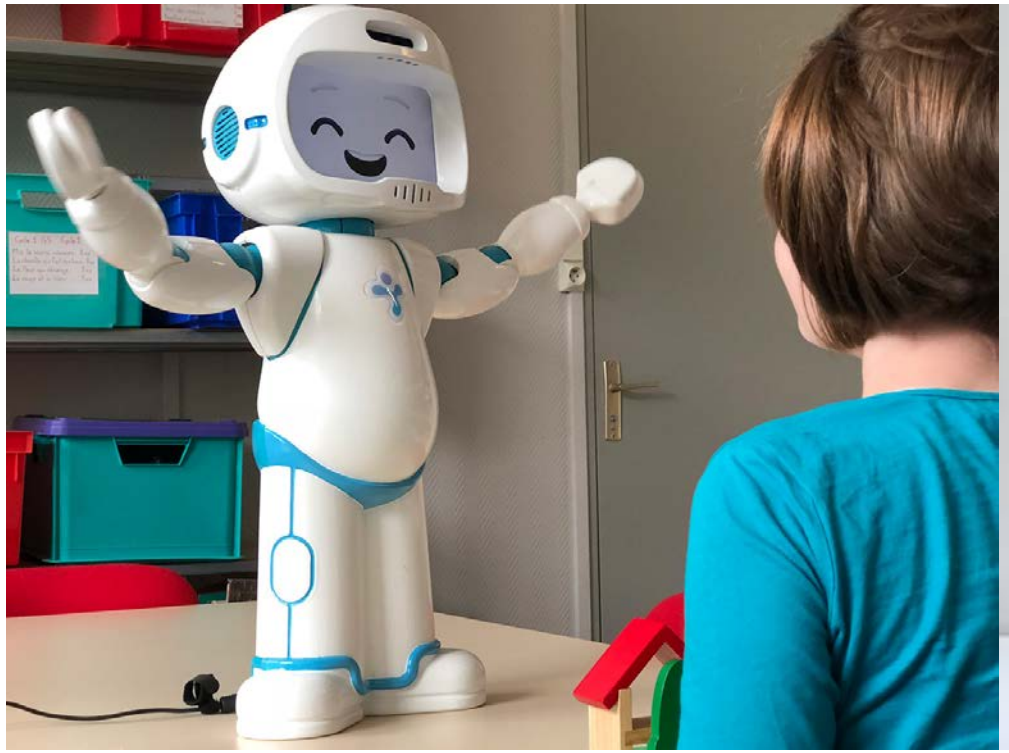
1 Introduction

Autism is a state involving a large variety of disorders with a weakening of social relations, communication and imagination, as well as seriousness and the nature of the symptoms varies from one person to another. Autism is a pervasive developmental disorder since it affects the person during all the periods of his development. The characterization "pervasive" indicates that the disorder globally affects the development of the person and the term "disorder" expresses the sense of deviation from normal. Autism has no cure but with early intervention, much can be done to improve the quality of life of those who have been affected. Several therapeutic approaches are in such a state during the treatment years. However, due to the nature of the disorder and its large variety of symptoms, there cannot be a single approach established as the best treatment model, because it can work well with a child but may not work at all with another [1,2].

The use of robots in autism intervention has been widely used in the last years. Over the last decade, robots are used as intervention tools for individuals with Autism

EMOTIONAL ROBOTS CAN TEACH AUTISTIC CHILDREN

EMOTIONAL INTELIGENCE- EMPATHY & SOCIAL SKILLS



Robot Therapy for Autistic Children

https://spectrum.ieee.org/the-human-os/biomedical/devices/robot-therapy-for-autism
https://news.utdallas.edu/health-medicine/robots-help-teach-social-skills-to-kids-with-autis/
https://www.slideshare.net/pratima0627/robot-therapy-for-autistic-children-1

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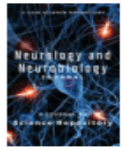

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Research Article

S.T.E.M.: Inquiry-Based Learning and Gifted Education

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ABSTRACT

The aim of this paper is to investigate the relationship between the education of gifted students and S.T.E.M. activities. More specifically, we investigated whether the characteristics of inquiry-based learning (the teaching method that is mainly used in S.T.E.M. education), such as collaboration, exchange of views, complexity, etc. are compatible with the needs and learning preferences of gifted students. Then we explored applications of such activities and their results in gifted education. According to our results, the characteristics of inquiry-based learning are compatible with the preferences of gifted students, while the results of the application of S.T.E.M. activities in the education of gifted children are effective.

