# The Card Game of Bebras-like Tasks for Introducing Informatics Concepts

Valentina Dagienė, Gerald Futschek, Jari Koivisto and Gabriele Stupurienė

Lithuania, Austria, Finland

**Abstract.** The Bebras challenge on Informatics and Computational Thinking is an education community network which consolidates over 60 countries with aim to introduce informatics (computer science) concepts to pupils [1]. Usually Bebras challenge are performed using online platforms to solve informatics problems. Bebras tasks contain concepts of about nearly all areas of basic informatics. Tasks are an essential part of the challenge. Each task involves at least one informatics concept. An idea of a card game was originated on the ground of the Bebras tasks. Children like games and countless card games exist. Most card games are old folk games with varying rules by region, culture, and person. We have created Bebras-like tasks on cards, placing one task per card and short basic information on informatics concepts involved in the task. Some variants of the game rules are proposed as well. The card games based on Bebras-like tasks should stimulate teachers and pupils to deepen their knowledge in informatics and also inspire cooperation and work together, including collaboration in decision-making, looking for the best solutions, etc. [3]. Informatics concepts are introduced by using inventive storytelling questions. This didactical way is based on constructivist learning approach, when both teachers and pupils could learn through: 1) developing (constructing) tasks, and 2) analysing their solutions and explaining the essence of these tasks and why it's informatics (deconstructing) [2].

**Keywords:** Informatics education, informatics concepts, problem solving, computational thinking, constructionist learning, Bebras-like tasks.

## 1  Contents and practical implementation

This workshop addresses first at all primary school teachers who would like to introduce computational thinking for pupils using interesting quiz like tasks. Also the workshop can be interesting to educationists and education scientists who are interested in how school students can learn informatics (computer science or computing) concepts through Bebras-like tasks presented on the cards. Participants are asked to try to deconstruct the Bebras tasks and find what informatics concepts are hidden there. We expect that participants will experience wow-effects while solving Bebras-like tasks. Participants will learn how thinking is directed to solving strategies that are typical for informatics.

At the Bebras challenge, tasks are an important source for introducing kids to informatics concepts and procedures [1]. The most important goal of the Bebras challenge is to present informatics concepts in an understandable way and an attractive format so that everybody could learn these concepts and would like to learn informatics.

Tasks are highly valued at the Bebras challenge and their development has been used by the authors in teacher training courses and workshops. Task development workshops were used as a means to help teachers be involved in teaching informatics and support them in reflecting on and revising what informatics is. It is important to mention, that Informatics is the only subject that teachers of primary schools have to teach, but never studied themselves.

We will analyse: Which concepts of informatics can be introduced through the card game of Bebras-like tasks. Teachers' constructionist and deconstructionist learning by using Bebras-like tasks. In this workshop, we provide two ways development tasks focussing on teachers' constructionist and deconstructionist learning. The task is the output, the informatics concept is usually the learning goal and task content, the constructionist and deconstructionist ways are the learning models that are applied to accomplish the task 1.
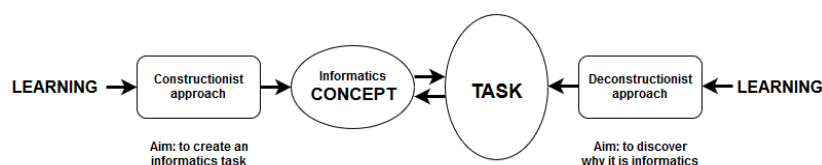


**Fig. 1.** Constructionist and deconstructionist teachers' learning by developing tasks [2]

Teachers could learn in both ways:

1. through developing (constructing) tasks, and
2. through analysing them solving and explaining the essence of tasks why it is informatics.

Furthermore, the presented tasks allow us to argue that development of tasks gives teachers an opportunity to learn informatics concepts deeper. Both presented tasks demonstrate the constructionist and deconstructionist approaches and focus on the teachers' learning process. We will discuss how Bebras Challenge should be performed in a school context and how the teachers may use Bebras-like tasks and game cards in their teaching activities.

## 2   Items discussed in the workshop

- Operational definition of computational thinking
- Why Bebras tasks can convey computational thinking?

– Which concepts of informatics can be introduced through Bebras tasks?
– How to teach computational thinking using Bebras tasks?
– Teachers' constructionist and deconstructionist learning by using Bebras tasks.

