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UFSC INTERACTION – COMPANIES GRANTING INTERNSHIPS TO ENHANCE TEACHING, RESEARCH, EXTENSION AND ENTREPRENEURIAL EDUCATION ACTIVITIES: DIAGNOSING DEMANDS AND OPPORTUNITIES IN COMPANIES AND INSTITUTIONS

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Abstract: Although the teaching, research and extension tripod guides higher education in our country, it is only more recently, at the end of 2018, that an institutional response to the mobilization promoted by extension forums of public and private institutions of higher education, among others, was increased. segments. With a view to contributing to such a response within ''Universidade Federal de Santa Catarina", Center of Blumenau, the purpose of this investigation was to capture the evaluations of companies or institutions granting internships, through their supervisors involved in them, about aspects considered relevant in the performance of our students, aiming to increase the curricula of the three existing Engineering courses on campus and plan extension, research and entrepreneurial education actions capable of responding to the demands and opportunities listed. Concomitantly with the application of questionnaires to supervisors of companies or institutions, questionnaires were also applied to students, related to their completed internships. The results were consolidated for both instruments, pointing out, among the selection criteria for interns employed by the companies, proactivity and the ability to work in a team. Among the gaps pointed out by the supervisors of the companies, activities and actions aimed at strategic planning, innovation and entrepreneurship, project management capacity and mastery of English were highlighted. One of the contributions suggested as a product would be to unify the assessment tools for mandatory (Evaluation form) and non-mandatory internships (Report on non-mandatory internship activities - RAENO), to which some of the questions raised in the questionnaires of this research could be added.

Keywords: Curriculum training in Engineering; internship evaluation, extension curriculum.

INTRODUCTION

Our Federal Constitution, in its article 207, section 1 (On Education), chapter 3, advocates for universities the indissociability between teaching, research and extension (BRAZIL, 1988). Although this tripod has already guided higher education in our country since then, the extension, including as one of the goals of the National Education Plan - PNE 2014 - 2024, was only more recently, at the end of 2018, that it was increased by Resolution no. 7 (BRAZIL, 2018) as an institutional response-to a broad mobilization promoted by extension forums of public and private institutions of higher education, among other segments. This resolution instituted the guidelines for Extension in Brazilian Higher Education, conceiving it as:

> Activity that integrates with the curricular matrix and the research organization, constituting an interdisciplinary, political, educational, cultural, scientific, technological process, which promotes the transforming interaction between higher education institutions and other sectors of society, through the production and application of knowledge, in permanent articulation with teaching and research.

According to such resolution, the institutional forecast and compliance with at least 10% (ten percent) of the total student curricular workload of undergraduate courses for extension activities must be considered in the external evaluation in loco institutional and of courses, under the responsibility of the ''Instituto Anísio Teixeira" (INEP), an autarchy linked to the Ministry of Education (MEC), for the purposes of authorizing, recognizing and renewing recognition of courses, as well as for the accreditation and re-accreditation of higher education institutions, according to the National Evaluation System (SINAES).

Thus, extension activities come to be understood as a training element and position the student as a protagonist, participant in the process (''UNIVERSIDADE FEDERAL DE SÃO PAULO", 2017, p. 3-4). Ultimately, as the Unifesp Curriculum Guide (2017) reiterates, the extension curriculum instigates "reviews of teaching practice, changes and adjustments in the organizational structure of the University" and, also, a reflection on its concept and role in the context nationally and internationally today.

However, the pillar of extension as one of the axes of the university's tripod has been permeated by different conceptions, practices and conflicts. Based on theoretical and historical approaches, according to the Approved Opinion of the National Council of Education (BRAZIL, 2018), one can distinguish, in the extensionist practices of universities, three ideological conceptions that intersect and materialize: - the welfare position, guided by the meeting social demands by providing services to the community; the transforming dimension, in which the relations between university and society are dialogical and aim to promote social transformation, and, more recently, a function of producing goods and services, through the understanding that the demands arising from society are taken as new service expectations, creating a form of partnership between the university and other sectors of civil society, companies, etc.

Each of these conceptions of university extension refers to the limits of its practices: an eminently assisting role for needy communities can compromise its ability to solve problems of an economic, cultural or social nature; a "redeeming" role for the university may impose tasks that go beyond its capacity for action; and a role of producer of goods and services may incur a purely marketing bias, of only raising funds from the various sectors of civil society. That is why it is essential that, based on the macro-

guidelines established in the legal framework of Resolution nº 7, university extension can be conceived as enhancing the training of students and their ability to intervene for the benefit of communities outside higher education institutions. Through its characterization in the pedagogical political projects of the courses, the activities can be developed in the modalities of: programs; projects; courses and workshops; events and provision of services (BRAZIL, 2018).

Regarding undergraduate courses in Engineering, the old national curriculum guidelines, from 2002 (BRAZIL, 2002) showed that the engineer to be trained must have a cooperative, dialogic and interactionist attitude, endowed with technical-scientific and socio-technical knowledge that would enable him to absorb and develop new technologies, stimulating their critical and creative performance in identifying and solving problems, considering political, economic, social, environmental and cultural aspects, with an ethical and humanistic vision and with a vision of the world that emphasizes social value activity, socio-environmental sustainability and quality of life (MATOS; SAYÃO, 2020, p. 178).

The new guidelines, instituted on April 24, 2019 (BRAZIL, 2019), as a result of the revision proposed by the Associação BRAZILeira de Ensino de Engenharia (ABENGE), in addition to maintaining several assumptions of the previous document, began to indicate the importance of approximation of students with practice and the labor market, that is, the search for specific training, aligned with the needs of the market and society, which guarantees the employability of graduates or their success as entrepreneurs.

Although it was initially conceived as an institution that transmits knowledge, the university later adopted the function of generating knowledge (research), acquiring a "second mission" (ETZKOWITZ, 2003 apud RUIZ; MARTENS 2019, p. 122). In recent decades, according to these authors, universities began to enhance a "'third mission'", contributing to society and local, regional, national and international socioeconomic development in a more direct way, and the great challenge is to become entrepreneurial universities, is to create a strong culture of innovation and academic entrepreneurship as a stimulus for innovation based on science and technology.

