GUIDED PLAY: FROM INSTRUCTIONS TO CREATIVITY WHEN CONSTRUCTING AUTOMATA

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ABSTRACT

Play is a very important activity for children development and there are evidences that it can be an added value when used for educational purposes. Research about how to integrate play in education points to the importance of teacher role, namely how children play can be scaffold and guided. However, there is also lack of agreement about how to guide children playing and the impact of the guidance in the activity development and competences promoted.

Given the characteristics of automata, especially the fact that they include a narrative and a mechanism, they can be used within a play based pedagogy, to implement activities related to plan and construct toys and to promote competences as observation, problem solving, creativity in the STEM areas. To explore this potential of moving toys to promote STEM in the early years of schooling is the aim of the Erasmus + AutoSTEM project.

This work aims to describe the main objectives and resources of the AutoSTEM project, including the description of a workshop to construct a toy with a sliding mechanism, the Jelly Bird. The procedures involved the presentation and observation of the toy, detailed instructions on how to construct it, the decoration and the elaboration of a narrative about it. 23 children from the 2nd year of basic education participated in the workshop. The analysis of the prototypes shows that all the participants built them properly. Also some alternative ideas to the proposal initially presented emerged, as well as a diversity of narratives. These data suggest that the instructions enhanced the construction of the prototype, but did not inhibit the creativity of the work developed.

Keywords: guided play; automata; creativity; learning

RESUMO

Brincar é uma atividade muito importante para o desenvolvimento infantil e há evidências de que pode ser um valor adicional quando utilizada para fins educacionais. Estudos sobre a integração do brincar na educação apontam para a importância que pode assumir o papel do professor, a saber, na forma como sustenta e orienta a atividade lúdica. No entanto, há também falta de acordo sobre como orientar o brincar das crianças e o impacto dessas orientações no desenvolvimento das próprias atividades e nas competências promovidas.

Dadas as características dos autómatos, especialmente o facto de incluírem uma narrativa e um mecanismo, podem ser usados numa pedagogia baseada no brincar, para implementar atividades relacionadas com a planificação e construção de brinquedos e para promover competências como observação, resolução de problemas, criatividade. O principal objetivo do projeto Erasmus+ AutoSTEM é explorar o potencial dos 'brinquedos que mexem' para promover a motivação pelas áreas STEM (CTEM, em português) nos primeiros anos de escolaridade.

Este trabalho tem como objetivo descrever os principais objetivos e recursos do projeto AutoSTEM, incluindo a descrição de uma oficina para construir um brinquedo com um mecanismo deslizante, denominado Jelly Bird. Os procedimentos envolveram a apresentação e observação do brinquedo, instruções detalhadas sobre como construí-lo, a decoração e a elaboração de uma narrativa sobre o mesmo. Participaram na atividade 23 crianças do 2º ano do ensino básico. A análise dos protótipos mostra que todos estão construídos de forma adequada, tendo também surgido algumas ideias alternativas à proposta inicialmente apresentada, bem como uma diversidade de narrativas. Estes dados sugerem que as instruções potenciaram a construção do protótipo, mas não inibiram a criatividade do trabalho desenvolvido.

Palvras-chave: Guided play, autómatos, criatividade, aprendizagem

INTRODUCTION

Nowadays the benefits of playing in learning are already known, although these two principles are often presented dichotomously. To respond to this opposition, the guided-play concept emerges as a middle term between both principles. The guided-play concerns "learning experiences that combine the child-directed nature of free play with a focus on learning outcomes and adult mentorship" (Weisberg, Hirsh-Pasek, Golinkoff, Kittredge and Klahr, 2016, p.177). Guided play is only established in the presence of two key elements, the child's autonomy

and the guidance of an adult. In the AutoSTEM project the implementation of this type of teaching is done through the combination of its two aspects, on the one hand "adults design the setting to highlight a learning goal while ensuring that children have autonomy to explore within that setting" (Weisberg et al., 2016, p.178) on the other hand, "adults follow the child's lead and shape the learning experience through thoughtful questions and interaction" (Hadan and Rood, 2018, p.5) thus reaching the learning goals. In this type of practice, the locus of control is placed on the child, in order to guarantee his/her involvement and commitment, which will in turn enhance learning.

The balance between adult guidance and the child's self-discovery is often difficult to achieve, as the concepts to be learned become more complex there is an increased need for scaffolding. Therefore, the implementation of this strategy in the AutoSTEM project is extremely pertinent, as the concepts of STEM areas, in addition to being important, can be extremely complex, being essential the mentoring of an adult to achieve their full learning.

This work describes a workshop developed in the scope of the AutoSTEM, designed to follow the aims of the project to investigate how automata can enrich young children's play to promote a better understanding of Science, Technology, Engineering, and Mathematics (STEM) and to promote motivation for STEM and the development of creative thinking, problem-solving, and comprehension ability.

