

# Co-designing a Civic Educational Online Game with Children

Ana Cláudia da Costa<sup>1</sup>✉, Francisco Rebelo<sup>2,3</sup>, and António Rodrigues<sup>4</sup>

<sup>1</sup> Câmara dos Deputados, Brasília, Brazil  
analustosa12@gmail.com

<sup>2</sup> Faculdade de Motricidade Humana, Universidade de Lisboa, Estrada Da Costa, 1499-002  
Cruz Quebrada - Dafundo, Portugal  
frebelo@fmh.ulisboa.pt

<sup>3</sup> Centro de Investigação em Arquitectura, Urbanismo e Design, Universidade de Lisboa, Rua Sá  
Nogueira, Alto da Ajuda, 1349-063 Lisboa, Portugal

<sup>4</sup> Laboratório de Pedagogia, Faculdade de Motricidade Humana e UIDEF, Instituto de Educação,  
Universidade de Lisboa, Cruz Quebrada, Portugal  
arodrigues@fmh.ulisboa.pt

**Abstract.** This study presents the co-design process of an educational game for citizenship, involving children aged 10–14 years old. The game project was born in the context of “Plenarinho”, a portal of the Chamber of Deputies of Brazil. Several authors have shown that using digital games has great teaching potential, as they have important principles of different learning theories. However, the creation of an educational game is a complex process that must focus itself on the educational goals of the demanding organization and on final users’ interests. Notwithstanding, in educational game design, target groups rarely contribute since the beginning of design phases. Facing this, we decided to explore the co-design methodology as a way to find answers to the following question: What type of contributions can a creation process involving children bring along to the design of an educational game? Our study was constituted by two stages. The first stage was made up of meetings with the organization’s team and it was dedicated to the definition of the game requirements. The second stage was the one of co-design with children and was dedicated to collective creativity throughout the design process. It was constituted by six meetings. Results suggest that co-designing with younger users is a promise to successfully conciliate learning into fun and engaging games. Users, despite their age, can provide us information about various game mechanics characteristics, visual and narrative characteristics, helping us to design solutions, which considered both pedagogical and playful sides.

**Keywords:** User centered design · Co-design · Child users · Educational games · Citizenship education

## 1 Introduction

Several authors have shown that digital games have great teaching potential, as they have in themselves important principles of different learning theories [10, 11, 16, 19, 23]. This can explain the growing interest in serious games or gamification of educational contents. In the case of civic content, it's not different. Previous studies have shown that digital games can incorporate learning methods that have been found to be effective in research on civic education in the classroom [3, 21, 24]. Among them, we can point out fostering youths' competences to discuss and express their opinions about current events, practice civic problem-solving and decision-making, and simulations of real-world civic events [2, 15, 17].

However, the creation of an educational digital game is a complex process that, beyond its multidisciplinary character, must focus itself on the curriculum educational goals and, at the same time, on the expectations and interests of the users [7]. This article describes on the co-design process in which concepts for a civic educational game were defined based on user-centered approach.

We focused on civic learning because of its importance in democratic societies [12, 15]. The lack of interest in politics concerning Brazilian students may be partly due to the difficulties school had to deal with during the formation of active citizen [18]. The game to be developed is a demand of Plenarinho - [www.plenarinho.leg.br](http://www.plenarinho.leg.br), the children's political website of the House of Representatives in Brazil. The website was launched in 2004, and it is a commitment made by this Institution to create mechanisms to promote political education and active citizenship.

The decision to design a digital game was supported by recent studies [3] showing that decreasing interest of young students in political issues can be fought with educational games. On one hand, "Compared with more traditional media formats these games draw attention, enhance engagement in their topic and induce a positive attitude toward learning and behavioral changes [4]."

On the other hand, it has been recognized that putting together learning and fun is quite a challenge [14]. Many educational games are criticized for failing in achieving their entertaining goals [25]. In order to create a compelling game experience by designing an effective educational tool - ensuring knowledge acquisition and improved attitudes, we decided to rely on an user-centered design approach, bringing users and the demanding institution into the design process, since its initially phases [9, 22].

