DOI: https://dx.doi.org/10.21879/faeeba2358-0194.2021.v30.n64.p19-35

SENSES OF INNOVATION IN ITS RELATIONSHIPS WITH EDUCATION AND TECHNOLOGY

*Mary Valda Souza Sales**
(Bahia State University)
http://orcid.org/0000-0002-9488-0103

*Vani Moreira Kenski***
(University of São Paulo)
http://orcid.org/0000-0002-1787-0243

ABSTRACT

In this article we seek to understand the meaning of the term innovation and its relationship with Education and Technologies. The study was oriented towards surveying the opinions of teachers in an online survey, based on the survey methodology, distributed via WhatsApp. The valid responses of 19 public higher education teachers were analyzed and categorized. The methodological proposal was inspired by emerging qualitative approaches, such as grounded theory. Based on the analysis of the categories, we sought the thought of theorists who would deepen the aspects pointed out by the teachers. We prioritize updated publications on the meaning of innovation, innovation in education, the relationship of innovation with technologies and the future of innovation in education. This process led us to verify the different meanings that the term innovation has assumed in different periods up to the present moment, with its consequences, inequalities and inconstancy. In the end, we understand that Innovation is a social and human process of change for the creation of new realities, guided by the needs, availability and contexts of each period. Those emerging technologies can generate changes in education. Changes conditioned to the political action of inclusion and changes in all educational instances to overcome inequalities to train citizens who are aware and integrated into current and future social and economic contexts.

Keywords: innovation; technologies; education.

* Post-doctorate in Education and Educational Technologies, M.Res. and PhD in Education. Licentiate in Pedagogy. Full Professor in the Department of Education I and in the Graduate Program in Education and Contemporaneity at the State University of Bahia (UNEB). Leader of the Training, Technologies, Distance Learning and Curriculum Research Group (ForTEC). Author and editor of books on education, training, technologies, and innovation. E-mail: marysales@uneb.br

** M.Res. and Ph.D. in Education. Licentiate in Pedagogy and Geography. Professor at the Graduate Program in Education at the University of São Paulo (USP). Director of SITE Educacional Ltda. Creator and former Coordinator of the Graduate Course in Instructional Design at SENAC/SP and UFJF. Former professor at the State University of Campinas (Unicamp) and at the University of Brasília (UnB). Author of books and papers on education and technologies. E-mail: vanikenski@gmail.com

RESUMO

SENTIDOS DA INOVAÇÃO EM SUAS RELAÇÕES COM A EDUCAÇÃO E AS TECNOLOGIAS

Neste artigo buscamos compreender o sentido do termo inovação e suas relações com Educação e Tecnologias. O estudo foi orientado para o levantamento das opiniões de professores em enquete *online*, baseada na metodologia *survey*, distribuída via *WhatsApp*. As respostas válidas de 19 professores do Ensino Superior público foram analisadas e categorizadas. A proposta metodológica foi inspirada nas abordagens qualitativas emergentes, do tipo da *grounded theory.* A partir da análise das categorias, buscamos o pensamento de teóricos que aprofundassem aspectos apontados pelos professores. Priorizamos publicações atualizadas sobre o sentido da inovação, da inovação na educação, da relação da inovação com as tecnologias e o futuro da inovação na educação. Este processo nos levou a constatar os diversos sentidos que o termo inovação assumiu em distintos períodos até o momento atual, com seus desdobramentos, desigualdades e inconstâncias. Compreendemos, ao final, que inovação é um processo social e humano de mudanças para a criação de novas realidades, orientado pelas necessidades, pela disponibilidade e pelos contextos de cada época. Além disso, compreendemos também que as tecnologias emergentes podem gerar mudanças na educação, sendo tais alterações condicionadas à ação política de inclusão e mudanças em todas as instâncias educativas para a superação de desigualdades no que tange à formação de cidadãos conscientes e integrados aos contextos sociais e econômicos atuais e futuros.

Palavras-chave: inovação; tecnologias; educação.