Introduction

S.T.E.M. stands for Science, Technology, Engineering and Mathematics. In recent years this interdisciplinary teaching method has been gaining more and more attention in the scientific community [1-4]. According to Li *et al.* the fact that the term S.T.E.M. is not very long leads to the fact that it is not very clearly defined [4]. The history of the term begins around the early 90's. The US National Science Foundation (NSF) integrated Engineering and Technology in Science and Mathematics education for k-12 education. At first the acronym used was SMET (science, mathematics, engineering and technology). Later the acronym SMET was replaced by STEM.

According to English and Li S.T.E.M. education can be seen in two ways [3, 5]. Either as a broader perspective on the teaching of the various components, such as science education, mathematics and engineering, or as interdisciplinary combinations of the individual components. Education in these areas develops students' basic skills (problem solving, critical thinking, etc.) [6-9].

Inquiry-based learning seems to be more effective in the education of science and technology within the general population. The new values of societies and educational systems, especially after the 1980s, focused on learning through Inquiry. This shift has changed the way we look at teaching and learning in general. Of course, the idea of Inquiry may not have been new, but its degree and scope of acceptance is [10-16].

In terms of gifted education, we need to identify whether inquiry-based learning and S.T.E.M. education are effective in this case as well. In other words, we have to look at what are the characteristics of Inquiry-based learning and see whether these characteristics are compatible with gifted students [17-19]. Then, we need to consider whether S.T.E.M. education is compatible with the educational needs the gifted students though the implementation in gifted education.

Inquiry Based Learning and Gifted Education

According to Trna (2014), a key factor in the development of gifted students is motivation. The behaviours of gifted pupils in the context of

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Using Robotics to Foster Creativity in Early Gifted Education

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Abstract. This paper presents our experiences from workshops with gifted primary school students (grades 2-4) especially in programming with robotics sets (Lego Mindstorms EV3) and other technology. As a part of extracurricular enriched program at the Center for Gifted Child Development in Zagreb, Croatia, we organized a number of robotics and ICT workshops. Main goal of these workshops was to introduce gifted primary school students to computer programming and robotics, teach them some basic programming and mechanics skills, and develop their algorithmic thinking, problem solving and creativity. However, trough lessons, students showed unexpected productive giftedness in specific domains of creativity, with children experimenting with different ideas and designs, discussing inventions or alternative approaches to the given problems, or expressing their visual arts or music talents trough robots and programming tasks.

Keywords: gifted education, productive giftedness, creativity, digital natives, skills in ICT, robotics, Lego Mindstorms

1 Introduction

Today's generations of children and youth were born and grew up surrounded with the technology. Motivated by flexibility and resourcefulness of ICT around them, they show very high levels of creativity and interactivity. The common term used to describe children and youth who have interacted with digital technology from an early age is „Digital Natives" [1], „n-gen" [2], or „Millennial Generation" [3]. Some authors ([1], [4]) suggest that for these students, a different learning environment and procedures should be created, to accommodate to their specific way of living (e.g. multitasking, nonlinear information processing, shorter attention span, communication over social media and text messages, etc.).

