STEAM AND ENGLISH FOR SPECIFIC PURPOSES: ONLINE COURSES FOR BRAZILIAN STUDENTS IN TECHNOLOGY

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Abstract[1]

Nowadays, we have an increase in informal online courses in Brazil with a variety of subjects, according to the students' needs and interests. These informal courses could complement the knowledge learned in schools and universities, associating formal and informal learning, as defended by the Education 4.0 model. Additional languages, especially the English language, represent a great part of these courses as our society now understands the importance of English in a digital and technological world. English for Specific Purposes (ESP) is an area of English teaching-learning that takes into consideration the student's needs in the curriculum design, focusing on a context where learners will use the language in real life. This area is also interdisciplinary because it connects linguistic structures with professional fields. For this reason, STEAM (Science, Technology, Engineering, Arts, and Mathematics) education could be an interesting approach in ESP courses by providing an integrative method. Thus, this paper aims to analyze three informal online English courses designed for Brazilian students/professionals in technology considering the ESP and STEAM approaches and compare them with university learners' needs. After the analysis, we understand in this paper that informal English courses, particularly ESP ones, should be designed by an interdisciplinary group of professionals, such as language teachers and specialists in the area, in order to show a meaningful learning experience. Besides, it is important to go beyond a list of vocabulary, integrating the four language skills and working with genres connected to the students' own areas of study.

Keywords: English for Specific Purposes, STEAM, Online Courses.

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[1] This paper is part of the first author's dissertation in the Doctoral Degree Program of Computing in Education at Universidade Federal do Rio Grande do Sul (UFRGS), with the second author as the advisor.

Introduction

In the last years, we have seen an increase in online courses in Brazil, especially during the COVID-19 pandemic, when people tried new modalities of learning and not only face-to-face classes as they were used to (Painel TIC Covid-19, 2020). Flexibility and autonomy are two aspects that called the attention of students to online courses, saving them time by offering them the option to study at their own pace and anywhere they go. With a variety of subjects, nowadays students can also choose a course according to their interests and needs and study them through their computers or even smartphones.

English as an additional language is a significant part of these online courses since this knowledge became a required skill to live in a contemporary world where most of our technologies are planned and organized in English. Digital skills and the English language are now essential cultural capitals that can help us be part of a multicultural and digital ubiquitous society (Finardi, Prebianca & Monn, 2013). By using digital technologies in the English learning process, we have more contact with the language in use as well as a real audience to interact with, not to mention the number of authentic materials that we could have access through the internet to improve our reading and listening skills.

Thus, it is crucial to address an education that faces the challenges of a future still to be created. STEAM - Science, Technology, Engineering, Arts, and Mathematics - approach, for example, discusses some concepts that will be important through this journey, such as the digitalization of education, the integration of formal and informal learning, interdisciplinarity and creative spaces among others (Shatunova, Anisimova, Sabirova & Kalimullina, 2019). However, the most important part of STEAM education is to create meaningful learning by connecting the content studied in class to real-life situations beyond the school walls.

English for Specific Purposes (ESP) is an area that already includes an interdisciplinary approach and focuses on the student's realities in order to create contextualized learning (Araki, 2013; Uliana, 2017). Today informal online English courses aimed at specific groups of professionals are more common because they offer a product that is relevant to their careers: it is the knowledge contextualized - as advocated by the STEAM and ESP approaches.

Therefore, this paper aims to analyze three informal online English courses in Brazil designed for professionals/students in technology, considering the ESP and STEAM approaches. It has also an interest in understanding how these courses are organized and how they manage the interdisciplinary and integrative methodology that should be present in an ESP context.

STEAM and English for Specific Purposes

STEM education is a pedagogy created in 2007, during the Americans for the Arts-National Policy Roundtable discussion, in order to increase students' interest, especially some minority groups, in Science, Technology, Engineering, and Mathematics fields (Perignat & Katz-Buonincontro, 2019). The A for Arts was added lately to the acronym with the aim to integrate creativity, problem-solving, and humanities in general into technical knowledge (Shatunova et al, 2019).

