DEVELOPMENT OF A QUIZ ON CIRCULAR ECONOMY

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ABSTRACT

The recovering of minerals from post-consumer materials is a proposal aligned with the circular economy concept, and known as urban mining. The main goal is to reduce the impact of waste generation and provide an alternative to natural resources exploitation, an efficient proposal for secondary raw material recovering. Although, not well known by society. During the analysis phase, the research team on Waste Electrical and Electronic Equipment (WEEE or e-waste) found the need to measuring the knowledge from the target groups. However, we noticed that a questionnaire might not be the optimal form of conducting this research, due to the possibility that the respondents might become disinterested. Thus, we elaborated and validated a quiz game to test and measure the knowledge on the topic in an interactive and competitive way. For the game's prototyping, we used the Web format, and developed using the Svelte tool. In initial tests, the game has shown to be intriguing and stimulating for the search of a greater understanding of e-waste urban mining. We have concluded, therefore, that the quiz is in fact a viable project, as we expected, and that it can be expanded beyond the prototyping phase.

Keywords: Waste Electrical and Electronic Equipment (e-waste), Prototype, Circular Economy.

1. INTRODUCTION

The recovery of raw materials from waste is a concept that has gained a lot of attention in the last decades due to the practice of reverse logistics, urban mining and other alternatives that are part of a broader concept: circular economy (COSSU e WILLIAMS, 2015).

Despite waste management having been regulated from 2010 due to the National Solid Waste Policy (PNRS) (BRASIL, 2010), little is known about the theme throughout society and, for that reason, actions haven't achieved the success that was expected.

The awareness of the importance of recycling Waste Electrical and Electronic Equipment (WEEE) grows steadily among the lay public because, as knowledge spreads, the fundamental role that recycling plays in the maintenance of circular economy is ever so noticeable. It is a market with huge economic and financial potential and, because of that, a vast understanding of the whole scope that the theme encompasses is crucial.

Countries like Japan, China and Germany or provinces like Ontario (Canada) and California (United States) have developed practices of circular economy and regulated on the theme for the last decade. Investing in urban mining represents increasing the possibilities of obtaining needed resources for different products that demand mineral resources, beyond natural reserves, as well as mitigating the impact of waste on human and environmental health (XAVIER e LINS, 2018).

2. OBJECTIVE

Keeping in mind the relevance of a broader understanding of the theme, we idealized the concept of a quiz game to test the knowledge of a player in the field of WEEE management. To validade that idea, we proposed implementing a prototype and proof of concept with a restricted number of questions and functionalities in a test environment.

3. METHODOLOGY

We developed a Web application (Web App) that utilizes the device's own browser to render the HTML, CSS and JavaScript from the application. This way, there is no need to download and install the application on one's device. Users can share the game by sharing the site's URL (link). The game is not restricted to mobile devices, as it also works on computers and notebooks, broadening the target audience.

4. RESULTS AND DISCUSSION

Although there are few scientific references specifically about the theme, the game can be considered an important tool for capacitation and education (CARRILLO et al., 2019 e RAMOS e SEGUNDO, 2018).

After approximately two months of development, we obtained a functional prototype that achieves most of our expectations: (i) a friendly interface; (ii) functionality and (iii) minimum interactivity via the credits and score grades. Were proposed five different categories, as follows: laws, environment, logistics, Brazil and world. According to these categories, is presented a variety of questions with different grades of difficulty. The gamer has the opportunity to verify the correct answer and in the end of the game it is possible to get the final score.

