

# BOARD GAME BASED LEARNING: HEMBIZIKA

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***Abstract** In this paper the concept of the board game Hembizika will be explained. The faults of the first version of HEMBIZIKA will be shortly discussed. The solution led to creation of a new version of the game called HEMBIZIKA 1.2 Rules for HEMBIZIKA 1.2 will be explained and the examples of used questions will be given. The results of implementation in education will be shortly discussed.*

**Keywords:** game based learning, STEM, quizzes, active learning, Hembizika

## 1. INTRODUCTION TO GAME BASED LEARNING

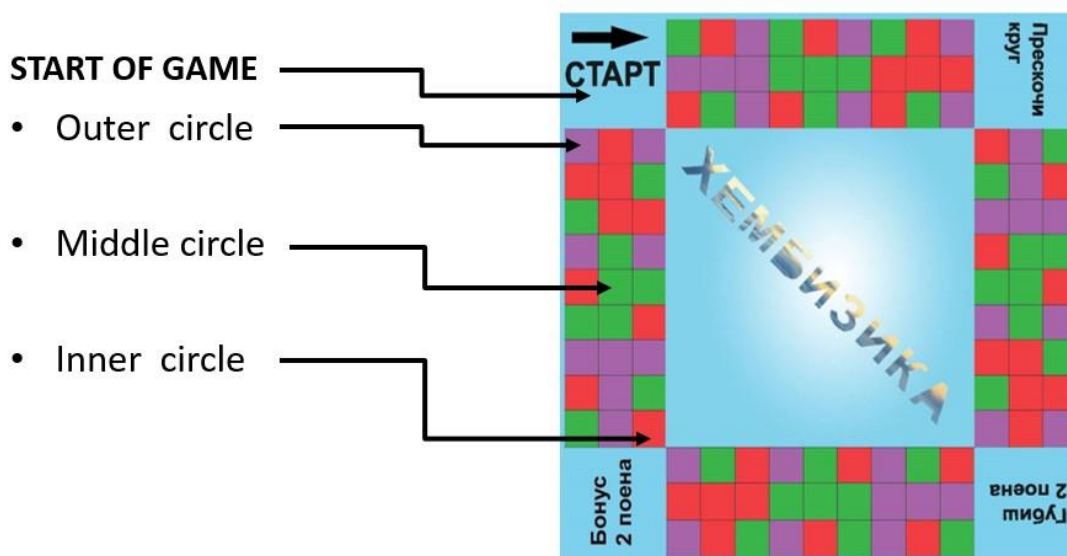
During last few years a great number of research papers has been dealing with game based learning. Many authors have found this method to be highly efficient. Prensky (2007) concluded that video games have changed the way we learn, while Hwang, Yang & Wang (2013) concluded that games not only help with learning, but also reduce effort at the same time. In case of board games many researches successfully developed and applied them in their classroom. Some of examples include Chiarello & Castellano (2016), Ober (2016), Anyanwu, (2014) and many others.

In Serbia's educational system a new exit level test at the end of elementary school consisting of five subjects (chemistry, biology, physics, history and geography) was introduced in 2014. At the same time a new way on entree exams for universities has been announced to start in 2020. In order to help students and teachers prepare more efficiently for these exams, and any other future challenges, the first version of HEMBIZIKA, a quiz based game, has been developed by a team of teachers and students from Gimnazija in Zaječar. The origin of the name HEMBIZIKA is a combination of three subjects: chemistry, biology and physics (hemija, biologija, fizika in Serbian). Later improvements of HEMBIZIKA have been led by the author of this paper.

## 2. GAME DEVELOPMENT

### 2.1. The first version of Hembizika

In the first version authors have decided to use game boards shown in the figure number 1, much similar to the well known board from Monopoly.



**Figure 1.** Board design for the first version of HEMBIZIKA

Each subject is represented by a different color (red for physics, purple for chemistry and green for biology). Starting from a position marked as START (СТАРТ) players would throw dice, then move figures. After landing on the field they would get a question from subject determined by the field's color. In case of a correct answer a number of points determined by a question difficulty would be added to student. When starting a game, players will move their pieces on outer circle, after passing START again they will move to middle circle, and finally move their pieces in inner circle. Each circle brings more difficult questions, and they correspond to three levels of educational standards used in Serbian's school system (basic, middle and advanced).

