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Conceptual foundations of technology and technological teaching: concepts, conceptions, and teaching performance

Fundamentos conceituais da tecnologia e do ensino tecnológico: conceitos, concepções e atuação docente

Fundamentos conceptuales de la tecnología y la educación tecnológica: conceptos, concepciones y práctica docente

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Alcemir Horácio Rosa
ORCID: https://orcid.org/0000-0002-2359-5903
Instituto Federal de Educação, Ciência e Tecnologia do Amazonas, Brazil
E-mail: alcemir.horacio@ifpi.edu.br
Daniel Nascimento-e-Silva
ORCID: https://orcid.org/0000-0001-9770-575X
Instituto Federal de Educação, Ciência e Tecnologia do Amazonas, Brazil
E-mail: danielnss@gmail.com

Abstract
The phenomena of technology and technological education have been constituted in recent years as a space for broad debate. However, the deficiency in approaching the conceptual foundations of these phenomena in educational environments and the training of professionals is notorious. The research met this demand. It sought to bring provocations on the conceptual foundations of technology and technological education. Authors such as Reydon, Neder, Bazzo, Saviani, and Vygotsky, among others who contributed to the definitions and conceptions on this topic, were called to the debate. The research goal was to reveal the conceptual foundations of technology and technological education phenomena. It could contribute to an adequate understanding of technology and technological education and, finally, the importance of this relationship for teaching. It was possible to establish a concept of its own for each of the phenomena to contribute to the academic world and future works. An alternative means a good understanding of the terms above. The methodology used was the scientific-technological one, which established the identification of the problem, the guiding question, the organization of data, the answers, and the proposition of alternatives. The work managed to reveal a basis for the conceptual foundations of the phenomena. It enabled an accurate understanding of technology and technology education. The research concluded that the two phenomena investigated are themes present in educational environments, but they need to be understood more carefully for a practical awareness of the existing reality.
Keywords: Technology; Technological education; Concept; Conceptions; Teachers.

Resumo
O fenômeno da tecnologia e da educação tecnológica têm se constituído nos últimos anos como um espaço de amplo debate. No entanto, é notória a deficiência em abordar os fundamentos conceituais desses fenômenos nos ambientes educacionais e na formação dos profissionais. A pesquisa atendeu a essa demanda. Buscou trazer provocações sobre os fundamentos conceituais da tecnologia e da educação tecnológica. Assim, foram chamados ao debate autores como Reydon, Neder, Bazzo, Saviani e Vygotski, entre outros, que contribuíram para as definições e concepções sobre esse tema. O objetivo da pesquisa foi revelar os fundamentos conceituais dos fenômenos da tecnologia e da educação tecnológica. Para que pudesse contribuir para uma adequada compreensão da tecnologia e da educação tecnológica e, por fim, da importância dessa relação para o ensino. Foi possível estabelecer um conceito próprio para cada um dos fenômenos, para que pudesse contribuir com o mundo acadêmico e trabalhos futuros. Um meio alternativo para uma boa compreensão dos termos acima mencionados. A metodologia utilizada foi a científico-tecnológica, que estabeleceu a identificação do problema, a questão norteadora, a organização dos dados, as respostas e também a proposição de alternativas. O trabalho conseguiu revelar uma base para os fundamentos conceituais dos fenômenos. Permitindo uma compreensão precisa de tecnologia e educação tecnológica. A pesquisa concluiu que os dois fenômenos investigados são temas presentes nos ambientes educacionais, mas precisam ser compreendidos com mais atenção para uma efetiva conscientização da realidade existente.
Palavras-chave: Tecnologia; Ensino tecnológico; Conceito; Concepções; Professores.