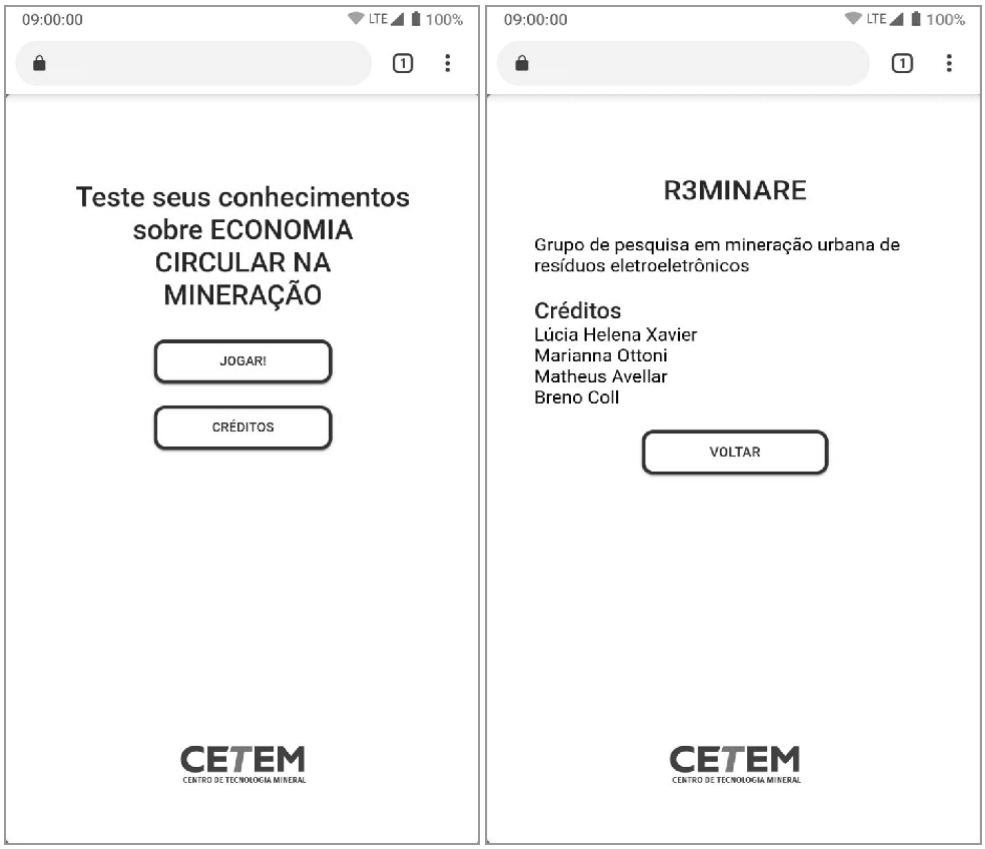

Figure 1: Initial menu and credits screens.

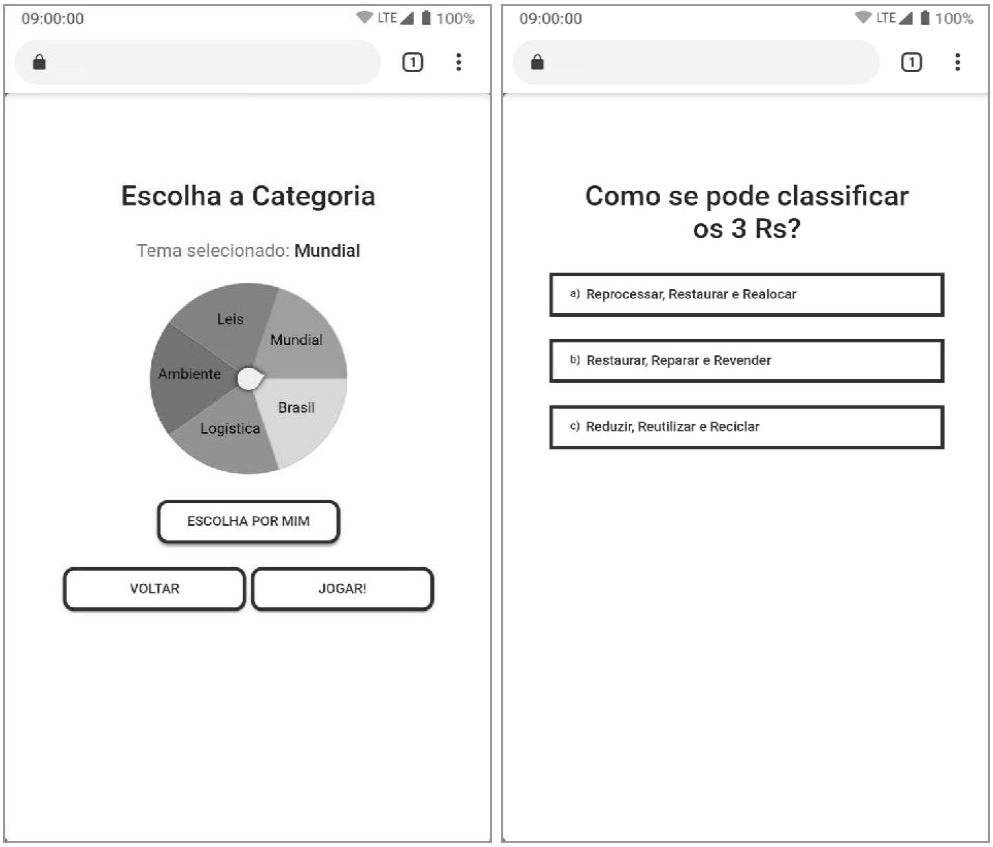

Figure 2: Theme selection screen and sample question screen.

