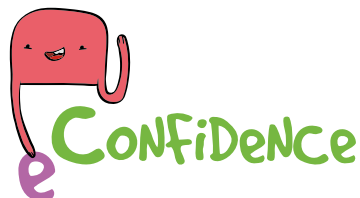


# eConfidence in Behaviour Changes through Serious Games

# Booklet



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement - No 732420. This communication reflects only the author's view. It does not represent the view of the European Commission and the EC is not responsible for any use that may be made of the information it contains.





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# ABOUT ECONFIDENCE

Serious games - that is, games with an educational purpose - have become a popular tool for knowledge transfer, behavioural, perceptual or cognitive change. At the same time, effectiveness of the games in behaviour change has been analysed in only several studies.

In that sense, **‘Confidence in behaviour changes through serious games’**, hereinafter referred by its acronym eConfidence, focused on testing whether the use of serious game could produce behavioural changes. The project defined a methodology and tested it with two serious games developed considering behavioural aspects in relation with two themes: **Safe Use of Internet** and **Bullying**.

eConfidence was a 24 months project that started in November 2016, funded by the European Union’s Horizon 2020 research and innovation programme (Grant Agreement No. 732420). The partners of the research project were ITCL Institute of Technology (Spain) (Project Coordinator), European Schoolnet (Belgium), everis (Spain), Nurogames (Germany), University of Salamanca (Spain) and University of Rijeka, Faculty of Humanities and Social Sciences (Croatia).



# METHODOLOGY

A serious game is a game designed for a primary purpose other than just entertainment. The term serious refers to the added component of the game that enables players to perceive the game as a learning experience.

The eConfidence project defined a methodology for serious games development and tested it with two serious games. Based on recognised scientific methods, the new methodology is tested successfully on the design and implementation of: **'School of Empathy'**, a game created to encourage positive behavioural change facing bullying situations and **'Go Online'**, a game made to encourage positive behavioural change in the area of safe use of the internet.



The eConfidence methodology is the result of two years of intensive collaborative research and innovation among partners of the eConfidence project. It builds on two well-known methodologies in psychology: the Intervention Mapping Protocol (IMP<sup>1</sup>) and the Applied Behaviour Analysis (ABA). ABA (Applied Behaviour Analysis), also frequently referred to as behaviour modification, is the application of principles of behaviourism, primarily principles of operant conditioning, in order to modify behaviour(s) as part of an educational or treatment process. Intervention Mapping is a protocol for developing effective behavior change interventions.

1 Bartholomew, L. K., Parcel, G. S., & Kok, G. (1998). Intervention Mapping: A process for developing theory- and evidence based health education programs. *Health Education and Behavior*, 25(5), 545-563.

The methodologies were integrated in one comprehensive methodology that consists of six steps, starting from the topic selection process to the psychological analysis of the behaviour and final assessment.

A key aspect is that behaviour is included from the very beginning of the game development process, involving experts such as psychologists. Additionally it assigns responsibilities and assesses the validity of the output, the latter another essential aspect to cover, in order to create an effective Serious Game.

The main novelty of this methodology is that it is focused on the behavioural aspects integrated in the games. Other Serious Games projects, or initiatives for sexual health<sup>2,3</sup>, have applied some psychology techniques, but not based on a methodology. It is notable that for other types of serious games some methodologies do exist, like HABS<sup>4,5</sup> RETAIN<sup>6</sup> GOMII<sup>7</sup> or MDA<sup>8</sup>, only to mention some of them.

Obviously, the methodology by no means removes any creativity that must exist in the creation of any serious game - following the rules to create a Cubist style painting is no guarantee for a good painting! Game designers are free to be creative while covering the topics as defined by the team of psychologists. What the eConfidence methodology focuses on is the correct exchange of documentation, on validations by psychologists and game designers, and on the assessment of the behavioural change. Templates for

2 Brown, K., Bayley, J., & Newby, K. (2013). Serious Game for Relationships and Sex Education: Application of an Intervention Mapping Approach to Development. In S.Arnab, I. Dunwell, & K. Debattista (Eds.), *Serious Games for Healthcare: Applications and Implications* (pp. 135-166). Hershey PA: IGI Global.