Resumen

El fenómeno de la tecnología y la educación tecnológica se han constituido en los últimos años como un espacio de amplio debate. Sin embargo, es notoria la deficiencia en abordar los fundamentos conceptuales de estos fenómenos en los ambientes educativos y en la formación de profesionales. La investigación cumplió con esta demanda. Buscamos traer provocaciones sobre los fundamentos conceptuales de la tecnología y la educación tecnológica. Así, fueron llamados al debate autores como Reydon, Neder, Bazzo, Saviani y Vygotski, entre otros, que contribuyeron a las definiciones y concepciones sobre este tema. El objetivo de la investigación fue revelar los fundamentos conceptuales de los fenómenos de la tecnología y la educación tecnológica. De modo que pueda contribuir a una adecuada comprensión de la tecnología y la educación tecnológica y, finalmente, la importancia de esta relación para la enseñanza. Se logró establecer un concepto propio para cada uno de los fenómenos, de manera que pudiera contribuir al mundo académico y trabajos futuros. Un medio alternativo para una buena comprensión de los términos antes mencionados. La metodología utilizada fue la científico-tecnológica, la cual estableció la identificación del problema, la pregunta orientadora, la organización de los datos, las respuestas y también la propuesta de alternativas. El trabajo logró revelar una base para los fundamentos conceptuales de los fenómenos. Permitir una comprensión precisa de la tecnología y la educación tecnológica. La investigación concluyó que los dos fenómenos investigados son cuestiones presentes en los ambientes educativos, pero necesitan ser comprendidos con más detalle para una toma de conciencia efectiva de la realidad existente.

Palabras clave: Tecnología; Educación tecnológica; Concepto; Concepciones; Maestros.

1. Introduction

Technological education and technology are realities present in educational/social environments, whether formal or non-formal. It is a fact, and where there is learning or knowledge construction for man's relationship with society and his environment, there is a man/technology/teaching relationship. The question that underpinned this research is whether the subjects (especially teachers and students) understood them as the mediating elements in the realization of knowledge (Saviani, 2019), are aware of the conceptions, senses, and meanings rooted in the concept of "technology" and "technological education" (Borgmann, 1984; Bryan, 1992; Cerezo, 2002; Dagnino, 2002; Dagnino & Novaes, 2004; Dickson, 1978; Feenberg, 1992; Reydon, 2018, Neder, 2010; Bazzo, 2003; Saviani, 2012; Vygotski, 1991; Lemos, 2021; Fontinelle et al., 2021; Vaz et al., 2021). Thus, the present work addresses "technology" and its relationship with "technological education." Between concepts and conceptions, a critical discussion on the subject is presented. Much is said about technology and technological education in the educational context, but what is perceived is that there is no precise treatment of what such terms mean. The phenomena need to be better conceptualized and adequately understood.

Although a properly human action is intrinsic to life, a precise concept of technology and technological education (inside and outside learning environments) has not been adequately established, much less its relationship with a man and its subsistence interrelation with nature. Or at least this conceptualization has not received the attention it deserves. That is, teachers and students, coexist without understanding what such terms mean. There is no denying that there is a tendency in society to summarize technology and technological education from practical thoughts. For example, it would not be uncommon for someone to translate technology into computers, the internet, and cell phones, among other contemporary objectification. And ignore the techniques, strategies, tools, instructions, experiences, and other realities linked to the phenomena and the history of humanity itself.

We were approaching the main concepts of technology and technological education. A formative work to help teachers and other agents/elements understand the idea, meanings, concepts, and issues of technology in the exercise of technological teaching. Authors such as Reydon (2018), Neder (2010), Bazzo (2003), Saviani (2012), and Vygotski (1991), among others, in an attempt to enable a better understanding of the use of technologies for engaging teaching for students; fully aware of what technology is, its concepts and possibilities. For the proper management of information and to achieve the established objective, the scientific-technological method was used (Nascimento-e-Silva, 2019) in the search to understand the problem, seek solutions to the identified challenges, as well as propose alternatives and artifacts that may respond to the problem identified in this

research. The goal of this work was to reveal the conceptual foundations of the phenomena of technology and technological education without losing sight of the challenges and the search for alternatives.

Technology is understood as an action intrinsic to the man himself - which is revealed throughout human history in activities related to nature and cannot be reduced to modern devices and goods (Rosa, 2019). The work presented the conceptual foundations and a theoretical debate about the phenomena. It identified the need for proposals for training processes concerned with offering conditions, studies, and reflections so that they perceive technology as a much broader human action than utilitarian reductionism.

