

# Extension Project Based on Flipped Classroom to the Development of Hard and Soft Skills in Brazilian Outskirts: Case studies

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## Abstract

The pandemic has brought many consequences for society, especially in education for those that are less fortunate. In Brazil, public policy measures taken weren't enough to help an expressive percentual number of students in their academy journey during the pandemic. Giving this, this paper presents a teaching-learning model based on flipped classroom to the development of hard and soft skills in universities students and young people from Brazilian outskirts, helping to fill the gap left by the insufficient educational formation during the pandemic and encouraging them to start a higher education, especially in the IT market, which is a promising area with many opportunities. In the proposed model, university students learn by themselves, instructed by professors, about IT area content and then, beyond bringing the content to be discussed in the classroom, from the traditional flipped classroom method, they also have to give lessons about the content they learned to underprivileged young people from the outskirts. Three case studies were carried out by this paper, with outskirts from three states of Brazil. Results show that the model is scalable and therefore, can be applied in different communities with small adaptations. It could be observed that university students developed many skills by participating on the project and young people from the outskirts learned new contents, developed their confidence and their motivation to start higher education and some of them even got job opportunities because of the project. The study demonstrated a class attendance rate exceeding 70%, with over 75% of students from the three case studies expressing satisfaction with their participation in the project.

**Keywords:** active methodologies, flipped classroom, extension project, teaching-learning model

## 1. Introduction

A study carried out by the UNICEF (United Nations International Children's Emergency Fund) reveals that after two years of the Covid-19 pandemic, about 2 million young people aged 11 to 19 who had not yet completed basic education left school in Brazil (VEZARO, 2022).

According to INEP (National Institute of Educational Studies and Research Anísio Teixeira) in INEP (2017), 99.3% of Brazilian schools suspended face-to-face activities during the pandemic. A total of 43.4% of state schools provided computers, notebooks, tablets and

smartphones to teachers. In the case of cities, this percentage is 19.7%. When it comes to free or subsidized internet access at home, 15.9% of Brazilian states adopted measures in this regard; in the municipal network, the number was 2.2%.

Regarding strategies for the development of teaching-learning activities, the availability of printed materials for collection at school was the most used during the pandemics. Then, there is the offer of materials, assessments and tests carried out remotely over the internet, as pointed out by INEP (2017). Unfortunately, these measures weren't enough to help an expressive percentual number of students in their academic journey during the pandemic. In addition to that, according to Brazil (2021), 82.7% of Brazilians have access to the internet, but only 45.1% have a computer at home. This makes it difficult to use tools, software and websites for doing school tasks at home.

A non-sufficient educational formation can bring many consequences to the country, especially to the job market. One example is the Information Technology (IT) area, which is very promising and has several job opportunities, but it does not have enough skilled labor to keep up with its growth. According to the Association of Information and Communication Technology Companies (BRASSCOM) in Lopes et al. (2022), the IT market in Brazil will demand around 797 thousand talents between 2021 and 2025.

Giving this scenario, this paper presents an extension project carried out by professors and students from four universities (UniBH, UNA, IBMR and Uniritter - universities from an education group called Anima Education that has more than 390 thousand students around Brazil) to elaborate a teaching-learning model to the development of hard and soft skills in universities students and young people from Brazilian outskirts. The main objective is to deal with these skills not only in needy societies, but also with university students, since it is the students themselves who provide technical training for needy young people of Brazilian outskirts.

The model presented here is inspired by the active methodology called flipped classroom with additional improvements. In the proposed model, universities students learn by themselves, instructed by professors, about IT area content (e.g., the digital world, logic and computational reasoning, development of software, among others) and then, beyond bringing the content to be discussed with professors and classmates, from traditional flipped classroom method, they also have to give lessons about the content they learned to underprivileged young people from the outskirts, in order of evaluating their learning.

Apart from promoting learning evaluation, experimental results showed that the project has also helped the development of soft skills, teaching students about social skills and the importance of helping less fortunate people in their education after the pandemics, enabling them to act in IT market, and therefore, helping to discover talents to be hired in this promising area. The main objective of the soft skills development is to show project students that there are other important skills, in addition to technical skills, that need to be incorporated into their lives, mainly in the way how to act in environments as fragile as those of less fortunate communities. In this sense, skills such as empathy, communication and interpersonal relationships, collaboration, working under pressure and resilience are the main topics addressed. It is believed that introducing these skills weekly to students throughout the projects helps to naturally disseminate these skills and feelings also to young people in the communities served by the projects, who are also able to assimilate, put into practice, and propagate this kind of skill in their lives.

The connection between young unprivileged people to the university can encourage them to start their higher education, since the rate of people with university degrees in Brazil is low

because most of them can't support it financially and some are still thinking that the university environment is unreachable for them. In addition, the model proposed is also scalable and generic, which means that it can be applied in different contexts with small adaptations. To verify the model scalability, three case studies were taken in different outskirts areas from three states of Brazil: Minas Gerais, Rio de Janeiro and Porto Alegre.

