<A Day at School>: A Serious Game for Social Skills Training

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Abstract: Soft skills are the personal characteristics of an individual that enhance his/her interactions, career prospects, and job performance. Soft skills include social skills which incorporate characteristics like empathy, self-control, socialization, and friendliness. The development of soft skills at an early age is vital. Currently, there are few serious games for social skills training aimed at primary school pupils. A serious game does not only provide fun but a player can discover knowledge about himself. This paper presents a serious game named "**A Day at School**" that helps primary school pupils to develop social skills through an educational scenario. In this scenario, the hero of the game faces various situations during a usual day at school. The scenario deals with the situations of bullying, racism, and social awareness of children. By using the educational application, pupils discover appropriate behavior and get the first stimulus for acquiring their social skills. The serious game helps them to socialize and gain the basis to cultivate empathy, friendliness, and self-control. Primary school pupils and teachers evaluated the serious game. The results showed that teachers found that the game is suitable for teaching purposes and its graphical user interface (GUI) is appealing.

Keywords: Serious games; Soft skills; Social skills; Educational games.

Introduction

In the last decades, the use of Information and Communication Technologies (ICTs) for teaching and e-learning purposes has increased significantly [4][8]. Many governments have made large investments in equipping schools with smart computing devices and software tools (games, text, animations, video, and audio clips). In addition, the adoption of e-learning services in teaching practices has spread rapidly. ICTs provide access to a wide range of e-learning resources, and thus pupils can improve their educational outcomes [21]. Also, the use of ICTs can reduce educational costs in the long run [6]. It can promote personalized teaching and better monitoring of pupils' progress [8]. ICTs can increase pupils' flexibility and autonomy while improving their learning attitudes and experiences [6]. Furthermore, ICTs can be used to improve teaching materials and make e-lessons more comprehensive, engaging, and interactive [4] [13].

In the near past, technical skills (also known as hard skills) were the only skills required for professional employment. Nowadays, technical skills are not enough in the current workplace [3]. Soft skills are required as well. Soft skills include social skills which incorporate characteristics like empathy, self-control, socialization, and friendliness. ICTs can develop people's soft skills which employers want from them [15]. There has been a lot of research ([2][3][15][18]) that focuses on the importance of soft skills in the workplace. In many cases, successful job placement depends on people's soft skills, while technical knowledge plays a secondary role. As the workplace progressively seeks employees who are mature and socially well-adjusted, soft skills are valued as the number one qualification for entering the

workplace successfully. Many studies such as [1][3] [7][15][18] suggest that starting the development of soft skills at an early age is vital. For instance, at an early age, primary school pupils can play serious games aimed at their social skills training. Notably, primary school teachers are often unaware of the importance of soft skills and they cannot teach social skills lessons. Moreover, they are not aware that their pupils have not acquired proper soft skills. Discovery learning through serious games can solve this problem. Moreover, serious games, based on discovery learning, can help pupils to develop their social skills through experimentation and practice.

This paper presents a new serious game (named "A Day at School") that helps primary school pupils to develop their social skills. Also, it presents its evaluation by teachers and pupils.

SERIOUS GAMES FOR SOCIAL SKILLS TRAINING

Social skills include verbal and non-verbal communication such as speech, gesture, facial expression, and body language. In particular, they include the traits of humor, empathy, self-control, socialization, fierce personality, subtlety, friendliness, and body language [19]. They are interpersonal, human behavioral, or management skills necessary to apply technical skills and knowledge in the workplace [14] [22]. A person has acquired social skills if s(he) knows how to behave in social situations and understands rules when communicating with others [7]. A lack of soft skills can ruin the promising career of a person who has the technical ability and work experience but not interpersonal skills [1][5][10].

In a school environment, empathy, self-control, socialization, and friendliness are important for creating and maintaining friendships. Interactions of children are not always smooth and a child must be able to use appropriate tactics to resolve conflicts. Also, children need to be 'empathetic'. Empathy is the ability to understand (or feel) what another person is experiencing inside. Self-control is the ability to control ourselves, our emotions, and our behavior by anticipating situations. This is how we get better results in our social relationships. With self-control, pupils can effectively deal with conflicts that may arise in a school environment. Socialization is a sociological term that means the process of transmitting to the individual the morals, customs, rules, and ideologies necessary for participation in society. Friendliness and friendship are important factors in the socialization of children and the development of healthy relationships.

