Revista ARACÊ
ISSN: 2358-2472

FINDROUTE APP: A PROPOSAL FOR AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (AAA) FOR STUDENTS WITH ASD OF MEDIUM FUNCTIONALITY IN THE COURSES OF LANGUAGES - GERMAN AND ENGLISH AT FALEM-UFPA

https://doi.org/10.56238/arev7n2-077

Submitted on: 01/07/2025 **Publication date:** 02/07/2025

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ABSTRACT

Currently, there is a significant number of students with disabilities in higher education institutions. At FALEM-UFPA there are no records of ASD students with medium functionality, adults, enrolled in the courses of Letters – German Language and English Language, however, we know that these students may present, as one of the characteristics of their disability, communication difficulties both in their mother tongue and when using a second language. For this research, the FindRoute APP was planned as a way to develop the linguistic skills of these students so that they can use both languages – German and English – to ask for and give information about directions and how to get to certain places at UFPA. For the conception of the APP, the developers perfected a Thematic Board for AAC, in physical format, for an online platform, from the APP Inventor software, such motivation arose from instigations of the discipline of Development of Educational Products for Assistive Technology. Due to the limited time for the application to be made available, the validation of the resource cannot be performed, however, in the future, there is the possibility of testing through the application of the APP with a group of 10 adult ASD students with medium functionality. After using the resource, these app users can give feedback, through a questionnaire, on the effectiveness of the educational product and results can be collected for later improvements and adaptations of the FindRoute APP, if necessary.

Keywords: ASD students. APP FindRoute. Language Skills. German language. English language.

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ISSN: 2358-2472

INTRODUCTION

In view of the reality that is currently being experienced, there is a significant growth of students with special needs within educational establishments, whether they are in basic education or higher education. In this regard, the Higher Education Census (2023, p.65), carried out by the National Institute of Educational Studies and Research Anísio Teixeira (Inep), recorded in 2023, the number of 92,756 enrollments in undergraduate courses of students with disabilities, global developmental disorders, or high abilities/giftedness. Considering the admission of these students in courses at Higher Education Institutions (HEIs), Costa and Júnior (2013) point out some difficulties faced by students.

> [...] Academics with various special needs face many problems in graduation, such as the difficulty of following the subject taught by professors due to the lack of electronic resources and the lack of training of these professionals, the difficult access to works and texts in the area, the difficulty of getting along and accompanying other students in extracurricular activities, such as participation in lectures, seminars, studies of concrete cases, etc. (Costa; Júnior, 2013, p. 189)

In this way, the application entitled "*FindRoute*" has the proposal to provide an Alternative and Augmentative Communication (AAC) through the projection of a digital pedagogical resource – developed through the *APP Inventor*[5] – for students with Autism Spectrum Disorders (ASD), adults, of German Language and English Language of the Faculty of Modern Foreign Languages (FALEM) of the Federal University of Pará (UFPA), from level A1.2 of the Common European Framework of Reference for Languages (CEFR).[6]

In relation to the aforementioned disorder, within the standards of the World Health Organization (WHO), autism falls under the International Classification of Diseases, hereinafter ICD 11, in the indication of code 6A02 as stated by the Instituto Singular (S/D).

> In the ICD-11, all disorders that are part of the autism spectrum, such as childhood autism, Asperger's Syndrome, childhood disintegrative disorder and hyperkinesia disorder, for example, **were grouped into a single diagnosis: ASD (Autism Spectrum Disorder),** prescribed by code 6A02 (Instituto Singular, S/D).

In this way, the educational resource presented in this work, establishes as target audience or users, the ASD students – who have the diagnosis in ICD 11, code 6A02 – in the courses of German Language and English Language at FALEM-UFPA, considering that

[5] Free online platform for app development. Available at: https://appinventor.mit.edu.
[6] Available at: https://area.dge.mec.pt/gramatica/quadro_europeu_total.pdf.

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ISSN: 2358-2472

these students have as a common characteristic "[...] difficulty in communication and social interaction" (Salton *et al.*, 2017, p. 33).

To use the application, ASD individuals with medium functionality will be able to use the digital educational tool to work on communication in both languages – German and English – as this group "has difficulties communicating, does not look into the eyes of others and repeats behaviors [...]" (Salton *et al.*, 2017, p. 33). It is important to mention that, although the application has been developed in two languages (German and English), its use is not conditional on bilingual teaching, but on individualized use in German and English Language courses, respectively.

