Moving Automata Toys in the Classroom: a Multifaceted Didactical Pathway

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1. Rationale

CLOHE highly responds to the EU policy perspective & to the strategies and the challenges on Education & Training domain. Within the EU 2020 Strategy, learning and education processes are becoming more and more important since they literally shape up the building of the future. Some challenges are implied in the EU 2020 policy and these relate *inter alia* to the domains of creativity and innovation. Innovation and creativity in Education & Training is to be achieved through the promotion of Key Transversal Competences and partnership with the world of work. The role of ART education in forming the competences for young people for life in the 21st century has been widely recognized at the European level. The European Commission proposed a European Agenda for Culture that acknowledges the value of arts-based education in developing creativity and the EU strategic framework clearly emphasizes the importance of transversal key competences, including cultural awareness and creativity [1] Finally, theoretical studies underlie the importance of bringing children exposed to early engineering concepts [2]. Engineering fosters problem-solving skills and sharpens children's abilities to function in three dimension; Learning early about engineering will promote students' awareness of and access to scientific and technical careers.

2. Learning as result of experience

I hear and I forget. I see and I remember. I do and I understand
[Confucio]

The idea of experience seems strictly connected to the concept of learning and this is surely true if we define learning as a "a relatively permanent change in behavior that results from practice.[3] and it is defined as such in many theories that consider the quality of life experience as crucial in child learning successful development [4]. Experience is vital before, after and during the process of learning.
Dewey and the Social Activism School identified three aspects on which learning should be funded:
- The needs of the learners
- The cooperation principles applied in learning
- The personal significance of the learning pathways

Some years later, Jerome Bruner (1967) outlined the principles of *discovery learning* whose educational goals include promoting a “deep” understanding, developing meta-cognitive skills and encouraging a high level of student engagement [5]
Discovery learning:
1. Actively engages students in the learning process
2. Motivates students to participate
3. Encourages autonomy and independence
4. Promotes the development of creativity and problem-solving skills
5. Provides an individualized learning experience [6]

Thus, learning is most effective when learners are protagonists, when they enact and choose personal strategies as well as tools and behaviours which modify their own behavioural and understanding processes.
This claim is far more evident when learning processes occur in the age of 7-11, defined by Piaget as “concrete operational stage” [7], in which Children begin thinking logically about concrete events, but have difficulty understanding abstract or hypothetical concepts and therefore they need to touch and to see these abstract connections that are the basis of most of the imparted materials.

3. Automata as a learning tool

Automata are Mechanical Toys, small Kinetic Art sculptures with high significance. An Automata might be seen as a syncretism between engineering, cultural awareness and artistic expression. As other manual artifacts, Automata are child tailored communication device and can be defined as “story telling mechanical sculptures”. Automata‘s motion can be created in various ways: by batteries, solar
energy but more simply and commonly through mechanical & manual tools. The lower part, their base, being constituted by a set of mechanical elements (cams, cranks, gears, ratchets, levers etc.) and the upper part being the result of creative activities. Automata are thus a good introduction to engineering, mechanics and science, through syncretism between game and technical principles.

The steps occurring to realize an Automata enact several pedagogical implications in the direction of constructivism and more generally experiential learning, whose potential results and outcomes are suitable to be systematized and transferred at EU level.

In order to realize an Automata kids and children have to accomplish a series of concrete activities that imply the development of metacognitive skills:

- read/narrating a story (a text)
- identifying the key points of the story/text as a brief sequence that will represent the whole
- identify the images and/or the symbols that will define the cyclic sequence to be realized technically
- define and design the characters, the materials, colours, size
- design the automata understanding the mechanical structure of its motion
- assembling the mechanical structure, the components and the artistic upper parts
- testing the movement of the automata and using the feedback to bring amendments to the construction
- testing the representative character of the automata in relation to the story it tells and taking into account of the feedback to provide modifications and integrations

4. The CLOHE project

The project is a partnership amongst seven organization coming from different countries in Europe, amongst which Alivola and its Modern Automata Museum, a cultural representing the Arts and the Educational potential of Automata in Italy and in Europe.

CLOHE is targeted at primary schools pupils and educators and pursues the following specific objectives

1. Producing highly versatile didactics for enhancement of learning processes and Key and Transversal competences promotion
2. Promoting the introduction of elementary engineering principles within the earliest stage of education domain.
3. Evaluating the effectiveness (in terms of learning pedagogy) of Automata as a learning tool that combines technical aspects with creative expression.
4. Promoting transversal values such as ecology and sustainability in learning (Automata can be built with recycled materials)

References

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