Teachers must be aware when their pupils have not acquired the necessary soft skills. In this case, pupils should be encouraged to improve their soft skills by reading books, attending classes, participating in activities to broaden their horizons, such as presentations and discussions, or playing games. In addition, soft skills courses could be integrated into curricula. However, current curricula are already overloaded with technical skills lessons.

Serious games using discovery learning

A serious game includes elements of entertainment combined with a practical dimension [20]. The main purpose of a serious game is not entertainment, enjoyment, or amusement. Currently, the use of serious games for social skills development in the classroom is accelerating at a remarkable rate [23]. Pupils learn by playing serious games which can teach them social skills and concepts. Ref [23] is a systematic review that summarizes the current existing literature on social skill serious games for young people ages 5 to 19. A serious game can enhance the user's experience through interaction in education, training, health, or interpersonal communication [12] [23].

The most serious games are based on the discovery learning approach. Discovery learning is an inquiry-based teaching method (related to constructivism) that focuses on understanding the structures and scientific principles of a subject matter [17]. Discovery learning is directly linked to our experiences, it arises from and is influenced by the context in which it takes place. Also, it results from experimentation and practice. Consequently, pupils can develop social skills through experimentation whereby they can build their knowledge in the domain of social skills and derive rules and conclusions from the results of their experiences [23].

THE GAME: "A DAY AT SCHOOL"

We developed a serious game, named "A Day at School". In this game, the player is asked to move the hero of the game and find the best way to help friends and classmates in various situations such as

bullying, racism, etc. This educational application helps primary school pupils to develop their social skills through a simple educational scenario. By playing the serious game, pupils discover appropriate behavior and get the first stimulus as a trigger for acquiring social skills.

Design and Implementation

We developed the serious game by following the software design and development processes. Based on the discussion with teachers, we created the script and determined the functional and non-functional requirements of the game. We designed the use case diagram with the main functions of the application with which the user interacts. We wrote the source code of the serious game by using the *Pygame* and *Pygame_GUI* packages [9]. We created the graphics of the game by using the open-source application *Inkscape* [11]. Figure 1 depicts the application structure and system architecture.
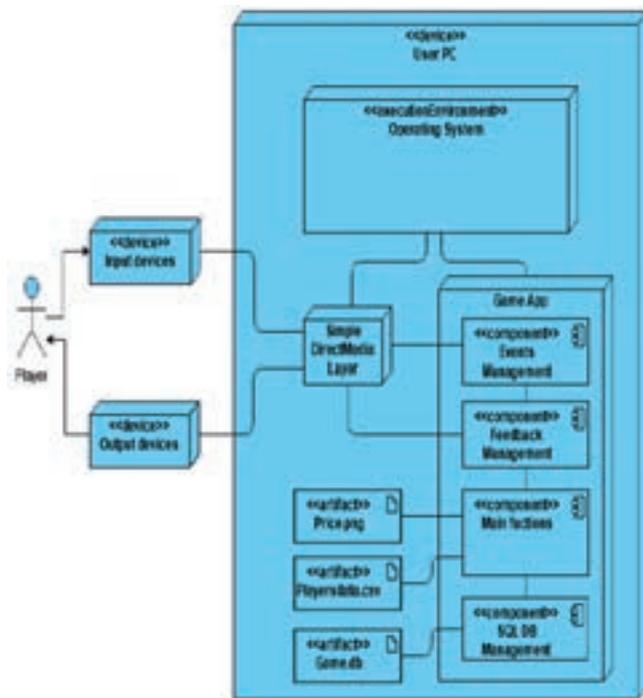
Figure 1. Deployment diagram

The application connects to the input devices via the *Simple Direct Media Layer*, through which the input events are received for management by the application. The output devices give feedback to the player. In addition to the main functions, the application has less important functions for exporting and manag-ing data from the *SQL Database* as well as *Award extraction*. For the development of the application, we wrote the code by using the Python programming language, while we designed the prototype graphics by using an open-source editing application.

The Educational Scenario of the Game

The educational scenario takes place in a virtual primary school environment. In this scenario, the game hero faces various situations during a usual day at school. The scenario deals with the situations of bullying, racism, and social awareness of children. Bullying is the use of violence, verbal or physical, between children to cause fear, pain, or distress. Racism is the perception that people are not all equal to each other, but are divided into superior and inferior, distinguished either by skin color, ethnicity, religion, gender, or sexual orientation. Empathy is defined as identifying with another person's situation and understanding his behavior, motivations, and needs.