3 Tortolero, S. R., Markham, C. M., Peskin, F. M., Shegog, R., Addy, R. C., Escobar-Chaves, L., &Baumler, E. R. (2010). It's Your Game: Keep It Real: Delaying Sexual Behavior with an Effective Middle School Program. *Journal of Adolescent Health* 46, 169-179.

4 Marsh, T., K Yang, C Shahabi (2006). Game development for experience through staying there. In *Sandbox '06 Proceedings of the 2006 ACM SIGGRAPH symposium on Videogames* (Vol. 1, pp. 83e89).

5 Marsh, T. (2010). Activity-based scenario design, development and assessment in serious games, gaming and cognition: Theories and practice from the learning sciences (pp. 213e225).

6 Gunter, G. A., Kenny, R. F., & Vick, E. H. (2006). A case for a formal design paradigm for serious games. *The Journal of the International Digital Media and Arts Association*, 3(1), 93e105.

7 Amory, A. (2007). Game object model version II: a theoretical framework for educational game development. *Educational Technology Research and Development*, 55(1), 51e77.

8 Hunicke, R., LeBlanc, M., & Zubek, R. (2004, July). MDA: A formal approach to game design and game research. In *Proceedings of the AAAI Workshop on Challenges in Game AI* (Vol. 4, No. 1, pp. 1-5). AAAI Press San Jose, CA.

the psychologists and game developers, and practical examples of how to translate the generated information into game dynamics are provided along with the methodology. These examples can be seen as the classic post-mortem of a game, however focused on how to design and implement new games for Behaviour Change.

In the two games developed during the eConfidence project, the methodology was proven constructive as the scientific research results showed indications of potential improvement in bullying and online behaviour but also revealed guidelines for future game development.

Serious Games have been applied in education for a long time with good outcomes in different educational programs and schools<sup>9</sup>. They are developed for all ages but with a clear focus on children, and focus mainly on teaching. As a technological asset, games become better known and more widely used - most of us have some games on our smartphone nowadays. However, there was a lack of research on serious games used in order to bring a positive impact on behavioural change. The methodology developed and tested by eConfidence games aimed to fill in this gap.

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9 Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., & Pereira, J. (2016). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers & Education*, 94, 178-192.

# ECONFIDENCE SERIOUS GAMES

As a non-traditional teaching tool, games used in classroom give rise to many interchanges between teachers and students about their practices. A serious game is a game designed for a primary purpose other than just entertainment. The term serious refers to the added component of the game that enables players to perceive the game as a learning experience.

eConfidence designed two serious games (offline/online) with the aim to foster positive behavioural change. Due to the broad possibilities and desired outcomes when dealing with behaviour change, the main topics of interest for the games narrowed to two well-defined subjects: **Safe Use of Internet** and **Bullying**. In the eConfidence games, students become active agents in their learning through direct engagement in realistic simulations. Below there is a detailed presentation of each game.

## 1. School of Empathy game

One of the two eConfidence games entitled School of Empathy is a game created to encourage positive behavioural change facing bullying situations. School of Empathy, developed by ITCL (eConfidence project coordinator) with research and communication support from all project partners, gathers different situations recreating moments in which game players can experience actions of harassment in school environments. The game trailer is accessible here.