There are different definitions for STEAM in literature. In this study, we understand STEAM as an integrative approach in education that merges different areas of knowledge in an interdisciplinary, or even transdisciplinary way (Perignat & Katz-Buonincontro, 2019; Shatunova et al, 2019). STEAM is also an applied approach since it connects education with professional growth considering that its focus is on the knowledge learned in context. Thus, STEAM can be a helpful pedagogy to build problem-solving skills and to challenge students to make connections between what is learned in class and the situations of the real world.

In the STEAM approach, there are five steps to follow during a project: observing, asking questions, making predictions, experimenting, and discussing (Miralimovna, 2022). Through these stages, the students focus on a subject, research and observe this subject in their realities, find possible questions or gaps that go beyond this field, make predictions about what they are going to discover, experiment by applying the knowledge they have learned so far in a context, and, finally, discuss the results with peers. In this pedagogy, the learning process becomes more flexible and meaningful, and the student is at its center.

Therefore, the English for Specific Purposes (ESP) area can be linked to the STEAM approach. ESP has been used since the 70s in Brazil to describe English learning and its focus on a specific context in which the language appears. Celani (2009) highlights that the ESP's special dedication is making its students see meaning in language learning in their most practical everyday life. Usually, ESP is divided into two subareas: English for Academic Purposes and English for Occupational Purposes, depending on the students' interests and needs.

As in the STEAM approach observing and asking questions are the two first steps, the needs analysis is the first stage of ESP since it is a moment to identify students' prior knowledge and future needs. According to Araki (2013), ESP's differential is mainly the awareness of students and teachers about the present needs and gaps - a fact that in many teaching levels ends up not happening. The analysis of students' needs through a questionnaire, or an interview is essential for the teacher to establish the objectives and purposes of the course in adapting the curriculum to its students (Irshard & Anwar, 2018).

Dudley Evans and St. John (1998) postulate that certain aspects should gain importance in this phase of the investigation, such as needs related to language, the students' interests in the course, the gaps presented, information regarding specific situations in the area studied, prior

knowledge of students, and students' personal and professional information. Meanwhile, Hutchinson and Waters (2006) summarize that this analysis identifies not only the needs but the gaps and interests of the target audience. Also, it is equally important to seek the opinion of specialists in the area about the contents addressed in the course (Oliveira & Cooper, 2018).

Another link between STEAM and ESP is the interdisciplinary approach. In an ESP course, it is important to mobilize not only language content but the knowledge from the students' professional or academic fields. ESP is centered on language, skills, discourse, and appropriate genres for the activities that the professional will face in the future (Araki, 2013). In the area of technology, for example, where the English language has a high degree of importance, the student/future professional must be able to read and understand manuals, carry out warning messages, understand complex texts about basic computing, and present projects among other activities.

Currently, in Brazil, many ESP courses focus on learning mainly reading strategies, technical vocabulary, and basic notions of text production. This format is wrongly called by many as Instrumental English. Celani (2009) explains that it is a myth to believe that Instrumental English or ESP is synonymous with teaching only reading or technical vocabulary in the area. For a professional already placed in some way in the field, the technical vocabulary itself is not his biggest challenge (Araki, 2013). Thus, it is important that the learning process goes beyond these topics, integrating the four language skills (reading, writing, listening, and speaking) and presenting them in a contextualized way in the area for which the course is aimed (Uliana, 2017). We need to expand the ESP study to discursive genres (Hyon, 2018), and, from them, work on aspects such as vocabulary, grammar, etc.

The material provided in an ESP class should also be as authentic as possible to the context so the content and experience make sense to the student (Jonhs & Salmani Nobouchan, 2015). One good example of this aspect is the decision made by the Brazilian National ESP Project, coordinated by Celani (2009) at PUCSP University, to not adopt or produce a specific textbook. In this way, it can guarantee the recognition of diversity and local cultures in each ESP course. Therefore, it is important to analyze different contexts of ESP, like the technology field, to understand how they work and how can they learn from the STEAM approach.

Online English courses in Brazil

We have seen an increase in the offer of online courses in Brazil in recent decades, mainly in Higher Education. They arise with the aim of facilitating access to study by adjusting the pace to the student's individual routine. There is no consensual definition of Distance Education in the literature, but most researchers highlight the physical separation between teacher and student and the use of means of communication as mediators of the teaching and learning processes (Barin & Bastos, 2014; Fernandes, Henn & Kist, 2020).