This paper is organized as follows: section 2 presents the related work in methodologies for education science that have improved students' learning process. Section 3 shows the main concepts and methodologies used in this article. The details of the proposed model are presented in section 4 and the experimental results and analyses are presented in section 5. Finally, section 6 summarizes the final discussions and remarks of the paper.

## 2. Related Work

In recent years, numerous studies have aimed to improve the teaching and learning process. This is especially true in places where public education policies do not provide adequate education.

Many studies in the education science area use active methodologies as tools for improving the academic journey of students, encouraging them to interact more with classmates and professors. Among these works, some are highlighted in this paper for their relevance and the way in which the problem was approached.

The literature review of this research project shows that flipped classrooms are widely used in higher education at different levels and in different fields, with engineering and health sciences being the most common. The review has also demonstrated how the flipped classroom model can be applied in university education across various disciplines, highlighting both its advantages and potential obstacles.

Most studies suggest that the implementation of this active methodology can enhance student learning outcomes. However, several challenges and issues require careful consideration, including the absence of clear standards and consistency in the model approach, the complexities of evaluating and comparing results, student and teacher readiness, and ethical and legal concerns.

The flipped classroom has the potential to enhance student creativity through fluency, flexibility, and novelty (Al-Zahrani, 2015). This is due to the challenging nature of this model, which can stimulate the development of learners' self-efficacy and knowledge (Hao & Lee, 2016) and foster positive perceptions of the course (Zainuddin & Attaran, 2016). Additionally, Xiu et al. (2018) concluded that incorporating the approach could potentially cultivate positive attitudes towards learning among students.

The flipped classroom is a promising and original strategy for improving students' writing performance, according to Hao and Lee (2016). The authors additionally emphasized the advantages of this approach in fostering students' higher-order thinking abilities, critical thinking abilities, and metacognitive skills. However, limitations were found in the study due to the small sample size of students used, the absence of a pre-test, and the incomplete analysis of the impact of potential variables in the academic environment.

Fathi and Rahimi (2020) also investigated the impact of the active methodologies on students' writing skills using a pre and post-test design. The results indicate that the use of flipped classroom approach enhanced both the students' global (i.e., content) and local (i.e., grammar) writing performance.

A study by Zhang (2018) from the Normal of Luoyang University showed that flipped classroom method has brought many benefits to English teaching, has encouraged students to learn independently and creates a cooperative environment between teachers. In that work, experimental results showed that 96% of students demonstrated greater engagement related to learning English, developing self-directed learning, focused and persistent.

According to Tarim (2009), the Cooperative Learning method can be successfully applied in teaching and developing skills of verbal problem-solving during pre-school. To demonstrate the efficiency of this method, two experimental groups participated in a case study in that work: one group with traditional teaching and the other with cooperative learning. The results showed that preschoolers in cooperative learning groups developed skills such as cooperation, sharing of knowledge, listening to speakers, and team work better than the other group.

Labouta et al. (2018) presents the proposal of an Integrative Cultural Model for students in all disciplines, creating opportunities to conduct authentic interdisciplinary research projects. The target audience is marginalized students who believe they are not intelligent enough to study science, and therefore drop out halfway through their studies. Based on the flipped classroom method, in that work, students are instructed in doing their own research and experiments, which fosters a more supportive and encouraging environment of learning.

In order to facilitate the identification of these studies' contributions, Table 1 is presented below. In this table there is a summary of some relevant studies found in the literature review about education science strategies to improve soft and hard skills of students.

Table 1.

*Summary of the literature review about education science*

Reference	Methodology	Number of students involved	Results
Tarim (2009)	Cooperative learning	36 children divided into two groups	Children in the cooperative learning group benefited significantly more than those in the control group.
Al-Zahrani (2015)	Flipped classroom	not mentioned	Enhancement in student creativity through fluency, flexibility, and novelty
Hao and Lee (2016)	Flipped classroom	Small sample	Improvement in students' writing performance
Zhang (2018)	Flipped classroom	130 students	96% of students excelled using the methodology proposed
Labouta et al. (2018)	Integrative Cultural Model	not mentioned	Results show that students are more motivated to complete their studies.
Fathi and Rahimi (2020)	Flipped classroom	not mentioned	Enhancement in both the students' global and local writing performance

### 3. Theoretical Fundamentation

This session presents the main concepts and methodologies of science education used in this article: research and extension project, active methodologies, soft and hard skills.

#### 3.1. Extension Project

According to Correa et al. (2017) university extension is the key axis of university education committed to the problems of society, it is a specialized field of intervention for the construction of knowledge.