A bibliographical research carried out by Ruiz and Martens (2019), in order to propose a theoretical model of an entrepreneurial university, outlines some traits in this direction:

> It is an institution that has the capacity for change, through its insertion in an eco-entrepreneurial system formed by the government, business/organizational groups and a multidisciplinary institutional professional body, capable of developing knowledge for society. In addition, it has a participatory strategic management, in which the academic community develops knowledge, through teaching, research and extension, seeking to modernize its infrastructure and capture different sources of financial resources.

In Blumenau, the Campus Pedagogical Project, created in 2014, is based on an axis of Regional Development and Social Interaction, implying, therefore, in its philosophy, an action permeated by partnerships with the public and private sectors and civil society entities in a way broad, with a view to training professionals capable of contributing to the promotion of local and regional development and to the solution of problems.

To strengthen the achievement of this purpose, the Nucleus for Regional Development and Innovation (NUDRI) was constituted, in which the researchers of this project participate, whose objective is

to develop teaching, research and extension activities that promote social interaction and regional development, stimulating social innovation and technological innovation, as well as entrepreneurship within the scope of graduation and post-graduation at the centre.

Therefore, interaction strategies with the various social agents are essential, such as the construction started before the pandemic of a partnership with the ''Sindicato Patronal das Indústrias Metalúrgicas, Mecânicas e do Material Elétrico" (SIMMMEB), which brings together around 200 companies, among metallurgical, industrial automation, transformer industries, etc., through the joint efforts of FEESC (Stemmer Foundation for Research, Development and Innovation), NUDRI (Nucleus for Regional Development and Innovation) and the direction of the Technological Center for Exact Sciences and Education from blumenau[1].

Such a partnership could compose an initial ballast and later be expanded to other productive sectors and entities of different natures, contributing to foster an entrepreneurial ecosystem. Although there is no consensus on the concept of entrepreneurial education to be implemented by universities, among the assumptions guided by Schaefer and Minello (2016), the following stand out: the emphasis on the process; integrated, interdisciplinary and transversal training and learning through experiential, contextual and cooperative action, perfectly harmonized with the pedagogical project of the Blumenau Center itself.

Delors (2003) guides the well-known 4 pillars of Education: a) learning to know, b) learning to do, c) learning to live together, d) learning to be, to which Leal (2009) adds a fifth pillar: learning to undertake.

In this view, an entrepreneurial education must strengthen: the student's autonomy as a subject and family member, in the face of an increasingly demanding market in terms of professional development and new businesses; knowing how to plan, in addition to being able to identify and take risks; knowing how to identify market opportunities; knowing how to deal efficiently and creatively with the resources available to him and, above all, always keeping up-to-date, which are aspects consistent with the current guidelines for graduation in Engineering mentioned above.

Thus, aware of the difficulty of carrying out diagnoses of the reality of industries and companies, the initial idea of this research, developed between July 2020 and March 2023, was to elect those affiliated to SIMMMEB for a preliminary scenario, including a technological one. Subsequently, a concrete plan of action could be drawn up that would bring together the teaching, research, extension and entrepreneurship functions of the university, once properly in tune with both the Brazilian legal framework that today guides the training of engineers and the pedagogical project of the Centro Tecnológico de Exact Sciences and Education in Blumenau and with the Regional Development and Innovation Nucleus.

With the first contacts with some companies, in view of the limitations imposed by the pandemic period and the realization of the need to have more concrete data from them in relation to engineering students at UFSC, Centro de Blumenau, it was decided to carry out the research in companies and

1 The triggering of this partnership occurred on the initiative of Professor Daniel Alejandro Ponce Saldías, from the Department of Control, Automation and Computing Engineering and currently coordinator of NUDRI, in conjunction with the representative of FEESC, Diego Paulin, with the aim of promoting strategies for the development set of products and processes, inserting our students and stimulating them to research, extension and entrepreneurship, in addition to the possibility of adjusting the curricula of graduations in engineering at the Center to the industrial reality. As the coronavirus pandemic came about, this process had its march slowed down, which demands a resumption and a prior survey of needs and opportunities for a more concrete plan of action.

entities that have been offering internships to our students since 2014, when they started[2].

The purpose of this investigation was, then, to capture the evaluations of companies or entities, through their internship supervisors, about aspects considered relevant in the performance of our students, aiming to increase the curricula of the three existing Engineering courses on the campus and to plan actions of extension, research and entrepreneurial education capable of responding to the demands and opportunities outlined. Concomitantly, evaluations were also carried out with the students, related to their completed internships.

GOALS

The general objective of this research was to diagnose opportunities and needs with companies granting engineering internships at UFSC, "Centro de Blumenau", with a view to enhancing the curriculum of students and research, extension and entrepreneurial education actions.

Also searched:

- Stimulate the insertion of students and professors from the Blumenau Center in research, extension, entrepreneurship activities and in the pedagogical adequacy and content of disciplines of the courses, in an articulated way with the productive systems of the target companies of the investigation.
- Map gaps detected by student trainees in their training based on their experience in productive and institutional environments.
- Translate the technical, social, environmental, cultural and socioeconomic demands raised into possible criteria to be incorporated into the training and curricula of the courses implemented in the Center of Blumenau, once compatible with its pedagogical project.
- Instigating students to practice research, in order to raise in them the perception of their surroundings, the interaction with the various social and productive actors and the detection of problems and innovative proposals for intervention and action.
- Contribute to the improvement of the evaluation instruments for interns in force at UFSC, Centro de Blumenau, more specifically the evaluation forms and the reports of non-mandatory curricular internship activities (RAENOs).

PROBLEM AND HYPOTHESIS

This investigation intended to answer the following question: What demands do companies present, based on the experience of our students in internships, in terms of better curriculum training for our engineering courses?

Another relevant aspect was seeking to discover opportunities in this interaction with companies capable of mobilizing actions with UFSC relevant to research, extension and entrepreneurial education. In addition, how do students who took part in internships evaluate their curricular training in light of their experience in these productive and institutional environments?

A preliminary hypothesis pointed out that, given the diversity of the productive and organizational level of the companies and the panorama of the post-pandemic economy generated by the coronavirus, the demands would tend to be based on short and medium term solutions, with high financial balance and innovative potential.

2 Within the range of companies granting internships to students at UFSC, Centro de Blumenau, it was found from the list obtained that only 13 of them were affiliated with SIMMMEB.