Subsequently, the application (*APP*) was planned to be a tool that involves the use of technology together with the work with the inclusion of the target audience – regarding this characteristic of the educational resource in question, Walter *et al.* (2024, p. 17735) states that "inclusive education requires adaptations that go beyond the modification of pedagogical practices, covering structural, communicative and methodological issues" –. Therefore, in relation to the communicational scope, the application also addresses a common theme in the study of foreign languages, spatial orientation. This topic involves the integration of different elements of the grammars of the German and English languages, namely: the use of prepositions, adverbs, position verbs, among others. It was observed that the theme has the potential to stimulate communication skills, thus promoting an effective interaction between foreign language learners.

Thus, the "*FindRoute*" application will be a didactic instrument for the communicational stimulation of ASD students, with medium functionality. These students will have the opportunity to develop communication in German and English through a fully digital resource, in addition to being functional in relation to the guidelines in the spaces of the university in which they study, UFPA.

In addition, it is considered that the application can be used from the perspective of Universal Design for Learning (UDL), combined with its guiding principles: i) offer multiple forms of involvement – the digital format of the product, as an application, has the potential to stimulate the engagement of all students; ii) offer multiple forms of representation – the content presented in the APP is available in visual and auditory format and presents alternative text for all images; iii) offer multiple forms of action and expression – at this point, the tool allows users to express themselves in an alternative way to oralization, by pointing out images, touching the screen, etc. In addition, it allows students to have the

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ISSN: 2358-2472

power to decide how to communicate and make choices in the act of communication, in accordance with the syntax of the languages. That said, UDL principles enable teachers to establish teaching objectives, create materials and assessment methods that are suitable for all students.

From the ideas outlined, the following question-problem was projected: what educational resources could be designed for the development of the communication skills of ASD students, with medium functionality, of the German Language and English Language courses of the Faculty of Modern Foreign Languages (FALEM) of the Federal University of Pará (UFPA)?

In an attempt to solve the focus question, the general objective of this work is: to develop the communication skills of ASD students with medium functionality, in German and English, from level A1.2. In addition, the specific objectives of the research are configured with the aim of working on spatial orientation in German and English; to design an application, as a playful tool, for students in the courses of German Language and English Language at FALEM-UFPA; stimulate communication activities; promote effective interaction of ASD students of foreign languages; and enable the use of the application, in the long term, beyond the classroom context.

METHODOLOGY

In view of the area of training and performance of the developers of the educational product – teaching and learning of languages – its conception, then, was designed to meet the communicational needs of ASD students in relation to the use of foreign languages, German and English. In addition, the *FindRoute APP* was inspired by the daily needs of students when moving around the different spaces of UFPA. In view of the flexibility of the application, other students in the regular classes of these undergraduate courses can also make use of the tool to improve their oral skills in both languages.

The first inspirations were born from the production of a thematic board for AAC in a tangible/physical format, as such a resource "[...] it is an area of clinical and educational practice that proposes to compensate [...] the incapacity or deficiency of the individual with severe communication disorder" (Walter, Undated). Thus, the target group could use this resource to stimulate their communication skills and transmit information related to location and movement in the surroundings of the university.

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At first, the theme of the chosen board included the work related to vocabulary to indicate directions in the German and English languages. Such vocabularies explored were related to personal pronouns, prepositions, places in the Federal University of Pará (UFPA) and dialogues in the target languages. In this CAA, the resources used were diversified. In the structuring of the thematic plan, a binder with different pages was used and, on these pages, images representing vocabulary were contained, as well as phrases. The target audience to whom the resource was intended, in its first phase of construction, were ASD students and the visually impaired.

Image 01: Thematic Board – CAA

Source: Personal Archive.

Image 02: UFPA Places.

Source: Personal Archive.

