

ARTICLE

**THE CONTRIBUTION OF THE BRAFITEC AND ENGINEER 3I PROGRAM TO THE IMPROVEMENT OF THE UNIVERSITY'S INTERNATIONALIZATION**

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**ABSTRACT:** The objective of this research is to compare the Engineer 3i Program with the *Brazil France Ingénieur Technologie (Brafitec)*, regarding the participating institutions, the courses involved, the funding offered, the language requirements, the teamwork, the presence of a partner company, the content and the certification, with the focus on identifying aspects that can improve the internationalization of the university. This is a documentary study of a qualitative nature. The Engineer 3i Program, despite important financial limitations when compared to the Brafitec Program, stands out for providing a complementary formative path, aiming at an engineer who works in teams, faces real problems and presents communicative domain in three languages. We conclude that mobility programs produce important lessons for the internationalization of the Brazilian public university and for improving the quality of its teaching and research. The three i's of the Program, proposed by two technological institutions that want to internationalize, appear as an important reference to think about the becoming of the engineering profession in a world without borders.

**Keywords:** Brafitec, Engineer 3i, internationalization, University

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## **A CONTRIBUIÇÃO DOS PROGRAMAS BRAFITEC E ENGENHEIRO 3i PARA O APERFEIÇOAMENTO DA INTERNACIONALIZAÇÃO DA UNIVERSIDADE**

**RESUMO:** O objetivo da presente pesquisa é comparar os Programas Engenheiro 3i com o *Brasil France Ingénieur Technologie* (Brafitec), quanto às instituições participantes, aos cursos envolvidos, ao financiamento ofertado, às exigências do idioma, ao trabalho em equipe, à presença de empresa parceira, ao conteúdo e à certificação, com o foco em identificar aspectos que podem aperfeiçoar a internacionalização da universidade. Trata-se de um estudo documental de natureza qualitativa. O Programa Engenheiro 3i, apesar de limitações financeiras importantes quando comparado com o Programa Brafitec, destaca-se por proporcionar um percurso formativo complementar, almejando um engenheiro que trabalha em equipe, enfrenta problemas reais e apresenta o domínio comunicativo em três idiomas. Conclui-se que programas de mobilidade produzem lições importantes para a internacionalização da universidade pública brasileira e para melhorar a qualidade do seu ensino e da sua pesquisa. Os três *i* do Programa, proposto por duas instituições tecnológicas que querem se internacionalizar, aparecem como uma referência importante para pensar o dever da profissão engenheiro num mundo sem fronteiras.

**Palavras-chave:** Brafitec, Engenheiro 3i, internacionalização, Universidade

## **LA CONTRIBUCIÓN DE LOS PROGRAMAS BRAFITEC E INGENIERO 3i PARA PERFECCIONAR LA INTERNACIONALIZACIÓN DE LA UNIVERSIDAD**

**RESUMEN:** El objetivo de esta investigación es comparar los Programas de Ingeniero 3i con *Brasil France Ingénieur Technologie* (Brafitec), con relación a las instituciones participantes, los cursos involucrados, la financiación ofrecida, las exigencias de idioma, el trabajo en equipo, la presencia de una empresa asociada, el contenido y certificación con enfoque en identificar aspectos que puedan perfeccionar la internacionalización de la universidad. Se trata de un estudio documental de carácter cualitativo. El Programa Ingeniero 3i, a pesar de importantes limitaciones económicas en comparación al Programa Brafitec, se destaca por brindar un itinerario formativo complementario dirigido a un ingeniero que trabaja en equipo, afronta problemas reales y presenta dominio comunicativo en tres idiomas. Se concluye que los programas de movilidad producen lecciones importantes para la internacionalización de la universidad pública brasileña, para mejorar la calidad de su docencia e investigación. Las tres *i* del Programa propuestas por dos instituciones tecnológicas que quieren internacionalizarse aparecen como una referencia importante para pensar el futuro de la profesión de la ingeniería en un mundo sin fronteras.

**Palabras clave:** BRAFITEC, Ingeniero 3i, internacionalización, Universidad.

## **INTRODUCTION**

The internationalization of Higher Education Institutions (HEIs) assumes, at the beginning of the 21st century, a necessary and urgent character, according to the global neoliberal discourse that is imposed on society. This phase of imperialism is called the benevolent version, with leadership in the European Community (EC) and in the educational sector. The imperialism that the educational sector is currently experiencing was preceded by two other phases. In the first phase, located between 1870 and

the First World War, Africa was divided among the European states and part of Asia was occupied by Japan and the United States of America. The second phase of imperialism focused on the reconstruction of Europe with the support of Fordist capitalism and the commodification of social relations. In the current phase, the intention is to implement an international education policy, a European standard, that aims to reach the world. Benevolent imperialism is shown in the Bologna Process. The idea is to promote a way of life, thinking, acting, and consuming along the lines of the logic of the European market. To socialize this hegemonic idea, education is the space and the university and intellectuals the actors of the new order (LEITE; GENRO, 2012).

The consequences of the homogeneity of curricula, evaluations and accreditations, and the conveyance of mercantile values to education are in the disregard of the local, in ignoring cultural diversity, in rejecting the history and the formation of the political subject, in refusing "[...] the daily life lived by different subjects inserted in university institutions, organizations and social movements" (LEITE; GENRO, 2012, p. 771).

Although the scenario may seem coercive and without alternatives, there are other motivations for the internationalization of universities as the expansion of research capacity, knowledge and intercultural understanding, without losing regional and local ties, cultural and historical diversity and the political formation of the subject (DIAS; NUNES, 2017).