Based on these situations (bullying, racism, etc.), we created an educational scenario. Through these situations, pupils are trained in empathy, self-control, socialization, and friendliness. The goal of the educational scenario is for the pupil to discover knowledge on his/her own in an explorative way. In this scenario, the pupil can think and explore which is the appropriate choice/option so that s(he) can earn the corresponding points. There are positive, neutral, and negative situations for the pupil to understand the correctness of the actions of the game hero by winning enough, a few or no points. At each step of the game, if the player has not won any points, an opportunity is given to try again. In the design of the educational scenario, there is positive feedback so that the player is motivated to interact positively and perform the required actions. There are no negative scores. All players may receive a prize in the form of a commendation.

The educational scenario consists of six levels of training.

Analysis of Training Levels

Each level concerns training in a different subject. At each level, possible options are proposed to the user, and s(he) is asked to decide which option/solution is the correct one and earns the corresponding points. At each level, the user is asked

to decide whether the hero will do the right thing or not. Below, we analyze each level.

Level 1: Socialization on the way to school (Socialization - Empathy)

At the traffic light (located near to school) our game hero sees a classmate on the street. The classmate is sitting in a wheelchair and cannot activate the pedestrian crossing to cross the street. What the hero should do? There are three options:

1. He approaches the traffic light to activate it. Therefore, he can cross the street and continue on his way, not caring about his classmate.
2. He approaches the traffic light to turn it on. He helps his classmate to safely cross the street and takes her to school.
3. He carelessly passes the traffic light without helping and continues to school.
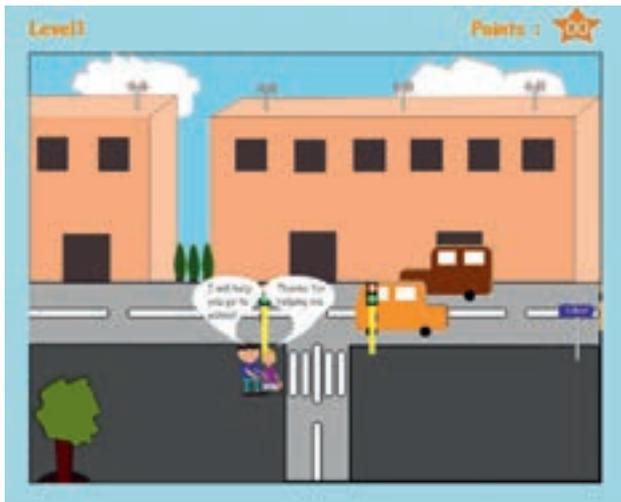
Figure 2. The hero is ready to help (Level 1)
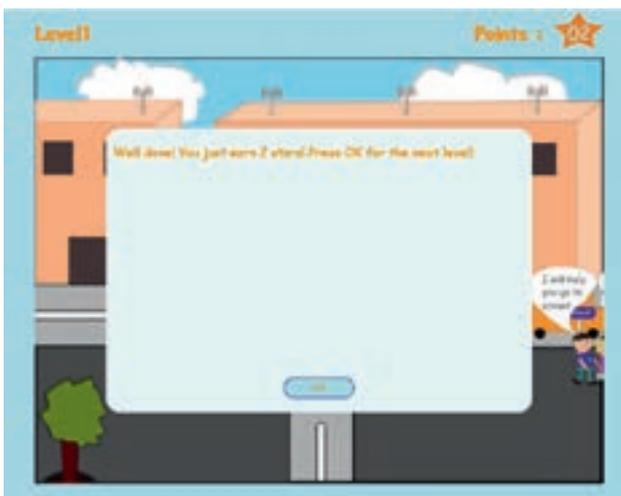
Figure 3. Successful completion of Level 1

Level 2: School violence - bullying in the classroom (Friendliness - Self-control)

As classmates leave the classroom, some of them knock down a classmate. What the hero should do? There are three options:

1. He goes to his classmate and remarks to the others that violence is not the solution.
2. He walks out of the classroom, wondering if he should talk to the teacher.
3. He goes over to his classmate and mocks him.
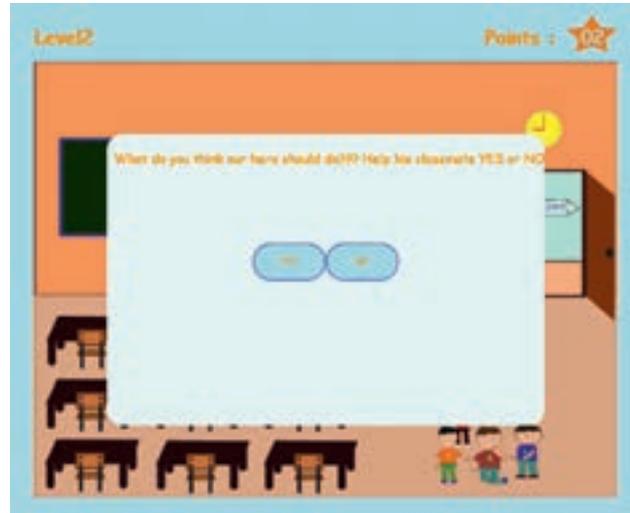
Figure 4. The pupil is asked to decide what the hero will do (Level 2)

Level 3: Distinctions between pupils at recess (Empathy - Friendship)

While the hero is with his classmates (next to them), he notices an isolated child being made fun of. What the hero should do? There are three options:

1. He approaches the child and tells him to join the group.
2. He approaches the child and tells him that he should just sit there since they do not want him in their group.
3. He goes to the dining room for his lunch. He hopes to find his teacher.

Figure 5. The hero is ready for action (Level 3)

Level 4: At meal-time (Empathy - Friendship)

The hero observes that a child is sitting without eating. What should the hero do? There are three options:

1. He approaches the child and discreetly gives some of his food. He tells to the child to talk about its problem to the teacher.
2. He approaches the child and shouts "Why are you sitting here if you have nothing to eat?"
3. He leaves the dining room to the stadium to talk to the teacher.
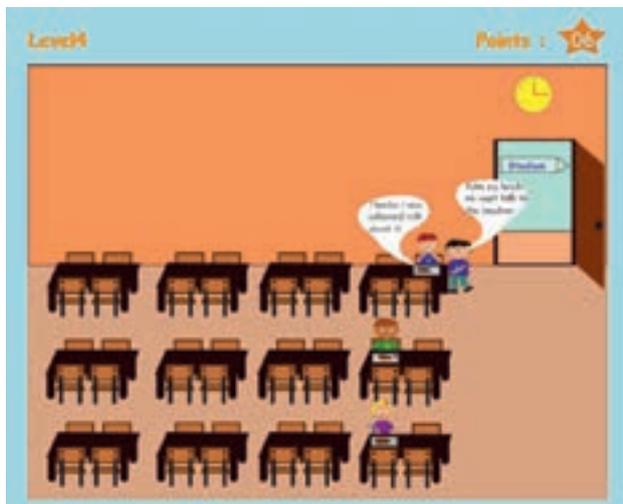
Figure 6. The hero helps his classmate (Level 4)

Level 5: Distinctions between pupils in gymnastics (Empathy - Friendship)

A classmate cannot cope in sports and sits in the stands. What should the hero do? There are three options:

1. He approaches his classmate and tells him that it's okay if he can't play but if he wants he can be a referee.
2. He approaches his classmate and tells him that since he cannot play, he shouldn't take part in gymnastics.
3. He leaves to go to his classroom and get ready for leave from the school.
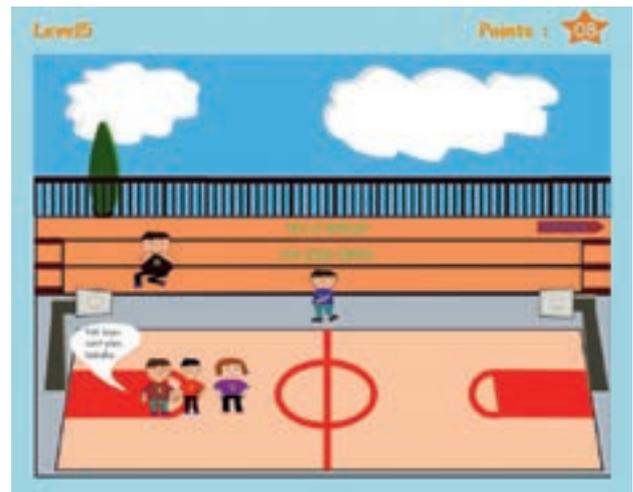
Figure 7. The hero is ready to help his classmate in the stands (Level 5)

Level 6: School violence-bullying (Friendliness - Self-control)

In this training level, the hero is the victim of verbal bullying by a group of kids. What the hero should do? There are three options:

1. He thinks he should not pay attention and leaves for his house heading for the park.
2. He returns to school to inform his teacher and the Principal.
3. He approaches the group of children and replies by mocking them. Then, he leaves towards the park.