An extension project aims to promote social development, that is, the pursuit of scientific knowledge with practice. The extension project usually works as follows: the institution offers a space for students to experience what they have learned in the classroom and put their knowledge learned through research.

### **3.2. Active Methodologies**

To actively participate in the learning process, students must read, write, ask questions, discuss, or get involved in problem solving and project development (Barbosa and Moura, 2013). To understand the active methodology, we have to understand how traditional teaching works, only the teacher demonstrates his knowledge all the time, the students listen, receive content and then apply assessment to verify what was understood. The active methodology brings new possibilities in the field of education, where the students are the protagonists of their own knowledge, giving them autonomy and improving their communication skills.

#### **3.1.1. Flipped Classroom**

According to Pereira and Silva (2018), the flipped classroom is one of the active methodologies that emphasizes the use of technology to enhance learning, so that the teacher can make better use of his time with interactive activities. We can define it as a teaching model where the teacher leaves and explains the contents and passes the turn to the students themselves. This study proposes to put into practice this methodology called "inverted classroom" to make students assume more active postures in the classroom, interacting with colleagues, answering questions and actively participating.

### **3.3. Soft Skills**

According to Robles (2012), soft skills consist of a combination of interpersonal skills and career-related personal attributes. That study points out the top 10 soft skills as perceived the most important by business executives, which are: integrity, communication, courtesy, responsibility, social skills, positive attitude, professionalism, flexibility, teamwork, and work ethic.

### **3.4. Hard Skills**

Hard skills are the technical skills of a professional to work in each area. They are those that he can prove through diplomas, certificates, and practical tests. Consist of technical knowledge needed for the job. This skill is related to achievements listed in a curriculum, such as level of education, work experience, knowledge, and level of specialization (HURRELL, SCHOLARIOS, THOMPSON, 2013). Robles (2012) states that Hard Skills are specific, justifiable, measurable and can be learned and improved over time.

## **4. New Teaching-Learning Model Based on Flipped Classroom**

The main objective of the teaching-learning model proposed by this paper is to help in the development of hard and soft skills in university students and in the educational formation of unprivileged young people from Brazilian outskirts.

In order to better explain the model and its capability of generalization and scalability, the general scheme of it can be seen in the business model process flow chart from Figure 1 and is described as follows:

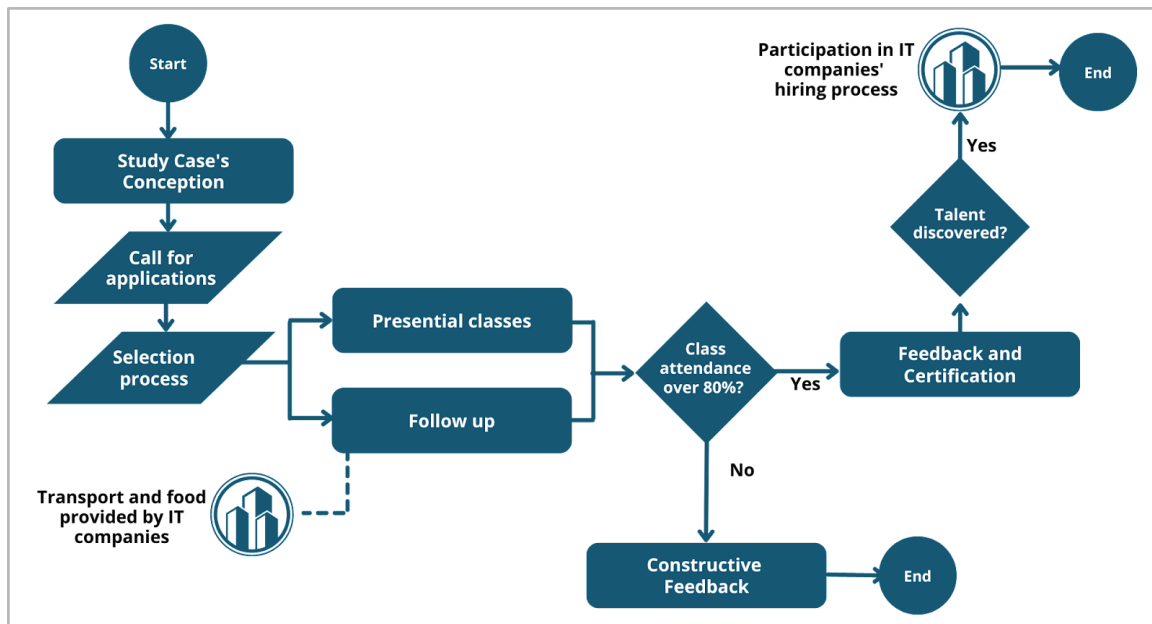


Figure 1. General Scheme of the Proposed Teaching-Learning Model

- **Case Study Conception:** The process flow starts with university professors gathering with non-governmental organizations (ONGs) of less fortunate communities to present the model and understand the need of adaptations considering outskirts characteristics. This is an important step, since some regions may be dangerous, and some young citizens may not have enough family support.