Behar (2009) defines Distance Education as a new pedagogical space characterized by the development of skills and abilities, respect for the student's individual pace, the formation of learning communities, and the creation of coexistence of networks. Distance Education requires a different teaching model since it is not just a mere transposition of the methodology used in face-to-face classrooms. It is important, for example, to discuss previously how the content will be presented to the student, how the evaluation will be done, and how feedback will be given. In this modality, the teacher is responsible for helping create an online community among the students and mediate learning through the materials chosen. On the other hand, the student has greater autonomy and is responsible for his/her own study, which requires discipline and good study strategies (Behar, 2009; Fernandes et al, 2020).

In the same way, informal online courses have also expanded. The number of students in informal online courses today almost triples the number of formal ones, being one of the main vehicles for informal learning (Araújo et al., 2019). The subjects offered are generally related to the personal interests of the students and provide opportunities for learning in different domains due to the fact that the internet provides a range of possibilities, from everyday knowledge to scientific knowledge (Viana, Costa & Peralta, 2017).

Informal online courses are usually characterized by little or no formalization of teaching, that is, they do not stipulate a structure that the student must follow. The student often organizes his/her study to achieve his/her personal purposes with the course. The learner also does not keep his/her learning only based on the course, rather they search for different materials, such as papers, websites, discussion forums, podcasts, etc, to improve his/her learning (Viana et al, 2017)

Puncreobutr (2016), when describing Education 4.01F[2], mentions the importance of informal contexts of learning and how they should be recognized more by universities. According to the author, the university itself cannot provide an integrative education without opening its doors to the real world and its needs. We live in a technological era, and we must be prepared for a future that still does not exist. Informal courses together with academic education can help students become updated and problem-solving future professionals, which the STEAM approach also advocates.

According to the Painel TIC COVID-19 (2020), during the pandemic, there was an increase in Brazil in students over 16 years old subscribing to online courses, formal or informal ones. 40% of these students who studied online were enrolled in an additional language online course, especially focused on the English language. This number shows the importance given nowadays to additional language learning and how the English language became a fundamental knowledge to survive in a technological world.

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[2] An education model urged by the needs of Industry 4.0, which provides for teaching-learning a focus on learning by doing and experimentation in the context of Web 4.0.

Methodology

The methodology applied in this study is qualitative, based on a case study. The case study is an interdisciplinary method used to understand a phenomenon in its context. It is situated in qualitative research because it has an interpretative and descriptive aspect when investigating the phenomenon in its natural environment, focusing mainly on its process. In addition, it takes into account the interpretation of the phenomenon by the subjects involved in it (Yin, 2014; Stake 1999).

The case study is then used to understand complex social phenomena from a holistic perspective (Yin, 2014) by seeing the case as an integrated system and seeking to understand it in its entirety (Stake, 1999). For this purpose, different forms of data collection are used, which, in the end, will be interpreted and analyzed by the researchers.

Since this paper aims to analyze informal online English courses for Brazilian students/professionals in the technology area, the research carried out was divided into two moments, following the steps of STEAM - observing, asking questions, making predictions, experimenting, and discussing. In the first moment, a needs analysis questionnaire was distributed through *Google Forms* to 24 students of Software Engineering from a federal university in Brazil[3]. The questionnaire had a total of 12 questions and sought to verify the point of view of the students about the area of technology regarding the use of the English language in their future careers. The second moment was an analysis of three informal online English courses for Brazilian students/professionals in technology. This analysis had the objective of comparing the needs in this field and the course's purposes.

Needs analyses with university students in the area of technology

The questionnaire applied to the students was based on the models of Neves (2019) and Monteiro and Bezerra (2012). It had the objective of identifying the profile of the students, their motivation for the chosen profession, their skills in the additional language, and their perception of the importance of the English language for their careers.

In general, the students mentioned having studied English before Higher Education, especially during High School (22). Some have also studied in private courses (12) and even online courses (7), including a great number of students who have learned English by themselves (18). However, the participants considered their English knowledge more advanced in reading and listening skills, and more at a beginner level when considering the production skills, like writing and speaking.

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[3] This research was approved by the Research Ethics Committee of Universidade Federal do Rio Grande do Sul (CEP/UFRGS) by the CAAE number 63440822.5.0000.5347.