User centered design methods emphasize the importance of investing time and energy in understanding users and in bringing them into the design process [1, 8, 9, 13, 22]. Nonetheless, in educational game design, children and other stakeholders rarely contribute since the early design phases [25]. As a result, many technological innovations, designed with educational purposes, are carried out without taking students' needs and abilities into consideration.

Excluding users from the early concept and design phases, often leads to game designer's self-referential definitions [1]. Misconstructions about (child) user can contribute to make the game fail in its educational goals, especially because the intrinsic difficulties in conciliating fun and learning.

The question of how to bring and involve children users in the development process of an educational game arises. To address this question, we decided to use a co-design method as a framework to involve child users and stakeholders in a manner that maximizes the value of their contributions and the use of collective creativity shape the game. [13, 25]

Both, users and stakeholders, took part as informants. “Informant design” approach is, according to Scaife [22], the best method “for the design of interactive software for non-typical users or those who cannot be equal partners (e.g., children)”. As an informant, they can have a bigger impact on the direction of the development of the game.

In this article we describe the third phase of a larger study dedicated to the design of a civic educational game aiming students aged 12 to 14 years. The other two phases are described in previous articles [5, 6], and are dedicated to the creation of three children-persona, which supported some final decisions concerning game design.

Thus the aim of this study is twofold: it describes a case study that used a methodological co-design framework for educational game, involving child users, and the concept of a citizenship educational game generated during its implementation.

## 2 Methodology

The third phase, presented here, was organized in two stages. The first stage was made up of two meetings with the organization team and it was dedicated to the definition of the educational game’s requirements. The second stage was the one of co-designing with children and was dedicated to collective creation throughout the design process. It was constituted by six meetings, which involved organization’s team, including game designer/developer and children.

The first stage focused on defining organization’s learning goals and its connection with Brazilian curriculum. Two members of Plenarinho’s team participated in two different sessions. In total, each session lasted approximately two hours.

At the first session, the three children-persona resulted from the previous phases were presented as an input to the discussion, in order to enable a better understanding of the target users. Personas, as fictive characters based on factual information (archetypal user), help the team to deep understand end-users and their likes, dislikes and capabilities [1, 8, 20]. The advantage of discussing learning goals with inputs provided by personas is that they bring into discussion relevant characteristics that can lead the team to reconsider and redefine some of these goals [1].

During the second stage (co-creation with child-users), we ran five focus groups sessions with students, and three game developers/designers of Plenarinho’s team; we conducted one interview with one student, and four meetings with Plenarinho’s game designers, pedagogue and director.

A total of 17 students participated in the co-creation session. All participants were middle school students and were between 10 to 14 years of age. Six participants were girls. To recruit them, we sent an email to all the House of Representatives’ functionaries, inviting them to bring their child to participate in a game design process. The emails

were selected on a first-come, first-served basis. Five focus groups took place at the House of Representatives, and one interview was conducted at the students' house. The brainstorming sessions were recorded, coded and analyzed by the researchers.

The first focus group lasted for three hours, with a 30 min lunch break. The 12 participants were 10 boys and 2 girls of age 10 to 13. The procedure was: (1) *Warming and Introductory Round*. First we presented the reasons why we invited them to participate and our educational goals. After, as an icebreaker, we played a game that helped participants to know each other and better engage in the following activities. Next, we started a conversation about their civic knowledge. To facilitate it, we asked them three questions: (i) What comes to mind when you listen to the word politics? (ii) What games can teach? (iii) Can a game teach politics or civic behavior? They were not obliged to answer and they could bring a different subject as well. The warming and introductory round took around 35 min, including the chat. (2) *Big Circle*. It was how we called the beginning of each focus group. It was the moment when we would talk about the last meeting and prepare the actual one. On the first day, because we were mainly interested in helping them to reflect about civic subjects in order to broaden the space of possibilities to the game, we proposed a finish me story activity. We gave them the beginning of a story, which has a civic context, and they have to finish it. *Big Circle* lasted around 45 min. (3) *Thinking and Designing the Game*. The student group was divided into two subgroups and each group was invited to brainstorming about a game to teach civic behavior and knowledge. They received paper and black pencil and were invited to prototype the ideas that we have shared during the previous moments, mixing it with their game preferences. This round lasted around one hour.