However, after provocations of the discipline entitled Development of Educational Products for Assistive Technology, taught by professors Dr. Arlete Marinho and Dr. Dionne Monteiro, the students and authors of this work critically reflected on the user's point of view and the composition of the material in question. In this way, it was possible to improve

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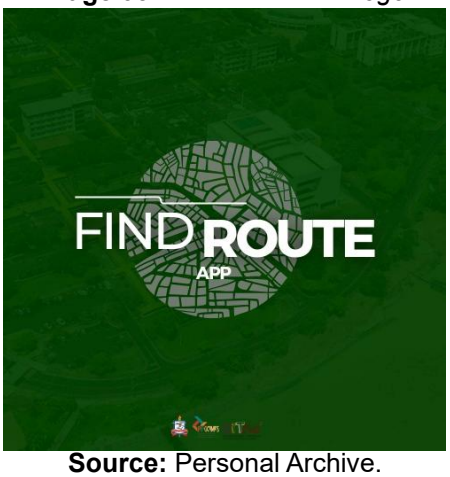
the thematic board for the digital environment, as "in addition to physical devices, the use of adapted technologies in the classroom has also proven effective" (Walter *et al*., 2024, p. 17737-17738). In addition, the authors also highlight that with the insertion of assistive technologies as part of educational planning, "it is possible not only to meet the specific needs of each student, but also to create a fairer and more inclusive school environment". Thus, through these incentives and constant guidance from teachers, the *FindRoute application was born*, developed from the APP Inventor digital platform. In the program of this discipline, the instruction for the use of the platform was offered in unit III, in the phase called "Application Development as Assistive Technology (AT)".

Image 03: FindRoute APP *logo*.



Source: Personal Archive.

Regarding the architecture and design of the *FindRoute APP,* the developers were first inspired by their own areas of expertise. As both authors work with language teaching, it would be coherent to adopt a name that contemplates both languages, German and English. Thus, the authors named the application with the name "*FindRoute*", based on the purpose of using the *APP*, spatial orientation at UFPA. Thus, we have "*Find*" as a verb with the same meaning in German and English (to find), in the same way, the term "*Route*" was used, observing the occurrence in the languages in question.

Regarding the composition of the logo (image 3), the shade of dark green was considered, which refers to the wooded environments of UFPA, in contrast with white, a color often found in the institution's buildings. In addition, a graphic element was used, in the center, in a circular format, representing a gray map. In the background, there is an aerial image of the university and in the center, at the bottom, are the logos of UFPA, the Graduate Program for Creativity and Innovation in Higher Education Methodologies

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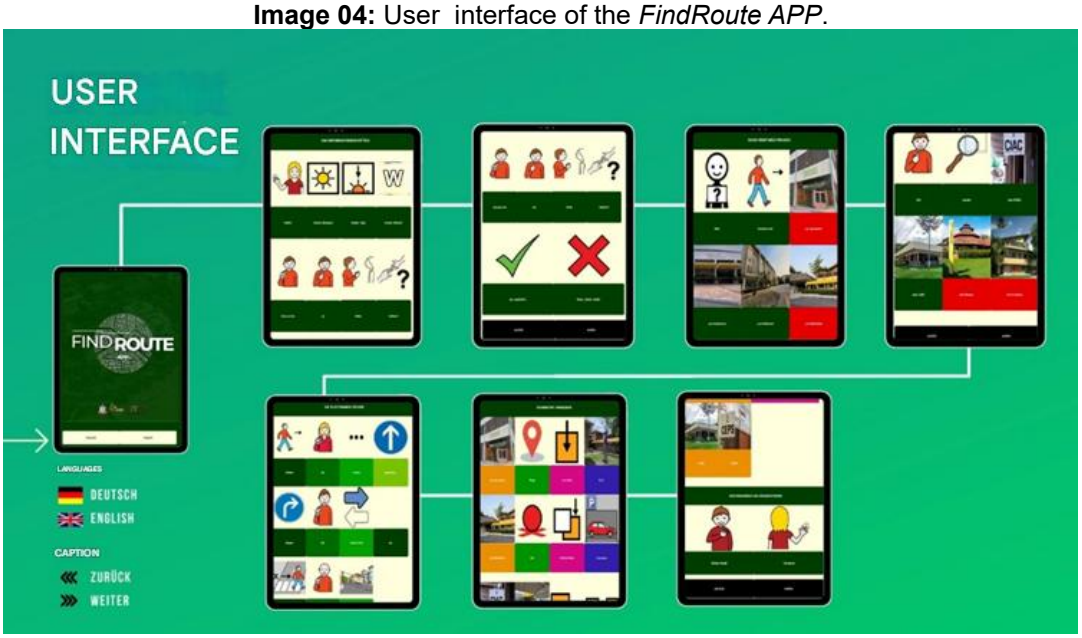
(PPGCIMES) and the Center for Innovation and Technologies Applied to Teaching and Extension (NITAE²), respectively.