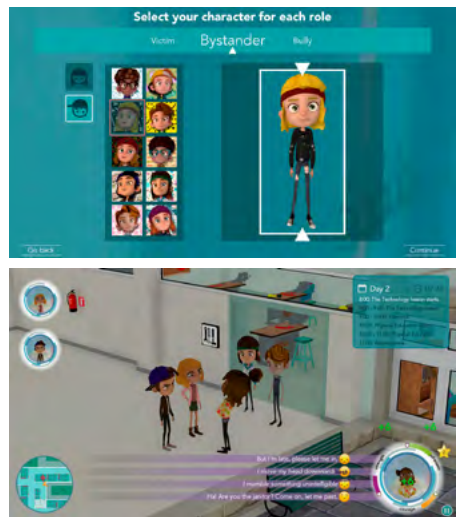




School of Empathy addresses the following aspects:

- Improved adequate assertive and empathic behaviour in potential bullying contexts
- Decrease on hostile or by-standing behaviour
- Increased acceptance of differences and non-hostility towards colleagues
- Increased awareness of the impact of one actions over others and cooperative behaviour
- Incorporation of reproof of anti-social behaviour at individual and group-level.

The game is set in a school environment and reflects the life of students in real life situations. Players can have three roles when they play the game: victim, bully and observer. The player, through dialogues and different dynamics in the form of mini games, “interprets” the different characters that can be immersed in a situation of these characteristics. The ultimate goal is that young people eventually learn how to detect, respond and solve bullying situations.



## Educational benefits of School of Empathy

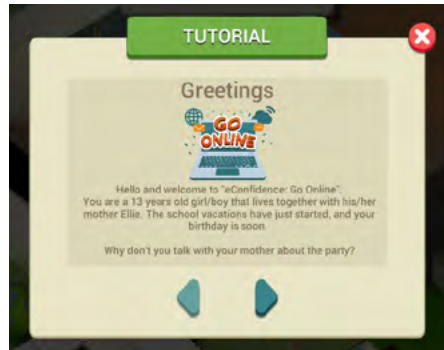
School bullying and peer victimisation are recognised as a widespread social problem among children and youngsters that many youngsters experience during early adolescence. Most children are not directly involved in bullying incidents, but they are present as observers (‘bystanders’) and play an important role in encouraging or discouraging bullying behaviour. Among different approaches to intervention, serious games can be suitable tools for intervention with children and adolescents as they make the learning process more enjoyable and effective.

The goals of the eConfidence game tackling bullying are to help students:

- Improve the ability to recognize bullying situations, including incidents of verbal and relational violence
- Understand different roles children can play in bullying contexts
- Identify and use adequate, assertive ways of coping with bullying situations, either as a victim or a bystander
- Identify and use adequate, prosocial ways of interaction with peers (instead of aggression).

## 2. Go Online game

The second eConfidence game is Go Online, a serious game made to encourage positive behavioural change in the area of safe use of internet. In cooperation with eConfidence partners, Nurogames researched, selected and developed ideas to be included in the game. In collaboration with ITCL, a suitable graphical style for the target audience was determined. The game trailer is accessible [here](#).

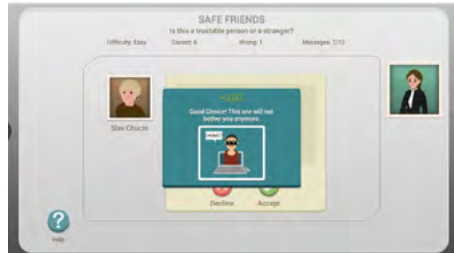


Go Online addresses the following aspects:

- Increased awareness of consequences and of interacting in a social online environment.
- Sense of privacy, avoidance of harassment or support of improper/anti-social behaviour.
- Self-awareness of “virtual self” implications and importance of concepts such as anonymity, right-to-be-forgotten.
- Awareness of online risks and how to cope with them.
- Self-monitoring of excessive or improper usage of Internet.

- Increased awareness of the importance to use internet and its facilities as a communication, research and empowering tool, but not as replacement to real-world interactions and activities.

In terms of structure, 'Go Online' consists of five mini-games. The user has the role of a teenager while preparing a birthday party. Then the game puts the user through a decision making process that indicate the level of safe use of internet. The mini-games are enclosed by a story in which the player moves around in a household environment familiar to every student. The household environment was chosen to immerse the player into the game and to facilitate the relation between game environment and real world.