The second focus group took place one week later with ten students, nine boys and one girl of age 10 to 13 years. The procedure was: (1) *Big circle*. We discussed the previous session, its outputs, and we presented some mockups designed by Plenarinho's team, based on students' prototypes and suggestions. Because we had two different prototypes, one for each subgroup, they voted for the best solutions. We alternated phases of diverging (creating choices) and converging (making choices) [8]. *Big circle* lasted around one hour. (2) *Thinking and Designing the Game*. We split them in three sub-groups. They were given paper and black pencil. Based on their decisions concerning the results of our previous meeting, they were oriented to come up with game concepts, each prototyping their own ideas about civic problems, creating narratives, solutions, difficulty levels, game mechanics, etc. They were not constrained in the creation and conceptualization of those prototypes. This phase lasted around one hour and a half.

The third focus group happened with a smaller number of students, three boys and one girl of 10 to 13 years. The procedure was the same of the second meeting, but we didn't need to split the group. (1) *Big Circle*. We discussed the results of previous session, making choices about the solutions they have presented. (2) *Thinking and Designing the Game*. They were encouraged to think of the further steps of the game concept. Each session lasted around one hour.

After those three focus groups, the results were analyzed and presented to the members of Plenarinho's team during two different meetings. In both, they were asked

to review the learning goals with regard to the solutions proposed by the students. New storyboards were created in order to articulate content and game mechanics.

The fourth focus group took place one month after the third one. A total of four students, three boys and one girl, between ages of 10 to 13, participated in this session. Procedures were the same from previous sessions. (1) *Big Circle*, we presented some Plenarinho's comics and discussed with the students their use as reference to the game narrative and characters. They all agreed. *Big Circle* lasted around one hour. (2) *Thinking and designing the game*, when they were told to discuss and refine game mechanics and narrative. Plenarinho's game developers took part in this sessions, redesigned the previous storyboards in order to register new solutions. This session lasted around one hour and a half.

Fifth meeting was an interview with a 10 years old girl. She couldn't participate in the last focus group, but would like to contribute with us. We went to her house, presented her the last storyboards and asked her to evaluate. We analyzed together the storytelling, game missions, rules, tutorials, buttons and navigation. This meeting lasted around two hours.

Sixth and last focus group was carried out with four girls, aged 10 to 14 years. The procedures were the same from previous sessions (*Big Circle* and *Thinking and Designing the Game*) and we carried on refining the game. This meeting lasted around 2 h and half.

After concluding the focus group phase and analyzing all the data we gathered, we organized two more meetings with only Plenarinho's team. We discussed all the solutions (game characteristics) presented by the students and its integration with the original learning goals.

### 3 Results

Sessions with Plenarinho's team were crucial to determine game's learning goals: (1) Game should function as motivational tool to arise interest and engagement in citizenship behaviors; (2) Should help players make connections between individual actions and larger social consequences; (3) Should induce think reflection about civic behavior and how it can be practiced in children context; (4) Should better understand concepts as democracy, authoritarianism, politics, citizenship; (5) Power and life in the game should explore citizenship behaviors (cooperation, persuasion, negotiation, mobilization, conflict solutions, etc.).

Based on these goals, game requirements that should be used during the co-design phase were defined: (1) Game missions should provide students with citizenship challenges that are connected to real world events; (2) Game should be located within a fantasy world, using Plenarinho's characters and narratives as reference to the game design; (3) Could be played outside formal school context. Even though we recognize that teachers and peers are very important to make meaning of the game experience, the organization didn't want to depend on teachers' adherence to the game to achieve its educational goals.