Figure 8. The hero is verbally bullied (Level 6)

EVALUATION OF THE GAME

Methodology

Teachers and pupils evaluated the game. Twenty-six (26) teachers of primary school education evaluated the game. Also, 28 primary school pupils participated in the evaluation process (57.1% were boys and 42.9% were girls). Among them, 7.1% were pupils in Primary Class A, 7.2% in Primary Class B, 14.3% in Primary Class C, 14.3% in Primary Class D, 35.7% in Primary Class E, and 21.4% in Primary Class F. The evaluation took place online from March 14, 2021, to March 20, 2021. For the evaluation of the game, we used questionnaires with metrics and Likert scales [16]. One questionnaire for teachers (see **Table 1** in **Appendix**) and two questionnaires for pupils (see **Tables 2 and 3** in Appendix) were distributed by email to investigate the subjective satisfaction of teachers and pupils. Teachers and pupils completed their questionnaires online through a free form creation service.

Table 1 shows the Questionnaire and the teachers' responses (%) per question. Table 1 includes questions about the teachers' experience with serious games, the design, and the educational scenario of the game, whether the intentions of the game are clear. Finally, this questionnaire asks the teachers' opinions about the effectiveness of the serious game and its possible integration into the teaching process.

Pupils were asked to answer questions before and after the playing of the game. The evaluation investigates:

- The experience of teachers and pupils in serious games, and how much they have been involved into the educational process.
- The effectiveness of the application on pupils, (i.e., whether they learned through the game).
- The suitability of the application for use in the school environment.
- The usability in terms of ease of use.
- Accuracy in the design of the application concerning the scenario and the topic it deals with.
- User satisfaction with the design of the application environment (i.e., graphics, sounds, etc.).

The first Questionnaire **(Table 2)** asks pupils questions about whether they play computer games and whether they have played serious games. Pupils were asked to answer how they would behave in certain situations. In the second Questionnaire **(Table 3)**, some questions are asked again to find out if a pupil has learned through the game, and additional questions are asked about the usability and design of the game. The Likert scale was not used in the pupil questionnaires because this would confuse them due to their age.

Results Analysis

Teachers: A large percentage (84.6%) of teachers had no previous experience with serious games. However, they understood the purpose of the game. They found that the design of the graphical user interface (GUI) is appealing to pupils, and considered it suitable for education. Regarding the design of the game, 92.3% of the teachers answered that they would not change anything, with the remaining 7.7% concerning the graphics. Regarding the effectiveness of the app, teachers were completely confident or almost confident that the app can raise pupils' awareness and develop social skills **(Figure 10).** A small percentage of teachers could not answer with certainty about the suitability of the application for use in the educational process. Almost 70% agreed with its suitability **(Figure 10).** Regarding the suitability of the serious game for the development of social skills, 69.3% of teachers considered it suitable (or rather suitable) with the remaining percentage expressing doubt **(Figure 10).** In terms of the accuracy of the game and the
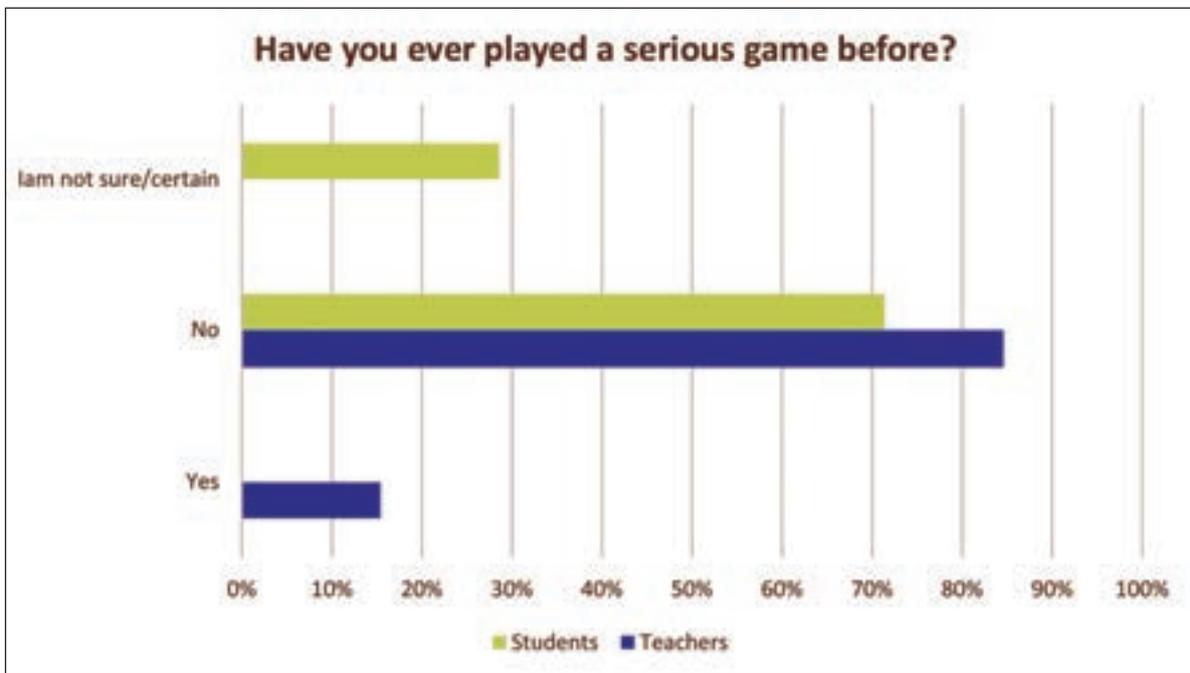
Figure 9. Use of serious games by teachers and pupils

