

Kids Exploring Streets: An Interactive Educational Tool for Road Safety

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Abstract: *The article presents Kids Exploring Streets, an interactive software application designed to educate children aged 7 - 9 about road safety and traffic rules. Utilizing engaging games and activities, the software aims to teach children about the Brazilian Traffic Code CTB and good traffic practices. The study adopted an experimental method with applied research, involving 12 children to evaluate the software's effectiveness. The results indicate that the application successfully raises children's awareness and interest in road safety, suggesting it as a valuable educational tool for improving urban mobility and reducing traffic accidents.*

Keywords: Application; Games; Traffic; Education; Signaling

1. Introduction

In Brazil, there are miscellaneous advertisements and awareness campaigns for conductors in relation to norms, guidelines and to the Brazilian Traffic Code Laws (CTB) aiming at the decrease of accidents in traffic. There are several researches who show that almost 90% of accidents are caused by the recklessness of the conductors in regard to noncompliance with traffic laws affecting traffic safety (G1, 2013). Driving using mobile phones gains great prominence in the ranking of traffic accidents, followed by the absence of the use of seat belts, exceeded speed limit allowed on roads and the disrespect to vertical horizontal traffic signs.

1.1 Problem

The current society in which we live induces the use of the private sector transportation to the detriment of the use of public transport remitting this to an example of purchasing power. Many kids when questioned about what career they will follow or what they will have when they grow up; they answer that they will buy their big and luxurious cars to avoid having to take the bus or subway and to get to places in great cars and be well assisted. This shows that the awareness about the good practices at traffic must be done since the first years of childhood, because these children will be multipliers of information and of awareness for their relatives.

1.2 Justification

This work justifies itself based on the preparation of a good dissemination plan for the software application in order to expand access to CTB information besides the importance of using and respecting road signs.

1.3 Objective

This article is significant as it introduces an innovative educational tool that addresses a critical public safety issue by teaching children about road safety and traffic rules through an engaging and interactive software application.

1.4 Methodology

For this study, the experimental method was adopted, with applied research, descriptive, bibliographic, action and qualitative research. The goal was to create an environment that could be accessed from anywhere and at any time. This environment aimed to bring knowledge and awareness about good traffic practices to children.

In the alpha version, the experimental method was adopted for the development of the software application, aiming at the first user and application interactions (Marconi; Lakatos, 2003). Based on the data obtained in relation to traffic accidents, it is possible to boost the feeling of awareness based on the causes provoked by traffic accidents. Developed countries; such as, the Netherlands teach children how to behave in traffic in the early age, in the primary school years (Cruz, 2015). For the construction and development, applied, descriptive, bibliographical, action and qualitative researches were used. The use of applied research came due to the direction of the study focused on the use of technology. Descriptive research supported the construction and development of the software application. We believe that teaching a topic of such importance to children, in a playful way, is a big challenge. Nonetheless, relevant information can be transmitted during an educational game. Therefore, this work was directed towards the development of some educational and interactive games in the software application itself with the objective to help children to understand the

Volume 13 Issue 7, July 2024

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

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current legislation regarding traffic rules and laws. For this, data was collected using bibliographical researches with the intention to understand if games were efficient and effective for children. Tests were carried out with action research. The interpretation of the collected data was carried out in a qualitative way. (Marconi; Lakatos, 2003). To validate the usage of the application, 12 (twelve) children were selected, within the age range in between 7 (seven) and 9 (nine) years old to collect the data. It is known that this number of samples does not represent all the children who could use this software application, but to know if the interface and the information are understandable a few tests were carried out. The phases of inquiries of the functionality and usage of the software application were divided in: a) presentation of the software application; b) observation of the interaction of the child with the software application; c) notes taken of the questions about the activities; d) interest in continue using the application. To understand the rate of satisfaction of the children, a short form was prepared regarding steps “a” to “d” in which the child could mention whether they liked the software application or not, if they interacted or not, ask or not continue using the software application or not. The understanding of the data was carried out following the qualitative approach.

2. Development

2.1 Games in software applications

A game can be defined as the application of a test run by a software. This simulation contains the commands/decisions that will be given by the user while using the game. “Thus, the simulator's application is limited to the operationalization of variables and the complexity is attributed to the gameplay dynamics with the environment of uncertainty characteristic of the opponents' decisions and of the group's behavior in the process of negotiating a single decision.” (Motta; Quintella, 2012).