The co-design focus groups with students and Plenarinho's team resulted in an adventure game concept that was composed by five different phases, corresponding to five different levels of growing difficulties. The game was conceived to be played on tablet or mobile.

Users decided that game scenario would be an archipelago (Fig. 1) in where each island were facing a social different problem. When the game begins, players would informed about a problem they have to solve (main mission). As they play the game, many challenges would come their way, and apart from having to find out the origin of the main social problem, they must help to fulfill some basic needs of citizens in the island, such as needs for food, water, and housing. Players could choose when to accomplish these smaller missions, but if they take longer, problems would go grow bigger, and they will need much more (citizenship) energy to solve them. Such events include epidemics, invasion by a neighboring island, environmental accidents, etc. Feedbacks should be provided by alerts, short animations that would pop up on the screen and also by changing scores in the resource bar (Fig. 2). Checking points were suggested in order to avoid restarting from the beginning levels. Rewards should be useful within the game context and missions, but they also advocated in favor of easter eggs or free mode moments.

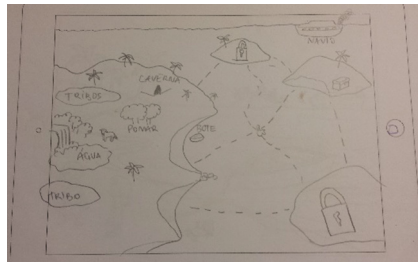


Fig. 1. Story board created by children. Focus group 2

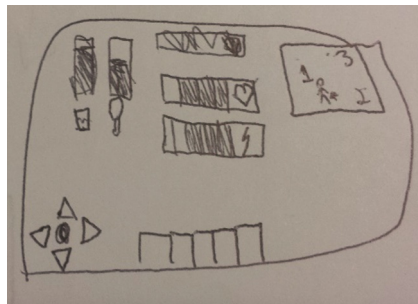


Fig. 2. Ressource bar designed by children (focus group 2)

## 4 Discussion

Overall, the results revealed a variety of ideas that could put together fun and learning, showing considerable promise on this kind of cooperative methodology to design educational games. *“We are making a game that people will play for real”* (boy, 10 years old, focus group 1); *“I like this game because it will be a bit of adventure and strategy”* (boy, 10 years old, focus group 2); *“When playing, if you do not help people, the game does not tell you that you have done the wrong thing. But, if you keep not doing it, after a while, you receive alerts that warn you if you have done the right thing or the wrong thing”* (Girl, 10 years old, focus group 4).

The first two focus groups with more than 10 students was less effective and has brought us some difficulties in controlling the activities. Students were easily distracted, making us spend a lot of time to reorganize them. Our experience with 5 or 4 children were much more productive.

During the meetings, in what concerns students civic knowledge, we were surprised by their awareness about national social political issues, even though their speech showed a tendency to reproduce what is contained in the media (or parents) discourse. *“Politics is a total mess”* (boy, 10 years old, focus group 1); *“... It is an attempt to organize a big country like ours”* (boy, 12 years old, focus group 1), *“I think of deputies”*, *“I think of elections... is to choose a representative for yourself”* (boy, 10 years old, focus group 1), *“Politics is an opportunity that can or can't be used”* (boy, 11 years old, focus group 1), *“It is a country choosing someone to govern it... It depends on whether you are choosing right or wrong...”* (girl, 10 years old, focus group 1). Those results reinforce our understanding that it is important to contribute with educational technologies that can help them to think critically about this subject.

Results also indicated that co-design sessions with children have the potential to determine game elements that can answer user's needs and preferences, and, at the same time, provide the leaning goals aimed by the organization. The variety of ideas generated during the co-design with end-users and stakeholders, in this study represented by Plenarinho's team, showed considerable promise to successfully conciliate learning into fun and engaging games. Some comments made by students during our meetings can highlight this perception: *“Oh, I can't wait it to be finished, I want to play it as soon as possible, please!”* (Girl, 10 years old, focus group 5); *“I told my friend what we are doing here and everyday he asks me when he can play this game ...”* (boy, 10 years old, focus group 5).