scenario, this was considered to be understood by all teachers with almost half of them stating this with absolute confidence. With the same results, the approach to the topics dealt with in the game was judged to be apt. Still, 92.3% felt that the design matched the scenario, with only a small percentage of doubt.

In terms of user satisfaction, teachers found the design of the game to be appealing to the children's interest and the flow would not tire the user. Moreover, they did not suggest any change in the design of the game.

Pupils: Most of the pupils did not know the term "serious games" but they understood what the

Figure 10. Teachers Effectiveness - Suitability of the application
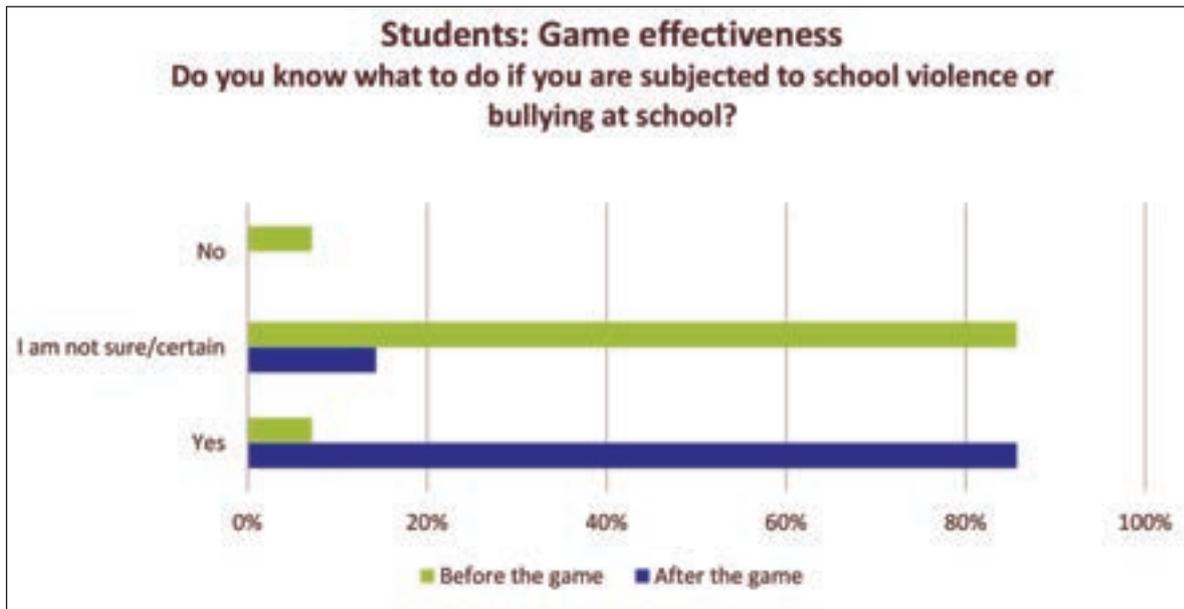
Figure 11. *Effectiveness on pupils - Before and after playing the game*

teaching purpose of the game was. The pupils had not used serious games at all or were not sure about it **(Figure 9)**. Among the pupils, after the game, 92.9% said that they now know what bullying is, that they have understood what discrimination between people is with 71.4%. 85.7% responded that they know what to do if they are bullied and with the same percentage that the game helped them to understand how to deal with different situations **(Figure 11)**.

