

A European effort to explore games and the gamification of official statistics

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1. INTRODUCTION

Games and the gamification of educational material are no strangers to academic institutions. Pedersen et al. [1] present their interactive virtual learning environment for advanced quantum mechanics. Zamora et al. [2] introduce the gamified learning platform that allows students enrolled in the Master of Economics to check into seminars and classes to earn badges. Vogel et al. [3] showcase the mobile learning environment created by the City University of Hong Kong that encompasses a range of games, spanning from crossword puzzles and quizzes to e-tips and tattoos.

These global efforts to motivate students and help them learn material should not surprise us. After all, a wealth of literature vouches for the efficacy of such initiatives. Teachers [4] and students [5] alike, were enthusiastic about the possibilities for gamification in an Australian research programme. They recognised the “potential for games to impact positively upon learning environments” [4]. And they do not stand alone. Seaborn and Fels [6] reviewed 30 studies that specifically used gamification and found that – for those studies that included control groups – the results were measurably positive. Similarly, Su [7] finds that “gamification has a positive effect on learning motivation” and “learning motivation has a positive effect on academic performance”. This is confirmed by Smith [8], who is one of the few researchers to look into the potential of games and the gamification of statistics. She posits that statistics is often perceived as cumbersome by students and that elements of gamification can positively change this attitude. After giving small groups of her students access to learning material that has been gamified to different degrees, she concludes that “there was a positive impact on students’ attitudes towards statistics and learning” [8].

Naturally, National Statistical Institutes (NSI) in Europe also wanted to inspire the students in their countries. In an age of fake news and interpretable facts, it is of ever increasing importance to provide students with the tools they need to critically engage with the information presented to them. In many countries of the EU, statistics is an optional course though. So, in order to stimulate interest new solutions had to be found.

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² SURS

³ INE Spain

⁴ Statistics Greece

⁵ BNSI

⁶ Statistics Portugal

⁷ Statistics Poland

⁸ ISTAT

The DIGICOM project⁹ of the European Statistical System (ESS) set out to do just that. Its goal is to modernise the communication and dissemination of European statistics. This is achieved by exploring and developing innovative dissemination products and services based on experiences within the ESS and concrete needs of European statistics users.

This paper presents a range of the products developed by Eurostat and seven Member States under this framework. It does so by, first, clearly distinguishing between gamification and games, before then presenting projects that are currently running. These range from mobile apps, to online games and offline games. Finally, the paper will present some future projects before concluding. The paper is thus limited to a portfolio of products and does not assess the efficiency or potential of games and the gamification of statistics. Rather it presupposes both to subsequently showcase a close, innovative and creative European partnership.

2. THEORY

It should briefly be noted that the authors of this paper distinguish between games and gamification. As Smith [8] points out,

gamification is the adaptation of game elements with the goal of influencing behaviours and motivational or attitudinal constructs that mediate or moderate learning [...] Serious games seek to directly impact learning whereas gamification seeks to directly influence attitudes, which then moderates learning.

Both are important in different contexts. Through close cooperation with the respective Ministries of Education, NSIs can develop gamified products or actual games that enthuse students and complement national curricula. As Malone and Lepper [9] found in 1987 already, “in designing intrinsically motivating instructional environments, we sometimes need to create toys that challenge learners to use skills they would not otherwise have wanted to use”.

3. RESULTS

The results highlight the most important mobile apps, online and offline games developed by Eurostat, Slovenia, Spain, Greece, Bulgaria, Portugal, Poland and Italy.

3.1. Mobile apps

Four mobile apps are currently being produced under this framework. First, Slovenia is developing a geostatistical quiz. The game takes place in an imaginary Slovenia. In it, players compete by answering trivia questions which are related to statistical data and geography. For correct answers, they collect resources such as wood, which they can then invest into their city. Players from the same region compete against players from other regions. The goal of the game is to build the most advanced city in Slovenia.

Second, Greece is producing a quiz-based educational game with different levels and randomly chosen questions from an archive of statistical problems. It is designed for “solo” players, as well as for team competitions.