For example, in the case study taken in Rio de Janeiro, professors had to ask for permission from outskirts leaders, so the bus provided to transport students could get into the region and sometimes classes had to be suspended because the bus could not get into the region because of the gang conflicts.

Once the project is approved by the ONG, university professors start gathering with IT companies and the universities' board to get support with the infrastructure and resources needed for the project, such as: transport, food and scheduling and preparation of the university classrooms and laboratories for the classes. Finally, when all the details are settled and documented, the call for the application process starts.

- **Call for Applications:** In this step, young people subscribe to participate in the selection process from the application form in Appendix 2. The propagation of the projects with the details of the selection process took place in schools, on the social networks of partner companies and ONGs, in the physical locations of the ONGs.
- **Selection Process:** In the selection process, applications are read and analyzed by professors and the ONG analysts, and the results are published and sent to the candidates, through phone calls and a list published on the projects' social networks
- **Presential Classes and Follow up:** Since most of the young from the communities don't have computers at home and in order to connect them to the university environment, classes are taken in the universities by its students and in the case of Favelaware, classes took place at the partner ONG.

Students must learn by themselves, content given by professors, about IT area (the digital world, logic and computational reasoning, development of software, among others) and then, beyond bringing the content to be discussed with professors and classmates - from traditional flipped classroom method, they also have to give lessons about the content they learned to the young people from the outskirts.

Since classes are in-person, students from universities and young people from the communities receive help for transportation and food from IT Companies and Non-governmental organizations (ONG), partners of the universities.

While classes are conducted, professors evaluate students' knowledge about the content given and their soft skills improvement. The professors watch student's lessons, take notes, give them feedback, follow up and evaluate their performance through the questionnaire from Appendix 3. Classes are also evaluated by the young people from the communities.

In each class, a call is made to monitor the attendance of young people to classes. The professors also follow up young people's attendance to classes and they only get certification if their class attendance is more than 80%.

- **Constructive Feedback:** Whether young people's attendance is lower than 80%, leaders from the ONG are notified, they inform young people's parents to understand what is happening and gather with the young to give constructive feedback.
- **Feedback and Certification:** Young people with the attendance higher than 80% receive a certificate for conclusion of the course in a symbolic graduation event.

During the Case Study Conception, Call for Applications and Selection Process, the material is constructed and is updated according to the needs of each class. All the material used in the classes was prepared by the instructors and evaluated by the guiding teachers. The idea is to transmit learning from young people to young people, in addition to developing the ability to collaborate and teach among students. This approach allows students not only to absorb the content, but also to understand it more effectively by seeing how their peers explain and present the concepts.

In addition, this methodology encourages the active participation of students in the educational process, promoting engagement and the exchange of ideas. Instructors, being young too, are able to better connect with students, understanding their perspectives and challenges. This creates a more inclusive environment and makes it easier to build positive relationships between everyone involved.

Guiding professors play a key role in this system, ensuring the quality of the material and alignment with educational objectives. They oversee the material creation process, provide guidance to instructors, and ensure that content is correct, relevant, and up-to-date.

By developing the ability to collaborate and teach among students, this approach also prepares students for future professional challenges, where the ability to communicate and share knowledge is crucial. In addition, it strengthens students' self-confidence, as it gives them the opportunity to excel as leaders and mentors, contributing to the educational community in a meaningful way.

## 5. Experimental Results

In this section, the experiments carried out in this paper are presented, according to the three case studies in Table 2.

Table 2.

*Case studies undertaken*

<b>Name</b>	<b>Favelaware Una</b>	<b>Favela Tech IBMR</b>	<b>Jovem Tech Uniritter</b>
<b>Date</b>	from April/2022 to “ongoing”	from May/2022 to August/2022	from September/2022 to December/2022
<b>City/State of Brazil</b>	Belo Horizonte/Minas Gerais	Rio de Janeiro/ Rio de Janeiro	Porto Alegre/Rio Grande do Sul
<b>Outskirt(s)</b>	Barragem Santa Lucia, Morro do Papagaio, Vila São José, Conjunto Santa Maria, Vila Leonina, Vila Estrela e Morro das Pedras	Morro da Providencia	Grande Cruzeiro
<b>University</b>	UNA	IBMR	Uniritter
<b>Number of university students</b>	8 university students	6 university students	6 extension students and instructors
<b>Number of Professors</b>	2 Professors	4 professors	3 professors
<b>Number of Outskirts Young People assisted</b>	38 people	24 people	38 people
<b>Age of Outskirts Young People</b>	15 to 22 years old	15 to 24 years old	15 to 22 years old
<b>Class Schedule</b>	Class 1: from 7 pm to 9 pm and from 9 am to 4 pm Class 2: from 1pm to 4pm	Class 1: Wednesdays and Saturdays from 13:30 to 16:30	Class 1: Wednesdays and Saturdays from 13:00 to 16:00
<b>IT Partner Company</b>	Mundiale	-	HMidia and Sinergy
<b>Non-governmental organization</b>	Obras Pavonianas	Gerando Falcões and Instituto Entre o Céu e a Favela	CUFA (Central Única das Favelas)
<b>Social media and website</b>	<b>Instagram:</b> <a href="http://instagram.com/favelaware/">http://instagram.com/favelaware/</a> <b>Site:</b> <a href="https://favelaware.animahub.com.br/home">https://favelaware.animahub.com.br/home</a>	<b>Site:</b> <a href="https://favelatechibmr.animahub.com.br">https://favelatechibmr.animahub.com.br</a>	<b>Site:</b> <a href="https://jovemtechuniritter.animahub.com.br/">https://jovemtechuniritter.animahub.com.br/</a>