As for the neoliberal reading of the internationalization of HEIs, some initiatives present counter-hegemonic alternatives. One of them is in Santos (2008), when he defends alternatives of research, training, extension, and organization as a specific contribution of the university as a public good, at the service of the definition and collective solution of social, national, and global problems. Santos (2008) points out as a counter-hegemonic solution the implementation of a national project that values and considers education as a public good and that prepares students for the construction of a sustainable and just society.

Santos' suggestion (2008) was the alternative that the National Association of Directors of Federal Higher Education Institutions (Andifes) chose for public HEIs in Brazil. The booklet called *Federal Universities: heritage of Brazilian society* (ANDIFES, 2017) shows that the Public System of Federal Universities is unique in the country in terms of human resources training, technological development, community service, and promotion of citizenship. The Andifes initiative values the university as part of Brazil's history and goes in the opposite direction of the hegemonic one. By launching the primer, it values each institution, the national cultural diversity and the political formation of the different subjects inserted in the universities. The initiative inhibits the homogeneity and standardization of the university, the focus of hegemonic internationalization.

The practice of internationalization of the university occurs when: there is international mobility of teachers, students and leaders; there is a network of joint work and publications in partnership; double degree agreements are signed; there are established inter-institutional programs and when there are human resources training programs (DIAS; NUNES, 2017).

As a scenario that marks the practice of internationalization of a HEI, the challenge lies in "[...] promoting the development of intercultural communication skills, learning about the cultures of other countries, improving skills to work in multicultural environments and becoming international people, prepared for the challenges of the future" (STALLIVIERI, 2017, p.18).

The practice of internationalization in universities has been discussed in HEIs, and publications demonstrate how immersed universities are in this practice. Stallivieri (2017) writes about concepts, benefits, trends, risks, and challenges of university internationalization. Oregioni (2017) works on the concept of internationalization in HEIs in Latin America. Wunenburger (2017) writes about the importance of the General Service for International Relations, sector of European universities for the mobility of undergraduate, master's and doctoral students. Dias and Nunes (2017) evaluate the internationalization of federal universities in the southern region of Brazil in the aspect of international agreements for student, faculty, and technical-administrative mobility. Charle (2013) deals with the transformations of European universities, especially from 1980 on, a period in which internationalization gains prominence, in addition to dealing with the increase of private funding in universities.

The Federal Technological University of Paraná (UTFPR) is one of 69 federal and public HEIs in Brazil. Of the more than 300 *campi* linked to universities, 13 are connected to it. It was born in

2005 from the transformation of the Federal Center of Technological Education of Paraná (CEFET-PR) into a technological university. Still as CEFET-PR, the practice of internationalization was already happening with the University of Technology of Compiègne (UTC), located in France, an institution that strongly influenced the technological university model adopted by UTFPR and that, at the time, was CEFET-PR's biggest international partner.

Today, UTC is one of the UTFPR's main partners. UTC was founded in 1972, being the 66th university created in France. It is a public establishment of scientific, cultural, and professional character, which operates exclusively with engineering courses (UTC, 2013). The focus of this study is two mobility and human training programs in place between UTFPR and UTC: the 3i Engineer Program, one of the most recent programs in internationalization practice between the institutions, and *Brazil France Ingénieur Technologie (Brafitec)*, a program between the Brazilian and French governments, consolidated and in place for over 15 years.

Regarding the programs that will be compared in this study, the literature on the Engineer 3i Program is still incipient. The text by Cziulik et al. (2016), written during the planning stage, highlights the challenge of creating an innovative proposal for training the engineer of the future. In the study, it is evident how time and planning are part of the foundations to establish an international program between institutions. Cechin, Pilatti, and Ramond (2018) describe the profile of the teacher who should work with the 3i Program. As for Brafitec, Grochocki (2016a, 2016b) took it as the object of his dissertation.

Considering the practice of internationalization of HEIs, from the standpoint of human development, to better understand and live in a different environment and a diverse culture, the question is: how do the mobility programs Engineer 3i and *Brazil France Ingénieur Technologie (Brafitec)* fit into the internationalization project of the participating institutions, particularly the Brazilian ones, considering the courses involved, the funding offered, the language requirements, teamwork, the presence of a partner company, the content and the certification?

The objective of the research is to compare the Engineer 3i and the *Brazil France Ingénieur Technologie (Brafitec)* Programs as to the participating institutions, the courses involved, the funding offered, the language requirements, the teamwork, the presence of a partner company, the content and the certification with the focus on identifying aspects that can improve the internationalization of the university.

The present study is characterized as documentary, of a qualitative nature. The documental corpus is constituted by the edicts of the Call for Selection for the Engineer 3i Program (UTFPR, 2017), the Call for Selection for the CAPES/Brafitec Program (UTFPR, 2018), Edict no. 13/2017 of CAPES (2017), the slides of the meetings held until 2017 (RAMOND, 2017) and the authors' logbooks during the inter-institutional meetings of the Engineer 3i Program. The data collected were submitted to the content analysis technique and the parameters proposed by Bardin (2016) were observed.