The workshop was developed around the construction of a prototype with a sliding mechanism, called Jelly Bird. The Jellybird is a moving toy made from paper, and cardboard that makes bird like movements when constructed. STEM subjects can be introduced when constructing the Jellybird, namely to learn about physics and mechanisms, to develop engineering competences of analysis and construction or other soft-learning goals as problem solving and creativity.

Taking in account the Guided play concept, the workshop also aimed to analyse the relation between the instructions given by teacher and children creativity.

METHODOLOGY

Participants

Participants in the session were 21 children, 7 and 8 years old. During the session, Science Education bachelor and Master courses were also presented, carrying on participant observation.

Structure of the activity and processes

The workshop started with the presentation of the automata and the construction of the JellyBird automata. Firstly, the teacher showed a model of the Jellybird. Children observed the Jellybird, and make comments and ask questions about how it functions. Teachers talked about movement in a very simple way, calling attention for the mechanism, a sliding mechanism.

The JellyBird construction process was explained. As the children were building the same, the teacher explained the next steps. First of all, the students cut out the geometric shapes that would shape the automata. After the initial stage guided by the teacher, the children continued the activity, finishing the construction and painting the prototype. There was some variability in the steps described above, given that some children started decorating the prototype before finishing its gluing and construction, while others completed the construction and only started painting. When this step was finished, the teacher proposed the elaboration of a story, about the toy constructed.

Learning outcomes

Learning outcomes to be achieved were as follows: to know the sliding mechanism, be able to construct the mechanism and to solve problems and develop creativity.

Evaluation

The evaluation was done through participant observation, an evaluation questionnaire, and analysis of products developed, namely the prototypes and the narratives.

The observation guide includes indicators on interest and motivation learning, experienced difficulties and creativity.

The questionnaire includes statements and open questions about motivation, perception of learning, experienced difficulties when doing the activity, suggestions for improvement. The automata produced as well as the narratives were also considered for analysis of the learning outcomes and creativity.

For analysis of the learning processes, perception of learning was considered but also analysis of the automata, namely of the mechanism and its functioning.

creativity, some indicators were considered as:

- the automata mechanism is a copy of the one presented / the automata has new mechanisms;
- he automata narrative part is a copy of the one presented/ the automata has new elements;
- characteristics of the narrative and similarity between them.

During the workshop, the trainers talked with the children, about their ideas, and took some notes, and made photos and videos of the constructions. After the workshop, children answered the questionnaire.

RESULTS

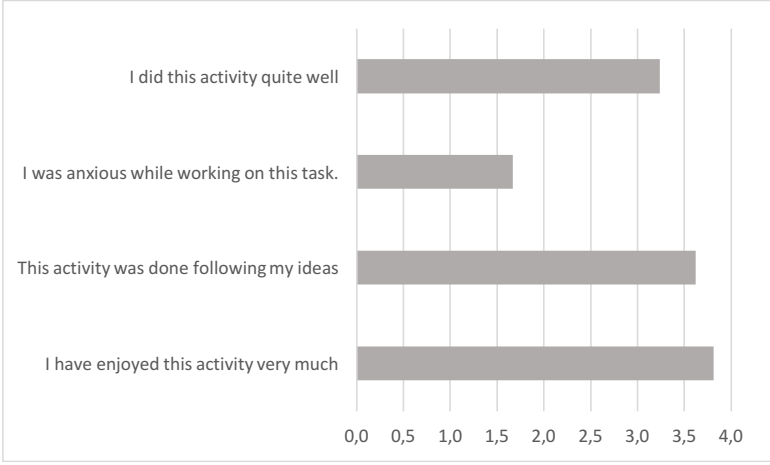
Based on data from the observation guide, responses to questionnaires and analysis of the automata and narratives produced, different indicators were analyzed, namely motivation, learning and creativity.

Interest and motivation

The analysis of the observation records shows that during the construction of JellyBird, the students were enthusiastic and curious about the activity, showed interest and cooperated with everyone. During the activity there was no child who showed resistance to participate in them, in general they always showed great enthusiasm.