Each of these case studies has one completed class of the first training shown in Appendix 1, with a total workload of 90 hours and duration of 3 months. Favelaware case study has already started a next class training about website development – a new training that is in progress and will be soon analyzed. Jovem Tech Uniritter also has the support from the City Hall of Porto Alegre.

The data collection process happened as follows: i) at the time of registration, those interested answered a form so that it was possible to know a little about their history; ii) at the end of each class, the instructors filled out a form to assess their experience, learning, applied methodology and developed skills. Details of the experiments and results found in each of these case studies are presented in subsections 5.1, 5.2 and 5.3. Finally, subsection 5.4 presents feedback from participating instructors. To all these case studies were designed identification brands, social media pages, shirts and websites. The brands and shirts can be seen in Figure 2.





Figure 2. Bus to transport students and t-shirts with the project's identification

### 5.1. Favelaware Una

As shown in Table 2, the Favelaware study case took place in the city of Belo Horizonte. According to the Brazilian Institute of Geography And Statistics (IBGE), the average percentage distribution of unemployed people between 14 and 24 years old, in the city of Belo Horizonte, is 19.15%. The research from IBGE (2022) shows that the IT area has grown significantly and with very attractive salaries, especially in Belo Horizonte, where there is a community with more than 300 startups, known as the San Pedro Valley.

The survey applied with young people from this project, in this study case, showed an approval rate of over 70%. This result has an impact not only on technical training, but also on the students' permanence until the end of the course, ensuring an improvement in posture, oratory, dealing with other people, speaking in public and expressing themselves.

The project developed at the end of the training required for the student to develop a prototype using the technologies and content learned and present it to the classmates. It also helped them in the development of teamwork, creativity and in solving problem skills.

Class attendance was over 70% and students' knowledge about the content taught in Appendix 1 was evaluated. Considering the context of lower attendance and evasion in Brazilian public education, this is a good result, as it means that students were motivated to learn and stay in the project. Figure 3 shows the average percentage of learning evaluation and attendance for each topic taught.

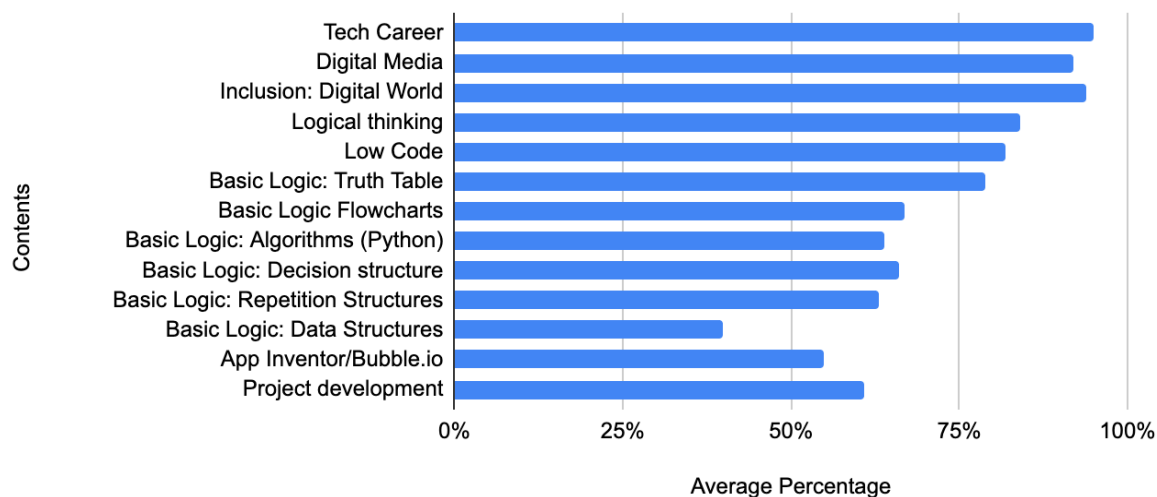


Figure 3. Average percentage of attendance per content

## 5.2. FavelaTech IBMR

The youth unemployment rate in the city of Rio de Janeiro, where this case study was undertaken, is relatively high compared to other regions of the country. According to IBGE (2022), the average percentage distribution of unemployed people aged 14 to 24 in Rio de Janeiro was 16.25% in 2022. However, the IT market in Rio de Janeiro has shown growth and there are good opportunities for unemployed youth. The city is an important technology hub in Brazil, with many IT companies and startups. In addition, the city has a constant flow of tourists and events, which generates opportunities for startups and IT companies in areas such as tourism, entertainment, and digital marketing.

