Preliminary Experiences Towards an Inclusion of Dramatists - Teach Logic with Language

Anette Bentz and Bernhard Standl

Karlsruhe University of Education, Germany
{anette.bentz,bernhard.standl}@ph-karlsruhe.de

Abstract. With the ongoing process of digitalisation, it is undoubtedly necessary to integrate informatics as a compulsory part of school education. Assuming that not all groups of pupils will become familiar with the concepts of informatics easily, two questions arise: What types of pupils can be identified with regard to the learning of informatics and how can motivation and learning success of pupils with lower participation be increased? From literature we identified a way to classify two types of pupils' play styles: *dramatists* and *patterners*. For dramatists, social interaction seems to be the key to motivation and learning success, while patterners follow a more structured, straight-forward and planned approach. In our preliminary study in our teaching-learning-lab, dramatists were, in opposite to patterners, significantly more motivated when a coding task involved a story or social interaction. Further research is aimed at investigating the effects of different workshop settings on the motivation of these two learning types for an equal involvement of both groups.

Keywords: Learning-styles · Motivation · Participation

1 Introduction

One of the reasons why students show different interests and motivation for informatics, is probably due to their personal prior experiences with computers [7]. There has also been a lot of work in the field of gender distribution in connection with informatics at school (e.g. [3]). Even though, pupils' coding-related skills are not necessarily related to the gender, pupils still own different characteristics in the way they choose an approach for solving problems in informatics. This is possibly also related to the different early childhood education of girls and boys. Another distinction is also described by Papert, who mentions different aptitudes of either for language or logic and that based on these individual characters, the development of interest in the opposite skill can be mobilized [4]. Related research on the distinction of learners' characteristics was identified in child-play, where two types of players as object-independent and object-dependent were identified and named *dramatists* and *patterners* [2, 8, 9]). Dramatists show strong interest in human surroundings and favour socio-dramatic play with for example stuffed animals. Mitchel Resnick stated that these two types of styles

are not limited to early childhood education but can be observed at all ages. Moreover, the patterners are preferred to the dramatists in science education which again can be one of the reasons for less interest among some groups of students towards these subjects [5]. Furthermore, in [6] it is described, that it is possible to introduce robotics activities in a more appealing way for dramatists. As for dramatists social interaction seems to be the key to motivation and learning success, patterners follow a more structured and planned approach.

The remainder of this work is structured as follows: First, the two play styles of dramatists and patterners are described in more detail. Then we present the research questions, followed by the planned workshop setting. We conclude this paper with some insights into the first experiences we have had and a look at possible further research.

2 Dramatists and Patterners

In *Lifelong Kindergarten* [5] Resnick associates play styles of *dramatists* and *patterners* with students' attitudes towards learning informatics. He explains the different approaches of both play styles using an example: In one workshop, primary school children were to work with LEGO robot kits. The patterners immediately started working on a project and had an impressive result after a short period of time. The dramatists instead started a project but interrupted their work shortly after the start to first invent a framework story. They only finished their project when the storyline was satisfactory. Still, the result of dramatists was as sophisticated as the object of the patterners, but it took significantly longer. If the workshop had ended earlier, the group of dramatists would not have finished their project and would not have achieved a result in the goals of the workshop. Resnick further explains that these different interaction preferences can be observed among learners of all ages and adds a similar example from university context. He also points out that not taking play styles into account can lead to a negative attitude towards science for dramatists, when classes are designed only for patterners

3 Research Question

Resnick's experiences with the workshops for primary school pupils may not be transferred directly to workshops of our teaching-learning lab for secondary school pupils. Nevertheless, we are interested to what extent the play styles of dramatists and patterners can be taken into account in order to improve motivation and learning success in informatics. In order to examine the differences between dramatists and patterners and to make a choice of which measures are appropriate for the corresponding groups, we plan to conduct and evaluate workshops with different social interactions in our teaching-learning laboratory. Considering this, our overall objective is, to design workshops for our teaching-learning-lab to involve dramatists and patterners equally aimed at increasing

motivation and learning success in informatics education. In doing so, we first identify 7th grade pupils' learning types as dramatists or patterners and based on that, we design a workshop. In this paper we share preliminary results of our observations.