## Educational benefits of Go Online

Due to the widespread use of the Internet in everyday life, its safe use is, nowadays, an essential skill in today's society. Children and young people should learn to use in a safe way the multiple possibilities offered by the internet, applicable already in their day-to-day life.

The objectives of 'Go Online' are that students receive support to:

- Identify the different types of risks they can encounter online
- Understand the consequences of potential online behaviour
- Develop successfully digital skills
- Improve their behaviour in a digital environment.

# SCHOOL PILOTS

The effectiveness of the eConfidence serious games was explored through the pilot study that was carried out throughout the academic year 2017 – 2018. eConfidence serious games were tested with **343 students aged 12-14 years old**. Five schools in Spain and five schools from English-speaking countries (Malta, Ireland and UK) took part in the pilot study, with 34 to 36 students participating from each school.

## PILOT TESTS - DEMOGRAPHICS

**343**  
STUDENTS



**12-14**  
YEARS OLD



**5** SCHOOLS  
IN SPAIN



**5** SCHOOLS FROM  
MALTA, IRELAND  
AND UK

**34 TO 36** STUDENTS

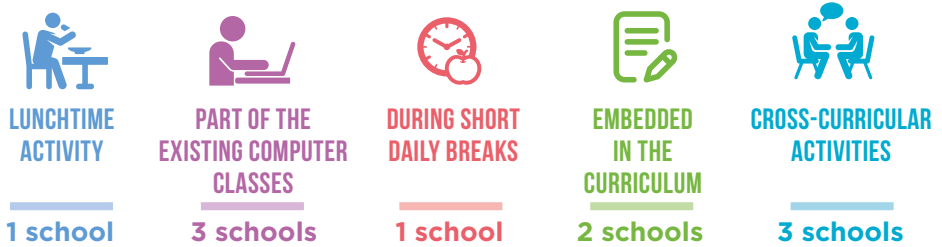
ACADEMIC YEAR 2017 - 2018

The evaluation of the games was done in a comparative way. The participants were divided in three groups: 1) students who played the game, 2) students who did not play the game and 3) students that played a different game.

Analyses were performed in order to examine the effects of the two video games on students' knowledge, behaviours and attitudes. Some of the variables analysed were the knowledge and behaviours related to safe use of the Internet and bullying, as well as attitudes, perceived behaviour control, self-efficacy, subjective norms and

behaviour intentions related to both topics. Furthermore, other social skills were tested such as assertiveness, empathy, and friendship. In addition, students' in-game behaviour in both games were analysed.

## PILOT ACTIVITIES INTEGRATION ACCROSS SCHOOLS

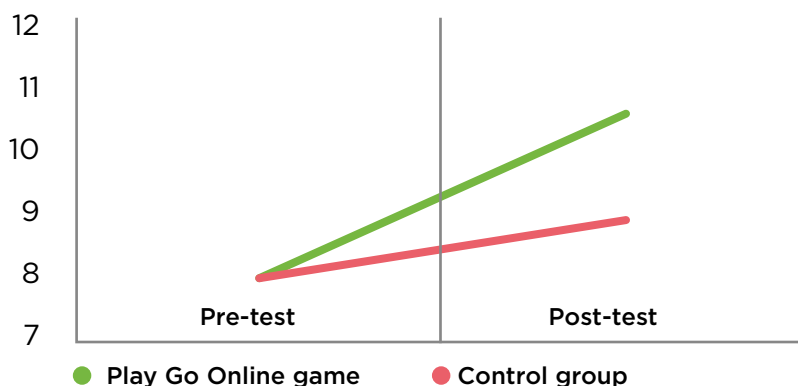


The pilot tests were carried out in different ways across schools, adapting to school practical requirements and curricula. For instance, the pilot tests took place as a lunchtime activity initiated from the teacher (1 school), as part of the existing computer classes (3 schools) and during short daily breaks from the normal class curriculum (1 school). In some cases they were embedded in the the curriculum as part of their learning process (2 schools) and included in cross-curricular activities within the skills development programme (3 schools).