2.2 Origin of physical and virtual games

There are disagreements regarding the origin of the appearance of games. There are those who claim that the origins of the games occurred 3, 000 years BC, with the simulation of the Wei - Hai war, in China, and with the game Chaturanga, in India, in which the games were used for educational purposes to develop skills. (Barbosa *et al.*, 2022). Motta and Quintela (2012) mentioned that the games may have emerged in the 19th century from the activities of the Prussian army, as stated by authors Tanabe (1973) and Martinelli (1987). Keys and Wolfe (1990 *apud* Motta; Quintela, 2012) “[. . .] the most elaborate game among several, the New Kriegspiel, would have been created by George Venturini, in Schleswig, in 1798.” Faria (1998 *apud* Motta; Quintela, 2012), points out that, in 1955, the first simulator for business games was developed, Rand Corporation's Monopologs, which simulated the American Air Force's logistics system. Games have evolved over the years and with the emergence of new technologies. “The pioneer of this evolution was the game - Top Management Decision Simulation, developed by the American Management Association, in 1957” (KEYS; WOLF, 1990 *apud* BARBOSA *et al.*, 2022) (Motta; Quintella, 2012). In the United States of America (USA), approximately in 1950,

games began to be used to help train administrators. From then on, other professionals; such as, consultants, researchers and teachers began to use this resource in their daily lives. In Brazil, this use began in the 1950s, with its intensification in the 2000s. (Motta; Quintella, 2012). The creation of software and electronic devices are valuable factors in disruptive technological advances, as they supported the growth in the supply of games. This way, games became more accessible to different audiences: children, young people and adults. Stock, racing, sports and other versions were created.

2.3 Advantages and disadvantages of games

Motta and Quintella (2012) state that different authors point out benefits in using games and simulations in training and training managers, helping with decision - making in the business environment. Another highlight is the possibility of using these games and simulations anywhere, at any time.

Games, due to their playful style, provide engagement between the person and the activity shown on the screen. The more dynamic and interactive the game is, the greater the power of attraction between the user and the game. They also provide the development of social and educational skills in a subtle way, without being monotonous. They help in the creation, development and fixation of content related to technical skills. (Ludospro, 2019).

It is evident that all activities when carried out in an ostensive way bring harm to human beings. In relation to constant exposure to virtual media on electronic devices, it would not be different. The consequences can be varied: lack of concentration, dry eyes, hearing problems, inadequate posture, difficulty in developing logical reasoning and motor coordination, among others. (Health, 2021).

2.4 Campaigns: Education for Traffic

Thinking of ways to raise awareness among the world's population regarding health standards, traffic and the attempt to reduce some of the biggest factors in traffic accidents led to the need to create some activities which could guide people to follow CTB standards. CTB mentions the creation of educational campaigns targeted to the traffic education Chapter VI - Traffic Education, Article 74.1st § and 2nd §. Transit executive entities must promote within their organizational structure or by agreements the operation of Public Traffic Schools in the patterns settled by CONTRAN (National Traffic Council), Article 75.1st § and 2nd §. (BRAZIL, 1997). In Articles 74 and 75, it is noted that campaigns must be permanent, widespread and uncharged. In Brazil, there is a campaign called MAIO AMARELO, (Yellow May). This month was chosen for the dissemination of traffic information. These educational campaigns are carried out with the use of pamphlets, posters, lectures, films and other activities. The idea is to arouse in the driver 's mind and in society the importance of driving responsibly. Two billions reais (the national Brazilian currency) is spent on creating and disseminating this information (Czerwonka, 2016). This kind of initiative most of the time is not given the importance it deserves because great part of society already carries their driving habits.

When it comes to educational campaigns, consideration must also be given to the disabled ones; the visually impaired. This consideration is secured in Decree no.186/08 (Brazil, 2008), Article 24, in which inclusive learning is assured, Article 24th Education, item 1, 1b and 1c. (Brazil, 2008).

2.5 Code in Traffic Brazilian (CTB)

The use of roads simultaneously increased with the automobile evolution so that the occupation of space happened in a balanced way; adopting the necessary laws.

On January 28, 1941, the current President, Getúlio Vargas, published the first National Code in Traffic, Decree Law n.2, 994. It aimed at organizing the circulation in roads, motor vehicles of any nature in the national territory (Brazil, 1941a). This code provided for road signaling, detailed the standardization of road signs. Nevertheless, the mentioned decree lasted for a short time being revoked by Decree Law No.3, 651, of September 25, 1941, with a new wording of the National Traffic Code. (Brazil, 1941b). Twenty - five years later, Law No.5, 108, of September 21, 1966, this decree was revoked by Decree Law No.3, 651/41 which established the National Traffic Code (CTB), Law no.9, 503/97. It is included 131 articles (Brazil, 1966). Thirty - one years later, the Brazilian Traffic Code was published on September 23, 1997, (CTB) Law no.9, 503/97. Currently, this code still remains valid. (Brazil, 1997). It can be said that traffic has been affected in Brazil since the Federal Constitution, dated of October 5 in 1988, regulated for the Brazilian Traffic Code (CTB), on September 27, 1997. In the International ambit, there is The Vienna Convention (Brazil, 2007), on November 8, 1968. It aimed at the internationalization of traffic in a safe way. The Decree of August 3, 1993 provides the agreement a basic unified transit regulation among countries which compose the Southern Common Market (Mercosur): Brazil; Argentina; Bolivia; Chile; Paraguay; Peru; It is Uruguay. (Brazil, 1993).