Advanced technology is very strong media and educational tools, capable to explain and visualize complicated abstract concepts, help students in developing their competencies, and at the same time keeping every student on the challenging upper

Metacognition, Mindfulness and Robots for Autism Inclusion

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Abstract—Autism is a neurodevelopmental disorder with multifactorial causes, characterized by major cognitive deficits in communication, socialization and emotion recognition and management. Children with autism face a memory mechanism malfunction, difficulty in the control processes (i.e attentional regulation and / or organizing their knowledge in order to make the appropriate decisions solving problems), making it difficult for them, adapt to various environmental changes. Many researchers have shown the effectiveness of robots in developing metacognitive skills to autistic children, as well as in improving social skills, emotion awareness and communication. This article highlights the detailed research took place between 2010 - present, while examining the impact of robots on autistic children through their interaction, use of art, programming, cooperative games and mindfulness training. The outcome of this review emphasizes to the ability of children, to manage and develop mechanisms such as self-control, self-reflection, visualization, focus attention, self-evaluation, self-regulation among others, necessary for their self-awareness. These results to helping children develop the higher mental abilities needed, so that decision-making and problem-solving achieved in their daily life.

Keywords—Autism, human-robot interaction, robots design, cognitive deficits, executive functions, metacognition, mindfulness, coding

1 Introduction

Autism is a neurobiological [1] and multifactorial disorder [2], which is characterized by some cognitive deficits. In this paper we have analyzed specifically dysfunction not only in language and attention, such as joint attention but in control and memory, such as working memory as well, based on scientific studies [3, 4, 5].

In addition to the cognitive deficits of autism, this article also deals with the characteristics, the functionality and the use of robots as intervention and treatment tools for autistic individuals. It has therefore been shown that the use of robots in the learning process reduces the cognitive and sensory deficits of people with this disorder while enhancing the development of metacognitive skills [6]. This is also due to the fact these children prefer contact with robots than people, because robots are simpler,

1. Deep theoretical knowledge on our cognition, in general, and our cognitive functions,in particular

2. Operational knowledge on the functionality of our cognitive functions in the level of scope and limitations

3. **Self-monitoring – Internal Attention of our physical, intellectual and emotional processes in real time through self-observation**

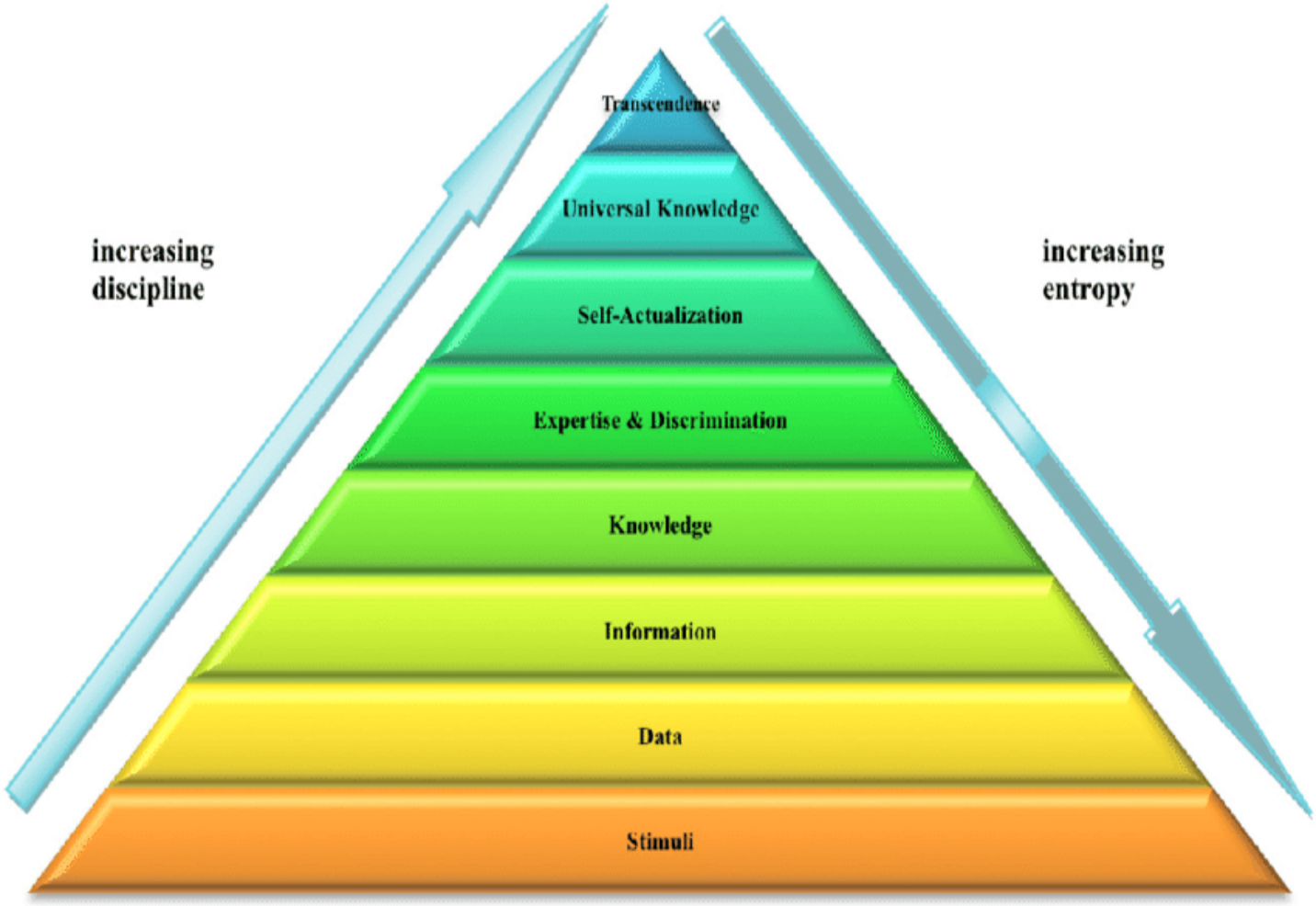
4. Self-regulation of our physical, cognitive and emotional operations through monitoring and control processes