In the same sense, the work concluded that technology has great potential for the process of building content and human knowledge; however, it is necessary to perceive the existence of ambivalence, as defended by Feenberg (Neder, 2010): on the one hand, there is a tendency towards a reproductive technology of the hegemonic scenario; reproducer of inequalities and rooted in the interests of an elitist minority, defending the interests of a privileged class; and, on the other hand, this same technology may have the potential to be worked democratically with the themes and aspirations of students and social classes involved in this educational process (Feenberg, 1992; Reydon, 2018, Neder, 2010; Bazzo, 2003; Saviani, 2012; Vygotski, 1991; Lemos, 2021).

For technological education to achieve its goals, technology needs to be well understood by mediating agents – mainly teachers and students. In the training spaces, it is established as an action that potentiates students, learning, and the very life of the elements involved. The concept of technology must be developed in learning environments so that it is understood as an act of man and has the potential to assist in the construction of new knowledge and the continuous relationship of man with nature and society.

The study contextualized the problem to the authors' thoughts present in the discussion, highlighting fundamental concepts for an adequate understanding of the term's technology and technological education. Also, it establishes the vision of how important they are for teacher training processes to perceive technology and technological teaching as possibilities for enhancing learning and the teaching-learning action itself, without forgetting the endless options and challenges in this relationship.

2. Methodology

The research was developed through the technological, scientific method (Nascimento-e-Silva, 2019). The method structured the work from four basic steps: the structuring of the guiding question, the investigation of the data, the organization of the data found, and, finally, the organization of the answer. The work sought to investigate the conceptions of Borgmann (1984), Bryan (1992), Cerezo (2002), Dagnino (2002), Dagnino and Novaes (2004), Dickson (1978), Feenberg (1992), Reydon (2018), Neder (2010), Bazzo (2003), Saviani (2012), Vygotsky (1991), Lemos (2021), and Vaz, Góes, and Silva (2021). The paper is organized in a logical structure. The introduction presents the contextualization of the work. The results and the discussion brought the draft of the data obtained, and the conclusion synthesized the results achieved. The theoretical framework had the primary authors that supported the study.

3. Results and Discussion

3.1 Conceptions of technology and its context in technological education

There are many challenges in our current society. Realities such as technology present themselves in social environments, especially teaching, as an increasingly relevant topic. In this sense, the teaching-learning process has encountered some provocations in developing a critical, significant, and conceptual approach for the subjects involved. The fact is that

technological education reaches educational environments in search of identity and meaning. The interrelationship of this reality in our training environments is not always on the agenda. We need further studies and clarification. We contextualized it among scholars in the technological area and, at the end of this discussion, an adequate conception of what is meant by the terms "Technology" and "Technological Education." Instead, it is necessary to understand the basic concepts of the term and its relation to science and the world. Thus, it is up to us, at first, to seek to understand what differentiates technology from other existing knowledge. Thus, the ideas and assumptions of four essential researchers in this dialogue will be presented: Bazzo (2003), Heidegger (Reydon, 2018), Feendeberg (Neder, 2010), and Lemos (2021).

I) For Bazzo (2003), technology can be understood as an approximation between science, the natural world, and technology; and it is in the meantime that technology appears as the element responsible for the definition of the human being since the emergence of the technical process coincides with the very origin of man. Therefore, the author identified the difficulty of defining technology since this term is inseparable from the definition of man. And although there are definitions in dictionaries that establish technology as something related to the production of materials and products, or even artifacts and constructions, the fact is that such a conceptualization proves to be a very incipient attempt. Because more completely and globally, we could consider technology as a set of actions that allow us to use the knowledge of the natural sciences for production. An essential characteristic is its dependence on understanding science and its material effectiveness, which is characterized by the products. Thus, technology can be understood as a close relationship between science and the technological process.

