Chapter 16

Curriculum and technology: use of digital devices to promote inclusion and autonomy in learning

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ABSTRACT
This text seeks to present and analyze learning resources involving the use of digital technologies to promote autonomy, and collaborative and interactive constructions to encourage inclusion through the digital environment. I am especially interested in recognizing adaptations in teaching practice through the incorporation of digital devices to promote student autonomy. In this direction, I make use of the theoretical conceptions of Lévy (2011) and Morán (2015) seeking to accentuate reflections on the pedagogical and social practices of resources of digital and assistive technologies. The methodological procedures start from teaching-learning practices with the use of digital resources and social networks as collaborative tools, as well as programs adapted for the elaboration of Integrative Projects (IP) by technical high school students integrated into the Environment of the Federal Institute of Education, science and technology in Rio Grande do Sul (IFRS). The analysis allows us to state that the use of technologies available on the network is not enough by itself to constitute autonomous learning. It is necessary to take further steps to work with the concept of digital emancipation, which in turn advocates the collaborative construction of knowledge. The digital devices used allowed for shifting the learning process from a more informative model to a more autonomous, collaborative, and interactive model of knowledge construction in the involvement of students.

Keywords: Education, Curriculum, Digital devices, Autonomy, Inclusion.

1 INTRODUCTION

"Opening the file": typing the first writings...

The most recent reflections on the forms and means of communication interactions in current scenarios allow us to state that the advent of the Internet brought significant changes to society. Among these changes, some are highlighted as fundamental, as they involve, in particular, possibilities of expression and socialization through communication tools mediated by digital and mobile technologies, among them: notebooks, tablets, smartphones, iPod touch, computers, etc. Faced with these changes, we can see a model of society that uses technology more and more (and with more recurrence and intensity) to use the means of communication. To Sancho (2001) individuals from societies influenced by information and communication technology have some unprecedented opportunities to access the flow of information. In this direction, the proliferation, use, and employment of information and communication technologies in the most varied historical-social, cultural, economic, and political instances have raised enormous possibilities for space-time compression processes.

Entering the educational sphere, the changes involving information, communication, and teaching-learning processes mediated by information technologies, allow us to perceive changes both for teachers and for students. For teachers, it is necessary to have a broader and more contextualized view of what the individual's process means and involves in his effort to adapt the environment to his needs and all the "know-how" elaborated and conducted in this effort. As for the students, other exploration spaces for

interaction, self-expression, and handling of the offered resources are envisaged and stimulated, stimulating creative and collaborative processes of knowledge construction. In this way, new technologies and multimedia environments, full of links and hyperlinks, videos, audio-visual content, and connections with other tabs, more dynamically and actively, can favor communication, cooperation, and collaboration between teachers and students. It can be said that new learning spaces and formats are emerging and making teaching and learning more dynamic and meaningful, among other factors, through shared school experiences. With that, by developing and making use of different technologies: methods, techniques, and tools in practices experienced in the school field, it aimed to stimulate other ways of responding to the educational demands of students.

Pierre Lévy (2011), a researcher of intelligence technologies, believes that cyberculture puts human beings in front of a "sea" of knowledge, where it is necessary to choose, select and filter information, to organize it in groups and communities where it is necessary to It is possible to exchange ideas, share interests and create collective intelligence. The organization in communities allows us to approach the group formations, composed by the network of students in the classroom, and in the school spaces, as communities connected to the information and means of communication of knowledge that circulates in society. In the same direction, Kenski (2012) will tell us that "technologies expand teaching possibilities beyond the short and delimited space of physical presence of teachers and students in the same classroom. The possibility of interaction between teachers, students, objects, and information that are involved in the teaching process redefines the entire dynamics of the class and creates new bonds between participants" (p. 88).