However it is important to remark that many game concepts that younger participants suggested resembled their best preferred games. So this was also a topic discussed with them and again, they surprised us with their knowledge when talking about copyright. *“Yes, we must be very careful to avoid problems with copyrights!”* (boy, 13 years old, focus group 2). We stressed that we could be inspired by those games, but that we couldn't make a version of them.

Users, as they listen to stakeholders, they can better understand the learning goals of the game, and thus better integrating them with their game preferences: *“Oh, I see... It's like in the game that I prefer to play. You are the son of a resistance movement member and you have to kill the dictator. But here our game is not going to be a killing*

*or murder one, thinks has to be done in another way, right?"* (Boy, 13 years old, focus group 1). On the other hand, when stakeholders and the design team can listen to and discuss solutions with users, they can put their own expertise in developing products that will appeal to the target audience.

## 5 Conclusion and Future Work

This article reported upon a co-design methodology for a civic educational game, in which children and the game demanding institution were involved since its initial phases.

Firstly, two meetings with Plenarinho's team were held in order to define game requirements and clear learning goals. Results of these meetings were used in all co-design phases enabling children to clearly understand the civic goal of this educational game. This is especially important when different stakeholders have different interests or the content has a broader concept. Plenarinho's team was focused on the game content, didactic and practical requirements, while children were interested in having fun.

Secondly, the focus groups sessions and interview with children provided us with game mechanics that meet previous established pedagogical goals and requirements. Results revealed that children tend to use their previous gaming experiences and preferences to choose game mechanics. Some game concepts were completely detached from the learning goals and we had to discuss it with them in order to make more appropriate decisions and choices. Possibly more input can be gather using game design techniques adapted to younger users.

The challenge of putting fun in an educational game remains. However, this was an innovative experience if we consider the participation of children on the design of educational games. This was a choice made based on the idea that only users can provide us with information about their preferences. Kids don't play for learning, they play for fun. If we do not bring them into the design process, who would inform us about what motivate them to play? On the other hand, educational content cannot be abandoned at the expense of fun aspect. Different stakeholders can help us finding that balance, since each one can contribute with their knowledge on the topic.

To conclude, results of the co-design methodology allowed us to infer that this can be a way to deal with the apparent contradiction in designing educational and fun games. Although this study focused on the co-design of civic educational game, we believe that this framework can be used for any educational game project. As highlighted by human centered design approach, for an effective technology, end users must take part during design processes Nevertheless, more experiences like this as well as empirical evaluations are needed in order to build basis for a more consistent co-design methodology for educational games.

Consequently, future work should focus on evaluating game prototype and discussing it with educators. We know their value in helping students to make meaning of their game experience, encouraging them to think over the game subject, and make connections with real world issues. They should take part in any educational game design process.