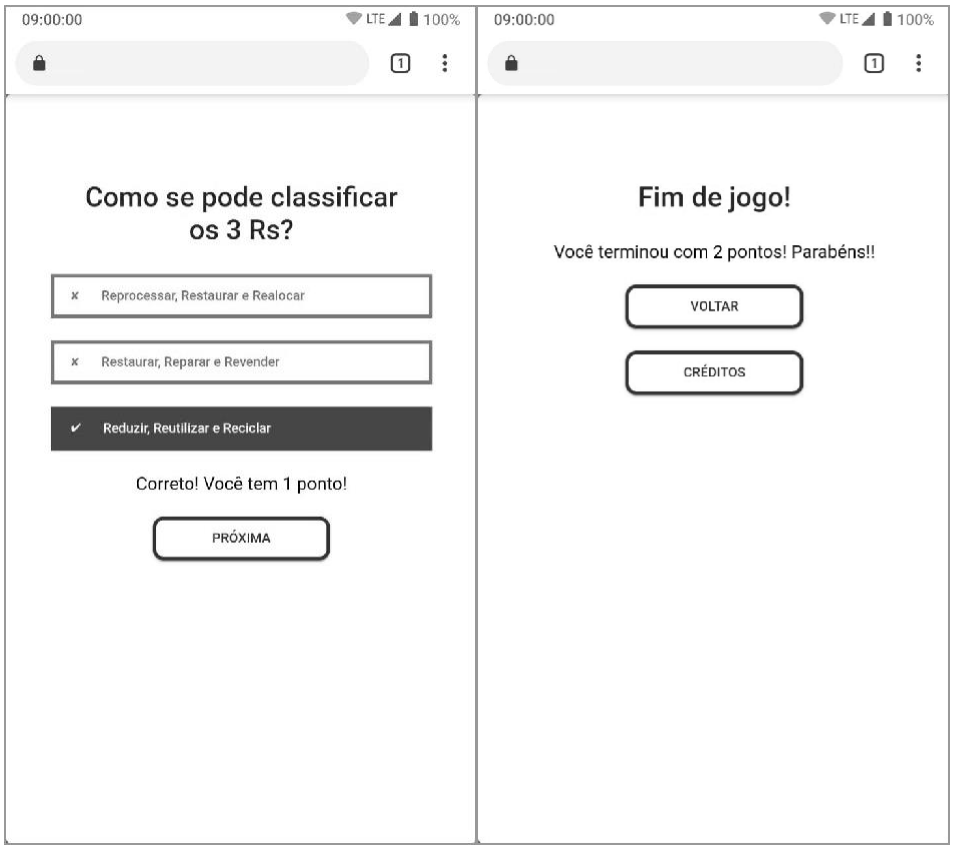

Figura 3: Correct answer and game over screen.

Initially, the user has the option to play, or to see the credits screen, as seen in Figure 1. After clicking Play ("Jogar"), the user is taken to the theme selection screen, which will be fully implemented in the second phase of development. Afterwards, the user is presented with the question screen, with the first question that they must answer. Both screens are shown in Figure 2.

As the user picks an answer, the game will inform them if that answer is correct or not. Being right, the user receives 1 point. Otherwise, no score is given. After some questions, the game ends, and the user may see how many points they acquired since the beginning of the game. These situations can be seen in Figure 3.

As proposed for the project's development deadline, the prototyping phase of the game was implemented and validated with 15 questions. We hope for the next phase to validade the visual interface and interactivity of the game, as well as the implementation of improvements suggested by the target audience.

The game, as part of the research project on waste electrical and electronic equipment management, seeks to promote the knowledge transfer in a ludic manner and of easy access to the lay public.

The tests remain for around 30 days among fellows and CETEM contributors, as a way of collecting information in order to improve the proposal.

4. CONCLUSIONS

The project was developed in two months and, despite having reached the established goals, it is in an enhancement phase and will be continued so that its first release version is finalized.

Given more gross development time, this project can become a valuable tool in determining the retention of acquired knowledge in lectures and workshops on the theme. Given that it is merely a prototype, we believe good progress has been made, achieving the proof of concept phase's expectations.

This proposal is a type of solution with no similar proposal among the digital distribution services such as Play Store, Microsoft Store or Apple Store by this moment. It can be a motivating solution to knowledge transference in a ludic way, in order to improve the education related to circular economy applied to the mining area.

5. ACKNOWLEDGMENTS

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6. BIBLIOGRAPHIC REFERENCES

BRASIL, 2010. Lei Nº 12.305, de 2 de agosto de 2010. Institui a Política Nacional de Resíduos Sólidos. Disponível em:<www.planalto.gov.br/ccivil03/_ato2007-2010/2010/lei/I12305.htm>. Acesso em julho de 2019.

CARRILLO, P., ALARCÓN, R., MERCEDES, L., 2018. Videojuego Minecraft como recurso para la alfabetización académica en la educación superior. Actualidades Investigativas em Educación, vol. 18, n.3, p. 664-680. COSSU, R., WILLIAMS, I.D., 2015. Urban Mining: Concepts, terminology, challenges. Waste Management, vol. 45, 1-3. DOI: 10.1016/j.wasman.2015.09.040. DOI: 10.15517/aie.v18i3.34382.

RAMOS, D.K., SEGUNDO, F.R., 2018. Jogos Digitais na Escola: aprimorando a atenção e a flexibilidade cognitiva. Educ. Real, Porto Alegre, v. 43, n. 2, p. 531-550. Available from <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S2175-62362018000200531&lng =en&nrm=iso>. Access 8 July 2019. http://dx.doi.org/10.1590/2175-623665738.

XAVIER, L.H., LINS, F.A.F. Mineração Urbana de resíduos eletroeletrônicos: uma nova fronteira a explorar no Brasil. Brasil Mineral, n.379. Março, 2018.