RESUMEN

SENTIDOS DE LA INNOVACIÓN EN SUS RELACIONES CON LA EDUCACIÓN Y LAS TECNOLOGÍAS

En este artículo buscamos comprender el significado del término innovación y su relación con la Educación y las Tecnologías. El estudio se orientó a sondear las opiniones de los docentes en una encuesta online, basada en la metodología de la encuesta, distribuida a través de WhatsApp. Se analizaron y categorizaron las respuestas válidas de 19 profesores de educación superior pública. La propuesta metodológica se inspiró en enfoques cualitativos emergentes, como la teoría fundamentada. A partir del análisis de las categorías, se buscó el pensamiento de teóricos que profundizaran en los aspectos señalados por los docentes. Priorizamos las publicaciones actualizadas sobre el significado de la innovación, la innovación en la educación, la relación de la innovación con las tecnologías y el futuro de la innovación en la educación. Este proceso nos llevó a verificar los diferentes significados que ha asumido el término innovación en diferentes períodos hasta el momento actual, con sus consecuencias, desigualdades e inconstancias. Al final, entendemos que la Innovación es un proceso de cambio social y humano para la creación de nuevas realidades, guiado por las necesidades, disponibilidad y contextos de cada período. Que las tecnologías emergentes pueden generar cambios en la educación. Cambios condicionados

a la acción política de inclusión y cambios en todas las instancias educativas para superar las desigualdades en la formación de ciudadanos conscientes que se integren en los contextos sociales y económicos actuales y futuros.
Palabras claves: innovación; tecnologias; educación.

Introduction

The academic community invests in research, studies, and experiments on the use of Digital Information and Communication Technologies (ICT) in education, and it tends to believe in a direct correlation between the presence of these technologies and the accomplishment of innovation. In this context, many a theoretical study links innovation to the insertion of technological artifacts, resources, and devices in schools, classrooms, and educational institutions.

Despite the many factors that hinder the use of ICT in our educational reality, such as a lack of public policy, training, and proper infrastructure for digitally mediated education, these technologies are not absent from the daily life of educational institutions because being connected is characteristic of our current social and individual reality and permeates all of our personal, professional, social and educational relationships.

The social distancing required by the Covid-19 pandemic resulted in a – largely improvised – development of digitally-mediated pedagogical processes and practices to avoid a complete interruption of educational activities. Changes in educational practices due to the use of ICT have led some Education professionals to consider these new processes as innovative. Are they? In this study, we reflect upon this question by adopting a broader perspective on what constitutes innovation in education, and how it can be promoted.

We set out to co-write this paper prompted by the need to identify the relationship between education, technologies and innovation. Our departure point were studies and research conducted over the last five years, upon which we based the current theoretical discussion about the meaning of innovation, of innovation in education, and of the relationship between innovation and technologies. Additionally, we have also dared to wonder about the future of innovation in education.

It was never our intention to answer our own inquiries. We wanted to hear from our peers, university professors who experience similar realities and share their concerns and reflections with us via digital networks. For this purpose, we developed a survey, using an online questionnaire composed of three open-ended questions: 1) *What is innovation*; 2) *What is innovation in education?* and 3) *The future of innovation in education is...*

The questions were sent via WhatsApp messenger to Higher Education Professors with various educational backgrounds who had been working in higher education for at least 6 (six) years, teaching in bachelor's and licentiate's courses. Those subjects were selected among one of the authors' contacts. We received valid answers from 19 public higher education professors working in the state and federal[1] systems, who contacted us between April 24th and 25th, 2021, agreeing to participate during the designated time and authorizing us to use their answers in the present study.

In methodological terms, this data collection procedure can be classified as a survey, considering that it facilitates "the openness of science, [since it] involves the collection and *quantification* of data, the collected data becomes a permanent source of information

1 The 19 professors who answered our questionnaire teach in the following fields (some of them have more than one area of expertise): 1. Math; 2. Economics and Pedagogy; 3. Languages; 4. Business Administration; 5. Pedagogy; 6. Pedagogy; 7. Computing; 8. Computing; 9. Math; 10. Public Relations; 11. Pedagogy; 12. Pedagogy; 13. History and Computing; 14. Pedagogy; 15. Business Administration; 16. Journalism; 17. Pedagogy; 18. Pedagogy; 19. Social Sciences.

[and can] confirm a particular theory of social behavior." (BABBIE, 1999, p. 159), and that it aims to describe, explain, and explore, according to Babbie (1999). To this end, we chose to gather information by directly asking people whose opinions are relevant to this study, thus formalizing our methodological construct.