When enrolling in the project, students answered a questionnaire, in which one of the questions was whether they had any experience with programming. Figure 4 shows that 82.8% of young people have never had contact with this subject. Another question in the questionnaire was if they use a computer during the week and 69% answered no. For those who answered yes, many used it at other places or at school.

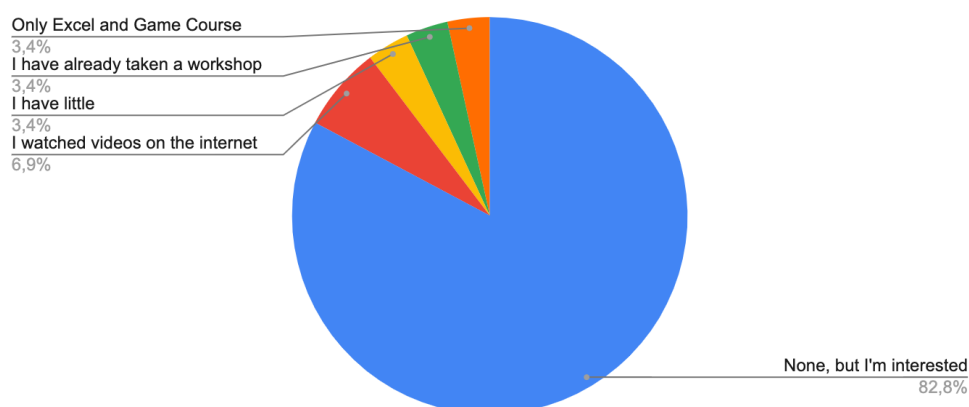


Figure 4. Programming Experience

With an approval rating of over 70%, it can be observed that the project was successfully completed. On the other hand, there was an evasion due to the non-support of some families and the fact that some of the young people do not identify with the IT area. Figure 5 shows the

average percentage of attendance according to the subject taught. It can be seen that most of the students remained until the conclusion of the project.

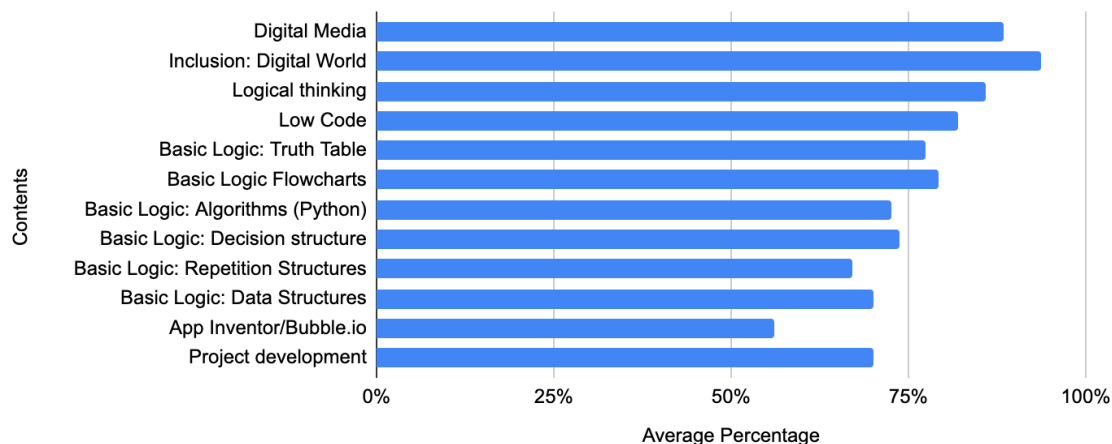


Figure 5. Average percentage of attendance per content

A great relationship was developed between young people and university students, creating a good environment of sharing knowledge and social skills. The teaching-learning process evolved gradually, and a survey showed that only 2% did not understand or had some difficulty with the content.

The results were even greater, one of the students was able to enter the IT job market due to the content learned in the project. Therefore, FavelaTech IBMR was of fundamental importance in the lives of the young participants, since it allowed them to enrich their curriculum and consequently insert them more quickly in the job market.