## References

1. Antle, A.N.: Child-personas: fact or fiction? In: Proceedings of Designing Interactive Systems, Penn State, pp. 22–30 (2006)
2. Bash, E.: Flow and cooperative learning in civic game play. Ph.D. Proposal, 1, pp. 1321–1338 (2015). <http://doi.org/10.1017/CBO9781107415324.004>
3. Blevins, B., LeCompte, K., Wells, S.: Citizenship education goes digital. *J. Soc. Stud. Res.* **38**(1), 33–44 (2014). <http://doi.org/10.1016/j.jssr.2013.12.003>
4. Bourgonjon, J., Valcke, M., Soetaert, R., Schellens, T.: Students' perceptions about the use of video games in the classroom. *Comput. Educ.* **54**, 1145–1156 (2010)
5. da Costa, A.C., Rebelo, F., Teles, J.: Child-persona: what I think to what they are. In: Rebelo, F., Soares, M. (eds.) *Advances in Ergonomics in Design*. AISC, vol. 485, pp. 43–51. Springer, Cham (2016). doi:[10.1007/978-3-319-41983-1\\_5](https://doi.org/10.1007/978-3-319-41983-1_5)
6. da Costa, A.C., Rebelo, F., Teles, J., Noriega, P.: Child-persona: how to bring them to reality? *Procedia Manuf.* **3**, 6520–6527 (2015). <http://doi.org/10.1016/j.promfg.2015.07.943>
7. Chee, Y.S., Mehrotra, S., Liu, Q.: Effective game based citizenship education in the age of new media. *Electron. J. e-Learn.* **11**(1), 16–28 (2013)
8. Cooper, A., Reimann, R.: *About Face 2.0: The Essentials of Interaction Design*. Wiley, San Francisco (2003)
9. Druin, A.: The role of children in the design of new technology. *Behav. Inf. Technol.* **21**(1), 1–25 (2002). <http://doi.org/10.1080/01449290110108659>
10. Gee, J.P.: *Bons Videojogos e boa aprendizagem*. Edições pedagogo, Portugal (2010)
11. Gee, J.P.: *Lo que nos enseñan los videojuegos sobre el aprendizaje y el alfabetismo*. Granada, Espanha: Colección aulae (2004)
12. Gibson, C., Levine, P.: *The civic mission of schools*. New York, Washington DC: The Carnegie Corporation of New York; the Center for Information (2003)
13. Geit, K. Van, Caubergh, V., Hudders, L., Veirman, M. De.: Using games to raise awareness. how to co-design serious mini, 532–540 (2012)
14. Lavigne, M.: Jeu, éducation et numérique - Approche critique des propositions logicielles pour l'éducation, du ludo-éducatif aux serious games. *Les enjeux de l'information et de la communication*, 49–71 (2013)
15. Lenhart, A., Kahne, J., Middaugh, E., Rankin Macgill, A., Evans, C., Vitak, J.: Teens, video games, and civics: teens' gaming experiences are diverse and include significant social interaction and civic engagement. *Pew Internet Am. Life Proj.*, 1–64 (2008). <http://doi.org/10.1016/j.chembiol.2006.01.005>
16. Malone, T.W.: What makes things fun to learn? Heuristics for designing instructional computer games. In: Proceedings of the 3rd ACM SIGSMALL Symposium and the First SIGPC Symposium on Small System, pp. 162–169. ACM Press, New York, (1980)
17. Niemi, R.G., Junn, J.: *Civic Education: What Makes Students Learn*. Yale University Press, New Haven (1998)
18. Pacheco, J.: A educação para a cidadania: o espaço curricularmente adiado. *Teias*, Rio de Janeiro, Ano **1**(2), 99–133 (2000)
19. Prensky, M.: *Digital Game-Based Learning*. McGraw-Hill, New York (2001)
20. Pruitt, J., Grudin, J.: Personas: practice and theory. In: Proceedings of DUX 2003: Designing for User Experience Conference (2003)
21. Raphael, C., Bachen, C., Lynn, K.-M., Mckee, K., Baldwin-Philippi, J.: Games for civic learning: a conceptual framework and agenda for research and design. *Game Cult.* **5**, 199–235 (2010)

22. Scaife, M., Rogers, Y.: Kids as informants: telling us what we didn't know or confirming what we knew already? pp. 1–26 (1998). <http://discovery.ucl.ac.uk/1324103/>
23. Squire, K.: From content to context: Videogames as designed experience. *Educ. Researcher* **35**(8), 19–29 (2006)
24. Westheimer, J., Kahne, J.: What kind of citizen? the politics of educating for democracy. *Am. Educ. Res. J.* **41**, 237–269 (2004)
25. Zaman, B., Poels, Y., Sulmon, N., Annema, H., Verstraete, M., Grooff, D.D., Desmet, P.: Concepts and mechanics for educational mini-games: a human-centered conceptual design approach involving adolescent learners and domain experts. *Int. J. Adv. Intell. Syst.* **5**(3), 567–576 (2012)