## **UTFPR-UTC ENGINEER 3I PROGRAM**

The Engineer 3i Program began to be formatted in a meeting that took place in 2015, in Brazil, in which UTFPR and UTC managers discussed the future of engineering education. At the time, the then rector of UTC, Alan Storck, commented that the engineer of the future should be able to think socially, economically, and technologically with agility and responsibility, and that the formation of this profile would be the next challenge of cooperation between UTC and UTFPR, since collaborations of student and staff exchanges, dual degree courses, and internships in partner companies were already consolidated. As a response to the challenge, the Engineer 3i program was envisioned. The name 3i refers to the engineer profile that the Program seeks to build, with characteristics of Industry, Innovation, and Interculturality (RAMOND, 2017).

The industry profile focuses on training engineers who are prepared to work in an environment with people and processes involved in the production and supply of something (good, product, service). This environment increasingly requires professionals capable of understanding, formulating, and solving problems, designing projects aimed at solving the socio-technical challenges of globalized companies, with entrepreneurial skills, and working together with intercultural and interdisciplinary teams. The Innovation profile seeks to ensure training that provokes the development

of the student's creativity, so that he/she is capable of leading changes in companies, in the development and conduction of innovative international projects. The Interculturality profile seeks to provide the student with experience in different intercultural situations, including: international mobility during their education; the construction of foreign language skills; knowledge of and interaction in the context of different cultures; the experience of insertion in international projects and their immersion in international networks, whether personal, academic, or professional.

UTC showed interest in developing and implementing the project in cooperation with UTFPR. It was stipulated that the international offices of the two universities would be responsible for structuring the boundaries of the proposal and defining the work strategies. Next, the working groups, at UTC and UTFPR, were set up. These groups reviewed the literature with the aim of knowing the state of the art of engineering education and then projecting possibilities for education for the next 20 years (from 2015 to 2035). The group met virtually and regularly to address key issues related to the feasibility of the Program (CZIULIK et al., 2016).

The initial idea for the Engineer 3i Program was discussed and shaped during a sequence of four meetings involving teams from both institutions. The first face-to-face meeting to address the proposal took place in Compiègne, February 3-5, 2016. At the meeting, three conclusions were established: (i) there is a need to better prepare students for the complexity and heterogeneity of contemporary environments; (ii) there is a need to identify competencies related to knowing, knowing-doing and knowing-being in students from real situations/problems; and (iii) there is a need for close pedagogical cooperation between the Program partners to identify innovative training modules and scenarios (RAMOND, 2017).

The further training of a differentiated professional is a concern of the Engineer 3i Program. Therefore, it focuses on the requirement of a professional with a dynamic, intercultural mentality, with a command of three languages, with internship experience in a company present in France and Brazil, with a sense of teamwork to solve real problems, of interest to industry, using varied means, with multicultural, face-to-face and distance staff (UTFPR, 2017).

At the beginning of the Engineer 3i Program, from the perspective of internationalization, we have a connection of integrated educational systems with university relationships happening beyond the nation (MARGINSON; RHOADES, 2002).

As a perspective of this first meeting, it was decided to continue the work, with a deepening of the competences, modules and training scenarios, and the creation of an innovative training path was defined as a task, with progressive implementation of specific modules for a 3-year program.

The second meeting took place in Brazil, in Curitiba, September 29-30, 2016, at the Federation of Industry of the State of Paraná. At this meeting, the perspectives pointed out at the previous meeting were discussed. The competencies for the 3i Engineer profile were launched. It was established that the graduate should be able to: manage international projects, master collaborative tools, master non-technical aspects, adapt products and processes to other cultures, demonstrate entrepreneurial attitudes in international environments, propose systematic solutions to engineering problems, adapt solutions to heterogeneous contexts, propose projects for international fundraising, understand the different intellectual property mechanisms in an international context, propose creative solutions in engineering projects. For the innovative training, the group thought of discipline modules, Summer School, International Project Atelier (IPA), mini-project involving product adaptation in an intercultural context, language course during the international internship, six-month international internship, one-month immersion in a startup or incubator, exchange, among others (RAMOND, 2017).

What can be seen is the construction of a mobility program based on the profile of the engineering student that one wants to build. The structuring of this program corresponds to the proposition of a policy of change and development in higher education advocated by UNESCO, which highlights the importance of the elements that should be structuring in the internationalization of higher education.

XX. The **internationalization** of higher education is first and foremost a reflection of the universal character of learning and research. It is reinforced by the current procedures of economic and political integration, as well as the growing need for intercultural understanding.



The expansion in the number of students, teachers, and researchers who work, live, and communicate in an international context attests to this trend. The considerable expansion of various types of networks and other linkages between institutions, faculty, and students is facilitated by the continuing advance of information and communications technologies.

XXI. International cooperation must be based, first and foremost, on partnership and the collective pursuit of the quality and relevance of higher education. The deteriorating conditions under which institutes of higher education operate, particularly in some developing countries, require **international solidarity**. In this regard, it is important to promote programs and exchanges that can help reduce existing imbalances and facilitate access to knowledge transfer (UNESCO, 1999, p. 17, emphasis added).

The criticisms that internationalization processes have suffered, especially those related to the asymmetric mode of subservience that peripheral countries have in relation to more developed countries (NÓBREGA, 2014), can be diminished by having a bilateral relationship between the institutions involved.

The third meeting took place in Compiègne, at the UTC, during the week of October 2-6, 2017. Representatives from UTFPR and UTC discussed the competences that should be worked on in the student and the modules that would contemplate these competences, a verification exercise of what each institution would offer. As a result, a complete initial matrix for the Program was defined. The competency references, the catalog of modules and credits for validation, the cross-matrix between skill and module, and the certificate validation rules were released (RAMOND, 2017). The group discussions led to stipulate four families of competencies: 1) participate in the 3i projects; 2) design and innovate; 3) know the local and international context; and 4) master communicative situations in 3i context (RAMOND, 2017).