These methodological procedures are modelled after emerging qualitative approaches inspired by Grounded Theory (CHARMAZ, 2008), according to which the continuously changing reality cannot be framed only by the ideas of the authors who preceded it, for any knowledge of reality is based on the perception or meaning that contexts and people form about the researched object.

Therefore, Grounded Theory is a methodology based on a process of simultaneous data collection and analysis that often uses data and information during the development of a study, allowing for a revision of the research questions based on facts, issues, and concepts that emerge from data collection; its goal, then, is to produce theoretical foundations that can explain the object of study during the research process (CHAMAZ, 2008). This was our methodological inspiration.

Consistent with this perspective, Grounded Theory applies certain systematized procedures to shape a theory through induction and deduction based on data analyzed considering existing information and existing theories (CHAMAZ, 2008), which may give rise to new conceptions and theoretical approaches. Thus, we analyzed and categorized the professors' answers, then sought to articulate their stances with the ideas of current innovation scholars. It was only after we had systematized data and information, and formalized the conceptual categories established by the answers to the questionnaire that we proceeded to the analysis and development of the theoretical reflections, with the aim of explaining and describing how the term 'innovation' is understood in the education field. This provided us with information to understand something new, such as the subject of this paper, for example. That is the main goal of this text: namely, to understand how professors' perceptions relates to the various theoretical meanings currently comprised by the term 'innovation', especially in the education scene.

In this quest to determine what is innovation, we begin by examining the term's various meanings throughout history until we reach our day and age, with its consequences, inequalities, and variability. Hence, we aim to map broadened understandings of innovation and, from there, to adjust our focus to understand the relationships between innovation and both education and technologies. We also dare to think about the future of innovation in its relations with educational action, student protagonism, and technologies.

Changes in the meaning of innovation

Innovation easily ranks among nowadays' most used terms. It almost always designates something that is considered not only new, but that qualifies positively as different and good. Since the last century, the term has been associated with two key concepts of contemporary culture: sciences and technologies. Through advertising and the expressive power of the market and consumption, innovation has penetrated the popular imagination, the media, and public policy (GODIN, 2015) as a positive expression of something to be valued and desired. But it has not always been this way, because the concept of innovation has a long, multiple, disperse, and inconstant history. The concept changes throughout time and across cultures, so that it might be more appropriate to speak of innovations. In this section, we concisely present some remarkable meanings linked to different understandings of innovation at distinct times. This reflection contributes substantially to our efforts to establish connections between the multiple meanings of the word and its relationship with the other terms that challenge us in this paper: technologies and

education. Has 'innovation' always meant the same thing, for all people, in all areas?

Our attempts to answer this important question begin by examining various meanings of innovation at different times in Western culture. Innovation is present at the bedrock of Western culture: according to Godin (2015), it already presented itself (albeit not with this name) in the ideas of Greek philosophers, such as Plato and Aristotle, in reference to political changes and necessary modifications in the laws and customs of the time.

For 2,500 years, innovation was considered pejorative and political. An outrage against certainties, values, customs, and established standards. In the Middle Ages, innovation was related to heresy in spaces dominated by Christianism. Inquisition courts killed innovators who expressed ideas or practices contrary to what was allowed by the Catholic Church authorities of the time. Galileo, Copernicus, and Edgar Bacon are part of a long list of innovators who were punished by the Inquisition for thinking differently. In several other occasions, totalitarian political regimes persecuted those who dared to share innovative ideas or practices, as well as proposals that failed to agree with the beliefs, habits, customs, and views imposed by the social, economic, and political elites who exerted strong control over societies.

The results of these prohibitions are well-known. When human ingenuity is challenged, it does not freeze; much on the contrary. Often did innovative thoughts, stances, and practices germinate in the twilight of oppressive societies. Following centuries of domination, at different times, innovations brought us the press, the Protestant revolution, popular political movements, feminism, and minority rights, among others. Those can be considered disruptive innovations, as they fracture the established order and trigger radical changes in society, people, and structures.

Still at the beginning of the 20th century, innovation began to integrate liberal thought and to be associated with existing technologies. In 1912, Schumpeter's *Theory of Economic Development* states that technological innovations function as the engine of capitalist development. Thereafter the term innovation is adopted by the market and creates a prolific field of study in corporate areas related to innovation management.

Presently, according to Plonski (2017), the term is referenced and discussed in all technical areas, as well as in Social and Human Sciences. In turn, commonfolk usually understand innovation as something tied to technological innovation, highly committed to its contribution to *progress* and the economy.