All pupils said that: (1) they should help those in need; (2) they would help a classmate at school; and (3) they would inform their teacher **(Figure 12)**. Before pupils play the game, only 21.4% said they knew what school violence was. 78.6% were unable to say for sure. 85.7% were not sure about discrimination between people, while 14.3% did not know. A percentage of 71.4% and 78.6% said they were not sure if they would help a classmate at school with the remaining percentage being sure they would. Concerning bullying, 85.7% said they were not sure what to do if they were bullied with the remaining percentage split between those who either knew or did not know. After playing the game, most pupils
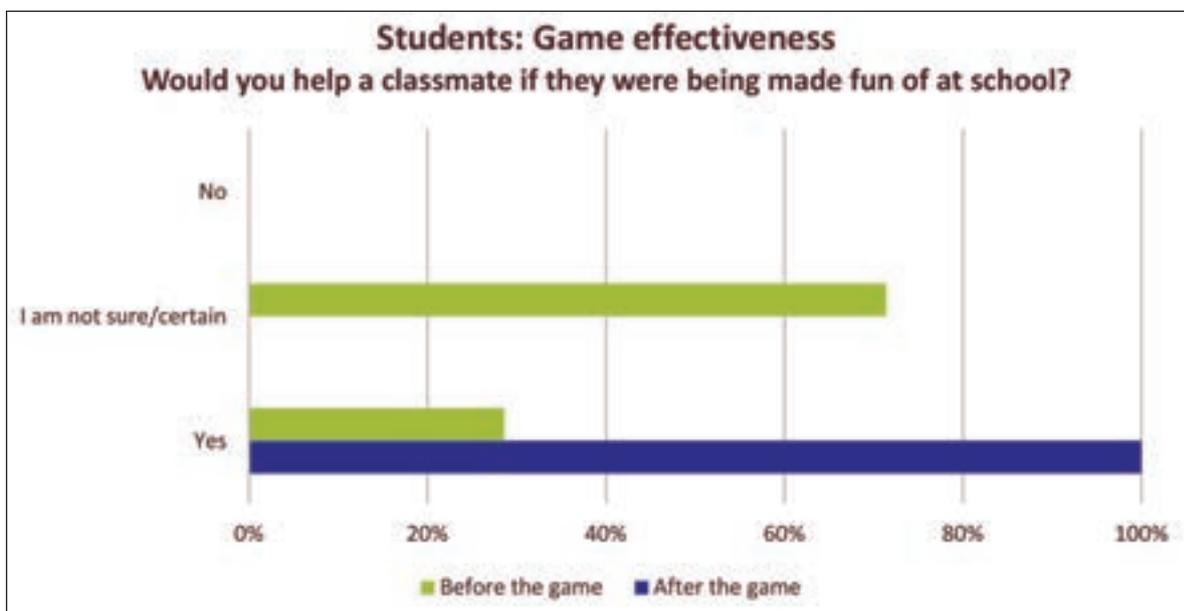
Figure 12. *Effectiveness on pupils - Before and after playing the game*

answered positively to all the above questions. All of them found that the game is easy to handle, with useful help provided.

By analyzing the above results, we conclude:

- Serious games have not been integrated into the educational process or widely accepted. The highest percentage (84.6%) of teachers had not used a serious game so far. The highest percentage of pupils was not sure if they were aware of serious games even though all pupils have played computer games before. Even if they have played a serious game, they were not sure about the term called "serious game".

- The game is effective as it convinced the teachers that it can raise awareness of social issues among pupils. By playing the game, pupils clarified the concepts of bullying and racism. It convinced them that they should talk to their teacher about all the issues addressed in the game. Moreover, although before the game, most of the pupils were not sure how they would help a classmate. After playing it, all of them answered positively. Therefore, the developed game helped them to socialize and gain the basis to cultivate empathy, friendliness, and self-control.