The first family of competencies relates to the engineering graduate's ability: to acquire, capitalize on, and share basic concepts in project management; to integrate with an intercultural (and interorganizational) team; to contribute to technical, innovative, and project management achievement; to have the ability to choose, master, and use collaborative management, technical, and communication methods and tools; to adapt methods and tools to the local and international context; and to participate in interdisciplinary projects within the program partner company's workforce.

The second family of competencies relates to the ability of the future engineer: to generate or adapt a product to different cultures and contexts; to integrate the durability dimension in product design and proposed solutions, considering *eco-design*, energy transition, circular economy, among others; to know how to bring out innovation in the dynamics of an intercultural group; to think of innovation as a driver of development and in line with the evolution of society; and to innovate in a context of co-development and international partnership, knowing contracts, intellectual property, legislation, among others.

The third family of competencies is related to the ability of the future professional engineer to: know the local and international context; capitalize, articulate and exploit knowledge for innovation; decipher a business strategy within the company in an international context; understand the rules and regulations at local, national and international levels; know the national and international funding programs; and understand the historical, ethical, socio-cultural, political, economic and administrative context of the countries involved in the partnership.

The fourth family of competencies seeks to offer the engineering student: the opportunity to practice the language of the host country and English, to master intercultural communication in the understanding that this student needs to know how to be, negotiate, manage conflicts, distance, decentralize, among others; possibilities to identify and take into account psychological profiles and personal motivations in project management, and to know how to communicate a project with resources and supports adapted to different types of audiences, such as decision-makers, the general public, or engineers. The description of this construction phase of the 3i Engineer Program is an example of how the internationalization of the university can happen inversely to the idea of internationalization driven by the categorization of education as a service, with regulation by the World Trade Organization, and gradually adopted by the conception of trans nationalization vis-à-vis the sovereignty of the nation-state.

The next meeting, the fourth, took place in Curitiba, at UTFPR, between November 20 and 24, 2017. At the time, the Call for Selection Notice for the Engineer 3i Program (UTFPR, 2017) had already been released. The aim of the fourth meeting was to validate, together with the industries located in the Metropolitan Region of Curitiba, the families of competencies built in the context of the discussions between the two universities, to define the rules for validating the Engineer 3i certificate, and to format the dynamics of the IPA and the Summer School, which would take place in February 2018, in Curitiba, for the students selected in Brazil and France for the Program.

For both Brazilian and French students, the 3i Engineer Program is therefore configured as an opportunity for improvement and complementary certification to the regular training of engineering courses, with a reinforcement in international mobility to validate the requirements of the 3i competencies. Validation takes place through modules in the Humanities and Languages, existing in the partner institutions, and through new modules in the form of seminars and internal and external IPAs (RAMOND, 2017). The time to certify an Engineer 3i student is estimated at three years. For the first cohort it was set mandatory to pass the modules during the first six semesters of the Program.

The 3i Engineer Program is developed in parallel to the undergraduate course, that is, if the student graduates in engineering during the development of the Program, he/she will be able to get the 3i Engineer certification, finishing the project inside a company or even with a one-year internship abroad. It will also be possible to validate activities outside the partner universities through conferences, seminars, courses. It was stipulated that the diploma validation rules must be compatible with the engineering diploma validation rules of UTC and UTFPR.

For a student from Brazil or France to have the validation of Engineer 3i added to the engineering diploma it is necessary to be approved in all modules and, mandatorily, to experience the international mobility in two semesters, one of classes and the other of internship. The participant will experience the stay and the internship in a company in the industrial sector, and of the two compulsory internships in companies, at least one of them must be abroad, with the 3i Engineer's partner. The validation of the 3i certificate requires the student's stay, short or long, in a startup or in a free project, linked to an existing startup. Another requirement is the student's participation in projects and in the IPA course, in which students from Brazil and France work as a team at a distance, during one semester, a pre-requisite of which is the completion of a discipline focused on Project Management.

The validation criteria also include a final report and the student's participation in 15 hours of courses, chosen from the modules offered by the catalog of Engineer 3i courses or outside of it, in the form of seminars or conferences on various topics such as sustainable development, circular economy, technology control and knowledge management in a 3i context, local economy, scientific or professional communication in English, interculturality, editing and financing projects, and advanced project management (RAMOND, 2017).

Validation is also conditional on the Interculturality and international environment criterion. Thus, for the student to obtain the Engineer 3i certification, he or she will need to attend at least one subject in the intercultural area, another subject that covers issues related to the foreign company, and also seminars on knowledge of the local economic context, either in Curitiba (Brazil) or in Compiègne (France). At the end of the Program, the student must prove C1 level language skills in English and in the language of the foreign country, that is, Portuguese for students from France and French for students from Brazil. To reach this level, the Program foresees the student's follow-up through the language teaching sectors of the universities involved.

The language proficiency requirements follow the marks of the French Universities of Technology, where the engineer's communication is fundamental in English and in the foreign language, that is, the 3i Engineer Program is trilingual. For academics from Brazil, although intensive French classes are foreseen, it is necessary, in order to enroll, to prove knowledge of French and English at the minimum level B1, according to the European Reference Framework. For students from France, the proof of this level is in English and Portuguese. The requirement was thought to speed up the student's communicational performance, since, starting from the B1 starting point, the student already has communicative independence, even if intermediate, in a classroom or internship situation at the cooperation partner company. The student will understand the main points of the subject matter, with the ability to express his/her thought in concrete and probable events, in verb tenses referring to the

past, present and future, being able to give an opinion, even if in a limited way, in some situations that demand argumentative discourse and logical reasoning. You can describe situations and deal with everyday occurrences in an easy way.