The first version of the game was tested by high school students, and although they found it fun and imaginative way of testing student's knowledge, some faults have been noticed. Following suggestions have been made to make game more adequate and suited for original intention:

1. Teacher has to get more control over questions and subjects tested (in the first version while teacher chooses questions, he has no influence on what subjects will be tested as they are completely random and depend on dice)

2. Faster play (it takes a lot of time to set up a board, and play actual game)
3. More active students (we needed to find a way to make them more active in preparing for game, not just during the game)

This led to the development of the new version of HEMBIZIKA.

## 2.2. HEMBIZIKA 1.2

In the next version of the game, it was decided to use cards (as shown in the figure 2.) instead of a board.

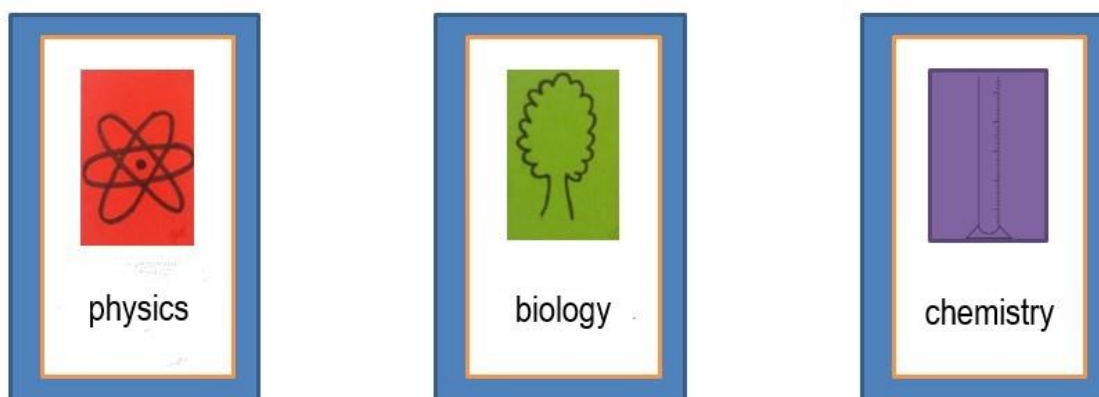


Figure 2. Cards with subjects used for HEMBIZIKA

At the start of the game each student gets 10 cards in his deck. This way teacher has a full control over subjects tested that day. For example, he can choose to focus on biology giving student 10 green cards, or he can decide to give him 6 green, 2 red and 2 purples, or any other combination he feels like is needed.

Student receives all 10 cards faced downwards. He then turns the first card from deck and after seeing what color card he has drawn he answers a question from corresponding subject. In case of a correct answer, he can draw another card in the next round. In case of a wrong answer, he will have to answer another question from same subjects on his next move. The goal of the game is to have no more cards in a deck.

During a class teacher divides students into pairs, who will play against each other, and gives them starting decks. In the first move student A draws a card and gets his question from student B. In the next move student B repeats the same therefore finishing the first round and starting a new one. The first student that has no cards in deck by the end of a round is the winner. Eliminating dice has proven to make gameplay faster.

### 2.3. Choosing questions

In the first version of the game questions were made by a teacher. In order to get more active students, it was decided that students would think of their own questions for this quiz. As homework students of 6<sup>th</sup> grade (13 years old) were assigned to think of the questions for the quiz. Class consisted of 32 students. Before introducing the game, they were asked about sources they had used when preparing for class. This group of students studied physics for the first time, and since chemistry class starts in 7<sup>th</sup> grade it was decided to focus only on questions from physics, so only red cards were used.

After the teacher had reviewed the first set of questions proposed by students it was noticed that students at first preferred to ask repetitive learning questions such as following:

- Define velocity?
- Define force?
- What measure unit is marked with N?

In order to achieve desired level of quality further work with students had to be focused on showing them an example of "good" questions. Tasks from numerous tests were shown (and solved) in class, such as PISA, final exams in the previous years, work books by different authors...