### 5.3. Jovem Tech Uniritter

This case study took place in the second semester of 2022, during a post-pandemic economic scenario, which the main characteristic was the existence of many unemployed young people as well as many open job opportunities in the IT area, and not only in Porto Alegre, where the project was undertaken, but also in Brazil.

According to the Association of Brazilian Information Technology Companies – South Regional (ASSESPRO-RS), there were about five thousand open positions for IT in the state of Rio Grande do Sul in 2022 still driven by the need for technological transformation, mainly after the COVID-19 pandemic. On the other hand, according to IBGE (2022), in the third quarter of 2022 there were about 11.6% of young people aged between 18 and 24 years out of the labor market in Rio Grande do Sul. Consequently, the timing for putting the Jovem Tech project into practice could not be better.

To participate in the project, young people answered a questionnaire so that the organizing team could learn a little more about their reality. One of the questions in the questionnaire was whether they had any experience with programming and 60.9% of them answered no. The percentage for those who had some contact with it was 19.6% (Figure 6).

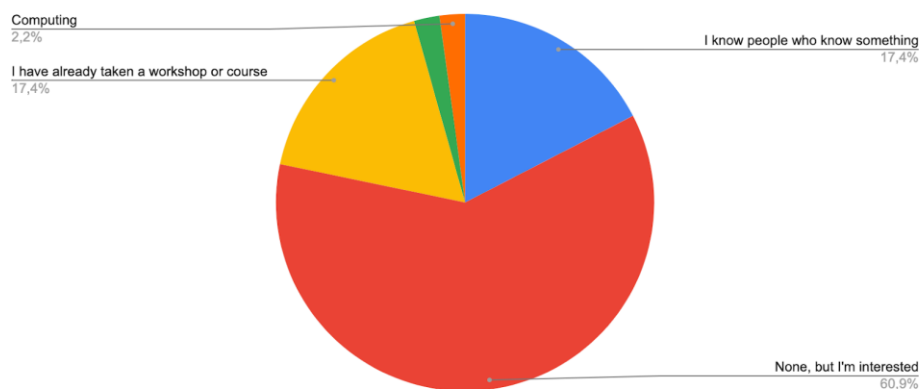


Figure 6. Programming Experience

Regarding the results of the case study of the Jovem Tech project from the point of view of the young people and students of the project, 3 items are important to be highlighted, which are: (1) the frequency of the students, that is, how many students started and finished the project; (2) the level of knowledge acquired in relation to the content taught; and (3) and student satisfaction with the classes taught.

All students who started the project were able to finish the project, which is an extremely satisfactory result, since many students usually have difficulties keeping up with their studies and consequently quickly lose focus. 92.3% of the students mentioned that the content taught in classes connects with their realities of life, while 7.7% said they had no contact with computing daily or did not have a computer at home.

Only 34.6% of the students mentioned they somehow managed to put into practice the content taught in the classroom, including developing algorithms to take care of their personal income. Many students continued to practice what was learned to seek a job opportunity. Many of the students who said they were unable to put it into practice justified the lack of opportunity. All students expressed themselves positively in relation to the material used and the way the classes were taught, 84.6% of the students expressed themselves positively in relation to the understanding of the content taught in the classroom, 15.4% of the students said they had difficulty with the subjects addressed and some of them found the content too extensive to be seen in 3 months.

#### 5.4. Feedback for the University Students

Regarding the results of the case study, from the point of view of the university extension students who taught the classes, 2 items are important to be highlighted, which are: (1) the impact of the project on these students (soft and hard skills) and (2) whether the project aroused interest in continuing a teaching career.

According to the data in Figure 7, the soft skills developed throughout the project and mentioned by more than 50% of the students were “communication” and “ability to solve problems”. In addition, collaboration, organization, leadership, and creative thinking were also well cited by the students.



Figure 7. Soft skills developed throughout the project

The other skill developed throughout the project and that was most mentioned by the students was “presentation skill” with 56.3%. In addition to this, two other skills were also mentioned equally: “managerial skills” and “technical skills”, both with 18.8%. When asked if the project aroused the students’ interest in participating in a master’s or continuing education program, 43.8% of the students answered that “they agree” and 18.8% that “they strongly agree”, with only 12.5% “disagreeing”.

## 6. Conclusion and Future Studies

The project was an important milestone for changing the lives of the young participants. Through the results, it can be observed that there were young people who were inserted in the job market, young people applying the knowledge acquired in daily routines, young people feeling more secure and confident to look for a job, which goes against the intention of the project of offer opportunities for young people to develop professionally and personally and promote digital transformation in the community.

Another expected objective was to allow young people to approach technology, not just as users, but as transformers. With the content taught, it awakens the interest of young participants to contribute to the development of tools that optimize processes and integrate different sectors of society, in addition to being an incentive for other young people to be interested and seek to transform the environment in which they live through technology.