4 Workshop Setting

The workshop *Algorithmic Thinking* lasts 90 minutes and is conducted with 7th grade students. The students' tendency towards the dramatist or patterners is determined by means of a survey which resulted in a random mixture of dramatists and patterners. The focus of the workshop was to teach students the concept of algorithms and to improve the ability to solve problems. At the beginning of the workshop we introduced robots contextualized with socially relevant topics and made comparisons with playful models. In our workshop we use Sphero Minin and SPRK+ robots, which can be programmed with the Sphero EDU environment that supports block programming. In the main part of the workshop we used both "unplugged" methods and "plugged" programming [1]. The first part of the workshop, the unplugged phase, was based on the ideas of Papert [4], in which the students walked through the room and made drawings to learn programming. Since our goal was to include more social interaction, we adapted the idea and let a pupil play the well-known "turtle". Thus, in our workshop situation, the students split into pairs, one student plays the programmer and the other the robot. The pupils defined a task, e.g. guiding the partner through the room or having a simple picture drawn. For programming, the programmer arranged magnetic blocks on a board on which commands such as "Take a step to the left" or "Draw a line up" are written. The blocks look similar to the blocks in the block programming language. The execution was done by the student robot. The team then compared whether the action was performed correctly and, if necessary, modified misleading commands. Through these activities, the pupils were introduced to the basics of block programming and debugging in a haptic and social way, without being distracted by the advanced functionality of a real development environment on a computer. Furthermore, the students either developed a basic idea of algorithmic thinking or moved towards a deeper understanding and experimented with variables and functions. Subsequently a simple real robot and a software as development environment were presented. After the students gained proficiency in controlling the robot, they were asked to continue with challenges in which the robot performs different tasks, for example rolling through a maze. The students could choose a task of their choice and work alone or in pairs. The tasks varied in difficulty and learning guides were available to support the students in their learning.

5 First results of the preliminary study

The first tests were conducted with four girls, which were identified as dramatists by long term observation. The pupils volunteered to take part in the project

within a free playing time. The unplugged programming part rather met the 'pattern style'. Nevertheless, the dramatists were surprisingly committed. They enjoyed designing a simple picture, programming it and watching the partner's drawing progress. For the "plugged"-part, we provided a programmable ball in the size of a golf ball as robot and simple programming tasks that they could solve with the knowledge from the unplugged part. The students spent some time with it but were not so enthusiastic anymore after a while. They explained that the robot should perform a real task, such as cleaning up the floor. We decided to let them create their own task using available materials like paper, pens and barriers. Very patiently they drew a nice labyrinth on a flipchart and added obstacles. When the labyrinth was finished and the robot was ready to be programmed, they lost interest. It was illuminating that the students were very motivated about the unplugged programming part, but then lost interest in the plugged part, although the structure of the tasks were very similar. As a consequence, we changed the tasks and added a social component. We let them play the game 'cat and mouse', where one robot is supposed to catch the other, using block programming. In this game, two pupils sit opposite each other in front of a framed, square meter area. The area holds various obstacles. One pupil has a golf ball sized robot (Sphero Mini) which plays the mouse and the other has a baseball sized robot (Sphero SPRK+), which plays the cat. Both robots can be programmed using block techniques. The cat is supposed to catch the mouse by touching it and the mouse is supposed to flee into the 'mouse hole represented by a flat circle. The pupils are allowed to execute a limited amount of commands in a row. Now the emphasis was on playing with a real person and the programming was just the tool. In this setting the pupils were much more motivated in carrying out the task.

6 Further Research

In the preliminary study the dramatists were significantly more motivated when the programming task involved social interaction. The study was carried out with a small number of test persons and therefore only gives a first impression. However, the initial results indicate that more investigations are worthwhile. Therefore, further research is needed to investigate the effects of different workshop settings on the motivation on pupils with different play styles.

7 Acknowledgement

This work was supported by the Vector Foundation.

References

1. Bell, T., Vahrenhold, J.: Cs unplugged—how is it used, and does it work? In: Adventures between lower bounds and higher altitudes, pp. 497–521. Springer (2018)

2. Han, M.: Individual differences in play style and literacy: A bioecological perspective. Play and literacy in early childhood: Research from multiple perspectives pp. 119–132 (2007)
3. Papavlasopoulou, S., Sharma, K., Giannakos, M.N.: Coding activities for children: Coupling eye-tracking with qualitative data to investigate gender differences. Computers in Human Behavior **105**, 105939 (2020)
4. Papert, S.: Mindstorms: Computers, children, and powerful ideas. NY: Basic Books p. 255 (1980)
5. Resnick, M., Robinson, K.: Lifelong kindergarten: Cultivating creativity through projects, passion, peers, and play. MIT press (2017)
6. Rusk, N., Resnick, M., Berg, R., Pezalla-Granlund, M.: New pathways into robotics: Strategies for broadening participation. Journal of Science Education and Technology **17**(1), 59–69 (2008)
7. Schulte, C., Knobelsdorf, M.: Attitudes towards computer science-computing experiences as a starting point and barrier to computer science. In: Proceedings of the third international workshop on Computing education research. pp. 27–38 (2007)
8. Shotwell, J., Wolf, D., Gardner, H.: Exploring early symbolization: Styles of achievement. Play and learning pp. 127–156 (1979)
9. Singer, D.G., Singer, J.L.: The house of make-believe: Children's play and the developing imagination. Harvard University Press (2009)