In the workshop the participants will learn more about the Bebras Challenge, how the tasks are created, which kind of tasks were produced, what are the effects on learning and teaching. Participants practically will try to deconstruct the Bebras tasks and find what informatics concepts are hidden. The participants will experience wow-effects while solving Bebras tasks and how thinking is directed to solving strategies that are typical for informatics and computational thinking. We will discuss how the Bebras Challenge should be performed in a school context and how the teachers may use the Bebras tasks in their teaching activities.

## 3 Resources

Sets of Bebras game cards in English (aimed to pupils age 7 to 12) will be provided to the workshop participants. Few cards are shown below. They present the following informatics concepts: binary numbers; sequence of commands; selection operation; coordinates; array; optimization.



Additionally, many Bebras tasks can be found on Bebras countries websites. Each participated country has established its own Bebras website. The international Bebras website www.bebras.org focuses on general information about
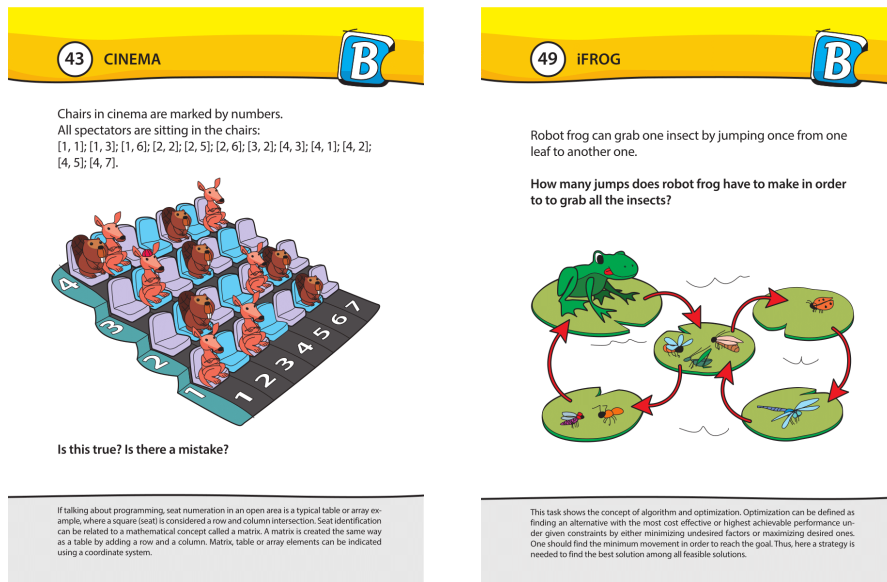
**Fig. 2.** Example of the Bebras cards

the contest and tasks. Interactive or dynamic tasks are the core of the contest. These tasks can be made using different techniques. Finnish Majava Kilpailu: http://www.majava-kilpailu.fi/ (available in Swedish as well).

## References

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### Short Biographies

**Valentina Dagienė** is a professor and principal researcher at Vilnius University Institute of Mathematics and Informatics. She has published over 200 scientific papers and more than 60 textbooks in informatics for high schools, participated in many EU-funded R&D projects, as well as in a number of national research studies connected with technology and education. She is an Editor-in-Chief of two international journals "Informatics in Education" and "Olympiads in Informatics". In 2004, V. Dagienė established an International Challenge on Informatics and Computational Thinking "Bebras" (www.bebras.org).

**Gerald Futschek** is a professor and director of Institute of Software Technology and Interactive Systems at Vienna University of Technology. He is researching and teaching in the fields of Software Engineering and Informatics Didactics. He is highly involved in a variety of national and international contests and competitions that aim to raise the interest of students in the field of informatics. In the field of informatics didactics he tries to answer the question how concepts of informatics such as algorithms and programming may be introduced to students with a low threshold and a high learning success.

**Jari Koivisto** is a long-time activist in the area of computers in education. He has made presentations in the area of computers in education in many international conferences all over the world. His articles have been published in international magazines and books. He has also worked several years and in several positions in the international computer olympiads IOI where he was awarded with a Distinguished Service Award in 2016. He had been working as a counsellor of education at the Finnish National Board of Education and as High School Principal in the LUMO High School in Vantaa Finland.

**Gabrielė Stupurienė** is a doctoral student at Vilnius University Institute of Mathematics and Informatics at the Department of Informatics Methodology. She has been working with Bebras challenge since 2010. As a Master student she worked on Conceptualisation of Informatics Fundamentals through Bebras Tasks of earlier years. Her main research focus is developing informatics concepts based educational model for schools.