The study of languages at UTC is part of the engineer's education. Of the entire training, 33% is humanities and language subjects. A newcomer student is instructed by the student guide to take a maximum of three languages simultaneously during the common core period (*tronc commun*), equivalent to four semesters, and to deepen them, leaving room for the other humanities subjects. UTC students can choose from eight languages, however, French, as a foreign language, is not offered to the native-born scholar (UTC, 2020). At UTFPR, language instruction is also offered. All *campi* have a Modern Foreign Language Academic Center (CALEM), however, the academics' attendance is not an integral part of the courses, as at UTC. English is offered on all thirteen *campi* free of charge. However, for other languages, such as French, Spanish, Italian, German, and Japanese, there is an offer at some *campi* and not at others (CECHIN, 2019).

Before drafting the first notice of the Program, the organizers chose an automotive company present in Brazil and France for students to develop an activity, seeking to solve a real problem within the industry. The chosen company has a branch in Curitiba and has been UTC's partner for many years.

The first public notice of the UTFPR for the Engineer 3i Program offered six openings for students of the UTFPR Curitiba Campus, involving the courses of Civil, Computer, Control and Automation, Electrical, Electronic, Mechanical and Mechatronic Engineering (UTFPR, 2017). Five students were selected. UTC also opened six places. A public call for applications was made. Of the applicants, the committee responsible selected seven students from the Computer Engineering, Mechanical, Mechanical Systems and Urban Systems courses, while it chose to exclude students from the Biological and Process Engineering courses from the list, as their profile would have little application in the automotive company. Another criterion applied to those selected in the first phase was having Portuguese language skills. Seven candidates remained at the same level. The commission analyzed and decided to create an additional vacancy. It should be noted that the French part of the Program (UTC) sought and obtained resources, until June 2018, from the *Sorbonne Universités* (group of universities of which UTC is part) for activities developed in the Engineer 3i Program.

The selection of candidates is based on a profile discussed by a committee from both institutions. The requirement of language proficiency is fundamental. Another characteristic is the criterion that deals with the student's experience and time in the academic environment. The time to get used to university life and consolidate a pattern of studies is hardly effective in the first year of the course (SOUZA et al., 2020). A mature student, accustomed to the university routine, is usually, in Brazil, an academic in the sixth or seventh period of the course. The criterion assumes that the student, attending more than 50% of the total course time, is prepared for the challenge of the engineer of the future, along the lines designed by the UTFPR and UTC. For the activities planned in the cooperation, it is fundamental to have students already inserted in the university culture, used to a routine that requires time management and advanced study habits.

The student profile selected increases the probability of success in the activities that were designed for the Program. If the student does not meet the expected performance, does not pass any subject in France or Brazil, or has any disciplinary or behavioral problem, he or she will not remain in the Engineer 3i Program, and even if he or she has been selected by a public notice for double degree (UTFPR, 2021), he or she will not be allowed to continue his or her studies at UTC or UTFPR.

Another criterion used was the school performance coefficient, which should be equal to or greater than 0.7 (zero point seven), according to UTFPR standards, which corresponds to the group of the top 25% of students.

In early 2018, the pilot of the Engineer 3i Program was implemented by holding the Summer School, which took place from February 5 to 16, 2018. During two weeks, students got to know each other and experienced cultural immersion activities. Two seminars on interculturality were also presented, one by a researcher in the topic and the other by a representative of a multinational industry, as well as seminars on innovation. In addition, the students had the opportunity to work for three days in the Creativity Center of the partner industry. During these three days, the students met with industry professionals working on the pilot project's topic of study, which was the focus of the IPA activity. Still



in the Summer School, the students, accompanied by teachers from both universities (three from UTC and four from UTFPR), defined the work strategies and the roles of each one in the group, for the realization of the distance activity during the first semester of 2018. The IPA activity presupposes students' autonomy in managing the project. This means that it is up to them to manage budget, distribute roles, schedule and manage tasks, technical and collaborative tools, think about logistics, communication, prepare the intermediate and final report, among other activities. Supervisors, professors and/or people from industry play an advisory or consulting role for business or projects.

In July 2018, the presentation of the projects by the students took place and the teams of Program managers evaluated the first edition of the Engineer 3i Program (RAMOND, 2017). The Engineer 3i Program was continued in the years 2019 and 2020, with the Summer Schools taking place in the respective February months, and the IPA activity, at a distance, in the period from March to June of each year. In the year 2019, there was the participation of five French students and eight Brazilian students, as well as four French professors and ten Brazilian professors. The students from different engineering modalities and the professors were divided into two groups. A first group, consisting of four students from the Ponta Grossa Campus and two French students, developed a project to optimize the engine production line of a truck industry of the company DAF. The second group, formed by four Brazilian and three French students, worked on the development of a gravity model of the transportation flow in the city of Curitiba, together with Curitiba's Institute for Research and Urban Planning (IPPUC).

