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in the Era of Pandemic

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## **Game-Based Learning and Gamification – Case Study ``Covering all the Information the Partnership Gained from the Project``**

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### **Abstract**

Game-based learning and Gamification are innovative pedagogical approaches used for educational purposes, but which require a strategic procedure both in terms of curriculum planning and in terms of the resources used. The aim of the article is to highlight the perceptions of adult education trainers about game-based learning and gamification at European level. The study was carried out by experts from four countries and highlighted the need to develop results available for other trainers who want to learn more about innovative pedagogical scenarios based on game and Gamification. As a result of the needs analysis, the intellectual outputs of the project were developed, which are also presented in this article.

**Keywords:** Cronbach's Alpha, Digital Learning, Game-Based Learning, Gamification.

### **Introduction**

Although new technologies have advanced rapidly in recent years, many trainers and teachers use outdated teaching methods, often unattractive for learners. Research on the integration of games in the educational process has highlighted the improvement of learning experiences, and its placement in a pedagogical approach different from the traditional one. As Plass, Homer and Kinzer suggested (2015), a basic structure of educational games has to consist of three key elements: a challenge, a response, and feedback.

To apply games as learning environments, it is imperative to understand the concepts of game-based learning (GBL) and gamification. There is a difference between GBL and gamification. GBL is the integration of real games into the learning process, usually to work a specific competency or achieve a learning objective (Lencastre, Bento & Magalhães, 2016, p.166). Gamification is the concept of applying game-based mechanics and dynamics to non-game situations to foster learners to engage in an activity (Lencastre, Bento & Magalhães, 2016, p.168).

GBL is a strategy that contribute to the development of communication, problem-solving, critical thinking and digital literacy skills. This strategy must be based on cognitive, affective, motivational and sociocultural foundations (Sung & Hwang, 2013). The potential of GBL is often untapped in formal education. GBL is an approach that introduces a form of interactive content worth exploring (Pivec, 2007). Educational games can effectively involve learners in a learning activity, by increasing the level of involvement, thus bringing a positive effect on learning (Sung & Hwang, 2013).

Moreover, the combination of the game with the individual study, especially for the adult learners, will help them to acquire deep knowledge in the studied field, at his own pace. Existing mobile devices have become much more accessible and

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compatible with educational games with interactive and attractive content. Therefore, the educational process must insistently focus on developing creativity, critical thinking, problem solving and decision making.

Gamification is a strategy that uses game design elements, game mechanics and game thinking in non-game activities to motivate learners (Al-Azawi, R., Al-Faliti, F., Al-Blushi, M., 2016). Studies conducted by many researchers in recent years have highlighted the need for quality pedagogical training on a new technologically digital Era where education has less to do with reproducing information passively and has more to do with the development of creativity, critical thinking, problem-solving and decision-making. Regarding adult education these considerations are even more evident.

To meet this need, the project "Gaming in Action- 'Engaging Adult Learners with Games and Gamification'" 2018-1-TR01-KA204-059315 (<http://www.gamificationproject.com/>) aimed to improve adult training with new pedagogical scenarios combined with technology to enrich the training process and simultaneously to ensure greater learning commitment and high retention rates. The main objective of the project was to design and develop a blended (face-to-face and online) training model based on Games and Gamification for trainers working with adult learners.

In order to achieve the general objective and the specific objectives derived from it, a consortium was formed consisting of seven organizations with experience in web-based applications and e-Learning design in the educational sector, from four different countries: Portugal, Turkey, Greece and Romania.

The target group of the project include: trainers with experience working with adult learners (and consequently their trainees), but also the local communities and local authorities. The results of the project were designed to meet the needs of the target group in order to meet the new challenges.

## Research Methodology

The research results presented in this article were obtained by applying an online questionnaire to adult education trainers from Portugal, Turkey, Greece and Romania. The survey was developed based on a procedure that was created by a group of experts from the "Gaming in Action" project consortium. The survey was distributed to 128 trainers in Portugal (30), Turkey (30), Greece (32) and Romania (36).

The data were collected through an online questionnaire, which was developed using a validated framework and analysed accordingly.