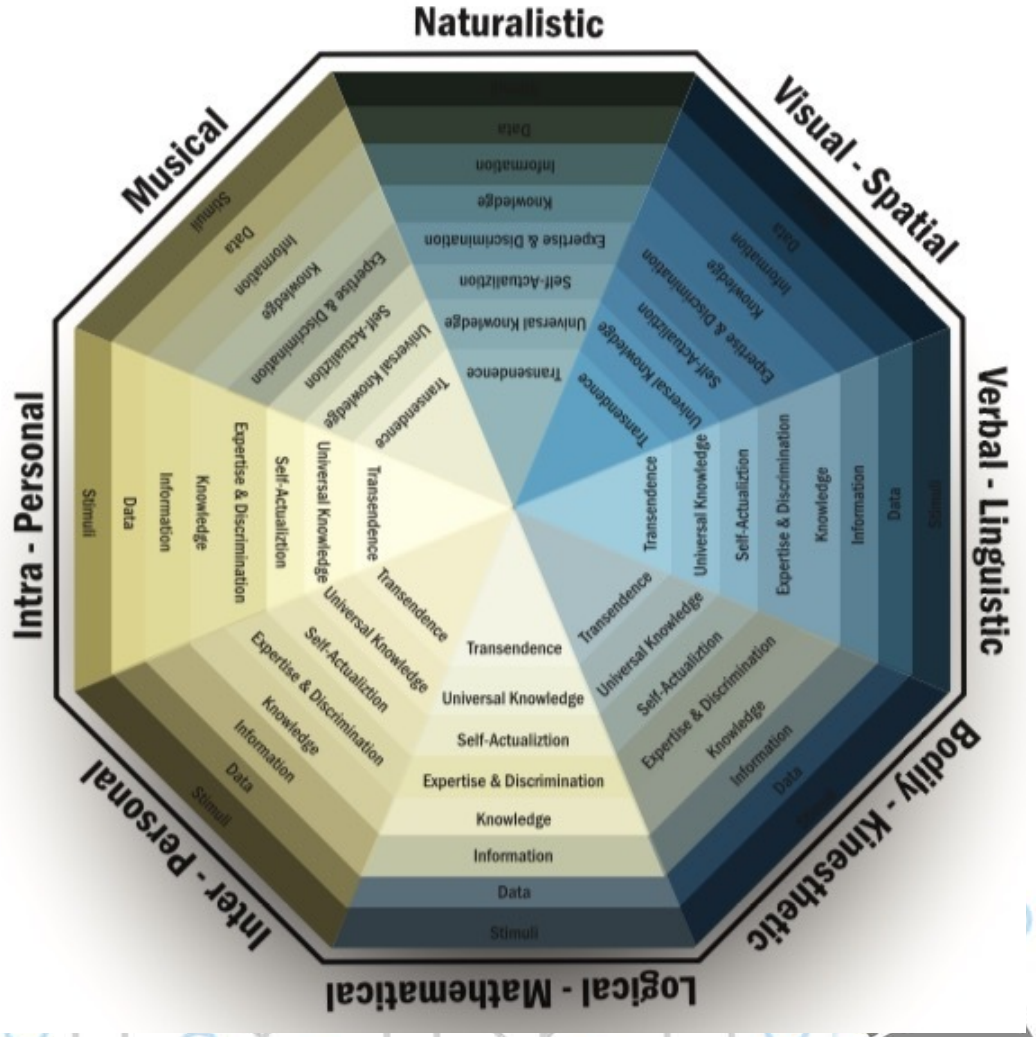
5. Adaptation of our physical, emotional and cognitive functions to perform every Task