Intending to look at the use of digital technologies in the educational sphere, this text seeks to present and analyze learning resources involving the use of digital technologies to promote accessibility, and collaborative and interactive constructions to foster inclusion through digital means. I am especially interested in identifying possible adaptations in teaching practice through the incorporation of digital tools and/or programs, in the educational sphere, to promote student autonomy. The reflections presented here are based on two directly intertwined concerns: the first is linked to my practices as a teacher at the federal education, science, and technology network, the Federal Institute of Rio Grande do Sul (IFRS) Campus Alvorada/RS, working in two mid-level courses integrated to the technician, namely: Audio and Video Production and Environment; the second concern refers to the investigations that I developed, in the process of continuing education, in disciplines of a postgraduate course in Digital Technologies applied to Education.

It should also be noted that, in a very particular way, the understanding of student autonomy in learning is an elementary precept advocated in the practices established for technical-professional training in Federal Institutes. The Federal Network of Professional, Scientific and Technological Education, constituted by Law nº 11.892/2008, establishes among its purposes and characteristics of operation: (I) to offer professional and technological education at different levels; (II) encourage applied research for the

means of production; (III) stimulate and innovation; and (IV) develop and distinguish technologies for society. The Federal Institute of Education, Science, and Technology of Rio Grande do Sul (IFRS), the institution to which I am linked, has a multi-campus structure covering seventeen campuses, distributed among cities in Rio Grande do Sul, with its rectory centralized in the city of Bento Gonçalves /LOL. It should be noted that in national dimensions, the Federal Network is made up of 38 Federal Institutes of Education, Science, and Technology distributed in virtually all Brazilian states, offering basic education (technical courses at a secondary level), graduation, and post-graduation. In general terms, it can be said that the principles of the Federal Institutes (FIs) are centered on seeking to promote the decentralization and internalization of the education offered as a network, guaranteeing access to public and free education, regardless of its location fixed in a sphere local or national, horizontally and vertically.

2 CONNECTING THE CURRICULUM TO THE TRAINING STRUCTURE: CURRICULAR COMPONENT INTEGRATOR PROJECT OF THE INTEGRATED TECHNICAL COURSE TO THE MEDIUM IN THE ENVIRONMENT

The technical courses offered in the catalogs of the Federal Institutes are characterized by their curricular organization within a didactic-methodological format that seeks to highlight a more practical character in the training of students. Therefore, the learning approach in project format is recurrent as a pedagogical tool making use of problem-based learning, for example, in which the learning method is centered on the student, and, although such a method leads the course or part of it to start from a project, differs from the simple use of it as part of the evaluation of a discipline.

The guiding document that regulates the proposals for student training is the Pedagogical Project of the Technical Course in the Environment Integrated to High School at the Federal Institute of Science and Technology Education – Campus Alvorada/RS (PPC Integrated Environment), 2016 edition document, the legal bases, and principles are based on the Law of Guidelines and Bases of Brazilian Education (Law No. and also in the set of laws, decrees, opinions, and curricular references that regulate Professional Education in the Brazilian context. In this basic document, the general objective establishes the

> (...) formation of critical subjects, to interact with the community in the territory in which they are inserted, acting in a critical, ethical, and reflective way to develop their professional activities, such as the identification and control of the socio-environmental impacts of productive activities, in management sustainable development; in the elaboration and implementation of public policies and the maintenance of the ecological and environmental quality of ecosystems. (IFRS, PPC Integrated Environment, 2016, p. 17).

The course was designed and structured in an integrated way for high school and to contemplate this more general objective, it presents a broader curricular structure that contemplates in an integrated way both general education and the area of professional technical training, lasting four years. In this way, the curricular components of the course are divided into two central axes: the core of the common curricular base for the formation of competencies and abilities in the areas of languages and codes, human sciences,

mathematics, and natural sciences for and/in the "integral formation of the citizen " (IFRS, PPC Integrated Environment, 2016, p. 8); the core of the technical-professional area: encompassing knowledge in the area of the Environment and Health technological axis, aiming at "scientific, social, organizational, economic, political, cultural, environmental, aesthetic and ethical foundations that underpin technologies and contextualization in the social production system " (IFRS, PPC Integrated Environment, 2016, p. 8).