In 2020, the program was developed with the participation of eight French and nine Brazilian students, and three French professors and ten Brazilian professors, again distributed in two groups. The Ponta Grossa group worked on the development of a web application for production line optimization, together with DAF. In the case of the Curitiba group, in the new opportunity of acting in partnership with IPPUC, they proposed a Sustainable Development Plan for the Umbará neighborhood. In all cases, the final results were presented and delivered to the partners (DAF and IPPUC), being duly praised by both. It can be said that the 2020 edition showed an evolution in the functioning of the program (selection of students, contacts with real world partners, realization and monitoring of the international distance research). This shows that the previous experiences were duly considered and capitalized for this improvement. All Brazilian students involved in the project left for France, some for a one-year exchange (one semester of study and one of industrial internship) and others for two years, to obtain a double degree (three semesters of study and one of industrial internship). With the covid-19 pandemic, the program did not operate in 2021. It is planned to resume in 2022.

## **CAPES/BRAFITEC PROGRAM**

The Brafitec Program was born on April 25, 2002 from a three-year experience of mobility of students from Brazil to France. The program emerged with a proposal, innovative and daring at the time, for an engineer of the century that was beginning, through mobility during graduation with monitoring of the institution (GROCHOCKI, 2016a). In this program, the student leaves the country of origin with a work plan, knowing that the subjects he or she will take will be validated at the institution of origin in Brazil. He has financial support for travel and permanence in the foreign country - in this case, France and Brazil (UTFPR, 2018). It focuses on a bilingual engineer with internship experience within industry in France. In addition, the program involves the mobility of the Project management teams in the institutions of the two countries.

Some features of Brafitec highlight the selling of a French model of education. The fact that education is commodity was seen by Wit (2013) in a list that identifies a set of problems inherent in the internationalization process. Among the problems is the discourse of internationalization, which is often dissociated from reality and conceived in the narrow terms of the old international education globalization, the intensification of the treatment of education as a commodity, and the notion of a global knowledge economy and society that have turned internationalization into a product, sometimes conflicting with its discourse; the fact that internationalization is very much based on numbers (input and output), to the detriment of results, and that little attention is paid to the norms, values, and ethical principles of internationalization practice; in addition to the fact that internationalization is still thought

of in the form of a process involving countries, disregarding the relationship between cultures and between the global and the particular.

The current model of the Brafitec Program started in 1997, with another name, and was gradually improved until 2001, when the Program for Integrated Training in French Engineering Schools for Brazilian Student-Engineers was launched. The Brafitec Program was a Brazilian demand, articulated by CAPES and organized in France by the *Conférence des Directeurs des Écoles Française d'Ingénieurs* (Conference of Directors of French Engineering Schools) (CDEFI), intended only for Engineering courses at the undergraduate level, with the objective of stimulating the exchange between Brazilian and French HEIs and of bringing curricular structures closer, including the equivalence and mutual recognition of credits obtained in the participating institutions (CAPES, 2017).

In the initial phase, the Program foresaw, for the years 1999, 2000 and 2001, three editions of one hundred students, for training in France. The goal was "[...] to create new ties between Brazilian universities and French schools of engineers" (GELAS, 2009, p.2).

The name Brafitec was adopted in 2002, when the experiences of the initial phase began to provide support for a better structured proposal and with a new format. A guide of charges was created and an edict launched for all the establishments involved in the project in Brazil and France, with editions scheduled every two years. The partnership projects between the institutions started to be evaluated by experts from both countries, a mixed steering committee and a coordination in Brazil and one in France (GELAS, 2009).

The call for proposals was launched by CAPES and was open to all Brazilian universities. On the French side, the same happens, it is open to several universities in the country. The registration of the first CAPES/Brafitec project in Brazil (no. No. 001/2003) involved three HEIs: Federal Center of Technological Education of Paraná (CEFET-PR), Pontifical Catholic University of Paraná (PUCPR) and Federal University of Paraná (UFPR) - in partnership with the Technological University of Compiègne (UTC), Technological University of Troyes (UTT) and Technological University of Belfort-Montbéliard (UTBM). In 2016, 53 Brazilian and 54 French HEIs were involved (GROCHOCKI, 2016a). From 2003 to 2018, 8,897 students participated in the Program in the Brazil/France direction and 2,936 students in the France/Brazil direction (GELAS, 2019).

The most recent call for Brazilian universities to participate is No. 13/2019. A characteristic of Brafitec is that the bilateral mobility takes place with students and faculty from the teams in Brazil and France, however, with the covid-19 pandemic, the mobility for the year 2021 was postponed to the month of September (CCS/CAPES, 2020).

After CAPES launches the call for universities to enroll in the Brafitec Program, it is up to each registered university to launch its call for students to be selected in the Program. The number of openings is set by CAPES. For a HEI to participate in Brafitec, it needs to present a project, which may or may not involve another HEI, with a maximum of three institutions involved. The proposal must have: a joint work plan between the Brazilian and French universities; a two-year plan for the activities (the proposal can be extended for another two years); a coordinator with a PhD degree, obtained at least four years before, for each HEI included in the proposal; a work team with at least two PhDs; and, also, the HEI where the coordinator works must be linked to a recognized graduate program recommended by Ministry of Education of Brazil.

The profile required of candidates to enroll in the Brafitec Program in Brazil includes the following requirements: being between the sixth and the eighth period of the course, having obtained a minimum of 600 points on the National High School Exam (Enem), taken as of 2009, and having completed at least 40% and at most 80% of the course curriculum. They must also be regularly enrolled in an Engineering course and present proof of B1 proficiency in French, certified by internationally recognized tests (UTFPR, 2018). In addition, the student must have a school coefficient equal to or higher than 0.7 (zero point seven) and cannot have more than three failures in the higher education academic pathway, a consideration made for the student's current course and other courses, if the student has requested transfer.