LITERATURE REVIEW

INDUSTRIAL ORGANIZATIONS IN THE LOCAL AND GLOBAL CONTEXT

Within the contemporary world scenario, the development and combination of new technologies in a wide spectrum of areas, "involving, for example, artificial intelligence, advanced robotics, big data, cloud computing, internet of things, nano and biotechnology, 3D printing etc.", is in progress (ALMEIDA; CAGNIN, 2019, p. 1).

New materials and new processes emerge within these transformations, which broadly affect all economic activities, including services and agriculture, but which have the potential to reconfigure the industrial sector, significantly leveraging productivity, profoundly altering business models and the skills necessary for greater value addition along the chains, as reiterated by Almeida and Cagnin (2019).

According to economist David Kupfer, in emerging countries such as Brazil, with pretensions to incorporating the digital paradigm, "advanced manufacturing is an end, it needs to be adopted, it is a form of inexorable modernization", and Brazil will have to walk in this direction. direction due to the need for survival of the industrial fabric (ALMEIDA; CAGNIN, 2019, p. 14-19). And he adds:

> The ingredients are well known: boost sectoral innovation systems – agro, health, oil, all studies mention this –; constitute a broad digital ecosystem integrating startups, R&D centers, training, technological services; build the backbone of broadband networks that are comprehensive, reliable and accessible to all; create a mobilization program to favor adoption, similar to what may have been the movement for quality, which may have happened back there; and programs to encourage the development and incorporation of new capital goods, aimed at modernizing the park, in addition to the new legal and regulatory framework. Fundamentally, however – and this worries me a lot – the technological convergence that is behind the digital transformation will require some form of institutional convergence, of new institutional articulation, both between agencies and the government as well as the representation of workers and companies in the country itself. society, in order to have the ability to formulate programs that affect the entire industrial structure across the board. This, probably, in Brazil, is the biggest problem and challenge we would have to face.

A study by iProspect points out that increasing consumer confidence in their brands and leveraging the use of technology, using data to create personalized consumer experiences and maximize sales in a digital environment, are the main priorities of companies in 2020 (ESTUDO…, 2020). In this direction, the efficient management of large volumes of data, understanding the impact of Artificial Intelligence (AI) on marketing strategies and improving the internal structure remain the biggest challenges.

Institutions and companies today are recognizing the importance of having global knowledge management projects capable of articulating the economy of skills and the economy of knowledge, creating single access portals, etc.

In order to guide the obtaining of information from the investigated companies through the data collection instruments of this research, the following configuration carried out by Zarifian (2001) contributed to the differentiation of competence areas, identified by three domains - autonomy, accountability and communication:

- Process skills: knowledge of work processes.
- Technical skills: specific knowledge about the work carried out particularly

by engineers.

- Organization skills: knowledge of how to organize workflows.
- Service competences: knowing how to link technical competence to the question: "What impact will this product or service have on the final consumer?"
- Social skills: knowing how to be, including attitudes that support people's behavior.

Also, the categorization carried out by Fleury and Fleury, in the transposition of a more strategic level to the level of formation of the individual's competences, generates a systemic perspective that raised questions that could be formulated to the target companies of this research (FLEURY; FLEURY, 2004, p. 36):

- Business skills: related to understanding the business, its objectives in relation to the market, customers and competitors, as well as the political and social environment. Ex: business knowledge, customer orientation.
- Technical-professional skills: specific to a given operation, occupation or activity. Ex: technical drawing, finance, product knowledge.
- Social skills: are necessary to interact with people. Ex: communication, negotiation, mobilization for change, cultural sensitivity, teamwork.

THE CURRICULARIZATION OF THE EXTENSION

Resolution nº 7 (BRAZIL, 2018) lists among the foundations of the extension guidelines: the constructive and transforming dialogue with the other sectors of Brazilian and international society, respecting and promoting interculturality, and the promotion of initiatives that express the social commitment of the higher education institutions with all areas, in particular those of communication, culture, human rights and justice, education, environment, health, technology and production and work, in line with the policies linked to the guidelines for environmental education, ethnic education -racial, human rights and indigenous education.

University extension in Brazil was introduced in 1914 at the Free University of São Paulo, according to Costa (2019), with the purpose of bringing intellectuals closer to the population through conferences that addressed political, social and economic issues. Since then, several ideological and theoretical extension versions have been printed, depending on the prevailing tone and political regime, shaping education plans throughout the period, until the bases for a new format, associated with research and teaching and encompassing the provision of services, emerged in the 1980s, with the creation of the Extension Forum of Pro-Rectors of Undergraduate Studies at Public Universities – FORPROEX, in 1987 (FORPROEX, 2006 apud COSTA, 2019).

Therefore, the arsenal of possibilities for university extension through programs, projects, courses, events and provision of services, among others, is wide. What some authors have emphasized is the care taken with the assumption of an extension concept that distances it from welfare or mercantile practices, aimed at providing services and offering free courses, and from university-company partnerships disconnected from the curricular proposals or the social reality (COSTA, 2019).

In the context of UFSC, undergraduate courses have been developing their curriculum extension policies since 2020, through the normative guidelines of Resolution No. 7 MEC/CNE/ÇES, of December 18, 2018

(BRAZIL, 2018), and Normative Resolution No. 01 CGrad/CEx, of March 3, 2020 (UNIVERSIDADE FEDERAL DE SANTA CATARINA, 2020), which stipulates in its sole paragraph:

> Extension activities are considered actions that directly involve external communities with higher education institutions and that are linked to student training, under the terms of this normative resolution and according to criteria established in the PPCs of undergraduate courses.

The three engineering courses at Centro de Blumenau have already had their extension policies and, concomitantly, their Pedagogical Projects (PPCs) approved by the extension and graduation chambers, and in 2023 are in the implementation phase of the changes made.

THE SCOPE OF ENTREPRENEURSHIP IN EDUCATION AND UNIVERSITY

Referring to some authors, Oliveira (2016) claims that what is observed is that most entrepreneurship courses at universities refer to what could be called "business education", rather than "education for entrepreneurship". It focuses too much on training aspiring entrepreneurs in disciplines related to the creation and management of small businesses, instead of seeking to identify and develop entrepreneurial skills, which would be more appropriate for a "coaching" process, or that is, the development of the skills and perceptions of the students themselves, so that they find the way out of their problems.