- The game is suitable for integration into the educational process (with almost 70% certainty) because the majority of teachers evaluated it with absolute (or relative) confidence. All the teachers were convinced that serious games are suitable for the development of social skills.

- The game is easy to play and attractive to users. The provided help system is satisfactory for pupils.

- The GUI of the game is satisfactory.

- The educational scenario is complete for addressing the issues of social skills training. It is appropriate and easy to understand by the teachers, which was reflected in the pupil's results after using the game.

- The purpose of the game has been achieved to a large extent. Some of the pupils may not have understood the social concepts dealt with in the game. However, after playing the game, all of them answered that they would help a classmate and would talk to their teacher.

CONCLUSION

This paper presented a game called "A Day at School" that is effective for primary school pupils for social skills training. Teachers found the educational scenario (script) appropriate. Moreover, they would like to integrate this game into the e-learning procedure. Also, pupils liked the game, understood the educational scenario of the game, and responded positively to what the game aimed to teach them. By using this game, pupils were triggered to develop and strengthen the social skills they discovered by using it.

Soon, we will expand our game by developing chapters with sub-levels where the user would select a category to be trained in other social skills subjects. We will develop an integrated platform to train primary school pupils in all social skills. Finally, we aim to use more effective graphic design capabilities that will enable the game even more attractive.

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APPENDIX: Questionnaires for teachers and pupils

Table 1. Teachers: Results of their Questionnaire

Reply Question	I agree (%)	I guess I agree (%)	I am not sure / certain (%)	I guess I disagree (%)	I disagree (%)
1. Have you ever played a serious game before?	15,4	-	-	-	84,6
2. Do you think is easy to understand the game scenario?	53,8	46,2	-	-	-
3. The design of the game is attractive to attract the interest of children?	100	-	-	-	-
4. Do the game flow and design tire the user?	76,9	23,1	-	-	-
5. Does the design of the game match the script?	61,5	30,8	7,7	-	-
6. Is it clear that the game wants to raise social awareness among children?	38,5	53,8	7,7	-	-
7. Is it clear that the game wants to make children aware of discrimination between people?	53,8	38,5	7,7	-	-
8. Is it clear that the game wants to make children aware of bullying?	53,8	38,5	7,7	-	-
9. Is it clear that the game will give children the opportunity to develop social skills?	46,2	53,8	-	-	-
10. Is the game's approach to the issues it addresses apt?	84,6	15,4	-	-	-
11. Could the game be integrated into the teaching process?	30,8	38,4	30,8	-	-
12. Do you believe that serious games can help develop social skills and attitudes?	30,8	38,4	30,8	-	-

Table 2. Pupils: Results of the first Questionnaire

Reply Question	Y e s (%)	I am not sure/ certain (%)	No (%)
1. Have you ever played a serious game before?	-	28,6	71,4
2. Have you ever played video games before?	100	-	-
3. Do you know what school violence/bullying is?	21,4	78,6	-
4. Do you know what discrimination between people is? (racism)	14,3	85,7	-
5. Do you think we should help those in need?	92,9	7,1	-
6. Would you help a classmate if s(he) was being made fun of at school?	28,6	71,4	-
7. Would you help a classmate if s(he) was being beaten at school?	21,4	78,6	-
8. Do you know what to do if you are subjected to school violence or bullying at school?	7,15	85,7	7,15

Table 3. Pupils: Results of the second Questionnaire

Reply Question	Y e s (%)	I am not sure/ certain (%)	No (%)
1. Do you know what school violence/bullying is?	92,9	7,1	-
2. Do you know what discrimination between people is? (racism)	71,4	28,6	-
3. Do you think we should help those in need?	100	-	-
4. Would you help a classmate if they were being made fun of at school?	100	-	-
5. Would you help a classmate if they were being beaten at school?	100	-	-
6. Do you know what to do if you are subjected to school violence or bullying at school?	85,7	14,3	-
7. Would you inform your teacher if a classmate was being beaten at school?	100	-	-
8. Would you inform your teacher if there was discrimination between children in your school?	100	-	-
9. Would you inform your teacher if you saw that a child from school was in serious trouble?	100	-	-
10. Do you think the game helped you to understand how to deal with different situations in your school and to be more socially aware/sensitive?	85,7	14,3	-
11. Did you like the images and colors of the game?	71,4	28,6	-
12. Was the game easy to use?	100	-	-
13. Was the help in the game understandable?	100	-	-

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