The digital thematic board, in this new version, was designed for ASD students with medium functionality. Its execution takes place through clicks on the images, taken from Arasaac[7], and words that will reproduce different moments of communication, both in German and English. Additionally, audio tracks generated by artificial intelligence were included in the languages worked. All audios were taken from the TTSMAKER page[8].

The application sequence works, first, with the choice of language – German or English -; then, there is the presentation of the vocabulary and acronyms for some spaces that make up the university (screen 2); On the next screen, users have grammatical structures to ask for information about the location of a certain environment (gymnasium, rectory, library, etc.) (screen 3, 4 and 5); and, finally, they acquire knowledge about directions and place prepositions to give information about locations (6 and 7), as illustrated in the user interface below.

Image 04: User interface of the *FindRoute APP*.



Source: Prepared by the authors.

The application was programmed online through the *APP Inventor platform,* as previously explained. The application consists of a total of 13 screens, an initial one where the user can long click on the button to listen to the audio of the language of use and with a

[7] Available at: https://arasaac.org/index.html.
[8] Available at: https://ttsmaker.com/

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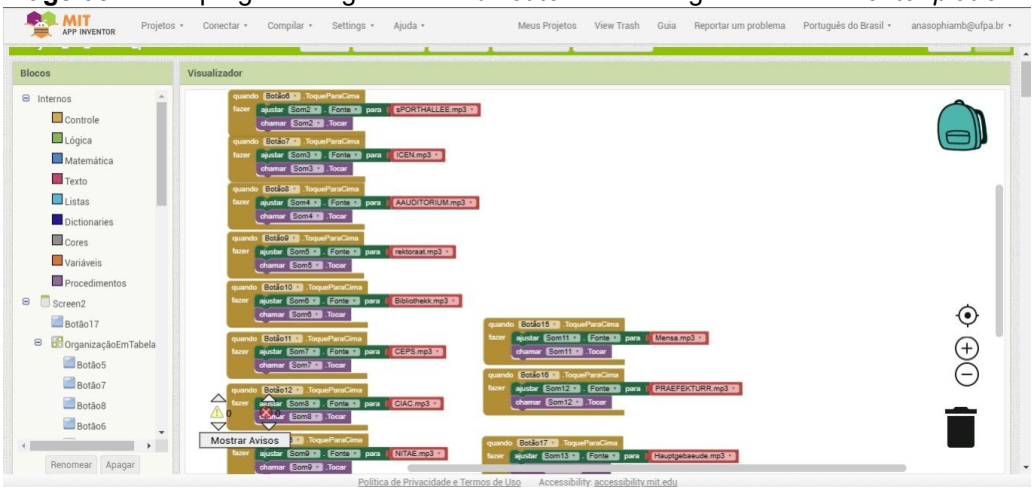
brief click can choose which language he wants to navigate through the application (German or English).

The screens that follow are composed of images, buttons and audios. In the blocks section of the APP Inventor online platform , it is possible to program the function of each component of the digital educational resource. Therefore, each *Screen* – as called in the operating system to represent the screens – has a set of blocks, which, properly programmed, work in an interactive way so that TEA students from the German Language and English Language courses at FALEM-UFPA can communicate to ask for information about location or give information about the location of a certain place within the university.

Image 05: Block programming of the *FindRoute APP* through the *APP Inventor platform*.



Source: Personal Archive.

Through the image, it is possible to observe the programming of the educational product, *APP FindRoute*, in line with the Assistive Technology of the AAC type (thematic board), developed on the App Inventor online platform. This site enables the creation of applications for free, and at the end of the process, you can download the product on Android.apk *systems*. Thus, it is possible to run the application on smartphones and tablets.