It is necessary to realize a fundamental relationship/approximation between technology and science in this attempt to conceptualize a technology, and this relationship does not occur in an autonomous or stray way. It should be understood as a regulated process. Between what can be called normal science, understood as that science capable of responding to society's current challenges, and extraordinary science, understood here as that which, as "normal science," could not solve specific difficulties, admitting that there was an extrapolation of its normality. In a kind of metamorphosis, absorbing new challenges and, from there, giving new answers – a change in the structure of the previous science, being a cycle that ends in the return of new normal science. It establishes a perception that technology is part of a regulated and interdependent process with science. It can be interpreted as technology and science, both integrated into human actions, mutually interrelating (Natalino & Tibúrcio, 2018; Paiva, 2018; Rocha & Chaves, 2021; Lévy, 1999). For this first perception of technology arising from the ideas of Bazzo (2003), it is essential to understand that regulated science is a fundamental part of interdependent technology, in which man is inserted in this process that is not considered possible to dissociate man from technology, so little of nature.

Now categorizing Bazzo's (2003) perception, it is necessary to understand how it fits into technological education. This vision of technology understands the individual as an elementary part. No teaching proposal can be made that escapes from a proposal that problematizes this relationship without being based on human action, nor can it be absent from teaching that questions /integrates/ values as issues related to man transforming himself and nature. A relationship with the potential to give man the conditions he seeks. Thus, Bazzo (2003) helps establish a first view of the meaning of the terms: technology conceived as an action intrinsic to man. As an act of man in nature, it is appropriate as resources for the species' survival. On the other hand, technological education, one may dare, would roughly be a way of bringing technological knowledge to new generations.

II) We now move on to another conceptualization of technology, this time based on Heidegger's thought in the book "Philosophy of Technology" (Reydon, 2018). Technology can be understood and conceptualized in two essential phases: an older technology that can be understood as a process of imitation of nature in which humanity sought to discover the realities arising from hidden and nature. And that would have to be unraveled to ensure man's survival. Man copies things that already exist in nature, revealing and reproducing them. On the other hand, we can understand contemporary technology (the second phase), the current aspect of technology - the restlessness that constantly challenges the man to challenge nature itself. There is here a dialectical relationship. Man is questioned to perceive the potentialities existing in nature not yet been discovered, but that

instigated can give space to new technologies, directions and consequently - finding new uses and transformations of nature into something that has not yet existed or is not known.

It is necessary to realize that nature is perceived as a great supplier of resources in this conception of contemporary technology. The ancient technology limits man from imitating nature's resources, seeking to take away his survival and maintain natural aspects. Heidegger, on the other hand, understands that current technology uses its energies and natural resources to extract natural objects that do not yet exist, as is the case with a nuclear power plant – a fact that leads the force of nature to provide elements and materials that do not yet exist or are not known in the real world. It caused a rift between ancient technology and contemporary technology. In the latter, man produces through natural resources, which forces nature to produce products and resources that do not yet exist (Reydon, 2018).

Here comes our question: what is the perception of technology and technological education? Or instead, what is the identity of technology and technological education that meets Heidegger's assumptions? A proposal contemplates an organization in the direction of this quest that challenges man to challenge nature. In other words, a suggestion that at least gives the minimum conditions for individuals to perceive the elements involved in a creative life in the face of nature and perceive themselves as active subjects in this search. Which necessarily helps to overcome the fictitious barrier that puts technological education below what it is. Constructive teaching of men to be aware of their social role. And not as mere buyers or sellers of technologies (reductionist and utilitarian view). It is not difficult to establish a vision of technology and technological education for Heidegger. Technology would be the attitude that leads man to challenge himself to remove from nature the changes necessary to human desires. At the same time, technological education would be the instrumentalization of knowledge that lead men to master and appropriate their reality.

III) The third conception of technology can be obtained through Neder (2010), who brings to the discussion the thoughts of "Feenberg's critical theory," which understands technology as a modern phenomenon and can be considered a non-neutral instrument. Thus, the defense is that technology embodies values linked to hegemonic systems, especially capitalism, in a business and market culture.

Technology can be understood as a process of domination of nature that needs a relationship of control of the human being. Thus, technology reveals itself as a process of controlling character, which shows the power of the human being in a relationship of degradation of social and natural connections. And it is in this sense, that technology reveals itself in a political rationalization. The author strongly criticizes the system of capitalism - in which technological power becomes the main form of social control, and technological achievements become a reinforcement of hegemonic and centralizing social structures. With this, the author emphasizes that technologies coexist with an ambivalence: on the one hand, serving to perpetuate the power of hegemonic forces and, on the other hand, operating democratic rationalization, which, according to the author, would be a way of constituting technology in actions, desires and human potentialities still denied. With the thoughts defended by Feenberg, it is clear that technology is understood as a system of open values. Technology is also understood as a reproductive guide to the importance of hegemony. Consequently, it proposes that an opportunity be given to a system of socialism that allows the discussion of themes denied by the dominant elite of the technological system.