The trivialization of the term leads us understand that innovation – even if advocated by the creators of new artifacts, methods, processes, etc. – depends on the perception of its users and on the society where the term circulates. The mere adjectivation of the concept in advertising calls – innovative technologies, methodologies, equipment, techniques – is not enough. It is necessary to create new realities, as argued by Plonski (2017), to whom innovation as creation is both the process and the result of creating something that did not exist before and the process of "giving a new form or utility to something that already existed" (PLONSKI, 2017, p. 7). The positivization of the term, however, does not exclude the possibility of failure for a great many changes, if we consider that an innovative process is not always better than the existing ones. Innovation does not always reach, in a positive way, all people, all classes, all social spaces.

Clayton Christensen (2012) explains that some innovations have attributes that make them disruptive, while others have sustaining qualities. Disruptive innovations lead to radical changes in processes and to the creation of new habits, behaviors, and values that uproot the foundations of a given area or sphere of human activity. The Internet, smartphones, as well as Copernicus' Heliocentric theory and Einstein's theory of Relativity are examples of such disruptive scientific innovations.

Incremental innovations, on the other hand – a concept created by Schumpeter, an Austrian economist, in 1939 – alter reality by means of small changes. These are updates that do not compromise the process already in place, but that can give rise to new realities. They contribute to reflections and learning, leading towards more significant changes, especially in traditional processes, such as those present in Education, for example.

Considering this brief historical overview, the next step is to investigate the meanings of innovation for educators, since, as we have already stated, innovation is understood according to the historical context and to people's social experiences.

What is innovation for educators

Our investigation of the changes in the meaning of innovation in education led us to seek the opinions of male and female professors whose education and activities span different areas. We pondered the importance of knowing the meaning they attribute to innovation, and especially to innovation in education. We also dared to inquire what they believe the future of innovation in education will look like. As opposed to distanced theoretical research, rather than presenting our own ideas or prematurely reproducing the thoughts of several researchers, we chose to start by asking professors who are dealing with the teaching reality of Higher Education in these troubled times.

Categories were outlined based on the systematization of respondents' answers, short excerpts of which will be highlighted in the following sections to better illustrate said categories. Respondents are identified by the order in which they answered the questionnaire. Each answer was also numbered according to the corresponding question:

1 – *What is innovation?*

2 – What is innovation in education?

3 – *The future of innovation in education is...*

Thus, Respondent no. 6's answer to question 3 is labelled 6.3.

Table 1 (below) presents a question, the categories defined according to the highest representativeness of the answers given, and excerpts that illustrate the basis of this categorization.

What is innovation?

The answers to the first question *What is innovation?* originated four categories. Representative excerpts from these answers are shown in Table 1. In accordance with our goals, we sought to relate respondents' perceptions of *innovation* to scholars' stances on the subject, thereby seeking to determine what is innovation, after all.

Table 1 – Professors' answers to *What is innovation?*

QUESTION	CATEGORIES	ANSWER EXCERPTS
Innovation is ...	Change	(12.1) "...renew, change, accomplish something new..."
	New. Novelty	(9.1) "A new, essentially different step that brings a new methodological or conceptual conception structuring the way to accomplish something." (14.1) "Novelty, new thing, new idea..."
	Process	(7.1) "Process by which a trend is unveiled that brings with it a change to a previous paradigm (a standard, a model, a rule...)."
	Technologies	(1.1) "...innovating is not necessarily associated with the use of these technologies..."

Source: Produced by the authors using professors' answers to the online questionnaire (2021).

The meanings expressed by the professors – Change, Novelty, Process, and a direct relationship with Technologies – structured the analytical categories and shaped the following stage of our theoretical research on innovation.

Innovation as Change

Based on the understanding of innovation as change, we searched the literature for a current understanding of the term in this sense. We came across authors for whom the multiple meanings of regarding innovation as change in contemporary society deviate from traditional perspectives. According to Andrade (2005), these changes reinforce the qualitative dimension of innovative practice. In our day and age, the force of indetermination in innovation, the presence of "intangible and changing elements of technological and social practice, in which relationships are more fundamental than things. The processes overcome the results" (ANDRADE, 2005, p. 153) and the opening for arrangements and models that were not previously planned changes the action and the understanding of what innovation is. Based on Latour (2000), Castells (2003), and other authors, Andrade posits that change integrates the very meaning of innovation. This change cannot be imposed; it requires the inclusion of distinct variables, in the definition of innovative practices; that is, according to him, "innovation is always an open-ended process, mediated by a countless number of variables" (ANDRADE, 2005, p. 154).