At UTFPR, an average of three students per year participate in Brafitec, with the exception of 2011, when nine students participated. This was the phase in which Brafitec and the Science without Borders Program had a partnership.

The Brazil/France Brafitec provides three types of financial support: the Work Mission, which refers to the allowance for project members; the Study Mission, which refers to the student; and the Funding Material, which deals with resources granted per year and per project for expenses with the acquisition of consumables. There are two Work Missions per year and per project. Each mission cannot be less than seven days and cannot be longer than 20 days. The project coordinator is the only one who can carry out a Working Mission in consecutive years. Team members have a two-year interval to participate in a Working Mission. The Study Tour covers expenses such as a scholarship abroad, installation allowance, health insurance, locality allowance, teaching material allowance and travel allowance. Included in this item is the financing of French classes, if the French IES considers it necessary. In this case, CAPES finances Français Langue Étrangère (FLE) for students at levels A1, A2 and B1. For levels A1 and A2, the funding can be up to two months of FLE course, and for level B1, the maximum time is one month. Brafitec France/Brazil provides only one type of financial support: the monthly scholarship, which can be for a minimum of four months and a maximum of ten months.

The Brafitec Program also foresees the Brafitec Forum taking place every year, alternating its headquarters between Brazil and France. The objective of the Forum is the meeting between project coordinators and the Program's management teams in both countries, for the evaluation and continuous improvement of the Program.

### ENGINEER 3i X BRAFITEC PROGRAM

The internationalization of a university can happen with the presence of students from the partner institution on campus, with the joint performance of research and production of patents, with academic cooperation, with the existence of curricular compatibility mechanisms, with faculty mobility, among other possibilities (BARTELL, 2003). Chart 1 shows a comparison between the 3i Engineer Program and the Brafitec Program regarding the countries involved, the participating institutions, the courses involved, the funding offered, the language requirements, teamwork, the presence of a partner company, the content and the certification.

Chart 1: Comparison between the 3i Engineer Program and the Brafitec Program

	<b>ENGINEER 3i PROGRAM</b>	<b>BRAFITEC PROGRAM</b>
Participating Institutions	UTFPR and UTC	CAPES, Brazil and CDEFI, France
Courses involved	Engineering courses	Engineering Courses
Funding offered	Funding only on the French side	Funding on French and Brazilian side
Language requirements	Initial requirement B1 in Portuguese or French and English and final C1 in French, Portuguese and English	Initial requirement B1 in French and Portuguese
Team work	Part of the Program proposal	Not part of the Program's proposal
Presence of a partner company	Part of the Program proposal	Not part of the Program's proposal
Program content	Pre-established, additional to the regular activities of the engineer's training	Curricular activities foreseen in the partner institutions
Certification	Engineer 3i Certification	Does not certify

Source: Own authorship (2020).

Based on the table above, the similarities can be summed up by the fact that both programs are developed in the scope of the Brazil-France international cooperation, and that they are focused on the international education of engineers.

As for the differences, the Engineer 3i Program takes place at the relationship level, through an agreement between two universities, UTFPR and UTC, while the Brafitec Program is the result of an agreement at the ministerial level involving CAPES/Brazil and CDEFI/France, open to several universities and engineering courses from Brazil and France. Another difference concerns the funding. The Engineer 3i Program, in this first edition, had full funding for the student only on the French side.

On the Brazilian side, the participant pays most of the expenses. Brafitec, on the other hand, has full funding for both Brazilian and French students. It is worth mentioning that the selection of the Engineer 3i Program (2018/2020 period), on the Brazilian side, selected two students who had already been contemplated by the Brafitec Program. Thus, these scholars will participate in both programs, and the Brafitec scholarship will help maintain the student at UTC while he also participates in the Engineer 3i Program.

Still focusing on the differences, regarding the language requirements of the host country (Portuguese or French), the application requires level B1, of the Common European Framework of Reference, for both Programs. However, for the Engineer 3i Program, English is added to these languages. For the 3i Engineer Program, proof of level B1 in English is required at the beginning, and C1 in both foreign language and English at the end of the program.

Another difference is in the specification of teamwork. In the Engineer 3i Program, the students selected in the year work in partnership with colleagues from the same country and with colleagues from the partner country, exploring platforms and means of simultaneous and remote interaction to solve a real situation/problem, common to the group presented in the IPA. In the Brafitec Program there is no such legitimized characteristic, because the student has a solitary academic path, although he works as a team in the activities proposed by the disciplines.

It is in teamwork that university characteristics become evident, which are strengthened from the middle of the course on: autonomy, adequate management of time, responsibility in the tasks to be accomplished, perception of the consequences of doing or not doing the activities, for example. For UTC, the understanding that the student's academic maturity is a personal construction acquired along the course comes since its foundation, in 1974. Being the first university of technology in France, the proposed model for the education of the student at the university of technology should be differentiated from the classical university and engineering schools at the time (LEQUIN, 2015). The understanding that the student, when entering the UTC, was still immature and would need to know the various branches of engineering, since the UTC exclusively diplomas engineers, meant that the disciplines - called Value Units (UV) - were organized as a *menu*, in which, in the first two years, the student transits in the common troch, getting to know the various possibilities of engineering activities, and then choose a specific branch, when he is more mature (CECHIN; PILATTI; RAMOND, 2020). UTC's and UTFPR's understanding that there is a time for the student to understand the university routine is important to act in the Engineer 3i Program.