The following items were taken in account for "Assessing the effectiveness of game-based learning":

- (Q1) encouraging pupils to take a responsible attitude to their own work and study;
- (Q2) helping trainers to be aware of pupils' capabilities;
- (Q3) helping trainers to be aware of pupils' prior knowledge;
- (Q4) guiding pupils to reflect on the progress they have made;
- (Q5) guiding pupils to reflect on their emerging needs;
- (Q6) supporting pupils' education at different stages of development;
- (Q7) engaging and motivating pupils;
- (Q8) being used to make accurate assessment;

The evaluation was done to measuring attitudes on a Likert Rating Scale of five points, considering that 1 represents low effectiveness and 5 great effectiveness (or very effective).

The sample on which the research was carried out in partners' countries consisted of 128 adult education trainers, most of them work with the trainees between the age of 19-25. The age group of the adults for whom the trainers are involved is not a limitation for this research.

The study of the internal consistency of the items was performed using the Analysis of Variance (ANOVA). The MS and Error values were used to calculate the Cronbach's Alpha coefficient (table 1) according to formula 1. Cronbach's Alpha is a measure used to assess the reliability of the internal consistency of a set of scale. The results obtained are presented in table 1.

$$\alpha = 1 - \left( \frac{\text{Error}}{MS} \right) \quad (1)$$

**Table 1: ANOVA Results**

<b>ANOVA</b>						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Rows	414.7344	127	3.265625	5.137592	2.84E-49	1.234575
Columns	43.42188	7	6.203125	9.758966	9.47E-12	2.019862
Error	565.0781	889	0.635633			
Total	1023.234	1023				
<b>Cronbach's Alpha</b>			<b>0.805356</b>			

Based on the data in the table above, using formula 1, a value of the Alpha Cronbach's coefficient equal to 0.81 was obtained. The obtained coefficient shows that the internal consistency level in the case of the applied questionnaire is very good for using the data obtained in the data analysis. The values of the Cronbach's Alpha between 0.70 and 0.90 suggest a good internal consistency in science education studies.

In order to avoid the dependence between two quantitative variables of the sample of data collected by applying the questionnaire, Pearson's correlation coefficient (r) was determined. The obtained coefficients had values between -1 (perfectly negative correlation) and 1 (perfectly positive correlation). The sign of the coefficient represents the meaning of the correlation, namely: the positive value corresponds to the variations of the same meaning and the negative one to those of the opposite direction.

The absolute values of the correlation coefficients, presented in table 2, express the intensity of the association between the items. Thus, for a <0.05, values of the correlation coefficient from - 0.25 to 0.25 were obtained, representing a weak or zero correlation, from 0.25 to 0.50 (or from - 0.25 to -0.50) acceptable degree of association, from 0.50 to 0.75 (or from -0.50 to -0.75) very good correlation.

**Table 2: Coefficients Correlation**

	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Q4</i>	<i>Q5</i>	<i>Q6</i>	<i>Q7</i>	<i>Q8</i>
<b>Q1</b>	1							
<b>Q2</b>	0.332496	1						
<b>Q3</b>	0.197054	0.358559	1					
<b>Q4</b>	0.131954	0.302273	0.333099	1				
<b>Q5</b>	0.336217	<b>0.545115</b>	0.466355	0.47839	1			
<b>Q6</b>	0.3365	0.447626	0.426176	0.492814	<b>0.546958</b>	1		
<b>Q7</b>	0.147928	0.220448	0.075459	0.20974	0.254497	0.441289	1	
<b>Q8</b>	0.177495	0.249258	0.30734	0.352736	0.264046	0.468367	<b>0.572709</b>	1

As it results from the table of correlation coefficients, it is found that all correlation coefficients are positive, resulting in a direct correlation (the two correlated variables vary in the same direction). A correlation coefficient of 0.57 was obtained between items *Q7* - *Q8*, 0.54 was obtained between items *Q5* - *Q6* and *Q2* - *Q5*, this means there are a very good correlation between these items.

As it can be seen in Table 2, there are items for which the absolute value of the correlation coefficient is weak, very close to zero. Between these variables there is a statistical link that can be taken in the analysis and interpretation of results, although the dependence is not linear.

Based on this analysis the project results were designed and developed.

## Project results and their benefits for the educational process

The project partnership has developed an innovative pedagogical scenario based on games and gamification, allowing learners to use their own learning tools. In the created environment, learners can experience scenarios based on their own strategies. The assimilated knowledge, motivation and experience acquired in such scenarios will be fundamental for consolidating the skills and competencies imposed by society.