## RESEARCH RESULTS

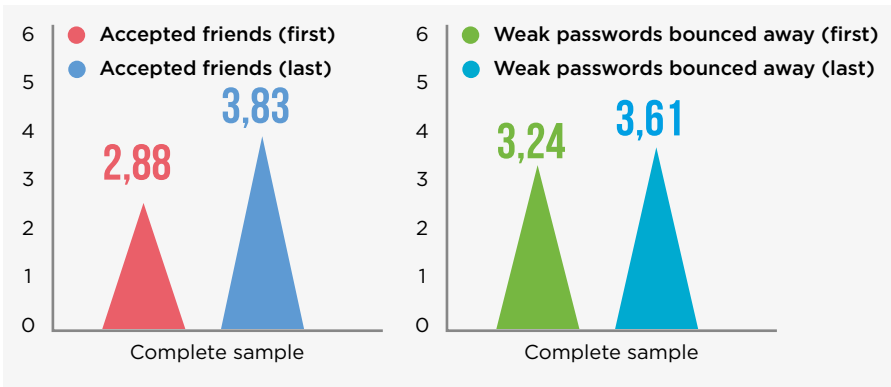
Participants of the pilot tests in both Spanish and English speaking schools had a good knowledge of the two topics: safe use of the Internet and bullying. Therefore there was little room for behavioural change and improvement of knowledge due to serious games. However, in the few cases that students were not fully aware of the topic, there has been some indication that the gaming activity could have affected positively their knowledge.

**Knowledge about Safe use of the Internet  
(LESS KNOWLEDGE SAMPLE)**



This brings us to the conclusion that a serious game can be efficient in changing students' knowledge and behaviour only if it is tailored and adjusted to students' existing knowledge over the topic, or the game should be applied to students with insufficient knowledge and inadequate behaviour.

It is notable that there was a positive change in the behaviour of students that played the game about the safe use of the Internet. At the end of the gaming activities with Go Online, students were able to distinguish better between reliable and unreliable people online, and between strong and weak passwords comparing to their awareness before playing the game. This change was also relevant to the number of times that each student played the mini-games.



As for the participants of the School of Empathy game, students who more frequently participated in dialogues in different roles (victim, bystander, and bully) showed higher perceived control and self-efficacy in protecting the victim and reported more assertive and less aggressive reactions in everyday situations after the pilot tests.

The results of the eConfidence pilot tests also stress the importance of the participants' experience in obtaining beneficial outcomes of the game. Immersion in the game and perceived competence can bring positive psychological outcomes.

### Students' point of view

Students' point of view is important as they are the final users of the games. Their opinion highlighted three important aspects: learning, fun and the technical characteristics of the games.

Students reported that they were able to learn concepts such as the use of secure passwords, the use of social media, what bullying is and how they can prevent it, what it means to be a victim, bully or bystander in different situations.

The comments of students revealed that some found games fun and entertaining and some students perceived some parts repetitive and boring. Therefore, dynamic games, tailored to the level of experience of each player (e.g. via providing hints when the challenge is too hard) could provide all players with an optimal level of challenge.

On the other hand, children are accustomed to dynamic games with high graphic quality and therefore serious games should find ways to combine fun and educational benefit.

## FEEDBACK FROM SCHOOLS

Following the pilot tests, eConfidence reached out to the 10 participant schools and asked the research coordinators and the participant school staff and students to provide their feedback regarding their experience in the project. The main feedback received is presented as follows:

### 1. Pilot organisation within the school programme

Most schools agreed that the activity was well organised and ran smoothly with the full cooperation of the parties, although it required several efforts from the school staff but also from the pupils' side in terms of commitment. Some schools noted that it was a useful exercise to learn more about such a research project, protocols and implementation aspects. Therefore, they considered useful to have preparation meetings and continuous communication with researchers and coordinators.