Once again, it is possible to ask: what is this? And what then are the role of technology and technological education in this technological bias? The author denounces technology's catastrophic reality as a potential reproducer of the hegemonic power of capitalist force/politics. There is no need to speak of technological education that does not minimally contain an intentional framework to democratize man's role in a democratic technological experience. Any proposal that does not have the pretension of training for the democratic and social use of technologies will undoubtedly fall into the error of a return or, at most, of a decontextualized training of concrete reality. This conception sees the technology as a planned and systematized teaching to awaken the human spirit the awareness. Here, technology is something non-neutral. Consequently, this non-neutrality must be

tried to achieve democratic rationalization, which, according to Feenberg, is the ability to include technological actions, themes, and discussions that the hegemonic power generally ignores.

IV) Finally, Lemos (2021) approaches technology as a social movement constituted by human values and desires. For this author, technology can respond to man's desires over nature. Thus, technology can be understood through Lemos' theories as a mechanism for reaching human desires, which places a relationship of means in technological teaching.

3.2 An own concept of technology and technological education

After exposing the reflections above on the concepts, conceptions, and meanings of technology and technological education, we start from our conceptualization, which we intend to be a valuable contribution to the debate. Mainly, taking into account that the work will serve as a basis for other works and teacher training processes, we seek to provide an adequate understanding of the terms, in this case, a new conceptualization. It is worth mentioning that technology is something intrinsic to man himself, in a kind of ontological reality, inseparable from the creativity and strength of the being that extracts the essence of the environment to achieve the desired ends. Thus, we conceptualize technology as a set of knowledge that, immediately related to science and human action under nature, manages to expropriate resources necessary for man's survival and the supply of his social aspirations.

On the other hand, technological education can be conceptualized as the constructive path of formation that links man to the systematized context of a relationship with the knowledge derived from regulated science. Teaching that materializes in research beyond the global technological perspectives, but which also adheres to local and environmental specificities, constituting a broad investigation of the man-nature relationship, in the face of a systematized science. Providing the instigation of discoveries in the technological field and critical awareness in the construction/reorganization of technologies and specifically the man-nature-science relationship.

3.3 Technology in the exercise of technological education

Having understood the concepts and some conceptions that involve the terms technology and technological education, it is now necessary to relate how these two themes are connected. Above all, seek to understand some of the main educational theorists' postulates about teaching, the teaching-learning process, and teaching performance to achieve a constructive and meaningful approach for the elements and agents involved. Freire (1996) defends an education that seeks to give meaning to the contents and the teaching-learning process, valuing the students' prior knowledge. In this study, it is necessary to relate the proposals to technology concepts and give meaning to technological education. Still, according to the author, it is the pedagogical process that makes students assume themselves as subjects in the face of their realities. Only when they assume an active behavior in the construction of their knowledge that they can have a dynamic, autonomous meaningful teaching process.

As for teaching, it is necessary to plan the processes of teacher training to understand that students cannot be understood as mere spectators of this process, so it is essential that teaching is concretely related to the reality of students. And in this case, for technological education, it is necessary to describe the concepts of technology as fundamental to the teaching-learning process and the reality of students' lives so that they can assume teaching and its respective contents as objects of meaning. The assumptions of Paulo Freire (1996) and Bazzo (2003), Heidegger (Reydon, 2018), Feenberg (Neder, 2010), and Lemos (2021) make it clear that such conceptions of technology will only make sense for technological teaching if they are postulated with a clear intention to help students understand what is being addressed. And for that, teaching needs to have a minimum planning concern that systematizes knowledge and adequate preparation of teachers to consciously deal with this process and with the necessary approaches to technological teaching so that they can guide students to a meaningful teaching-learning process and help them to assume a critical, active and genuinely conscious posture.