6. Recognition of the object's externals and internals, their relations, the correlations, the situations, the operations

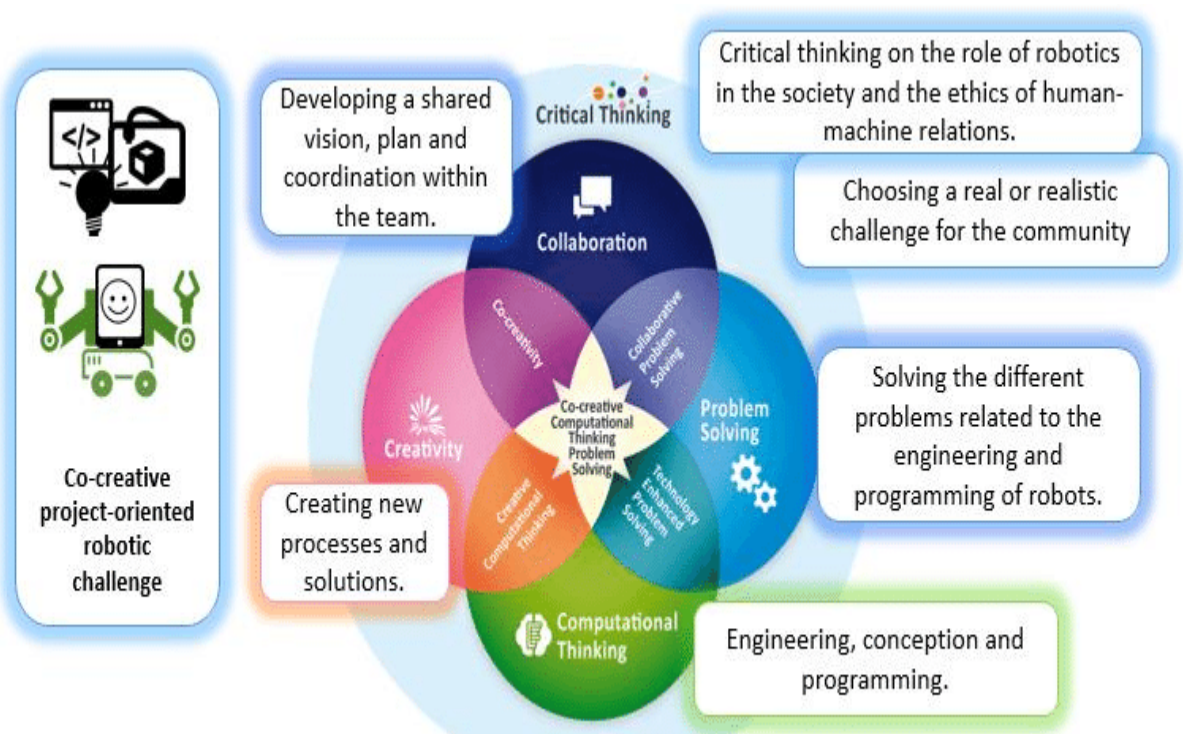
7. Discrimination between what is functional or not, what is the facilitator or not of our work or our targets