It should also be noted that the curricular proposal of the technical course in the Environment integrated into high school is based on a theoretical perspective, conceiving the school institution as a territory throughout its course, establishing actions that allow the student to continuously interact with the environment. The fixed areas of knowledge aim at interactions in the territory under the focus of the environment and health technological axis. To this end, each curricular component is (and should be) shared by more than one teacher, so that it can be conducted based on a more plural understanding of knowledge. The provision of this curricular organization format takes as a determining factor to safeguard the guiding principle of integration within each component, as well as between all, whether they belong to the same training center or not.

Thinking about the curricular component Integrator Project (IP) to which the core of professors who work in the orientation of investigative projects prepared by students integrates, among the specific objective of the component the proposal to "integrate the knowledge worked over the school period stands out, developing knowledge such as the ability to articulate, mobilize and put into action the knowledge worked on in the present period, focusing on the world of work and technological development" (IFRS, PPC Integrated Environment, 2016, p. 44). Because of this central objective, I understand that the challenge posed makes us intend to look at the propositions expressed by the students, linking them to the exercise of how to make possible connections with the technical area of the training course, which prioritizes the integral human formation of subjects who understand the complexity of environmental issues and their inseparability from social, economic, political and cultural issues.

In the three quarters of the 2019 school year, it was instituted as a teaching methodology, expository-dialogued classes, conversation wheels (with guests, students from other classes, professionals, and speakers), workshops, use of the computer lab, different bibliographic materials selected for classes and mainly from the student's own experiences in the fields of research and project development. Based on these previous selections, a continuous and qualitative evaluation model is prioritized, having as learning evaluation procedures: a) analysis of participation in the classroom; b) involvement in proposed activities; c) presentations in the form of socialization of the projects; d) construction of the records of the research process, through the report of the conception and execution process in the format/structure of a "Field Diary" (in physical, virtual format and also, in the format of descriptive audio reports); e) self-assessment. It was also established, as evaluation criteria, a presentation, at the end of each quarter, with the collaboration of a committee, composed of colleagues from the technical course of other years, in a format of socialization of the Integrated Projects elaborated.

In this organization, the challenge that I established for my practices in the classes became the process of integration and incorporation of technologies, digital and mobile resources, and social networks in the learning process, understanding them as more active possibilities for the acquisition and construction of knowledge with the challenge of seeking to adapt to a language format not so far from the resources already used by students in their daily lives. In addition, some proposed adjustments have moved towards providing other formats for student participation, as well as seeking to sensitize them, increasingly, to question, intervene and seek autonomously with the appropriation of these tools. More than that, these incorporations with practices involving digital technologies also happened because of enabling the digital inclusion of two students with disabilities (a blind student and a student with dyslexia) demanding accessibility tools to promote inclusion.

3 THEORETICAL CONTRIBUTIONS: DIGITAL TECHNOLOGIES AND AUTONOMOUS LEARNING

The possibilities in the context of the society in which technologies are increasingly being inserted in different spheres of daily life, providing new instruments that accelerate communication, transform production, the relationships of individuals with each other and with their activities and, in this way, the very dynamic organization of society changes. Nevertheless – and because they are part of this same social scenario – educational institutions also end up demanding changes in their school dynamics in the perspective of seeking to dialogue and involve the student through more inclusive educational practices.

Móran (2015) will tell us that the traditional model of the standardized school that "teaches and evaluates everyone equally and requires predictable results, ignores that the knowledge society is based on cognitive, personal and social skills, which are not acquired in the same way conventional and that require proactivity, collaboration, personalization, and entrepreneurial vision" (p. 16). For the author, technology integrates learning processes in different times and spaces, that is, teaching and learning occur in an interconnected way between classroom spaces and connections with the digital world. In this direction, we would no longer be conceiving educational processes in two polarized spheres (inside and outside the classroom) but rather within the classroom space in an extended format that constantly expands, merges, and hybridizes.