This is also Cardoso's (2014) stance, as he claims that change is a process of transition from one social reality to another. In his eyes, this process characterizes all human systems and their adaptation to diverse social environments. In this sense, innovation as change is an open-ended process that requires considering the possibility of transitioning from one reality to another, with the development of new attitudes towards a situation and the problems one experiences.

Understanding innovation as change involves adopting a worldview that is no longer deterministic, but global and networked instead. For Polish researcher Pachura (2017), innovation as change in modern times cannot be imposed. Pachura bases her work on an understanding of the networked relationships between institutions and the development of social interactions in a heterogeneous formal and informal space. Thus, she writes that innovation in these spaces must consider that

> The variety of characteristics, behaviors, social attitudes, social ties, as well as age and cultural diversity lead to the need for tolerance for what is different, non-standardized, untraditional, and even extravagant or exotic. Moreover, it also seems critical to recognize freedom of individualization of creative skills. (PACHURA, 2017, p. 180).

According to the view expressed in the professors' answers, innovation as change coincides with the perception of scholars who expand the term's meaning to encompass contextualized changes. Such changes must involve all participants of the innovation process and be articulated in reticular connections in which the most important is the inclusion and participation of everyone.

Innovation as novelty

To help us reflect on the meaning of innovation as novelty, we turn to Janssen *et al*. (2015) who identify the temporal component of the term's meaning. They quote Ancona *et al*. (2001, p. 1976): "novelty can only be described in relative terms, from a certain perspective and at a specific moment in time.". Accordingly, the condition of novelty found in an innovation process is fleeting. In addition, the same authors state that "novelty is not a valid predictor for an innovation's value. Merely analyzing an innovation's degree of novelty proves to be insufficient for understanding its value as this depreciates the work needed to construct value." (ANCONA *et al*., 2001, p. 1980).

These authors propose a new concept: *situated novelty*, in which "what is considered 'new' is situational within a specific historical context." (p. 1981). For them, innovations "gain meaning in practice, which makes it irrelevant to focus on the analysis of novelty alone" (p. 1981).

Moreover, according to Cardoso (2014, p. 47), novelty can:

- bring something 'new' – something not yet tried or experienced.
- be relative, because even that which has already been conducted in other places and at other times can be declared and considered an innovation by actors.
- be neither reproducible nor repeatable, in the narrowest sense of the term, because it has a singular character.

Thus, to think of innovation as novelty, it is important to consider the context, the practice, and the reality in which innovation takes place. Within those parameters, innovation must be something "essentially different, that brings a new methodological or conceptual conception structuring the way to accomplish something", as said by one of our respondents.

Innovation as process

Unlike the perception of innovation as novelty, the understanding of innovation as process is inscribed in a temporality and historicity of its own, as pointed out by Cardoso (2014), because it requires integrated stages of planning and practice to occur. For this reason, it is imperative to be clear about the notion of innovation as a human process, one that cannot be dissociated from the possibilities of development and experience of other realities, which are guided by the demands, needs, and requirements of social existence and tied to contexts that are intrinsic and specific to the relationships established at each time – and which, therefore, involve their own temporalities and historicities. Innovation cannot be properly experienced unless it is understood as a process in the aforementioned sense, and this proves even truer in educational contexts, lest we get sidetracked by the consolidation of stages that generate products that are meaningless in their contexts.

Table 2 (below) presents connections between this perspective and professors' answers:

Table 2 – Innovation as a process, according to the professors

QUESTION	CATEGORIES	ANSWER EXCERPTS
Innovation is...	Adoption of new products or processes	(4.1) Innovation is characterized by wide diffusion and adoption of these new products or processes
	Process/change	(7.1) Process that unveils a trend that causes a paradigm shift

Source: Produced by the authors using professors' answers to the online questionnaire (2021).

The emergence and evolutionary speed of technologies, especially the connected digital ones, during the first twenty years of this century, raise the need for changes in education, since the school is no longer the sole, privileged *locus* of learning, of access to schooled/scientific and academic knowledge, nor of the production of this knowledge. Therefore, thinking about innovation in education requires thinking about our conceptions of this process (about what we plan and practice), so that we may understand and experience it as such.