The programs are also different in terms of the participation of companies in the process. In the 3i Engineer Program, they are a part, acting in Brazil and in France, and also accompanying the two groups of students in both countries. On the other hand, in the Brafitec Program there is no partner company taking part in the Program, nor following the student's path. What the Brafitec Program can contemplate is the internship activity in companies abroad, not necessarily with insertion in both countries.

Still as a different point, there is the aspect of their content. In the Engineer 3i program, a specific program is planned, complementary and partially additional to the engineer's regular education in both countries. The Brafitec Program is based on the execution of curricular activities foreseen in the partner institutions in the projects.

As a final difference, the Engineer 3i Program certifies the participating student, differentiating him/her in the world of work from other students who did not participate in international mobility programs or who participated in conventional programs such as the one proposed by the Brafitec Program.

The comparison between the 3i Engineer Program and the Brafitec Program highlights aspects of both programs, in order to confirm that it is possible for mobility programs to improve the internationalization of the university and respond positively to the main criticisms of the internationalization process of higher education, such as the development of internationalization as a factor of imposition of neoliberalism values and certain cultures, the commercialization of education and the imposition of the mastery of the English language and the traditional university model (BARBOSA; NEVES, 2020; LIMA; MARANHÃO, 2011).



Programs such as Engineer 3i and BRAFITTEC make internationalization a means to an outcome rather than an end in itself. Wit (2013) states that the concept to be rescued is that "internationalization is a strategy to improve the quality of teaching and research," and the programs compared respond qualitatively to this concept.

Brazilian universities, notably public ones, in the direction of internationalization, despite a few exceptions, such as University of São Paulo (USP) and State University of Campinas (Unicamp), both public universities maintained by the Government of the State of São Paulo, present important limitations to internationalization. Among the challenges are: internationalizing to dialogue with the world; the use of the English language, especially in the offering of disciplines; the reduction of bureaucracy, legal and institutional, which imposes slowness and ties to the public system as a whole; overcoming legal limitations to the recruitment of researchers from abroad; the protection of the researcher's time; the little tradition of Brazilian universities; the funding; the lack of infrastructure; the low impact of scientific production; the lack of meritocracy in the teaching career; the high teaching workload; the small number of agreements with leading institutions that cover joint research and mobility (ESCOBAR, 2013). The picture is greatly aggravated by the lack of strategic planning by the state and the ongoing dismantling of public universities.

Although the programs present a positive response to many bottlenecks in the internationalization of universities, they can still be improved. Regarding the racial issue, for example, the programs dealt with here do not reserve openings for any specific race or social group. In the Brazilian case, there are no vacancies for the least privileged race in the country, which would be the Afro-descendant, and, in the French reality, these would be people assisted by national support programs for housing, food, culture and leisure. Another issue is the fact that the edicts of the programs are based on a very elitist profile of candidates. This may be less unequal in France, but in Brazil it eliminates many candidates. However, it must be considered that three out of four students who are in public universities have monthly per capita family income of up to 1.5 minimum wage (ANDIFES, 2019).

The nature of the programs compared is very distinct. Brafitec is a cross-country program and its mobility occurs primarily in the direction of Brazil to France. Engineer 3i is a program between two institutions that have experienced and learned from Brafitec, in which the participants present equivalent weight in an international partnership that is always complex.

The programs are almost two decades apart in terms of their progeny. Thus, despite important limitations, especially the elitist character, the Engineer 3i Program appears to be more adjusted to the present time. Even without scale, something that Brafitec presents, the 3i Program offers new things to be considered in public policies. In the direction of internationalization, despite important advances, the main Brazilian universities, notably the public ones, still need to "internationalize".

## FINAL CONSIDERATIONS

The Engineer 3i and Brafitec Programs operate in Brazil and France exclusively for engineering courses. The Engineer 3i Program was born in 2017. Involving two universities, it has unbalanced funding between the French and Brazilian sides. In it, the student is trilingual, works in teams with selected colleagues from home country and abroad, and has a partner company operating in both countries. The Brafitec Program was born in 2002. In it, several universities from Brazil and France are involved, the participants are fully funded, the student is bilingual, teamwork among the selected members is not a requirement of the Program, and no company is a part of it.

The Engineer 3i Program, more current, has some points that stand out from the Brafitec Program in the training aspect: for providing a complementary training path, aiming at an engineer who works as a team, in person and remotely, in the solution of a real problem, stipulated by a company present in the headquarters countries of the universities involved; for requiring a communicative domain in three languages; and for being a Program accompanied by the universities involved and by the Program's partner company, besides being certified by UTFPR and UTC. The Brafitec Program differs from the Engineer 3i Program in the funding aspect, offering financial support to students, professors and institutions in France and Brazil.

Brafitec has maturity, several editions, investment, and is a Brazilian government program. It has a relevant role in the consolidation of new programs such as Engineer 3i, which is young, still needs to be improved, has few resources and is an inter-institutional program, but which seeks innovation in the formation of the engineer of the future.

We conclude that mobility programs produce important lessons for the internationalization of the Brazilian public university, to improve the quality of its teaching and research. The three i's of the program proposed by two technological institutions that want to internationalize appear as an important reference for thinking about the future of the engineering profession in a world without borders.

\* The translation of this article into English was funded by the Fundação de Amparo à Pesquisa do Estado de Minas Gerais – FAPEMIG – through the program of supporting the publication of institutional scientific journals.

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**Submitted:** 12/01/2020  
**Approved:** 07/07/2021