This goes against the understanding of the author O'Connor (2013) that new views on the "entrepreneurial spirit" have changed the focus of an education for entrepreneurship, seeking much more to awaken an innovative behavior in a series of careers and professions, which can foster economic outcomes associated with entrepreneurship.

The starting point of academic entrepreneurship, deep down, is inspiration and also seeking to leverage student skills at each stage of their university career. And the challenge of solving problems, the experiences of the student and the teacher are factors that influence the inspiration and process of development and execution of entrepreneurial attitudes and innovation projects, in an internal articulation, with employees, students of various levels, and external, with former students, companies, entities representing society and the local and regional community.

The authors Giorgino et al. (2012) point out ten attitudes that characterize a successful entrepreneurial institutional education, among which: ability to anticipate facts and create new business opportunities; persistently facing obstacles; Willingness to take moderate challenges or risks and be personally accountable for them and commitment.

An entrepreneurial education, in the synthesis proposed by Krakauer et al. (2020), it is a process that seeks to encourage entrepreneurial thinking and action, an action that adds an integrated view of various perspectives in the areas: social, psychological, economic and management - where issues such as risk assessment, project development, search for the new and opportunities, come to prominence.

Research at the university on what to teach about entrepreneurship is emerging as relevant. To that extent, it becomes part of the professor's business to strive to consolidate the entrepreneurial ecosystem of which the university is a part (KRAKAUER et al., 2020). Their role, in a multidisciplinary context, implies being prepared to discuss different topics of interest to each group, which demands greater effort with regard to the instructional planning of the discipline.

In addition to university disciplines,

which continue to be important as a means of formalizing learning, "in which students are methodically exposed to pre-existing knowledge relevant to their chosen career" (KRAKAUER et al., 2020), other education spaces Entrepreneurial activity must be promoted, such as laboratories, junior companies and incubators, centers, as long as they focus on the development of processes that can transform ideas into solutions for society. And other methodologies in addition to classes, such as technical visits, projects articulated with other social agents, such as companies, associative entities, non-governmental organizations, etc.

METHODOLOGY

The design adopted in this descriptive research, in its broadest dimension, or its planning, which defined the procedures for collecting, analyzing and interpreting data, was what Gil calls surveys (GIL, 2019), which consists of questioning directly from the people whose behavior or vision it is intended to know, with the exception that statistically significant samples were not carried out due to the results obtained. This survey also sought to add perceptions, aspirations and motivations expressed by informants, which permeate the architecture of a qualitative data analysis or qualitative method.

Thus, with the help of the specific sector of the Academic Secretariat responsible for registering internships, a list was obtained of all engineering students who had completed internships, both mandatory and non-mandatory, since the beginning of this activity at UFSC's Blumenau Center, in 2014, with the names of the granting companies/entities, sectors in which the interns work and the duration of the internships.

From these worksheets, updated at various times, from 2020 to early 2023, the sample for this investigation was built, consisting of all companies that received two or more students as interns and at least one intern student per company selected. The universe of companies and institutions consisted of approximately 222 companies, but, according to the previously defined criteria, 78 companies made up the delimited sample.

In addition to this list, a significant number of reports on non-mandatory internship activities (RAENOs), evaluation forms and some reports on mandatory internships were made available to us by the employees of that sector. From the Department of Control, Automation and Computing Engineering, the evaluation forms of the course interns and the internship reports from 2018/1 to 2022/1 were obtained.

The research instruments designed to capture the necessary data relevant to this process of evaluating the performance of student interns were questionnaires applied to granting companies, directed to supervisors who monitored and evaluated interns, questionnaires applied to engineering students who carried out internships and the documents previously listed, such as internship registration spreadsheets, RAENOs, evaluation forms and mandatory curricular internship reports.

The construction of data collection instruments was based basically on the national and international literature on engineering education, extension and its curriculum, Education for entrepreneurship, in addition to aspects related to industrial and business management and organization.

Based on the researchers' previous experiences with companies, prior telephone contacts were made with the affiliated companies, in the form of the trainees' supervisors, before sending them the questionnaire, in which an attempt was made to learn about the dynamics of the company relevant to the demands and priorities

referring to the existing areas of engineering training on campus.

Even so, even though all companies/ institutions, with the exception of some whose contacts were not located, such as the University of Minho, among others, were contacted by telephone, through calls made by the researchers themselves, in a way that was often repeated and insistent, it was not possible to obtain the desired number of responses, despite the fact that the deadline was extended until the beginning of March 2023; only eight responses were obtained from company supervisors.

The student interns were contacted by e-mail at first, but, given the reduced margin of responses, one of the researchers contacted other interns, even former students who had done internships, through the Laboratory of Science, Technology and Innovation (LABCTI), seeking greater adherence and collaboration with the investigation, thus reaching the level of twenty-seven responses in a universe of approximately 950 students/ internships.

The SPSS Software (Statistical Package for Social Science for Windows), initially intended for processing the questionnaires, since it allows statistical and graphical analyzes to be carried out more accurately, could not be used because there were not, especially with regard to the companies, significant representativeness in the results obtained. This way, a systematization of the data was carried out, with some graphic images that only allowed a better visualization of the results, without any statistical significance, and a modest interpretation of some of the contents that translated the perceptions, motivations and evaluations of the supervisors and the trainee students object of this research.

RESULTS

CONSOLIDATING THE ASSESSMENTS AND ASPECTS RATED BY THE COMPANIES THROUGH THEIR INTERNSHIP SUPERVISORS

The companies and institutions surveyed, which were the ones that answered the questionnaires[3], operate in the sectors of plastics, dental materials, research laboratories in the area of materials and mechanical engineering, pumps and systems, mechanical systems and machining, electrical panels, residential and universal automation, materials and solutions for construction and industrial automation software. They offered internships to our students in several areas of their activity, such as: quality control and management, continuous improvement, process engineering, materials and mechanical engineering, control and automation engineering, development engineering, engineering in general, production and raw material analysis, manufacturing, general and product design, software development, including automation, robotics programming, tendering (offer engineering), regulatory affairs, nanostructured systems laboratories, information technology, human resources.

Most companies and institutions (75%) have internal regulations for the selection and performance of the interns they admit. The aspects most considered when hiring an intern emphasize proactivity and the ability to work in a team, as can be seen in Graph 1 below.