The question *How to accomplish innovation in education?* cannot be answered without considering that it is necessary to go through steps, procedures, or stages, for we regard innovation as a "dynamic phenomenon, with sequences that succeed each other in time,

according to periods of acceleration, emptiness, and re-acceleration according to differential moments, heterogeneous and spiral temporalities" (CROS, 1997, p. 17). From this standpoint, innovation involves advances, setbacks, interferences, which over the course of its development ultimately promote effective changes in subjects' being and actions, and/or in how institutions function and act. It is in this dynamic perspective of experiencing stages, steps, that we understand innovation as a process. In this process, it is worth noting, "it is essential to establish communication between the actors of the various educational levels" (CARDOSO, 2014, p. 18) and innovation takes place in events (in the philosophical sense).

The experience of educational stages/steps that were thought out and planned in/with the collective – and which allow the experimentation of diverse knowledge, varied methodologies, the interaction among the different and the differences between subjects, the interconnection of knowledge and know-how – promotes the sort of change that leads to problem-solving practices, to the proposition of collective ideas to meet a certain goal, with protagonism and authorship of the practitioners of the innovative process, producing innovation in the how we teach, learn, and experience education.

Innovation is not always technological

The professors' belief that "innovating is not necessarily associated with the use of technologies" is in line with the findings of researchers on the relationship between innovation and technologies. Amaral (2015), for example, quotes Dubeux (2009, p. 35) to whom technology works as

> [...] a mechanism that allows you to reach a certain goal by an easier, safer, or even more convenient way. Innovation, on the other hand, consists of the ability to use a new product or process that has not been used before, or at least not for this new purpose. This is a concept related to the previous existence of a certain product. It is not necessarily related to technology since an innovative product may not have a technological basis.[2]

Likewise, one of our respondents states that

> [...] innovation in education can be driven by the use of new technologies, but their use alone does not guarantee innovation, it is possible to innovate without the use of digital information and communication technologies – ICT. In this process it is necessary to consider new possibilities of spaces and time. (1.1)

We thus realize that innovation does not derive exclusively from some technological basis, regardless of whether it is digital or connected. Rather, innovation depends on temporal and social relations that take place in processes of change promoted by human beings and their social movements and relations. It does not arise in a vacuum, but as a result of the actions and interactions of various actors, human and non-human alike. Consequently, the understanding of innovation varies from one context to another, for it belongs, as stated by a professor: "to the field of social, collective construction, it is part of a social, contextualized production, even if it has as a vector an individual (or, better yet, a singular) subject" (12.1).

On the basis of such observations, we can safely posit that innovation is human and social, since it happens as a process inherent to the changes, improvements, inventions, and social modifications of human collectivities and subjectivities.

What is innovation in education?

The broader perspective on the meaning of innovation developed in the previous sections underscores the collective and social character of change processes that necessarily take place in a given context, which provides temporal

2 Available at http://ead.ifnmg.edu.br/uploads/documentos/kLA159du7E.pdf.

and spatial boundaries for the school (or educational institutions in general). This brings us to our second question: *What is Innovation in Education?* To answer this question, we started by categorizing professors' answers. They provided us with three categories under which to develop our reflections: 1) the concept of innovation and its relations with the act of teaching and learning, 2) how innovation relates to the broad context of learning institutions, and 3) the various stances on the meaning of innovation in Education. Some highlights of our respondents' thoughts are presented in Table 3, below:

Table 3 – Professors' answers to *What is innovation in education?*

QUESTION	CATEGORIES	ANSWER EXCERPTS
Innovation in education is	Teaching and Learning	(10.2) Adoption of new educational practices through new methods, technologies, processes, and skills that lead to the improvement and expansion of learning processes
	Educational Institution	(6.2) Generation and implementation of processes according to each institution's needs/reality.
	Education	(9.2) Ability to create solutions to previously identified educational problems.

Source: Produced by the authors using professors' answers to the online questionnaire (2021).

The excerpts quoted above dovetail with certain aspects of the meaning of innovation expressed both by our respondents and by scholars referenced in previous sections, such as: creation, change, difference, improvement, inventions/invention, process, novelty, and updates. The highlighted excerpts allow us to visualize innovation in teaching and learning, in the educational institution and in education itself, without losing sight of the process' actual meaning.