This led to more aware students who now turned to other materials in order to prepare better for the quiz. Work with them was continued, they were encouraged to use other literature, and the best questions were presented to class, giving students praise. In time students understood what was asked from them. The example of a "good" question suggested by one of the students is given in the figure number 3.

#### Example of questions by students

- What is mass of object on left scale?

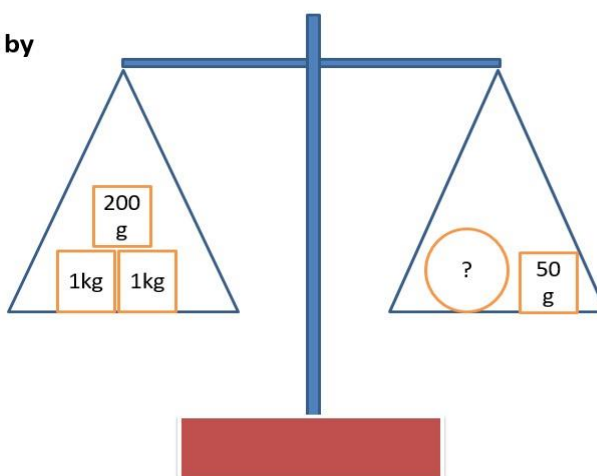


Figure 3. Example of a "good" question suggested by one of students

## 2.4. Results

Students were asked about sources they had used as learning materials at the start of HEMBIZIKA (approximately 6 months after they had started learning physics) and once again after the game had been played for several times. Results are shown in chart 1.

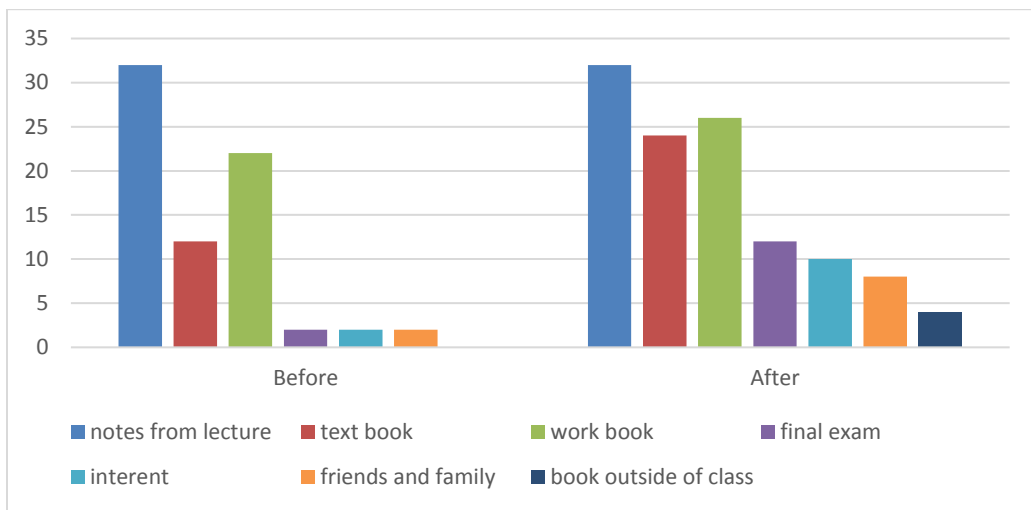


Chart 1. Sources used by students for preparation for game or class

As we can see from the chart 1 while most students were still using notes from the lecture when preparing for class after HEMBIZIKA v1.2 they also had to look for more sources in order to win. Number of students using text book has greatly increased, as well as those who have decided to investigate more on previous exams at the end of school. This way the primary goal of helping teacher and students to prepare for final exams has been accomplished.

## 3. CONCLUSION

Many authors have successfully applied game based learning in their class as we can see from large number of papers on this subject. Benefits of this type of learning has been used to various fields from medical science, biology to crisis management training.

HEMBIZIKA although a relatively new game, and tested on small number of students, has showed some progress. Students have been creating their own tasks and in this way they have been learning. We do notice that large number of students still use notes from lecture and workbooks as the only help in preparing for quiz, but we must also take note that students have become more interested in looking past year's exams which is a great way of preparing them.

In future we have set plans to expand a number of students involved in this type of testing.

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