Vygotski (1991), as a theorist of the socio-historical-constructivist current, identifies the need to relate the entire educational process to the environment and base this medium on the teaching process in which students must be guided. Therefore, in this understanding, we understand the need for technological education to have a clear conception of technology and an obvious direction so that students know where they are being directed. Otherwise, there is a risk of establishing vague concepts and knowledge without meaning for the students.

The hypothesis that Vygotsky defends the relationship between process and environment seems correct. So, it is not possible to want an effective and active technological education, with training in the knowledge of technology in a qualitative way, if the subjects and mediating agents of this process are not prepared. As discussed in this work, what is perceived is little discussion or even its absence when talking about technology and technological education. It is not uncommon to find a scenario in which students or even teachers do not know how to identify terms related to technology or technological education accurately.

Finally, it is essential to bring to this discussion the historical-critical thinking of Saviani (2012), who considers knowledge essentially necessary for students to live critically in society. Thus, it is up to technological education to have a well-established conception and planning and to involve students in this search for a more critical, democratic, and fairer reality. Saviani (2012) recognizes, among other things: the need for adequate teacher training and, in this case, something essential. As observed in previous readings, technology and even technological education are ambivalent realities, they can serve a democratic education full of sense and meaning for the students; but, if ignored in their due preparation and planning, they will be nothing more than repetitive and productivist constructions, without any purpose for the elements involved.

4. Discussion

As already seen in the concepts discussed earlier in this work, one can understand the importance of an adequate and continuous understanding of technology, technological teaching, and its relationship with the reality of the classroom and teaching performance. Technology is understood as something intrinsic to the man himself. It is an action of the relationship between the man who builds knowledge with nature and the environment in which he lives. So, this technology needs to be understood as an action that comes from the origin of man. Therefore, technology is inside the classrooms and intimately linked to the lives of these subjects. But do they know how to define this technology? Or do they believe that technology is all about devices and some more up-to-date instruments? Do they see the depth of the term, its meanings, and its real character? These are just a few key points that are revealed in this process.

In the meantime, there is the teacher's fundamental role as a mediator of actions and learning. Still, the question is: are teachers, especially those in technological education, attentive to concepts, senses, and meanings? Are they active subjects or just spectators of a process, oblivious to it? In this research, there was no attempt to answer the depth of this deficiency, but it was necessary to establish the search to reveal the conceptual foundations of such questions. The search for knowledge of the terms "technology" and "technological education" provokes the understanding that teacher education processes need to consider these issues a necessity. But this is not a straightforward approach. The need listed here is for an ongoing strategy. According to Nascimento (2000), whether initial or continuing, teacher training needs to have a continuity bias. Because there are many teachers' training projects but they fail because they don't have continuity.

The National Common Curricular Base - BNCC (Brasil, 2018) talks about a teaching process that gives protagonism to students, that educational objectives and goals must be aimed at building a process in which the student is active, critical, and conscious. And it is essential to highlight as the document addresses the need for changes in the teaching process so that students are seen as protagonists of their own stories. It also brings the information that the continuing education of teachers is essential. The change intended in teaching, whatever the level or modality, and here technological education is included, will only be achieved through adequate training of agents and subjects to monitor and propose changes (Brasil, 2018).

As discussed in this research, technology and technological education find an ambivalence both in their understanding and the perception of their exercise in society. In this, any merely utilitarian vision of technology needs to be overcome, which causes an illusion of technology as mere artifacts and products available. Overcoming this initial challenge, we began to understand a more complex need: to establish the technology in technological education as a tool capable of continuing the constructions of learning and human survival. In this sense, technological education becomes even more significant. Help students understand the importance of technology for a dignified and meaningful life in the society they live (Andrews et al., 2014; Apollinário, 2004; Ayildiz et al., 2016).

Focus on the development of technological education. Technological education, in its instructive and learning-building sense so that students can appropriate cultural knowledge, needs to focus attention on technology as a force capable of providing students with the mechanisms, techniques and actions necessary for the production of knowledge. Once again, the importance of adequately training the mediators of this process is reinforced. Teachers with the possibility of going through training processes that contemplate technology and its relationship with technological education for the critical perception of their role and performance in this process must be continuous.