When asked about the order of importance of some criteria for hiring an intern, such as: technical knowledge, training area, time in the undergraduate course, extracurricular experiences, proactivity, commitment, good predisposition to work and willingness to learn, the hierarchy was quite disparate,

3 The non-identification of the companies was protected in this research.

however, the criterion already highlighted above - proactivity - predominated among the most prominent, followed by the criterion time in the course. Other criteria raised by the interlocutors were: interest and ability to work in research, adaptability, flexibility and teamwork, clear and assertive communication and knowledge of another language, particularly English.

The subsequent question asked for the ranking of the following skills expected of an intern in order of importance: ability and perception of social knowledge, conflicts and socioeconomic and cultural problems related to the region where the company is located; ability to innovate socially and technically; logical, critical and analytical reasoning ability; dialogical and negotiation skills; capacity for reflection; technical competence; interpersonal competence; integrated approach to reality; ability to design and carry out projects; knowledge of different uses of technology. The responses and grading were also quite heterogeneous, with logical, critical and analytical reasoning standing out as the most significant in half of the cases.

Regarding the evaluation by the company of the academic training offered by UFSC, Centro de Blumenau, based on the experience with trainee students, 87.5% of the supervisors participating in the research claimed that it was sufficient in relation to the needs of the company and the others - 12.5 % - argued that it was sufficient in some respects, pointing out, in this case, a gap in activities and actions aimed at strategic planning, innovation and entrepreneurship.

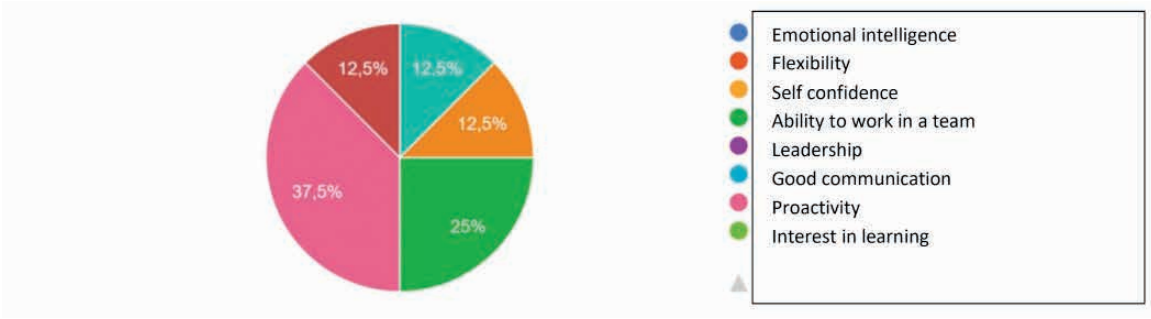
In the question that was formulated below if the supervisor would point out any gap that would require an alteration or reformulation of the academic curricula of UFSC, Blumenau, to meet the needs of his company, Graph 2 reveals a diversity in the answers, but the foreign language domain and activities and actions aimed at strategic planning, innovation and entrepreneurship gained a slight emphasis. The other delimited gaps consisted of: activities that foster the capacity for oral and written expression; activities that encourage teamwork; training and qualification in work routines; corporate ethics and socio-environmental issues.

When justifying their assessments, supervisors named activities and actions aimed at strategic planning, innovation and entrepreneurship, and project management skills (planning, monitoring deadlines, care for deliverables) as aspects that must be enhanced in training, evoking a student who stood out a lot for knowing how to conduct meetings with seriousness. According to them, some students still had difficulty with adequate technical writing for reports and technical documents related to the internship activities, in addition to the lack of command of English, today one of the premises for the areas of R&D and Innovation.

Regarding the follow-up of the intern in the company or institution, everyone receives this tutoring, according to the data collected. Half of the interlocutors claimed that there was no interaction between the internship supervisor at the company and the internship supervisor at the university, 25% said there was and 25% did not know how to inform.

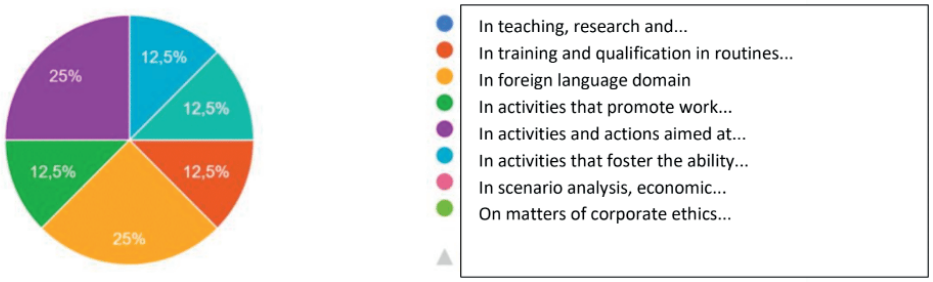
Regarding the year in which the company received the first intern from UFSC, Centro de Blumenau, the restricted sample indicated different moments, mostly the years 2018, 2019 and 2020. From the date indicated by each company onwards, it was asked how many of them were employees, and the calculation was registered in Graph 3, showing a reasonable absorption of our students after the internship experience.

In terms of diversity policies in companies or institutions, half of them said they did not have any specifically for the internship



Graph 1- Relevant aspects in hiring interns

Source: Own authorship.



Graph 2 - Gaps listed in the training of student interns

Source: Own authorship.

Graph 3 - Number of interns hired by companies and institutions

Source: Own authorship.

Graph 4 - Comparative perception of UFSC interns in relation to other academic institutions

Source: Own authorship

area, 25% are developing one and 25% have one, but did not specify its nature. About the hiring of interns according to their gender, the informants claimed not to know how to inform.

Regarding a difference evaluated in the performance of interns at UFSC, Blumenau, compared to other academic institutions, half of the supervisors (50%) considered it to be superior, 25% claimed not to notice a difference and 25% did not know how to respond. The arguments that guided the positive responses were expressed as follows: "we noticed a big difference in terms of technical knowledge and ease of organization of ideas and presentation of the rationale for each topic addressed, as well as synthesis and critical analysis. If the student does not know the question under discussion, he knows where to look for the answers"; "the interns selected from the Blumenau campus generally have good training to carry out the planned activities"; "I realized that many students come from other states and, due to the challenge they face when studying away from home, they end up being more proactive and interested; stand out for their general knowledge, ability to understand tasks".