From this perspective, technology has not replaced the presence of the teacher as a mediator in the process. Technologies and virtual learning environments are understood as spaces that can enable a broad interaction between teacher, student, and material; as well as the production of so-called collaborative learning. In this mixture, between the physical and the virtual environment to expand the discussions, the teacher assumes the role of articulator of the individual and group stages and must have the capacity to monitor, mediate, and analyze the processes, results, gaps, and needs, based on the resources made by students individually and in groups. To this end, the skills required of the student also start to be

reconfigured for models in which "research, evaluate situations, different points of view, make choices, take some risks, learn by discovery, walk from the simple to the complex" (MÓRAN, 2015, p. 18).

Expanding a little more on the definitions and uses of technologies in the school context, and their inclusive possibilities, assistive technologies serve to highlight the tools that were specially developed to favor and simplify everyday activities. When doing a quicker search, in the Houaiss dictionary, for the definition of the expression assistive technology, the results define it as a term used to identify the entire arsenal of resources and services that contribute to providing or expanding the functional abilities of people with disabilities and, consequently, promote independent living and inclusion. The definition contained in Article III of the Brazilian legislation, in its preliminary provisions, establishes that "assistive technology or technical assistance: products, equipment, devices, resources, methodologies, strategies, practices, and services that aim to promote functionality, related to the activity and the participation of people with disabilities or reduced mobility, aiming at their autonomy, independence, quality of life and social inclusion" (Law 13.146/2015). In investigations, the author Bersch (2017) will tell us that "in the first place, the term technology does not only indicate physical objects, such as devices or equipment but rather refers more generically to products, organizational contexts or ways of acting, which enclose a series of principles and technical components" (p. 3). Thus, assistive technology is understood as the technology that will allow the disabled person to have better participation in society, helping to eliminate some barriers that they may encounter in their daily lives.

To promote the inclusion of people, especially those with disabilities, with the use of assistive technologies, resources are considered to be any items, equipment, or parts thereof, products or systems manufactured in series or made-to-measure used to increase, maintain or improve the functional capabilities of people with disabilities. Such resources can vary from a "simple" cane to a complex computerized system. Listing some examples, we can insert: adapted toys and clothes, computers, software, and special hardware that address accessibility issues, devices for adapting the sitting posture, resources for manual and electrical mobility, alternative communication equipment, special keys and actuators, devices assisted listening, visual aids, prosthetic materials among many other items made or commercially available. Regard to services is defined as those that directly help a person with a disability to select, acquire or make use of the available resources. Those (services) professionally provided to people with disabilities to select, obtain or use assistive technology instruments are considered.

The understanding of autonomy is seen as an essential competence for promoting training processes, in this case, through the use of technologies and virtual environments, to instigate autonomous learning, allowing not only the inclusion of students, in general but also the incorporation of students with disabilities into the process. Therefore, the concept of autonomy adopted in the practices developed for guidance and elaboration of the students' integrative projects, was based on guidelines for preparing the individual to autonomously know how to seek information and transform it into the knowledge he needs, at the moment when needs them and in the most creative way possible. This premise is linked to the educational training

process model that addresses everyday needs, contributing to the formation of citizens with attitudes toward social and individual demands. This presupposes the sense of authorship, since formation/learning, conceived in this way, requires intervention in the work and not just contemplation of thought apart from the proposition.