Feenberg helps understand that technology cannot simply be in a classroom without problematization and contextualization (Neder, 2010). But on the contrary. Because the risk is that students will only follow vague and meaningless teaching, reproducing a strange reality. According to the author above, it is necessary to consider that students and society have the potential to place their desires and needs under technology. So that technology can be worked on in the classroom and culture, taking into account the subjects' desires themselves. That is why teachers, students, and all the elements involved in technological education need to understand the bias, conceptions, meanings, and identity of this much talked about technology, but not continually deepened or understood.

Thus, technology needs to be a planned and built element in its continuity to enable effective technological teaching. The possibilities exist as long as the details assume a constructive technology proposal about technological education. In such a way, the desires of the desired society are revealed in this relationship. However, there are many challenges for this to occur in its effectiveness:

1) Public policies are needed that make room for students to participate more effectively;

2) that teachers receive opportunities to participate in training processes with a bias towards technological teaching and their relationships;

3) that the institutions make possible the continuous formation of teachers;

4) that teachers have the freedom and time to deepen their knowledge;

5) that permanent formation is continued;

6) that institutions can understand technology as something beyond market reductionism;

7) that teachers have the resilience capacity to reach new knowledge, including those that can challenge previously acquired knowledge;

8) that teachers, students, and all the elements involved in technological education have the willpower to seek an adequate understanding of what technology is, technological education, and their roles in the face of this possibility;

9) that the policies of formation, preparation of classes, and approach of the subjects linked to the technological education are constructed taking into account the reality of the subjects, as well as the protagonism of the students.

It is known that policies are often brought from the top-down, reaching school environments as an imposition and only as execution goals. The challenge, in this sense, is for the subjects to seek more active participation both in the good

understanding of technology and technological education and in the planning, execution, and even evaluation of this entire process, to ensure that technology and technological education are a reflection of the desires of the subjects involved. In this case, teachers need to be interested and open to good technological teaching, with its nuances and biases involved in this process; on the other hand, institutions need to make room for this training; and when possible: encourage, propose and offer. All this, without losing sight of the much-needed training of mediating agents.

5. Conclusion

The scientific literature allowed the work to reveal the conceptual foundations and make a theoretical debate about the phenomena. It identified the need for proposals for teacher training processes, especially those who work in technological education, who are concerned with offering conditions, studies, and reflections to perceive technology as a much broader human action than the one with which the subject is discussed. Utilitarian reductionism is often perceived. But it is not limited to the technological artifacts used in this contemporary environment; on the contrary, technology is understood as an action intrinsic to the man himself – which is revealed throughout human history in activities related to nature. Teachers and students and all the elements present in this process must understand that, since its origin, the man has used technology to guarantee and maintain your survival. Thus, technology is intrinsic to the source of the man himself (Rosa, 2019; Silva et al., 2020), as it has always been present in man's relationship with nature. And when this relationship takes place within the scope of technological education, it is necessary to include the subjects actively. Technological education can reflect the desires that the subjects need to live a critical, citizen and effective life in society and its environment.

The challenges, as already highlighted in this study, are many. It is necessary to put in the teaching the understanding of a significant action to build fundamental learning and knowledge for a more participatory, fair, and effective society. Still, the subjects (organizational leaders, teachers, directors, students, and the school community in general) need to seek to break with everything and any reductionist mechanism of their participation. The importance of teacher training was also highlighted. How to propose changes in technological education without mentioning the adequate preparation of teachers? It is necessary to offer teachers training processes, but that it be continuous (Nascimento, 2000) because teacher training with ruptures ends up causing the opposite effect, keeping teachers away from the expected results.

Finally, the work also concluded that an adequate understanding of technology and technological education is of fundamental importance. Those are questions present in educational environments and need to be carefully understood to have practical awareness of the existing reality. Technological education needs to have clarity in its concepts and conceptions so that teachers, agents, and elements are aware of their intentions and desires. They can be critical, active, and knowledgeable agents of their reality. This study is open for future research. Although a specific concept of technology and technological education has been established here and conceptions on the subject have been presented, the fact is that teacher training and understanding of the teaching process -learning to technological education still lack further debates.

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