RESULTS

Due to the short period for the development of the application, it was not possible to carry out its testing and validation with the target audience, that is, ASD students, adults, with medium functionality. In the validation stage, the *FindRoute APP* could undergo

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adjustments in design and programming, in addition to being evaluated according to the pillars of accessibility such as autonomy, safety and comfort.

On the other hand, it is the intention of the APP developers to carry out this stage, in a planned period of one week and with an audience of 10 ASD students, through the proposition of practical activities within the university, specifically in Campus I (basic sector) of Belém, to work on the vocabulary related to spatial orientation.

At the end of the test, students would answer a Google form for validation of the educational product. In addition, in this form, participants could suggest improvements or adaptations to the *FindRoute APP*, in addition to reporting possible execution errors during the use of the tool.

DISCUSSION

As part of the activities proposed in the discipline Development of Educational Products for Assistive Technology, there was the production of a written text on the development of an educational product (PE) based on one or more technologies worked on throughout the discipline. In addition, the presentation of the developed EPs was planned, in a format of free choice, that is, oral presentation with or without slides.

According to Gonçalves *et al.* (2019), product development involves complex actions on the part of its creators. Among these actions are: "the adoption of language appropriate to the public for which it is intended; third-party replication capability; internationalization; availability for free access and accessibility by people with disabilities" (Gonçalves *et al.*, 2019, p. 76).

The complexity observed by the aforementioned authors was also the object of analysis by the professors of the discipline, with the main points of highlight: the language, simple and intuitive, contemplating elements of accessibility, the great potential for replicability by the intended public, the promotion of internationalization as it is an application operable in two languages (German and English), in terms of accessibility, the *FindRoute APP* has, in addition to linguistic resources, media resources such as images and audios in foreign languages and alternative text for the images.

On the other hand, we also consider the issue of the availability of the application as a challenge, since it has not yet been tested, and we do not have the validation to make the resource available on digital platforms (websites or application stores). As future

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actions, we intend to carry out testing and validation with the intended target audience and thus continue the dissemination strategies of the *FindRoute application*.

CONCLUSION

In this article, we seek to report the development of the *FindRoute* application in the curricular component Development of Educational Products for Assistive Technology, within the scope of the Professional Master's Degree in Teaching of the Graduate Program Creativity and Innovation in Higher Education Methodologies (PPGCIMES-UFPA). Through this digital tool, we aim to develop the linguistic skills of ASD students with medium functionality in the courses of German Language and English Languages, at proficiency level A1.2, at the Faculty of Modern Foreign Languages (FALEM-UFPA).

In order to achieve our main goal, we developed the application using the theme of spatial orientation at UFPA in a playful way in German and English. The proposal also aims to promote activities with an emphasis on communication, favoring the effective interaction of students with Autism Spectrum Disorder (ASD), adults, with average functionality in learning these foreign languages.

Although the application has potential for implementation in the sphere of inclusive education, we still find some limitations in this process, one of them being testing and validation with the target audience. Until the year 2024, the Faculty of Modern Foreign Languages at UFPA does not have ASD students with medium functionality enrolled in the German and English Language courses, but only ASD level 1 support, that is, they have the disorder of less complexity in relation to levels 2 and 3 of support. On the other hand, the lack of a target audience in FALEM's Letters courses leads us to another possible path: the usefulness of the *Findroute APP* for the TEA level 1 support audience. However, to prove this hypothesis, we must expand our studies and better understand the context of the ASD students of the Faculty in question.

ACKNOWLEDGMENTS

To begin with, we express our gratitude to the Federal University of Pará for offering us the necessary structure to embrace our academic research.

We also express our gratitude to our teachers, Professor Dr. Arlete Marinho and Professor Dr. Dionne Monteiro, it was through the learning and provocations in the discipline taught

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by them that today we were able to develop this research. Otherwise, we would not have been able to reach such high flights.

In addition, we are grateful for the effort that both students had for the development of the *FindRoute APP* and subsequent construction of this academic investigation. We are sure that, in the future, this study can help in the construction of new research and in the development of other educational products for Assistive Technology (AT).

We also put here the colleagues of the discipline who further fostered the discussions that were raised in the classroom, in particular, our colleague José Monteiro, who was fundamental during the discussions about the conception and use of AT's.

Finally, a special thanks to our family members who support us daily in our academic and training path, the journey is long and tiring, but without them nothing would be possible.

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