When asked about the existence of partnerships between the company or institution and UFSC, Centro de Blumenau, 50% indicated that they do not occur, 12.5% develop some partnership and 37.5% did not know how to inform. However, 87.5% of them showed interest in developing it.

CONSOLIDATING THE ASSESSMENTS AND ASPECTS SCORED BY INTERN STUDENTS

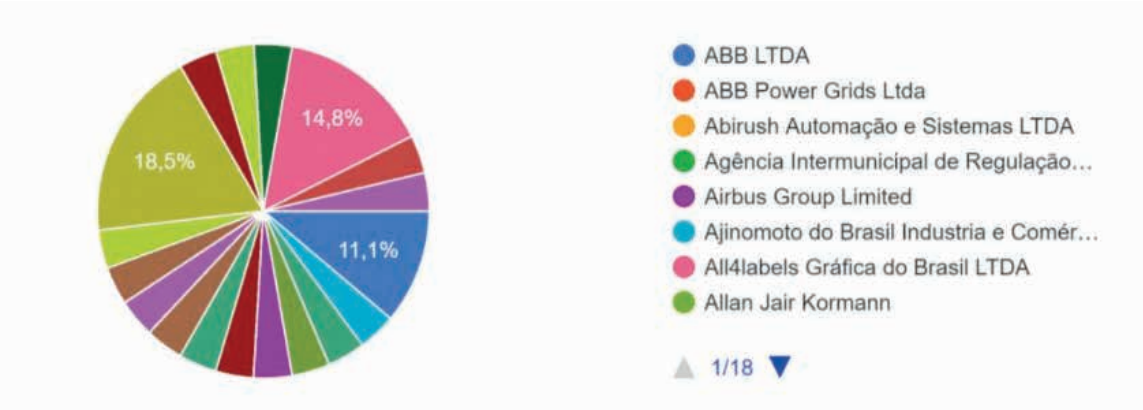
The questionnaires applied to engineering students who did internships at the companies or institutions selected for the sample had a reduced response margin, as mentioned in the Methodology, so, by expanding it to other engineering students who had already completed their internships, the number of responses it was expanded to 27. The interns participating in this survey will predominantly complete their courses in the current year (2023) or concluded it in 2021; 74.1% of them were from the Control and Automation Engineering course, 14.8% from Materials Engineering and 11.1% from Textile Engineering.

The companies and institutions in which respondents completed their mandatory internships cover a wide range, obviously larger than the sample of companies investigated here, which is shown in Graph 5 below. The companies with the highest proportion of interns in the sample of students were Schneider Electric BRAZIL Ltda (18.5%) and WEG Equipamentos Elétricos S/A (14.8%).

As for the duration of mandatory internships, Graph 6 indicates the prevalence of up to one semester. Most respondents (51.9%) stated that they also completed at least one non-mandatory internship, in addition to the mandatory one.

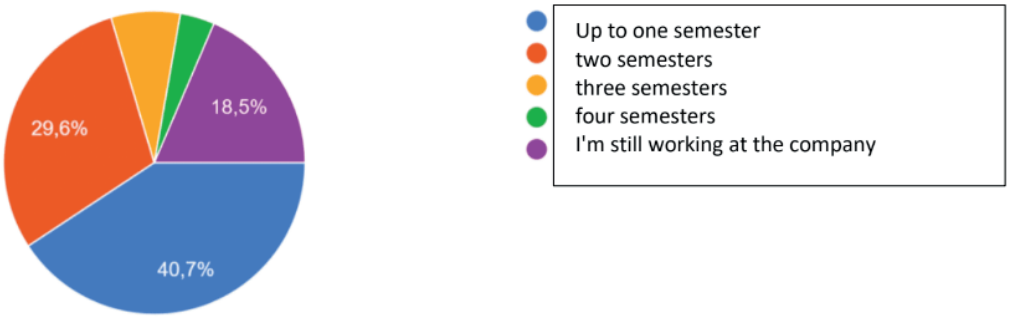
Regarding the procedures to which students were submitted when they were selected for internships in companies or institutions, Graph 7 presents the criteria used, which reiterate curriculum analysis, technical knowledge tests and interviews as hegemonic. The interviews were predominantly carried out individually online (59.3%), but behavioral or competence interviews (51.9%) and technical interviews (40.7%) were also adopted in a significant way.

When asked if the university had prepared them for the type of selection to which they were submitted, 66.7% answered affirmatively, while 33.3% negatively. Those who responded negatively were asked to clarify what could be done by the university to fill this gap. Even those who answered in the affirmative suggested some measures to be implemented



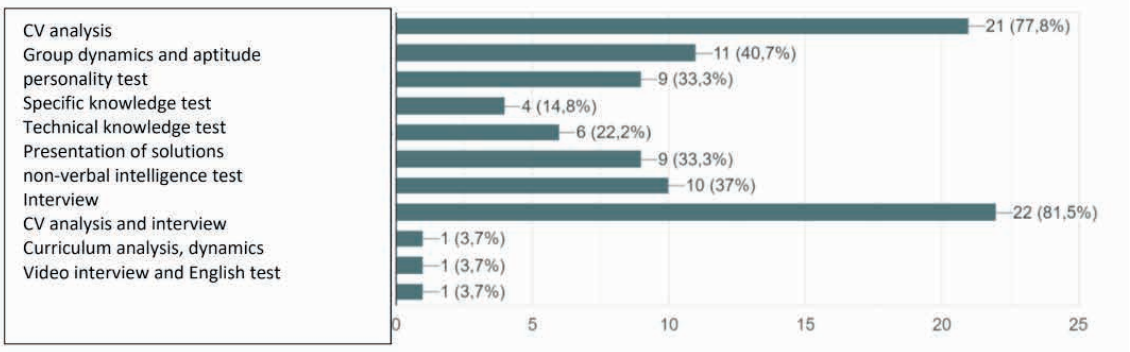
Graph 5 - Companies and institutions offering internships carried out by students

Source: Own authorship



Graph 6 - Duration of mandatory internships carried out

Source: Own authorship



Graph 7 - Procedures used by companies or institutions in the selection of interns

Source: Own authorship

for better student performance in the internship selection processes, among which the following can be highlighted:

> Yes, it prepared me. However, I believe that it could encourage "more" academics to participate in other activities outside the classroom, such as participation in research groups, junior companies, academic centers and other activities that require academic teamwork and communication mainly, in order to prepare you for the interview time. I am not saying that the university does not do this nor that the responsibility is entirely theirs, but it is difficult for academics during a semester full of activities and exams to take the initiative to look for other activities.