When asked what the reasons were for choosing the technology area as a career, the students described "*the broad job market*" or "*the many opportunities with which I have an affinity*" related to the job. Also, the desire of working abroad and/or having a good salary was also a factor behind the choice. These answers show that the students are thinking and planning their own future after university - and one student is already working in the field.

The students can identify the importance of the English language as well to their future professional life. They believe that "*English is crucial since most programming languages and development standards are based on the English language (...) and most of the documentation and study materials are in English.*" Then, they made a list of possible tasks that their future career could require in terms of English usage: being part of meetings, writing code (naming variables), reading documentation, communicating with vendors and partners, and participating in forums are some examples.

In this questionnaire, there was a comment made by one student that is important to be discussed here: *"In our university, we had Instrumental English, but the course approached words or situations that would not necessarily help us in the performance of functions in our area, again approaching basic high school things or even much lower levels, or common words, such as 'hardware' and 'software'".* His comment confirms some issues that other authors criticize (e.g., Celani, 2009) about most ESP courses: the strong focus on reading activities and basic vocabulary lists, without consulting the students' real needs.

Therefore, in this paper, we selected three informal English courses aimed at Brazilian students in technology to analyze their structures and purposes considering the ESP and STEAM approach. Additionally, this study has the objective of analyzing the requirements pointed out in the needs analysis into the courses to see if they attend them.

Analysis of informal online English courses aimed at the area of technology

There are few offerings of informal online English courses for students/professionals in the technology area in Brazil. Generally, they are developed by smaller companies and hosted on third-party online course platforms, like *Hotmart* or *Udemy.* Here we selected three online courses to analyze with the data collected in the year 2022. The courses are analyzed according to the following criteria: who created or is promoting the course, its slogan, its idea of the language learning process, the investment needed, the course structure, and its virtual learning environment. The courses are described below:

Table 1. Analysis of informal online English courses in Brazil aimed at the area of technology.

BEILS - INGLÊS TÉCNICO PARA T.I.	
Created by	Beils - Escolas de Inglês (part of the group Burlington English)
Slogan	"Be a reference in your professional area"
Idea of the language learning process	It emphasizes the use of language in a specific context, the IT area, despite presenting it as very general knowledge. It also has a greater focus on comprehension skills and written production and specific vocabulary of technical texts. It also reinforces the myth of the native speaker by stating that it takes confidence to talk with a native speaker.
Investment	The course does not display this information on the homepage of the website.
Course structure	Online or hybrid course, aimed at the following professions: computer technicians, developers, graphic designers, automotive sector, and network administrators. In its structure, some subjects addressed are: writing reports in English; defending professional arguments in English; studying technical expressions used in the job routine.
Virtual learning environment	It uses the school platform: https://beils.com/br/carreiras/ciencias-e-tecnologia/
Extra information	The language school offers English courses for other professional areas, such as business, law, finance, medicine, and travel.
CURSO DE INGLÊS PARA TECNOLOGIA DA INFORMAÇÃO	
Created by	Giorgi Bastos (Graduated in Publicity and Propaganda and post-graduated in Software Engineering / he has 30 years of experience with the English language).
Slogan	"IT professionals with fluent English have more chances in the market and can earn salaries of up to 5 figures."
Idea of the language learning process	It emphasizes the use of the language in a specific context, the IT area. It also has a greater focus on conversation, not on reading or writing skills. It follows what they call "accelerated learning techniques and non-linear methodology to enable IT professionals to communicate satisfactorily within their professional context, with self-confidence and ease".

Investment	BRL 34.90. Full lifetime access.
Course structure	The course is aimed at the following professions: Web Developers; Artificial Intelligence and IoT professionals; Database Analysts; DevOps professionals; Information Security Professionals; Software Engineers and Architects; Network Architects and Engineers; Business Intelligence professionals; Digital Marketing Professionals; and Game Developers. Therefore, the course is based on the real day-to-day experiences of these professionals. It is composed of 9 hours of videos, 4 articles, and 48 downloadable resources. It seeks to work on communication situations in the English language of these professions, such as conducting job interviews, presenting projects at conferences in the area, explaining the operation of an algorithm, or explaining problems and challenges in installing software or in information security. Its content is also to teach students how to improve their curriculum and *LinkedIn* in English.
Virtual learning environment	It is hosted on the *Udemy* platform: https://www.udemy.com/course/curso-de-ingles-para-ti/ It offers the possibility to join a group on *Telegram* as well.
Extra information	The course offers a certificate at the end. It can also be accessed on a mobile device. The course is aimed at students already at an intermediate level in English. There is also a continuation course on the same platform entitled "English Conversation Course for Information Technology"