2.6 Bus station signaling

The Traffic signs, even though quite elementary, made of wood or stones, were needed since the opening of the first paths. Considering that these signs are subject to the elements of nature and their journey is constant, stronger materials, such as, steel and aluminum were necessary. From the 20th century, aluminum sheets were used with plastic adhesives, waterproof and immune to the action of heat, water and wind. Over the years, new studies were carried out regarding visibility of signs. Retro - reflective materials were developed to increase the drivers' viewing ability. New signaling technologies emerge at the end of the 20th century and at the beginning of 21st (A History. . . , sd). According to CTB (Brazil, 1997) there is: the recommendation vertical signaling; the warning vertical signaling; the regulatory vertical signaling; horizontal signaling; traffic light signaling; signaling of constructions on road and auxiliary devices.

2.7 Software Applications with games and bus station signaling

The permanent signaling, consisting particularly of signs on plates and panels, road brands and auxiliary devices compose

a system of fixed control devices traffic to be introduced in highways to enforce, warn and guide its users. In general, signaling must gain the user's attention and trust, still allowing time for a suitable reaction. This objective is achieved with the use of signs and marks in appropriate dimensions and locations and the choice of dimensions and suitable locations depend on several factors which compose the road environment. Educational games made to teach people about one given subject, expand concepts, reinforce development and broaden the understanding of a historical and cultural event. That is, games have the goal to provide children some ethical and life values.

2.8 Statistics on the behavior of users of educational games based on software applications aiming at traffic education

In Brazil, educational games in apps, aimed at traffic situations focused on children. These are made using drawings for coloring, simulation of traffic circuits and some electronic games. However, statistical studies on the impact that these educational games cause in the population are rare. The Netherlands, as well as other European countries, face education at the Traffic as matter of basic childhood teaching. According to Cruz (2015), this kind of project has existed for more than 60 years. Children are taught to understand the role of each one at Traffic and to be good vehicle drivers or on a bicycle, automobile or even as pedestrians. The number of traffic accidents and deaths are low in European countries. Almost 85% of cities move around by bicycle. Most cars are used for delivery of goods and not for transportation of people.

Gomes (2014), at Instituto Avante Brasil, prepared a study on the statistics of deaths at Traffic. The result lead to a comparative rank among the top ten most violent countries.

According to the research, Brazil occupied the third position regarding the highest numbers of accidents and death in traffic standing only back from China and India. The Netherlands, in comparison, does not appear on the list. This may be a result of investment in training of traffic procedures since the first school years.

2.9 Application prototype proposal

In this study, a prototype of a software application was developed: Kids Exploring Streets. The idea was to arouse users to good traffic practices aimed at road signaling based on main traffic rules and guidelines; such as, the identification of traffic lights, the use of zebra crossing, the usage of safety belts and child seats among others. Several county, state and federal traffic agencies and departments have education programs aimed at children. Children are not drivers, but this does not exclude them from being active in traffic. They are also pedestrians, passengers and cyclists, which show their participation in the traffic education theme. It is extremely important that children know about their rights and duties and know about traffic laws since their first steps. For Campos (2018), CEO of Perkons, "a company which develops and applies technology for traffic management, with subjects as urban mobility and road safety, believe that these topics should be discussed in early childhood education". Besides contributing to their own safety, children who learn traffic

rules from their first steps provide protection to others, i. e; in the near future, these children will become more careful and conscious teenagers and adults. This software application which supplies interactivity in a playful way and with appropriate methodology, in this training, will be a tool of great value to society.

2.9.1 Environment analysis

The analysis of the environment can be conceptualized “as a process of identifying opportunities, threats, strengths and weaknesses which interfere in the performance of companies/products, the fulfillment of their mission and their ability to achieve stipulated goals”. (Nortegubisian, 2019). To develop the software application prototype, an analysis of the environment was carried out. In this analysis, the internal and external factors which can influence the creation and use of the software application, as well as its marketing relationships were observed.

2.9.2 Application

The software application “Kids Exploring Streets” presents a very initial proposal of what the application could be like. To download the software application, the user can search on Google (Figure 1). The application could be available on Google Play (Figure 2). The images used in the figures were taken from the platform www.canva. com. Images used in games, videos and drawings are available on Google Searches.