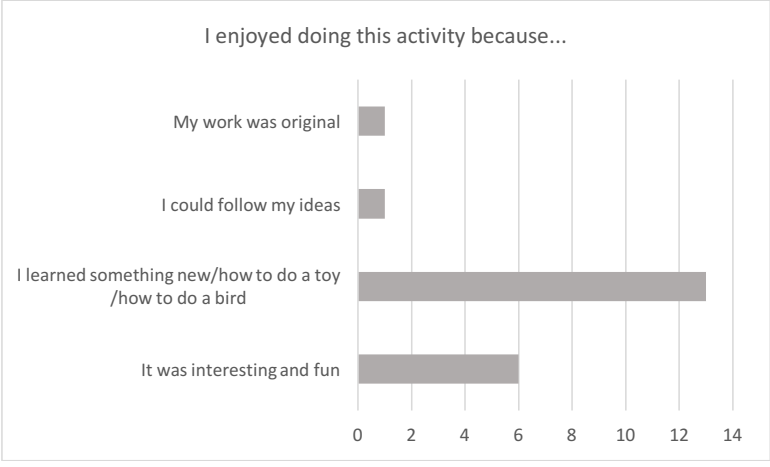
In the same sense are the responses to the questionnaire about the interest, autonomy, sense of effectiveness and anxiety experienced during the activity. The results obtained are shown in Figure 1. Satisfaction with the activity was the item that obtained the highest degree of agreement. However, both the perception of the possibility of expressing their own ideas and the sense of effectiveness when carrying out the activity obtained degrees of agreement that were frankly above the average value. In agreement with these results, there is a low degree of agreement with the anxiety experience during the session.

Figure 1. Results of the responses to the questionnaire.



A content analysis of the main reasons for having enjoyed the activity pointed to four categories, namely reasons that repeated that It was interesting and fun, others that considered the it was because they learned something new/ how to do a toy/ a bird. Other reasons were 'I could follow my ideas' and 'My work is original'. The category with higher frequencies was 'I learned something new/how to do a toy / a bird'. Categories and frequencies are presented in Figure 2.

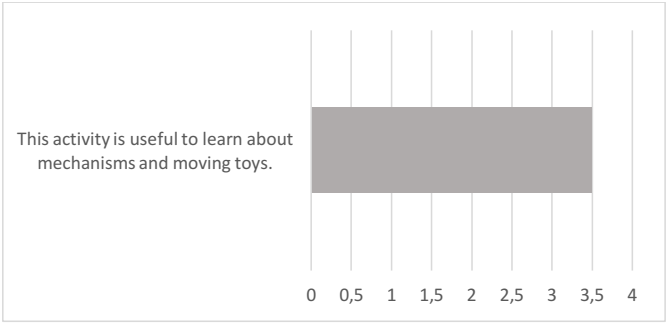
Figure 2. Frequencies of responses to the question about why they've enjoyed the activity



Perception of learning, difficulties and suggestions

An analysis of the automata built by the children makes it possible to register all the participants who successfully carried out a proposed activity. At the end of the session, each child had an automata that worked as intended. These data are in agreement with those obtained through the questionnaire, in particular, in the item 'This activity is useful to learn about mechanisms and moving toys' (3.5/4) (Figure 3).

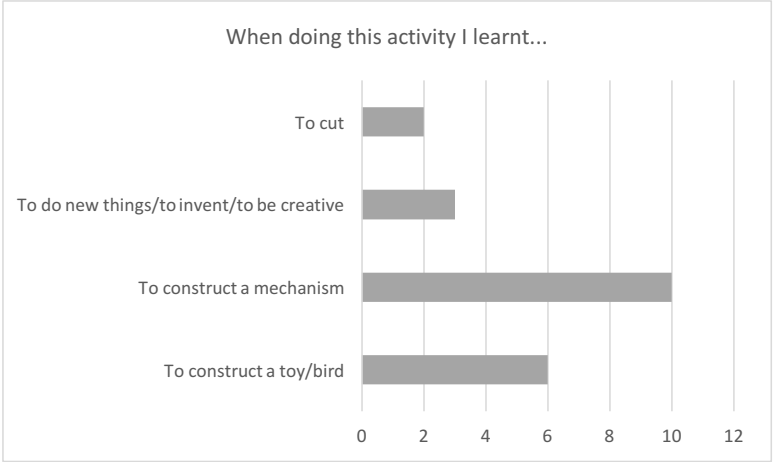
Figure 3. Results to the question item 'This activity is useful to learn about mechanisms and moving toys'.



From the content analysis of the responses to the question about the main learnings, four categories were identified: To construct a toy / bird, To construct a mechanism, To do new things / to invent / to be creative, To cut, the most frequently mentioned being To construct a mechanism (Figure 4),

