

# EDUCATIONAL COMPUTER GAMES AND GAMIFICATION IN INFORMATICS AND INFORMATION TECHNOLOGY EDUCATION – TEACHERS’ POINTS OF VIEW

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# Introduction

- Teachers' readiness and attitude – factor for implementation of educational computer games (ECG) in school practice;
- Focus of our study - Informatics and Information technology (IT) teachers' attitude towards use of educational computer games and gamification;
- Survey with 350 Bulgarian teachers in different subjects.
- 97 of the respondents teach IT and Informatics

## Main research questions

- What type of educational computer games (ECG) regarding costs are preferred by the teachers?
- Which pedagogical purposes of ECG do teachers prefer?
- What are the most used types of ECG?
- What type of end user devices are used in playing ECG in classes?

## Main research questions

- Which are the information sources for teachers about educational computer games?
- What is the efficiency of use of educational computer games in different pedagogical activities?
- Is there a statistically significant difference regarding barriers for use of ECG for teachers who use and such who do not use ECG?

# Subjects Informatics and IT in Bulgarian schools

## Information technology

- computer system,
- operating systems,
- word-processing,
- computer graphics,
- spreadsheets,
- computer presentations,
- internet communication,
- networks,
- internet safety,
- copyrights etc.

## Informatics

- focused on algorithms and programming languages;
- Visual object oriented environment;
- Languages – Visual Basic, C# or Java

## Modelling with Computers

- start from 2018/2019
- digital devices;
- safety of kids in digital world;
- algorithms;
- programming in visual block environment (Scratch);

## Subjects Informatics and IT in Bulgarian schools

| School Level                        | Compulsory  | Elective/Optional                            |
|-------------------------------------|---|--|
| Primary – 3-4 grade                 | Modelling with Computers – 2018/2019 – 1 hour per week  | IT – 2003/2004<br>1 or 2 hours per week      |
| Low Secondary - 5-7 grade           | Information technology, 2006/2007, 1 hour per week  | IT – 1 or 2 hours per week                   |
| Upper Secondary school – 8-10 grade | Informatics - 8 <sup>th</sup> grade (for some schools) – 2 hours per week,<br>before 2017 in 9 <sup>th</sup> and 10 <sup>th</sup> grades – 1 hour per week<br>IT -1 hour per week | Informatics<br>IT                            |
| High School – 11-12 grade           |   | Informatics<br>IT, at least 4 hours per week |

## Description of the Study

- questionnaire with 24 questions;
- 111 variables divided in two main groups and several subgroups;
- the first variable divides respondents in two groups
  - the first one consists of teachers who use educational computer games (ECG) in their practice
  - the second one consists of teachers who do not use ECG.

## Profile of respondents

- 304 respondents, 97 of them are teachers in IT and Informatics, 40 of them teach both subjects, 4 teach only informatics (excluded)
- 84% female IT teachers and 16% male IT teachers
- Ages

| Years      | 20-30 | 31-40 | 41-50 | 51-60 | 61+ |
|------------|-------|-------|-------|-------|-----|
| Percentage | 4%    | 28%   | 45%   | 22%   | 1%  |

- Typical for Bulgarian IT teachers - mainly females, older than 40 years with more than 10 years of teaching experience.



## Users of ECG among IT School Teachers

| Teachers                       | Use of ECG |
|--------------------------------|------------|
| All                            | 47,4%      |
| Primary School                 | 92%        |
| Low and Upper Secondary school | 42%        |

## *Attitudes of the Teachers who Use ECG*

### **RQ1. What type of ECG regarding costs are preferred by the teachers?**

| Type of costs   | Percentage |
|---|------------|
| • free online ECG   | 76.1%      |
| • free ECG delivered by the Ministry of education or by other institutions or organisations | 66.7%      |
| • single payment  | 8.9%       |
| • commercial license access   | 11.4%      |
| • payed with requirements of specialized payment for training.                              | 9.1%       |

## *Attitudes of the Teachers who Use ECG*

### **RQ2. Which are the preferred pedagogical purposes?**

- The teachers prefer to use ECG mostly for:
  - activities related to mastering of knowledge and skills;
  - obtaining new knowledge and skills;
  - propaedeutic of involving new knowledge and skills;
  - and revision of knowledge and skills.
- Assessment and evaluation however tend to be not as popular.

## *Attitudes of the Teachers who Use ECG*

### **RQ3. What are the most used types of games regarding game**

- games for attention development;
- memory games
- and jigsaw games.

A possible reason for this trend is the fact that most of the free online games belong to the above mentioned categories – respondents show preferences towards namely free online games.

## *Attitudes of the Teachers who Use ECG*

| <b>RQ3. What are the most used types of games regarding game type</b> | <b>MEAN</b> |
|---|-------------|
| <b>Games with social elements</b>                                     | 2.68        |
| <b>Simmulations of sport games</b>                                    | 1.90        |
| <b>Memory games</b>   | 3.65        |
| <b>Attention development</b>  | 3.81        |
| <b>Motor skills development</b>                                       | 2.91        |
| <b>Roleplay games</b>   | 3.14        |
| <b>Jigsaw games</b>   | 3.48        |
| <b>Adventure games</b>  | 2.28        |
| <b>Game with Tale storyline</b>                                       | 2.59        |

## *Attitudes of the Teachers who Use ECG*

### **RQ4. What type of end user devices are used in playing ECG in classes?**

|                        |       |
|------------------------|-------|
| desktop computer       | 95.3% |
| laptops                | 34.9% |
| interactive whiteboard | 25%   |
| smartphones            | 20.9% |
| tablets                | 14%   |
| TV screen              | 11.9% |