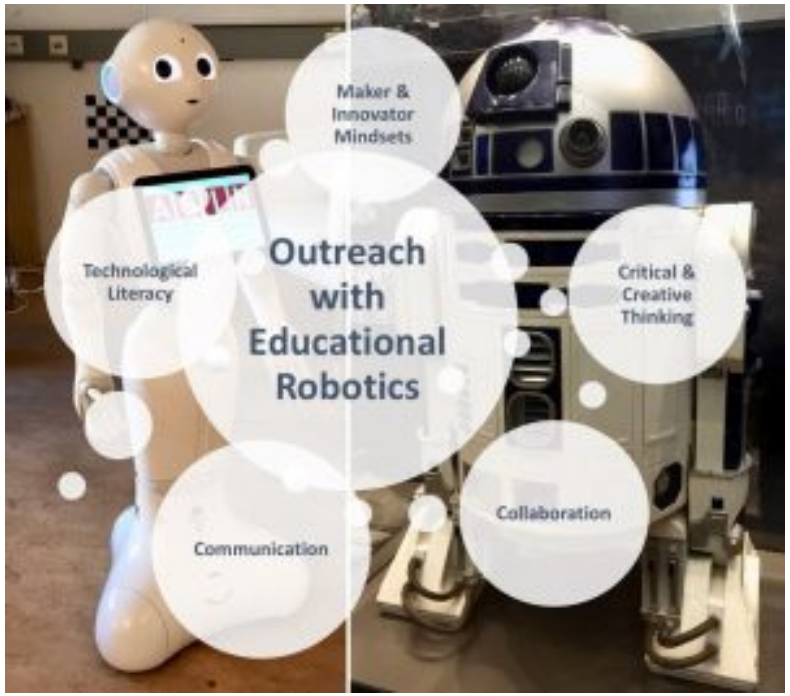
8. Mnemosyne: Be aware- recalling internalized knowledge as an exercise to selfremembering our real holistic total Self and Identity


increasing discipline
increasing entropy
Transcendence
Universal Knowledge
Self-Actualization
Expertise & Discrimination
Knowledge
Information
Data
Stimuli


Naturalistic
Visual - Spatial
Verbal - Linguistic
Bodily - Kinesthetic
Logical - Mathematical
Inter - Personal
Intra - Personal
Musical
Transcendence
Universal Knowledge
Self-Actualiztion
Expertise & Discrimination
Knowledge
Information
Data
Stimuli

ROBOTICS CAN FOSTER 21ST CENTURY SKILLS





https://www.acin.tuwien.ac.at/en/vision-for-robotics/outreach-with-educational-robotics/our-scientific-approach/
https://www.researchgate.net/publication/315066572_A_Scenario-Based_Approach_for_Designing_Educational_Robotics_Activities_for_Co-creative_Problem_Solving/figures?lo=1

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The twelve 21st Century skills are:

1. Critical thinking
2. Creativity
3. Collaboration
4. Communication
5. Information literacy
6. Media literacy
7. Technology literacy
8. Flexibility
9. Leadership
10. Initiative
11. Productivity
12. Social skills

according to the previously presented articles and research results we could conclude that educational robotics can support and foster our students how to develop 21st century skills and thus on how to think ….

Now I pass the token to the coordinator of the panel discussion

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