The meaning used from the elaboration of projects, starting from problematizing questions, was centered on proposing learning from the perspective of authorship implying the formation of a student who creates, modifies, builds, and becomes, therefore, co-author in this elaboration. Faced with this inversion, the skills that the teacher must have to propose the promotion of an interactive classroom, with participation, intervention, and engendering of cooperation, balancedly combining activities, challenges, and contextualized information allows one to perceive possibilities of experiences containing autonomy in learning. I could see in my experiences and use in the classroom that the insertion of digital technologies, such as hypertextual records, is potentialized training that promotes autonomy. In this direction, classroom practices using digital technologies in the learning process can provide constructions of meaningful learning, capable of triggering students' autonomy (in addition to instigating forms of interactivity).

4 TECHNOLOGIES IN USE: MEDIA, SOCIAL NETWORKS, DIGITAL SOURCES, AND PROGRAMS – POSSIBILITIES FOR INCLUSION AND LEARNING

Thinking about the possibilities and use of digital technologies in the classroom, I will present part of the experiences with some tools in the learning process of the integrating project component. As previously mentioned, in this curricular component, students develop, over the three quarters of the school year, a research project of their choosing involving some topic in the technical area of the course. The methodology for preparing the projects is based on Project-Based Learning (PBL) based on a problematizing inquiry. Starting from the problem question that guided the construction of the projects, the objective of the productions is to compose the following stages, in their respective quarters: 1. Challenging problem; Link to the technical axes of the course: Environment, Health, and Society; Critique and Review; 2. Student Choice; Theoretical reflection, 3. Methodological authenticity and Final Results. For organizational purposes, the stages should be recorded in a Field Diary (Virtual) so that it would allow understanding, in their compositions/selections, how the development of the project elaboration process took place.

Seeking to expand the discussions in the constructions, we used the WhatsApp social network to introduce the reflections in the virtual environment of a Seminar later discussed in the classroom. We started with the reading of the article Letter to a young investigator in Education, by Antônio Nóvoa (2015), where students should contribute contributions in the form of a summary to point out the main topics highlighted in their readings. In the class, in the form of a Seminar, students should debate the comments and/or discussions of the interactions previously carried out among colleagues in the virtual space, in the direction

of building a dialogue, based on the composition of the 8 elements that make up the "step by step " to be followed by the student-researcher to compose the "Field Diaries".

Figure 1. Conversations between students in the class whats group.
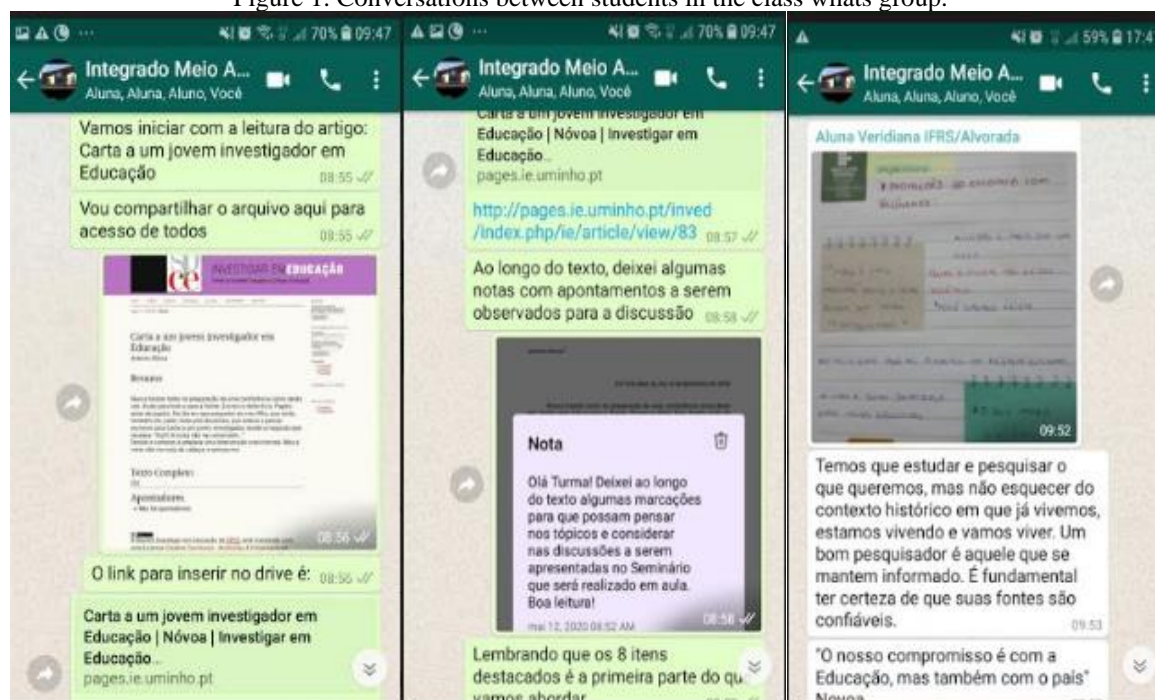
Source: The Author