> I also missed being prepared for the interviews and possible situations and types of dynamics, etc., that we could find in the university's partner companies, as I always had a problem with severe anxiety, I was very afraid, apprehensive and had a very bad time before conducting an interview, as I have never seen support about how it works or any kind of support and instruction from the faculty. [...] I believe that it would be very enriching if there were some program within the university as if it were a preparation for that moment, what happens is quite the opposite, where most of the professors fear about life outside the university and the search for internship, making us feel, many times, insufficient and incapable of getting a vacancy, mainly students who did not manage to present a great performance in relation to the grades, which surprisingly I was very grateful for the opportunity I got, because, in the company where I worked meeting, they value people who have a desire to learn and develop and at no time were concerned with the issue of curriculum notes, but experiences related to academic activities, such as research, volunteering, etc.

> There could be short courses on how to behave in the interview in practice, what to do and what not to do. having a simulation of what you will actually find in the job market.

> The university as a whole prepares us very well technically, the disciplines and methods of the professors prepare us to have good logical reasoning, solve problems easily and learn quickly. We leave professionals very well trained and prepared for the job market, but without much guidance on how to get into this market. Just as we have preparation for the Tcc (scientific methodology and specialized project), I believe it would also be of great value to have materials/workshop/ preparation for selection processes and a "guide" for career options.

> The junior company taught me a lot through real and challenging projects, improving my public speaking, communication, problem solving, teamwork and project management. I believe the university could help with projects that would result in these same types of development.

With regard to the students' expectations about the role they played in the internship, some of the reports were enlightening:

> That it would perhaps be much more complex and difficult than it really was. Yes, there are difficulties, and subjects such as programming are quite superficial at the university, but a large part of the preparation, for me, in programming came from scientific initiation and not from curricular subjects.

> The expectations were in line with the role I was going to play, which was to be a developer, so I ended up being surprised by the trust that my manager places in the interns and how in-depth all the work I do and the functioning of the construction of the projects is very thorough; it really is an analyst's work in all aspects, and I feel that I am being very well prepared for the job market.

> Since the beginning of my graduation I felt that I had aptitude for project management. Throughout college, I tried to participate in movements/initiatives that could expose me and put me in situations where I could gain experience in this area. With that, my expectations in the internship were precisely

> to be able to perform the function that I had already been, throughout college, "training" fully and that I would get along really well with project management.
>
> Put into practice the theoretical and technical knowledge seen in graduation.
>
> My expectation at the beginning was that I would not learn anything relevant, after a few months, I concluded that, if I wanted to perform new functions, I would have to prove that I was capable, and that's what happened, after additional good deliveries I managed to migrate to a area where I really wanted to be.

As for the functions they performed in their internships, around the areas outlined in item 6.1, the students highlighted a variety of attributions, from which they were extracted: programming a predictive controller for planning the movement of a robotic arm, in addition to testing and improving functions existing; analyze quality of materials, test development and evaluation of material processing; automation of spreadsheets and tasks through VBA and PowerBI; analyst: investigating problems and suggesting solutions and production supervisor: leading production teams; data processing and development of KPIs, control of orders and maintenance hours and development of automations to improve processes; assist in the development of performance methodologies for production lines, supporting on all possible fronts, from Lean methodologies, such as 5s, Kanban, even demarcating new layout for production lines; continuous improvement and developer of RPA; project management, programming of processes already defined by the production and programming of MES/ERP/SCADA tools; deal with agile methodologies; monitoring of polymer injection tests, execution of mechanical and fluidity tests on polymers, among others.

Most students (51.9%) did not consider the university deficient in the academic, administrative or bureaucratic sense in relation to the demands of their internship, while 40.7% considered it bureaucratic, justifying their evaluations in these cases on the basis of the slowness of work. UFSC's internal processes and rules, including documentation feasibility, faculty inflexibility, bureaucratization of the process between company registration and necessary signatures, some difficulties with the internship coordinator in understanding the urgency demanded by the company, etc.

With regard to the registration system for both mandatory and non-mandatory internships at UFSC, most students (55.6%) claimed not to have had any difficulties, and 29.6% reported difficulties in relation to documentation. Regarding the Internships Coordination, 48.1% of the students considered it good, 18.5% excellent and 18.5% regular. The Student Course Internship Secretariat was considered good by 40.7% of the sample, excellent by 25.9% and regular by 18.5%.

The monitoring of the internship by the internship advisor at the university was evaluated as in Graph 7, with a predominance of excellent for most students (51.9%) and good for 37% of them.

In the elaboration of the final report of the mandatory internship, almost all students (92.6%) of the students do not encounter difficulties, with a student suggesting the lack of reference material, along the lines of the TCC templates. With regard to the Internship Activities Plan (PAE), 92.6% stated that the activities performed at the company were compatible with what was described therein, except for one situation at WEG, in which the plan was considered generic and did not provide for operational activities.

Among the knowledge learned at the university most used in their work as interns, the programming and logic of programming

were clearly delimited, also being scored: resistance and failure of materials, analysis of weld quality and processing of metallic materials; technical knowledge of thermal treatment and procedures for carrying it out, as well as the part of thermal insulation materials and bibliographical research; "some knowledge of SQL and the analytical thinking that we develop throughout the course"; electrical, electronic, technical design and programming of PLCs; "critical analysis, textile technical knowledge to support my arguments"; knowledge in PLCs; computer networks, predictive control.

One student particularly highlighted the Control, Automation and Computing Engineering curriculum as "very complete in every sense, we learned a little bit of everything, we were able to link all the subjects with each other and we still have the possibility of specializing in the area with which that we most identify with".