What is innovation in teaching and learning

As already indicated, innovation in education is defined by issues directly tied to the historical, temporal, and spatial context. However, with regard to innovation in teaching and learning, we need to ensure flexible and contextualized processes, so that the curriculum can adapt to the contexts inherent to educative spaces so as to ensure the "implementation of practices that point to an entrepreneurial, interdisciplinary, and contextualized education" (SALES, 2020, p. 105).

Innovation takes place in the very same context as education. As Sales (2020) writes, it is a process that goes beyond methodological applications and the exposure/appropriation of content, and which requires movement and changes in the process itself, as well as creativity, art, inventiveness, and dialogicity.

Respondents' answers confirmed that innovation in teaching and learning is related to two pedagogical domains: a) methods and methodologies and b) planning and practices:

> [...] adopt new methodologies, new technologies. (1.2)
>
> [...] development of new pedagogical processes [...]. (4.2)
>
> [...] development and introduction of new features. (4.3)
>
> [...] adoption of new educational practices through new methods, technologies, processes, and skills that lead to the improvement and expansion of learning processes. (10.2)

It is perhaps useful here to return to some previously discussed points and remember that innovation is linked to social human pro-

cesses and that it constitutes, in education, a process of change. The notion of *new* that showed up in professors' answers must be observed in practices of both the collective and of the educational subjects; it must be visible in attitudes and actions, since in the school "where nineteenth-century citizens were educated under harsh rules of confinement and by force of blood, sweat and word, nowadays attractive webs of connection are extended, which operate differently and have different goals" (SIBILIA, 2020, p. 31).

Innovation in teaching and learning is connected to the development of disruptive pedagogical practices and to an interest in developing learning actions in line with the wishes and needs of today's society, as expressed by the professors:

> [...] breaking away from ... the traditional teaching and learning paradigms. (12.1)
>
> Proposing and developing creative solutions to challenges related to educative practices. (11.1)
>
> [...] alternative ways [...] to promote constructive and authorial student learning. (12.2)
>
> [...] is the application of new ideas, concepts and methodologies that serve to qualify the relationships between the subjects of (formal – school) education [...]. (14.1)

In this context, innovation points towards a trend of breaking away from traditional models of teaching and learning, with the mere insertion and use of technologies but without transforming the process or enabling change in people. As Couto (2020, p. 75) writes,

> [...] the mere presence of digital technologies in classrooms is not enough to promote innovation and improvements in the quality of teaching-learning. Often, certain technologies considered advanced are used to consolidate old ways of reproducing knowledge – so-called new technologies for obsolete teaching methodologies and practices.

To create innovation in teaching and learning is to promote processes that make use of shared, collaborative, participative practices in which student protagonism and authorship are key formative aspects, underlying both the achievement of pedagogical goals and the methodological orientation for working with various curriculum contents. To this end, innovation as change transforms massive practices into interventive and dynamic practices that include in the educational process the everyday life, the context, and the learning potential of each subject, thus making it a situated process. As Couto (2020, p. 71) states, based on Simondon's (1989) studies, "innovation only exists when people are able to remix the technical objects and, at the same time, remix their own experiences with technologies", with their ways of being and doing in education, teaching, and learning.

What is innovation in the educational institution

If innovation in teaching and learning refers to processes of change in the ways of being and doing in education, innovation in the educational institution must enable the planning and management of extended educational processes of change and disruption.

For Kenski (2013, 2020) and Valente (2013), innovation in an educational institution springs from the knowledge of its educational reality and the relationships established between the subjects involved in its processes. It demands communication, a formative commitment from the institutions, and respect for the structures that have been built based both on the demands of praxis and on the specificities of each educational reality.

Innovation in the educational institution requires more than the presence and use of advanced digital media in traditional management and teaching processes, and it is even less limited to the implementation of passing methodological fads or to curriculum changes. True institutional innovation – especially in large educational spaces – requires the involvement of all participants, requires planning and management for change, far beyond the processes that

take place in classrooms. It can only be achieved as process of commitment to new and different attitudes toward participation, collaboration, and commitment, leading to a creative and disruptive education that proves meaningful for the institution, for learners, and for society.