In the design, development, testing and analyse of the results were involved trainers who will apply innovative pedagogical scenarios based on learning and gamification in their teaching activities. The role of the trainers in the partner countries was to help them understand these models and adopt them in their pedagogical practices using mobile devices. The entire process of developing the results was monitored by the universities that are part of the project partnership.

Moreover, good practices identified by the project experts were made available to the target group together with a game-based learning plan and Gamification. In this learning plan, all important pedagogical aspects of the development process were taken into account, in the right order and with suggestions of adequate educational resources.

The most appropriate strategies were selected and customized for each target group and intellectual outputs, allowing participants to display their existing skills, ideas and knowledge on a particular topic. The results of the project were divided into five distinct, interconnected intellectual outcomes that contribute to the final creation of the established competence for education. All these results are available free to the stakeholders:

1. Training Course for Trainers on Gaming and Gamification  
[http://www.gamificationproject.com/docs/adana/IO3\\_Development\\_of\\_a\\_Training\\_Course\\_for\\_Trainers.pdf](http://www.gamificationproject.com/docs/adana/IO3_Development_of_a_Training_Course_for_Trainers.pdf)
2. eBook with Apps and Pedagogical Practices using Game-based learning and Gamification in innovative pedagogical scenarios  
[http://www.gamificationproject.com/docs/adana/eBook\\_with\\_Apps.pdf](http://www.gamificationproject.com/docs/adana/eBook_with_Apps.pdf)
3. Book about the reports of experiences and perceptions regarding the pedagogical practices  
[http://www.gamificationproject.com/images/Gaming\\_book.pdf](http://www.gamificationproject.com/images/Gaming_book.pdf)
4. Scientific Paper: "Survey on the state of the art for each of the partner countries on experiences in Game-based learning and Gamification in innovative pedagogical scenarios"  
<http://www.gamificationproject.com/docs/IO6%20Scientific%20Paper%20IBIMA2019.pdf>
5. Scientific Paper: "Covering all the information the partnership gained from the project"

## Training Course for Trainers on Gaming and Gamification

The main goal of the Training Course for Trainers is to improve training with new pedagogical scenarios combined with technology to enrich the training process and simultaneously to ensure more significant learning commitment and high retention rates. This training course aims to promote appropriate methodologies for the development of the 21st century trainer, namely through Mobile Learning, Flipped Learning, Gamification, Game-Based Learning, Augmented Reality and Digital Storytelling, using mobile devices as pedagogical resources that enhance these innovative pedagogical scenarios, never forgetting an active and reflexive practices.

The content of the intellectual output was structured as following: Introduction, Reasons for the training plan, Participatory design. Learning, Outcomes, Syllabus, Autonomous work, Methodology to be used in the training course, Training assessment thought Gamification, Training Course, Evaluation.

The partnership has involved the target group (trainers of adult learners) in the development of the results. Thus, in the participatory design process it was decided to address two primary concerns simultaneously: (a) collect sensitivities on appropriate topics; and (b) involve trainers facilitating the development of research activities and, in particular, the implementation and testing of training in real settings.

The contribution of the trainers materialized in the following:

- ✓ Recommendations for transforming traditional lessons into more attractive and interactive ones, using these pedagogical approaches based on play and gamification.
- ✓ Proposals for learning strategies that contribute to the development of knowledge, skills and attitudes.
- ✓ Resources that can be used to prepare students and adults in the context of dynamic job change.

The *Training Course for Trainers on Gaming and Gamification* is available here:

(<http://www.gamificationproject.com/uzak/login/index.php>).

The ``Gamin in action platform`` is a Moodle platform created by the consortium partners (Figure 1.). The platform is free and is used to store and present the educational material created within the project.