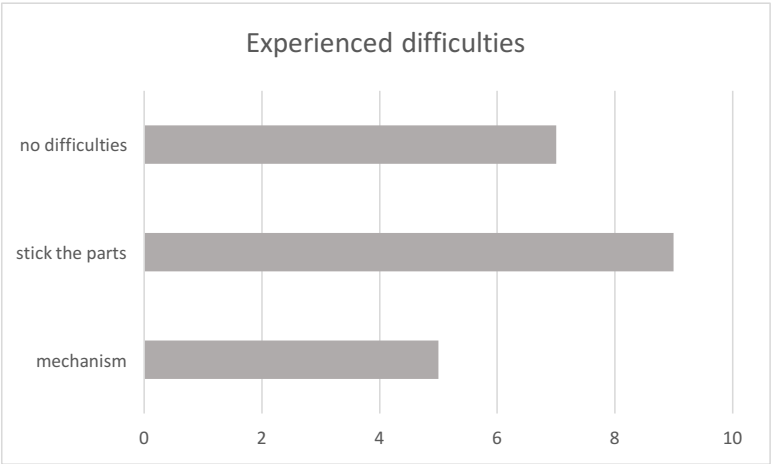
These results show that the established learning objectives were achieved, given that all children built the mechanism and most of them say that this was a learning experience that they had acquired.

Figure 4. Results to the question about the achieved learnings.



Difficulties experienced during the workshop are also referred. These difficulties centred around the mechanism construction and to bring the different parts together and stick them (Figure 5). The reference to difficulties is not contradictory to learning.

Figure 5. Difficulties referred by the children about the activity.



Most children reported not having any suggestions for improvement, and only one suggested making toys with a higher degree of difficulty.

Creativity

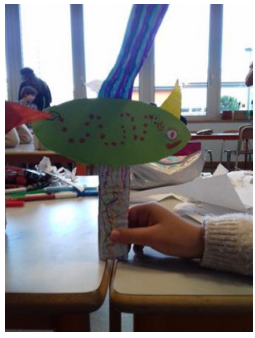
The analysis of the automata produced shows that in all cases, the automata mechanism is a copy of the one presented. However, some differences emerged, both in terms of the procedures followed by each child during construction, as in the part of painting or toy represented.

Thus, as the instructions progressed and the different parts of the automata were identified, it was found that some children chose to paint it first, while others chose to finish the construction first.

Also, although the instructions were given in a similar way to the class, the prototypes produced were all different from each other, in terms of painting and decoration. The works produced were diverse: if most of them represented birds, following what was presented, there were also whales, rockets, unicorns, among others.

From this analysis, a high level of creativity and initiative associated with the activity emerges, a result that is in line with the children's own responses, already mentioned regarding the reasons of interest of the activity, namely when they say it was creative or it was possible to follow their ideas

Figures 6, 7 and 8. Some examples of automata produced during the session.



The stories produced by each child about the built automaton also show a high degree of creativity. In fact, the stories are all different, namely in terms of characters, plot, problematic, duration of the story. As an example, the story 'The spaceship and the bird' and the titles 'The sparkling bird', 'The seagull and the fish', 'The footballer bird', 'The Tonico Whale', ' The green bird', ' The paper bird', 'The bird Herb extinguishes the fire', 'The Luluu bird'. The children were very creative in their stories, and these were just some of the titles, there was even a child who, with the same mold as everyone else, chose to adapt his own so that it was a whale and not a bird.

As an example, we chose to present one of the children's stories, 'The spaceship and the bird', for its originality and the creativity presented by this child.

In this story the child tells us that there was a spaceship that didn't know how to fly and therefore it felt sad in the middle of other spaceships that flew. That was when, on a stormy day, a bird appeared next to the spaceship that had lost his nest because it had flown and asked the spaceship to take shelter inside it. Meanwhile the bird asks the spaceship why it is sad and as soon as the spaceship says it's because it doesn't know how to fly the bird is readily available to teach it. After much training, the ship learns to fly and becomes friends with the bird and whenever they flew they did it together.

CONCLUSIONS

The activity generated a high degree of interest, with all the children actively participating and building their own toy. In general, the children followed the instructions given for the construction of the automaton. However, it was also found that after an initial construction phase, some of the children devoted themselves to decorating it, only finishing its construction later, while others followed the reverse procedure. In addition to this difference, it was also found that, despite the instructions, the built automata differed in decoration, color, accessories, etc., even with figures other than the suggested bird. However, it was in the narratives around the automata that the creativity of each child emerged unequivocally, given the diversity of characters, plots or type of text constructed. Considering the high degree of satisfaction and the lessons learned, it seems possible to state that the instructions given were important for the successful realization of the mechanism, but in no way limited or inhibited creative thinking.

Thus, we can see that the middle ground between the child's autonomy and the adult's instructions have no impact on the child's creativity. In this case, adult guidelines were essential in that otherwise children would hardly be able to assemble the toy, however, the children had complete freedom to decorate their toy and the narrative associated with it, making it completely autonomous and for this reason, so creative and diverse results emerged.

We can then recognize the importance and potential of guided-play even in learning concepts from STEM areas, without this type of more guided intervention having any negative impact on children's creativity.

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