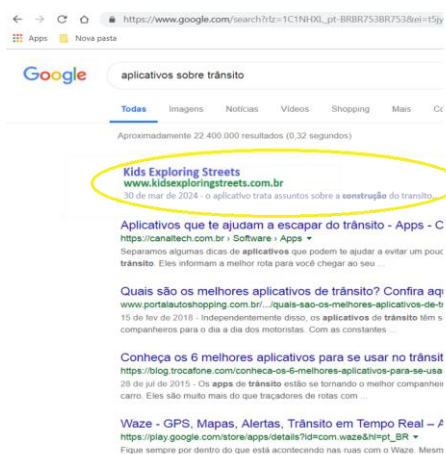


Figure 1: Download “Kids Exploring Streets” app on Google

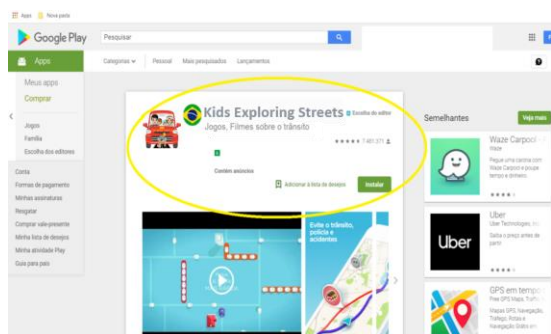


Figure 2: “Kids Exploring Streets” app on Google Play

After downloading, you will see the software application presentation (Figure 3). When clicking on the screen, the user will be directed to a grid with other icons (Figure 4).



Figure 3: Presentation screen for “Kids Exploring Streets” application

On this screen, the child will receive information about the importance of using zebra crossings and the meaning of the colors used on the signs



Figure 4: Interaction screen between the user and the application.

On this screen, the child will receive information about the importance of respecting the colors of traffic lights.

The icons on the interactive screens (pedestrians, cars, signaling, cycle lane, coloring drawings and games) include topics which will inform about issues related to urban mobility and its signs according to the CTB. Figures 5 to 12 show the screens with the information loaded into the application.



Figure 5: Pedestrian icon

On this screen, the child will receive information about the importance of respecting the use of cycle lanes



Figure 6: Signaling icon.

On this screen, the child will be able to color drawings with themes related to traffic and civil construction themes of road signaling



Figure 7: Cycle lane icon

On this screen, the child will see some signs used in the Brazilian road system.

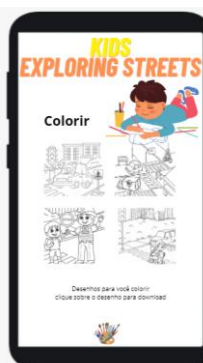


Figure 8: Icon with drawings to color

On this screen, the child can play and discover how to apply traffic and civil construction rules of road signaling.



Figure 9: Icon with traffic signs

On this screen, the child will be able to watch videos related to traffic and civil construction rules of road signaling



Figure 10: Icon with traffic - themed games

On this screen, the child or any other user can ask questions and make comments.

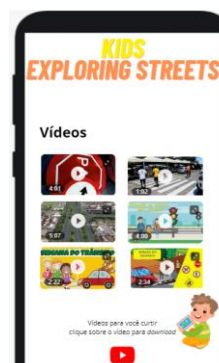


Figure 11: Icon with videos on traffic and civil construction themes of road signaling

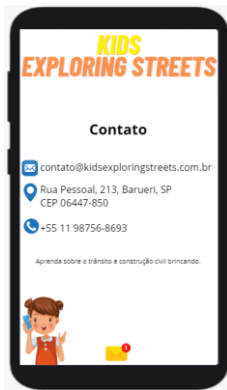


Figure 12: Contact icon

2.10 Analysis of results

2.10.1 Usability testing

In order to understand if the use of the application was efficient and effective for some children, *on - site tests were carried out* with 12 (twelve) children, with range age between 7 (seven) and 9 (nine) years old. The inquiry phases of the verification of the functionality of the software application were divided in: a) the presentation of the software application; b) observation of the interactivity between the child and the software application; c) taking notes of the questions in concern to the activities; d) interest in continue using the software application. To understand the level of satisfaction of the children, a small form was prepared regarding steps “a” to “d”, in which the child could mention whether they liked the software application or not, interacted with it or not, would continue using the software application or not. Analyzing qualitatively, children aged 4, 8 and 12 did not like the games placed on the software application. They did not ask about activities, however, interacted to see of what it was about and soon stopped using the software application. The other children showed interest in playing and getting to the end of the games and activities. They asked questions about signs and the plates.

3. Final Considerations

The Kids Exploring Streets software successfully teaches children aged 7 - 9 about road safety and traffic rules through engaging games and activities. The study demonstrates that the application is user - friendly, informative, and effective in raising childrens awareness of good traffic practices. Future improvements could enhance the interface and expand the information provided, further benefiting childrens education in traffic safety.

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