The conversations that preceded the meeting in the classroom in the virtual space were expressing how pleasurable and reflective the interactions were through what had become. It was possible to register productivity with the use of mobile technologies through applications to add teachers and students as part of didactic-pedagogical practices. In this practice, the educational process through interactions in a more participatory and collaborative way provided greater proximity in communication, brought about by messages sometimes written synchronously (when senders and receivers were online) and at other times asynchronously (when the receiver of the message was not available at the same time in real-time). Resuming the history of the conversations, it became noticeable the possibility of extending the space-time for discussions beyond the physical space for discussions of the topics covered.

Interaction tools make it possible to group participants, record and save conversations, share links, images, posts, and cards, insert gifs or graphic symbols, highlight notes in the text, and use color tones to highlight excerpts, in addition to allowing the exchange of audio. It is worth mentioning that the audio resource was essential to making the participation of the visually impaired student effective, making it very peculiar and enriching, both for me as a teacher and for the student himself, who began to send his audio recordings to be transcribed and inserted together with those of other colleagues.

Continuing the activities, after holding the seminar to introduce the research theme, the next moment was the preparation of a review of the book Manual of participatory methodologies for community development through the Google Drive tool. The book file was shared with the class so that they could

produce collaboratively, establish dialogues, mark notes and/or notes, share elaborate constructions, and exchange and interact with information. This tool allows the same document to be stored and edited by more than one user, in a collaborative way of building knowledge, and interconnecting ideas and projects. In addition, it serves as an incentive for collaborative writing as well as a stimulus and motivation for the exploration of other tools.

Figure 2. File in Drive shared with students in the class.
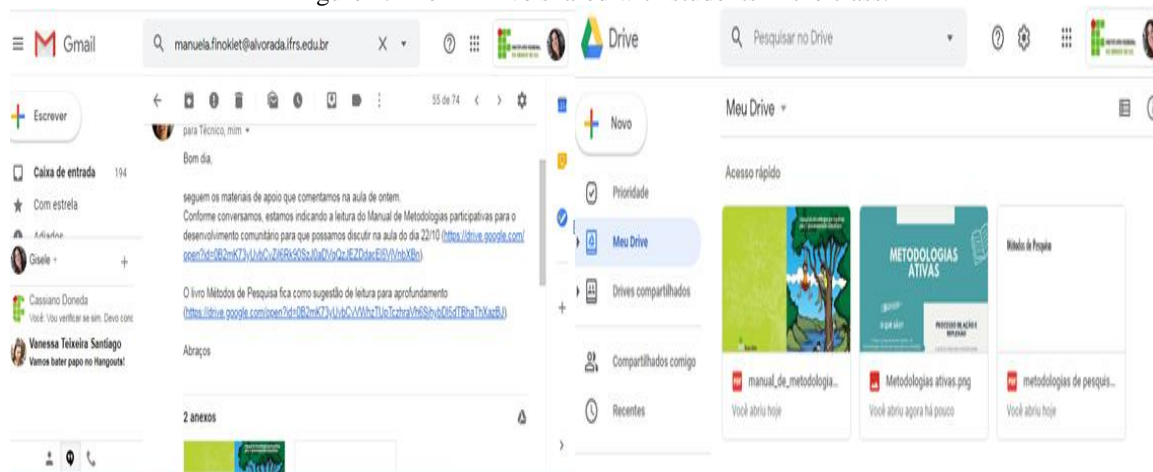
Source: The Author