This project was also extremely important for the university students of Anima Education, as it promoted a reflection on the importance of their comprehensive education, participating in projects in the community, which is one of the pillars of the institution. The project opened the door to jobs, internships and had a positive impact on the academic life of the instructors, in addition to their personal and professional development. The methodology used enables the development of protagonism by students and educators who, aware of their potential and roles, can become individuals and citizens who together will contribute to transforming reality inside and outside the classroom. At Favelaware UNA, a new learning path has already been started with more advanced content, such as: Database and Web Development.

As future work, it is intended to take the project to juvenile offenders, so that they can have a life-changing opportunity through technology and allow for a better re-socialization of them. This future project will take place at Fundação Casa in São Paulo - Brazil, in partnership with Escola de Nuvem from AWS.

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**Appendix 1 – Learning Path**

<b>TRAINING ABOUT CULTURE AND ENCHANTMENT IN INFORMATION TECHNOLOGY – 90 HOURS</b>		
<b>Item</b>	<b>Workload</b>	<b>Description</b>
Tech Career	3 hours	Introduction to careers in IT; How to put together a resume; Team work; Job interview; Oratory.
Inclusion: digital world	9 hours	How to access a computer; Hardware and software concepts; Digital tools for work.
Logical thinking	6 hours	Use of tools and games to develop logical reasoning.
Low Code	9 hours	Creation of stories, games and animations using ludic tools - Scratch and Construct 3
Basic Logic Programming	48 hours	Flowchart, algorithms, operators, decision, structure, repetition structure, simple data structure - Portugol and Python
App Inventor and Buble.io	9 hours	Block-based programming tools for building functional mobile apps.
Project development	6 hours	Application of knowledge acquired in training.



**Appendix 2 - Registration form**

- 1- Enter your full name:
- 2- Enter your age:
- 3- Select the outskirts in which you live?
- 4- Select below if you [Have completed elementary school]:
  - Yes
  - No
- 5- Select below if you [Have completed high school]:
  - Yes
  - No
- 6- Select below if you [Are attending high school]:
  - Yes
  - No
- 7- Select below if you [Participate in social projects]:
  - Yes
  - No
- 8- Select below if you [Volunteer in social projects/ actions]:
  - Yes
  - No
- 9- Select below if you [Like social networks like Instagram and Tiktok]:
  - Yes
  - No
- 10- Select below if you [Work]
  - Yes
  - No
- 11- Select below if you [Know work tools such as: word, excel spreadsheet, power point, e-mail, etc]:
  - Yes
  - No
- 12- Have you had any experience with programming?
  - Yes
  - No
- 13- Which of the items below do you like best?
  - Reading
  - Manual skills to build things
  - Math
  - Writing
  - Have ideas
- 14- Do you use a computer during the week?
  - Yes
  - Not
- 15- Do you use mobile apps?
  - Many
  - The basics
  - Don't have cellphone
- 16- What is your motivation for participating in the Favela Tech IBMR Project?

### Appendix 3 - Evaluation form for universities students

1. Of the soft skills below, mark the 3 that were most developed during the project:
  - Communication
  - Writing
  - Empathy
  - Collaboration
  - Flexibility
  - Organization
  - Work under pressure
  - Resilience
  - Ability to solve problems
  - Creative thinking
  - Interpersonal relationship
  - Overview
  - Leadership
  - Ethic
  - Negotiation
2. Did you have experience as an instructor/teacher prior to the project?
  - Yes
  - No
3. Did you find it easy to teach the classes?
  - Yes
  - No
4. What is the level of interest of the students involved?
  - 1      • 2      • 3      • 4      • 5
5. What is the level of collaboration between instructors?
  - 1      • 2      • 3      • 4
6. Has the project had a positive impact on your academic life?
  - I totally disagree
  - I disagree
  - Indifferent (or neutral)
  - I agree
  - I totally agree
7. Do you see the project as a form of life-changing opportunity for young people?
  - I totally disagree
  - I disagree
  - Indifferent (or neutral)
  - I agree
  - I totally agree
8. Was the methodology used ideal?
  - I totally disagree
  - I disagree
  - Indifferent (or neutral)
  - I agree
  - I totally agree
9. Check the skill you acquired the most from the project:
  - Technical Skill
  - Analytical skills
  - Presentation skills
  - Management skills
10. Did you have any achievements with the project?
  - Internship
  - Job
  - Personal development
  - Monitoring
  - None yet

11. Did the project help you better plan the way you study?

- I totally disagree
- I disagree
- Indifferent (or neutral)
- I agree
- I totally agree

12. Did the project meet your expectations?

- Yes
- No

13. Did the project make you interested in participating in a master's/continuing education program?

- I totally disagree
- I disagree
- Indifferent (or neutral)
- I agree
- I totally agree

14. Would you participate in a new round of the project?

- Yes
- No

15. What was your biggest challenge with the project?