Teachers agreed (with one exception) that **the eConfidence team support provided throughout the pilot tests sufficiently** helpful to overcome any flagged issues, being reliable and responsive, although for some technical issues the response time was longer than expected.

### 2. Participation in an international research and innovation project

All schools highlighted that their participation in an international research and innovation project was a positive and enriching experience, supporting their teamwork at the school level and increasing their awareness and interest towards other international projects. Most of the schools noted that this was also a beneficial experience for the pupils.



### 3. Using serious games for learning

All schools agreed that it was a useful learning opportunity and that serious games can have positive educational benefits for pupils (going beyond entertainment and looking into creative learning). However, a few schools mentioned that technical difficulties encountered by pupils could have an impact on their level of engagement. They suggested carrying out different tests in order to ensure that the games correspond to the age level of the students. When asked whether they would **recommend the eConfidence games to other teachers/pupils as educational resources effective in fostering positive behavioural change linked to bullying and safe use of internet issues**, all participants (with one exception) said they would do so.

### 4. Students' and school staff interest/motivation

All students and staff agreed that participants were very interested and engaged with the games in the beginning. However, during the pilot test, most schools lost slightly their interest and motivation due to the technical shortages of the games. Some schools and staff suggested that games should be more dynamic and less predictable.

### 5. Benefits of participation to the pilot tests



**For the schools**, it was a useful experience to participate in an international research project focusing on topical themes such as bullying and safe use of internet.



**For the pupils**, it improved their digital competences and awareness in these two topics.



**For the staff** involved, it was useful to work in an international project and implement new learning methodologies using technology.

## 7. Satisfaction in comparison with expectations

Emphasising that expectations were higher at the beginning of the pilot tests, participants commented that:

- Students lost their interest towards the end of the pilot tests
- They faced technical difficulties with one of the games. Most of the technical issues were linked to bugs (in both or just one of the games), others to the platform not saving the responses correctly. All technical issues had a negative impact either on the students' motivation or on the overall timeline of the pilot tests.
- Although the satisfaction is lower than the original expectations, the global assessment of the project is positive.

To sum up, the feedback from schools was a useful way to compile a set of comments, suggestions and recommendations for improvement from the 10 schools involved in the eConfidence pilot tests. All schools representatives responded that they were very motivated and satisfied to have participated in the eConfidence pilot tests. Their satisfaction however varied when switching from an overall perspective on the project to a specific one on particular stages (i.e. experimental).

The perception of the games varied from school staff to pupils, and while the expectations were set high at the beginning of the pilot tests, during the pilot tests the motivation dropped due to technical problems and lack of engagement offered in one of the games. The innovative approach using serious games for learning was nevertheless highlighted by all participants and it represented a positive experience (overall) for a more engaging learning experience with pupils.

Finally, the following recommendations can be made for eConfidence sustainability plan as well as for other projects applying such an approach/methodology working with schools:

- Dynamic and interactive serious games particularly for young pupils;

- High degree of responsiveness when tackling technical issues, particularly throughout an experimentation stage;
- Thorough coordination with the school calendar, bearing in mind possible local/national holidays as well as exam periods;
- Flexibility in terms of pupils' schedule in participation (linked to factors that may intervene and cause their absence during some sessions or even withdrawal);
- The educational benefits for schools participating in such exercise are valuable and should be considered in upcoming projects/opportunities.

## Partners



**ITCL Institute of Technology**  
[www.itcl.es](http://www.itcl.es)



**European Schoolnet**  
[www.eun.org](http://www.eun.org)



**Nurogames**  
[www.nurogames.com](http://www.nurogames.com)



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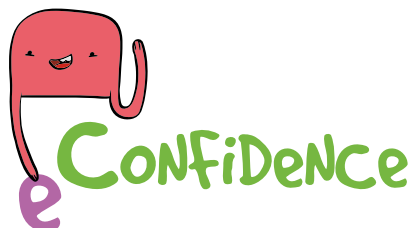
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