The experience with this tool allowed students, in the virtual environment, to interact and work in groups, stimulate critical and reflective thinking, negotiate conflicts as well as enable the construction of new learning. In addition, it allowed students to be encouraged to exchange ideas, share perspectives and arguments and make use of experiences already shared in search of a better solution for issues presented to be resolved. It is yet another tool with possibilities for interaction between teacher and student and between peers (students and students).

In the direction of promoting inclusion, through assistive technologies and adapting class participation, and also, seeking to contemplate the demands of the student with dyslexia, two practices were adopted. The first consisted of guidance on the use (through a free software package) of the OpenDislexyc font for printing class activities, assessments, printed texts, reports, articles, reviews, etc. The second adaptation, to expand their participation and greater autonomy, was directed to the use and elaboration of concept maps.

The construction of conceptual maps allowed the central topics of an article, for example, to be identified and organized more visually, helping to better understand the connections between ideas and memorize the information that is necessary for their understanding. Conceptual maps can be prepared manually (with paper and pen) or even using free and open-source software, such as LucidChart, upon prior registration to access the self-explanatory tutorials for handling. Concept maps are composed of three elements: shapes, arrows, and texts. Shapes (rectangles or ellipses) represent concepts and ideas, arrows show links between concepts, and text identifies selected concepts and their relationships. The concept map

must be built from a focal question to which the concept map has the functionality to answer. Composite and extensive textual expressions should be avoided, giving priority to central words, and making use of a maximum limit of twelve to fifteen words just for a conceptual map. For the constructions carried out in the classes for the elaboration of integrative projects, we worked with two interviews, a documentary, and an article by historian Yuval Noah Harari, Sapiens: a brief history of Humanity (2014), for theoretical reflections resulting in the elaboration of a conceptual map.

Figure 3. Conceptual map prepared for the Integrator Project.

Source: Students of the Integrated Course on Environment.

The highlights presented here make up a sample to exemplify activities that were developed to support and encourage the development of Integrator Projects organized by students. The first-year class of the Technical Course in the Environment integrated into High School, in 2019, started with thirty-three students. During the school year, three students did not stay at the institution and two students, for different reasons, did not complete their Integrative Projects. At the end of the year, among the graduating students, a total of twenty completed productions were obtained, of which thirteen individual productions and seven productions with the composition of two or more students grouped to compose the projects.

5 SOME FINAL WORDS

The reflections and considerations based on the methodological adaptations, for the organization of the constructions developed by the students, mobilize and instigate me to think for future editions of the Integrator Project component, in the direction of continuing to seek to delineate paths, practices, and discussions for adherence and even more effective expansion of the methodology involving resources and digital media to identify specific aspects for applications in the definition of guides and references, based on the specificities for the technical-professional performance of students. The experience shared in this

edition of the component by promoting constructions, discussions and methodological propositions in a collaborative way, aligned with technological trends making use of media, digital culture, and social networks as spaces for socialization and interaction, demonstrated possibilities for expanding communication, greater individual mobility, counting on action and integration not only between teachers and students but also with the students themselves, sometimes in virtual spaces, sometimes in the classroom environment. Therefore, it is possible to perceive that it is necessary to advance further to work with notions of digital inclusion, which in turn advocates the collaborative construction of knowledge. Finally, it is noted that among the practices highlighted, the tools and digital media used made it possible to shift the learning process from a more informative model to a model of building knowledge in a more autonomous, collaborative, and interactive way in the involvement of students.

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