## *Attitudes of the Teachers who Use ECG*

### **RQ7. What is the efficiency of use of educational computer games in different pedagogical activities?**

|           | Acquiring knowledge | Acquiring skills | Developing of creativity | Developing decision-making skills | Developing skills for experiments and fails | Developing motivation for learning | Developing critical thinking and problem solving skills | Developing communication skills |
|-----------|---------------------|------------------|--------------------------|-----------------------------------|---|------------------------------------|---|---------------------------------|
| Mean      | 4.16                | 4.23             | 4.18                     | 4.12                              | 4.08  | 3.88                               | 4.10  | 3.56                            |
| Median    | 4.00                | 4.00             | 5.00                     | 5.00                              | 4.00  | 4.00                               | 4.00  | 4.00                            |
| Mode      | 5.0                 | 5.0              | 5.0                      | 5.0                               | 5.0   | 5.0                                | 5.0   | 5.0                             |
| Std. Dev. | 0.95                | 0.87             | 1.13                     | 1.14                              | 1.07  | 1.12                               | 1.07  | 1.43                            |
| Variance  | 0.90                | 0.75             | 1.27                     | 1.29                              | 1.15  | 1.26                               | 1.14  | 2.05                            |

## Comparison of Attitudes towards the ECG of IT Teachers who are Users and Nonusers of ECG

- RQ8. Is there a statistically significant difference regarding barriers for use of ECG for users and non-users of ECG?
- Every statement is evaluated with 5 levels Likert scale – 5 – Definitely Yes, 1- Definitely No
- Independent Samples Kruskal-Wallis Test is used.
- The null hypothesis for every variable is:  
H0: The distribution of independent samples regarding groups of user and non-users of ECG are equal.



## Comparison of Attitudes towards the ECG of IT Teachers who are Users and Nonusers of ECG

| <b>Barriers</b>  | <b>P</b>     |
|--|--------------|
| 1. I do not have enough time for preparing and becoming familiar with particular ECG. 46.5% of users of ECG agree or strongly agree and 56% of non-users agree or strongly agree with the statement. | 0.444        |
| <b>2. The prices of the games are too high. 76.9% of users of ECG agree or strongly agree that ECG are too expensive. 52% of non-users of ECG agree or strongly agree with the statement.</b>        | <b>0.021</b> |
| 3. Lack of games with serious educational elements. 55% of users of ECG agree or strongly agree and 43% of non-users of ECG agree or strongly agree with the statement.                              | 0.188        |
| 4. Lack of information about where to find ECG with high quality. 56 % of users of ECG agree or strongly agree and 46% of non-users of ECG agree or strongly agree with the statement.               | 0.328        |

## Comparison of Attitudes towards the ECG of IT Teachers who are Users and Nonusers of ECG

| <b>Barriers</b>  | <b>P</b>     |
|--|--------------|
| 6. Lack of ECG relevant to school curricula. 45% of users of ECG agree or strongly agree and 36% of non-users of ECG agree or strongly agree with the statement.   | 0.697        |
| 8. It takes a lot of time of the lesson. 37.5 % of users of ECG agree or strongly and 35.4% of non-users of ECG agree or strongly agree with the statement.  | 0.627        |
| <b>13. Use of ECG is not suitable for the school level that I teach. 78.4% of users of ECG disagree or strongly disagree and 58.7% of non-users of ECG disagree or strongly disagree with the statement.</b> | <b>0.048</b> |

## Comparison of Attitudes towards the ECG of IT Teachers who are Users and Nonusers of ECG

| <b>Most important barriers for use of ECG by the IT teachers</b>                   | <b>Mean</b> |
|--|-------------|
| I do have not enough time for preparing and becoming familiar with particular ECG. | 3.409       |
| The prices of the games are too high   | 3.805       |
| Lack of games with serious educational elements.                                   | 3.369       |
| Lack of information about where to find ECG with high quality.                     | 3.353       |
| Lack of ECG relevant to school curricula.  | 3.318       |

## Use of smartphones for ECG and gamification and their pedagogical efficiency

5 level Likert scale – from 5- high efficiency till 1- no efficiency.

### **RQ9. How do teachers adopt pedagogical impact of smartphones for playing ECG or gamification?**

| <b>Pedagogical tasks</b>                        | <b>Mean</b> |
|---|-------------|
| <b>Obtaining of new knowledge and skills</b>    | 3.09        |
| <b>Mastering knowledge and skills</b>           | 3.39        |
| <b>Revision of knowledge and skills</b>         | 3.51        |
| <b>Propaedeutic of new knowledge and skills</b> | 3.11        |
| <b>Group assessment</b>                         | 3.11        |
| <b>Assessment and evaluation</b>                | 3.14        |
| <b>Self-assessment</b>                          | 3.4         |
| <b>Self-learning</b>                            | 3.51        |

# CONCLUSION

- About half of Bulgarian teachers in Information technology and Informatics have experience with use of ECG or gamification.
- They use ECG mostly for pedagogical activities related to:
  - mastering of knowledge and skills,
  - obtaining of new knowledge and skills,
  - propaedeutic of new knowledge and skills,
  - and revision of knowledge and skills.
- They do not explore the power of ECG or gamification for assessment or self-assessment of the students.

# CONCLUSION

- Most used hardware for playing of ECG in classrooms in IT and Informatics are desktop computers.
- The main barriers for IT and informatics teachers for non-use of ECG are:
  - lack of games with serious educational elements,
  - high prices of most of the good games,
  - lack of information about ECG with high quality,
  - the time needed for exploring of ECG.
- The teachers need ECG with high pedagogical impact, relevant to educational objectives of school subjects.

# ACKNOWLEDGMENT

- The study has been funded by Bulgarian national scientific fund, Contract No DN-05/10, 2016.

# Thank you for attention!



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