CURSO DE INGLÊS TÉCNICO PARA INFORMÁTICA	
Created by	Cursos Avante
Slogan	There is not a slogan highlighted on the website.
Idea of the language learning process	It says to emphasizes the use of the language in a specific context, the IT area. However, it has a greater focus on reading and reading strategies, as well as technical vocabulary.
Investment	BRL 67,00
Course structure	The course is aimed at the following professions: PC operators, IT instructors, system analysts, programmers, students and university students, salespeople and representatives. On the homepage of the course, it is shown the following curriculum of contents: – Interpretation of technical texts in English.

	– Acquisition of technical vocabulary. – Technical pronunciations. – Grammatical and morphological aspects of the English language contextualized in the computing area. – Strategies for technical reading of the English language.
Virtual learning environment	It has its own platform: https://cursosavante.com.br/produto/curso-de-ingles-tecnico-para-informatica/
Extra information	It offers a certificate at the end of the course. By purchasing the Technical English for Computing Course, you have access to other courses on the platform, such as the English Proficiency Assessment Course or the English Course for School Context.

We can notice from this analysis that the few existing English courses for professionals in the technology area — 3 so far — are generally offered by platforms of professional courses, not necessarily designed by language teachers. We can also point out that these courses do not include the four language skills in their tasks, each of them is focusing on a specific skill whether speaking or writing. Usually, reading and reading strategies are the focus of these courses, and the technical vocabulary is the aspect that stands out the most among them, assuming a great role in its curriculum.

Discussion

As shown in the results, there is still a distance between the students' needs and the reality of informal online English courses aimed at Brazilian students in the technology area. In the needs analysis questionnaire, a student commented that most of the ESP or Instrumental English courses are focused on mainly reading strategies and basic vocabulary of the field but according to him, it does not help the students complete the numerous professional tasks in which they have to use the English language. Celani (2009) had been critiquing this superficial curriculum of ESP courses for more than a decade. However, the informal English courses that we analyzed in this research corroborate with this discussion showing that the ESP courses still see language learning as just technical vocabulary and reading and writing activities, besides they sometimes say otherwise in the advertisement.

ESP (Araki, 2013) and STEAM (Shatunova et al, 2019) approaches defend an interdisciplinary and integrative point of view of knowledge, and, for that reason, a course, especially for the technology field, should provide more meaningful learning. Having language and technology specialists in the course's design team is a first step along with a previously made substantial needs analysis. It is important to understand what the students' interests and difficulties are and what the area of technology asks from them, and then planning the curriculum. We should not forget again that a constant evaluation of the course and the field is necessary in order to stay updated and relevant to the students. The STEAM steps (Miralimovna,

2022) - observing, asking questions, making predictions, experimenting, and discussing - should be a cycle, not a linear path that has an end.

In ESP and general English study area, it has been discussed for a while that learning and teaching processes should follow a contextualized methodology, usually teaching through text genres and the four language skills. It challenges us to propose tasks that integrate more than one skill since in real life they are not separate (Shamsitdinova, 2018). This is not something we see in the courses analyzed in this paper. Although some of them mention genres or more than one skill on their website, this does not apply in their curriculum.

Final considerations

In general, the number of informal online additional language courses aimed at the Brazilian public has intensified in recent years, as has their demand, which is a valuable advantage for Brazilian education in general. In the Education 4.0 era, where technologies are part of our lives, informal and formal learning are linked and together can boost knowledge learning and even its production.

However, it is necessary to improve the quality of the online courses' designs as well as their diversity, above all the area of English for Specific Purposes. We must offer ESP courses with a solid theoretical foundation based on recent studies, like STEAM studies, following the interdisciplinary approach that the area needs. As teachers, we should participate in interdisciplinary groups to collaborate in the architecture of qualified online courses.

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