⁹ The project for Digital communication, User analytics and Innovative products ([DIGICOM](#)) is one of the eight projects of the [ESS Vision 2020 implementation portfolio](#).

Third, Poland has recently published Stat Mission – a statistical game in app format targeted at teenagers. In it, they have to find Professor Statistix. By traveling through the galaxy and conducting conversations with the characters in the game, the player receives tasks in the form of mini-games. Upon successful completion of a task, the players then obtain information about the professor. The quiz focusses on official statistics, divided into thematic areas - a different topic is presented on each planet.

Finally, Eurostat is exploring the advantages of virtual reality by developing a mobile app in which high school students are asked to give career advice to avatars of their age. By browsing the official European labour market statistics, they get an impression for which job profiles are currently needed most or which countries tend to pay women considerably worse than men.

To add to this broad spectrum of games from a grass-roots level, Italy organises the contest “PlayStat. La statistica che diverte!” during which students and statisticians are asked to come up with innovative new apps that make use of official statistics.

3.2. Online games

In online gaming, Spain really stands out. It has created its [own website](#) with a collection of easy to access games that target pupils. In INEcity, for example, students can build their own cities based on the demographic and economic statistics of an imagined region. If the player invests wisely, the region booms and profits. But if one important indicator is not considered, the media reacts promptly and in outrage. For younger students, Spain has also developed the Prob family – a small cartoonish family of monsters that likes to eat fruit. Players are asked to predict the likelihood of a monster finding the fruit it likes when one, three or five of such fruits hang in a tree. That way, even very young pupils can get a first feel for statistical probabilities.

In a similar effort, Portugal launched its educative website [ALEA](#) in 1999. Since then it has populated the site with eight online games, including a Portuguese version of INEcity, a statistical trivia quiz and the “Glory game”.

3.3. Offline games

Portugal also features prominently in offline gaming through its comprehensive *Exploristica* – a travelling exploratory exhibition consisting of various interactive modules. It aims to give pupils in secondary school a good understanding of statistics and probabilities in a practical and experimental way. Its flagship project is the “Virtual Submarine”. Here, students sit in a chair, wear VR goggles and hold hand controls. Their task is to collect subspecies of a reptile. Based on the fact that there are three different subspecies of the reptile, which are distinguished in weight, age and size, participants produce boxplots of these variables for the sample data. By then comparing it with the population data, they can identify the subspecies that has been collected and release it into the wild again.

Italy is also engaging students offline by visiting lower-secondary schools across the country and hosting its statistical quiz “who wants to be a statistician?”. For it, the students (age 11-13) are split into two teams with one captain each. Teams then answer different question categories in turn, while the clock ticks down. Through a close cooperation with the participating schools, the questions are based on previously taught material. The team with the most correct answers wins. On top of this, Italy is also organising the annual “Festival of Statistics”, which encompasses a range of statistical games. The next one will be held in Treviso in September 2018 and includes creative

shows like “The many probabilities of a soap bubble” or calls for actions like “statistical graffiti”, during which histograms are painted on windows or graphic statistical designs are printed on shirts.

4. PLANNED PROJECTS

Given the success of Portugal’s initiative, Portugal and Bulgaria are now planning to make it more widely accessible by turning the “Virtual Submarine” into an extended mobile app. Additionally, both Member States will host the *Exploristica* exhibition in their countries to spark the interest of students. Furthermore, Poland is rebuilding already existing online games that used flash so that they remain relevant in the future, as well. Learning from European partners or the past is thus a fundamental part of the European effort. On top of this, Eurostat will also support completely new projects being launched by numerous Member States in the summer of 2018, which will hopefully lead to an even more diverse and creative gamified landscape of official statistics.

5. CONCLUSION

The games and gamified educational material thus make use of different media and trigger different individual motivations [9]. Some pose challenges for the users, while others plunge the students into a fantasy world. Some spark their curiosity through small riddles, whilst others let them control a simulation that is close to their reality. United and strengthened by this diversity, the members of the ESS can learn from one another, improve on projects that work well, and develop completely new ones together.

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