In order to assess how much the trainee student believed he had employed in the company in relation to the knowledge related to the curriculum of his course, the majority (44.4%) attributed a medium grade and 37% a reduced or low grade, depending on whether you can see in Graph 8:

Regarding the difficulties that the students faced in their internships, the open question allowed us to understand the experience of each student, and some of the testimonies are transcribed below. Many evoked not having had significant difficulties or having difficulties at the beginning or even within expected parameters, as it is a much larger scale environment than that of the university. Several even found support from the work team at the receiving company or institution.

> Difficulties in translating college learning into reality in the company, as the problems encountered were often on a much larger scale.

> I had to learn almost half a degree in Production Engineering due to the company's needs. Nothing university related. I also missed specific classes to assemble architectures with PLC/HMI, for example, configuring communications in practice and integrating the entire system.

> No, quite the contrary, I wanted to find a challenging and innovative environment.

> I didn't know the area so it was a huge challenge. However, I was very welcomed by the company in order to develop myself and learn all the functions that were delegated to me.

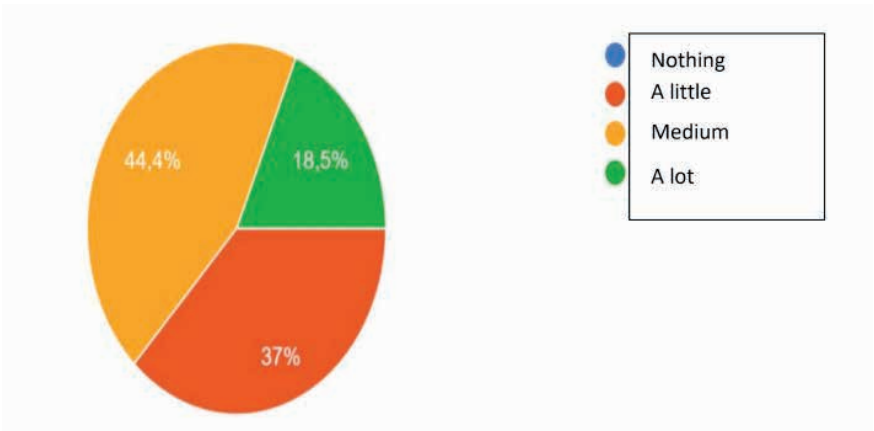
FINAL CONSIDERATIONS

The consolidated results could not be extended to the universe of companies and institutions that have been offering internships to students at UFSC, Centro de Blumenau, since they were not statistically significant, as planned in the project of this research and mentioned earlier, due to the reduced rate of responses obtained in the data collection, despite all the efforts made in this direction, mainly with the supervisors of the companies and institutions. However, they allow us to shed some light on aspects that could be absorbed in the curricular training of our engineering students, both through the curricular adequacy of disciplines and extension and research projects adapted to the productive reality of companies and the regional and local context in which who will act.

It was found that proactivity and the ability to work in teams were highlighted by supervisors as decisive attributes when hiring interns, in addition to technical mastery in engineering, emotional intelligence, good communication, creativity and leadership. According to Resolution No. 2/2019 (BRAZIL, 2019), which established the National Curriculum Guidelines for the Undergraduate

Graph 7 - Evaluation of internship advisors by respondent students

Source: Own authorship



Graph 8 - Percentage of knowledge related to the curriculum employed in internships carried out by students

Source: Own authorship

Course in Engineering, the training of current engineers requires that the student be imbued with adequate techniques of observation, understanding, recording and analysis of users' needs and their social, cultural, legal, environmental and economic contexts, which develops a capacity for reflection on their own practices, communication skills, teamwork and participation in multidisciplinary teams to solve problems, in a collaborative, ethical and professional way (MELO; COELHO; WIRMOND; SANTOS; MATOS; SAYÃO, 2020).

In short, the student is urged to enhance active learning, promoting the articulation between theoretical knowledge and practical knowledge, with intense use of laboratories and integration with research and extension activities, especially those developed from concrete cases proposed by the industry, of present and local situations, in which the interaction with workers and professionals in the daily life of their work areas becomes of great importance.

Among the gaps pointed out by the companies' supervisors, as presented in the Results, activities and actions focused on strategic planning, innovation and entrepreneurship, project management skills and English skills were highlighted. Even though most of them have noticed a superior performance of students at UFSC in Blumenau in relation to other academic institutions, in terms of technical knowledge, capacity for systematization and synthesis and rationality, it is worth seeking strategies to increase the aspects listed, including through partnerships and interactions with companies and institutions, especially the research participants, as they declared their interest in this regard.

Crossing the evaluations made by the supervisors of the companies and institutions with the evaluations of the interns, the gaps indicated by the former were not named by the latter. Students pointed out some difficulties in interpersonal communication, communication between sectors of the company or lack of corporate knowledge and tax or business issues in conducting their internships, and no substantive technical weakness was reported.

In the view of several of them, knowledge of programming, electrical, electronics, PLC programming learned at the university were the most used in their internships, but, in a later question, the proportion of knowledge used referring to the curriculum of their courses remained predominantly medium or reduced - 81.4%. Also due to the limited sample of students, for the reasons explained above, these results cannot be extended to the population of students who have already completed their internships.

The guiding problem of this research was constructed with the purpose of materializing demands and opportunities arising from companies and institutions and from the labor market itself, aimed at improving the training of our future engineering students. Although it generated a modest result, some suggestions named as gaps, willingness to partner and the interns' view of the challenges faced in companies can serve as ammunition for adaptations in the curricula of the courses, especially at this moment of implementation of the extension curriculum, which opens the university's horizons to the knowledge of social reality in its broad sense (in its political, economic and symbolic dimensions (SROUR, 1987), in a two-way street, in which society can have its scientific and technological development enhanced.

Extension actions inserted in disciplines or projects could contemplate the sectors and functions performed by the interns in their activities in companies and institutions, such as: programming for robotics, quality

control, company production, maintenance, predictive controller programming for movement planning of robotic arm, testing and improving existing functions; analysis of the quality of materials, development of tests and evaluation of the processing of these materials, among many others.

One of the suggestions of this research is to unify the instruments for evaluating mandatory internships (Evaluation form) and non-mandatory (Report on non-mandatory internship activities - RAENO), to which some of the questions elaborated in the questionnaires of this research could be added, favoring the internship monitoring processes and, at the same time, the absorption and subsequent implementation, whenever possible, of the pertinent suggestions in the improvement of the engineering curricula and of the disciplines taught by each course.

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