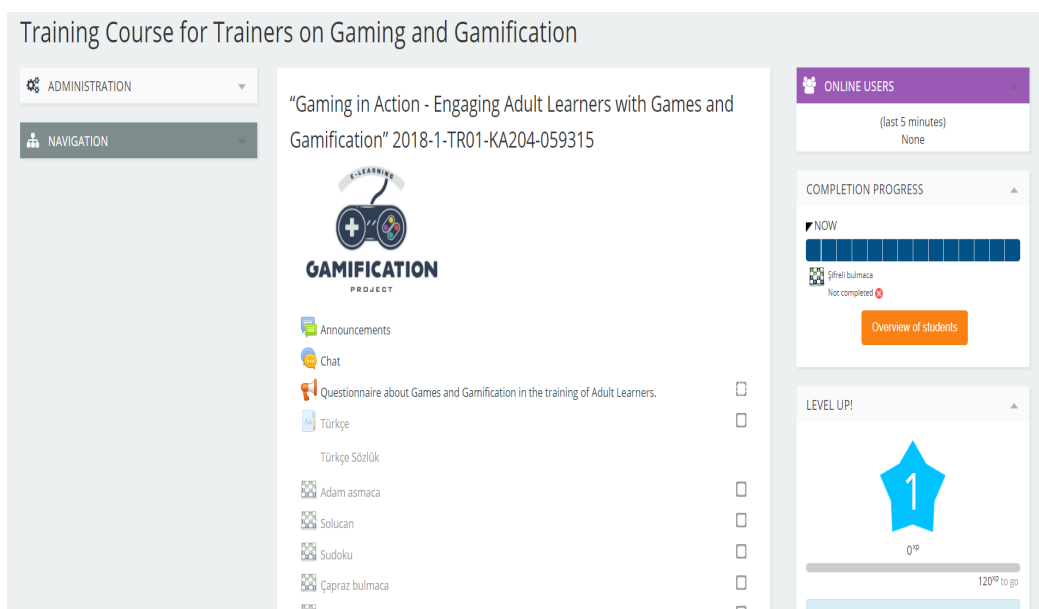


Fig. 1: The ``Gamin in action platform``

## E-Book with Apps and Pedagogical Practices using Game-based learning and Gamification in innovative pedagogical scenarios

The eBook is a guide that contains apps and lesson plans in which the game-based learning and gamification approaches are integrated as innovative pedagogical scenarios. This guide presents different apps that may be used in training to support the use of games and gamification. The main goal was to encourage trainers to integrate them in their training practice by facilitating the design of engaging learning scenarios.

The e-Book was structured in the following units: Introduction, Games and gamification proposes, Innovative pedagogical scenarios, Apps and Pedagogical Practices using Game-Based Learning and Gamification (Animoto, Aurasma,, ClassDojo, Kahoot, Mentimeter, Socrative, Padlet).

## Book about the reports of experiences regarding the pedagogical practices

The book is a collection of twelve chapters targeting an audience of practising researchers, and academics, but also the general public that is interested in the theme. The contents of the book are written in English by invited authors from Portugal and Romania. With the "big umbrella" of Games and Gamification, the chapters focus on reports of experiences about pedagogical practices, mainly with adult learners.

## Scientific Papers

Two scientific articles were written under the project. The first one was written at the beginning of the project, entitled ``State of the Art of Adult Education Trainers on Gaming and Gamification`` and was published on the proceedings of the 34th IBIMA 2020 Conference, and was indexed by Web of Science with WOS:000556337401033. The aim of the article was to identify the perceptions of EU adult education trainers about GBL and Gamification and to find out what these trainers know about their use as scenarios of pedagogical innovation. The paper presents the analysis of the results for the study conducted in Portugal, Turkey, Greece and Romania (Lencastre, Bento, Spanu, İlin & Milios, 2019).

A second article was written at the end of the project, "**Covering all the information the partnership gained from the project**". This scientific paper aimed to highlight the perceptions of adult education trainers about GBL and gamification at European level. The study of the internal consistency of the survey was performed using the Analysis of Variance (ANOVA). The MS and Error values were used to calculate the Cronbach's Alpha coefficient. In order to avoid the dependence between two quantitative variables of the sample of data collected by applying the questionnaire, Pearson's correlation coefficient (r) was determined. The intellectual outputs of the project were developed, which are also presented in this article.

## Conclusion

Using the results proposed by the project partnership, the trainers acquired: knowledge and experiences related to GBL and innovative pedagogical scenarios of gamification: teaching skills in terms of digital literacy and the creation of educational resources used for teaching such as applications, games. Moreover, trainers improved the quality of their lessons by using innovative pedagogical scenarios combining the teaching process with the use of modern technologies. The innovative scenario

The project showed that the development of a Training Course for Trainers was a real need to prepare the trainer for a "new learner" who knows how to use this new mobile technology educationally.

The educational resources presented in this article were tested by trainers from Turkey, Romania and Portugal. They stated that the introduction of new educational methods based on Gamification and gamification is absolutely necessary. The statement is based on the students' compartment to use computers and smartphones in all their activities, including in the educational process.

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