What is innovation and education

Carried out by educational institutions at all levels, formal education embodies society's broad understanding of *educating*. Thus, when asked about innovation in education, it occurs to very few to think of a greater commitment from society as a whole. Investigating the relationship between innovation and education is considered innovative in itself; in the words of one of our respondents, "a rupture of conservative educational paradigms, in which new paths, practices, and possibilities for education to meet social demands are presented." (9.2).

Thus considered, education opens up to situate the human being in his time, released from the chains of an anachronistic education which, albeit legally validated, does not correspond to the current social needs in terms of knowledge, practices, and relationships. In other words, an education that fails to meet the guidelines proposed by UNESCO at the end of the last century: knowing how to learn, to do, and to coexist considered as comprehensive social responsibilities.

In current terms, when innovation challenges us to think about education in a planetary manner, it is necessary to consider the conditions posed for *OnLIFE* Education, namely, "Education developed in a hyperconnected reality, in which the *real* and the *virtual* (con) merge, instigating institutions, professors, and students to rethink the educative system, as an ecosystem", as expressed by Schlemmer, Serra, and Di Felice (2020, p. 1). This is disruptive and necessary innovation for education at present. It is not constituted, according to Schlemmer *et al.* (2021, p. 26),

> [...] by transpositions, transmissions, combination mixtures, "seams", associations, aggregations, or composition by juxtaposition of spaces, methodologies, nor by separation or percentage of face-to-face physical and online activities/ meetings. [...] it is not about an Education enabled/enriched/powered by the digital [...].

A new educational reality has surfaced and presents itself today bearing the traits of a new formative process, considered by many as *Onlife* Education and defined by Schlemmer *et al.* (2021, p. 5) in the following terms:

> In Education, it is safe to say that the walls of the institutions and the walls of the classroom, which still exist and persist, separate formal learning from learning in a networked world, the former being reduced to the internal space of the classroom, to the instructional materials defined by the teacher, both occupying the centrality of the process and ignoring, therefore, the ecosystem of biodiversity of which man is part, in this network that today is also woven by technology. It is precisely technique and technology that enable an atopic inhabitation of teaching and learning, thus instigating the construction of an *OnLIFE* Education.

The challenges of innovation in Education bring new meaning to educational processes in and for today's society. The quest for an education that meets contemporary wishes and formative needs leads people to other paths, tracks, to search in networks, beyond schools and all their levels and diplomas, in a quest for disruptive learning.

To ensure their own survival, official formative spaces must urgently promote disruptive innovations to make sure that institutions are able to "create solutions to already identified educational problems", as one of our respondents wisely cautions.

The future of education and how it relates to innovation and technologies

The theoretical reflections and interactions presented in the previous sections lead us to

regard innovation as a temporal process that is constituted according to the culture, values, and existential conditions of each social group. We must now think about the future of innovative education and the role of technologies.

The stance expressed by most respondents calls us to face this challenge of thinking about the future of innovation in education in three distinct movements, presented in Table 4, below:

Table 4 - The future of innovation in education, according to professors.

QUESTION	CATEGORIES	ANSWER EXCERPTS
The future of innovation in education is...	Collective action	(3.3) collective force of creation/action, with the help of interactive practices built in networks of sociability.
	Student protagonism	(1.3) teaching-learning process that features the student as the protagonist, with diversification of strategies to provide opportunities for different ways of learning.
	Technologies	(14.3) possibilities afforded by countless digital technological devices and how they promote educative action based on a different perspective on time/space

Source: Produced by the authors using professors' answers to the online questionnaire (2021).

From these three distinct movements, we dare to make considerations and even gauge the future of innovation in education.

The future of Innovation in Education and collective action

Nowadays, the greatest challenge posed to networks – and to smart digital processes in particular – is to understand the new frameworks within which to regard the term innovation in the coming years and in various contexts. The speed of digital change and the corresponding changes in both society and people bleed into the perception of innovation in the future as something fleeting, constantly evolving.

In Education, the banalization of the use of digital mediations will require significant transformations in structures, policies, content, curricula, and methodologies. These innovations are already in progress. The various incremental actions conducted in planetary networks that include teachers, researchers, and educational institutions from different countries and levels, all of them in a permanent process of interactions mediated by digital technologies, give a sense of the new realities and of the future of education. Innovations.

As a historical trend, dominant educational processes in the upcoming information age will be increasingly organized around networks. Networks are the new social morphology of our society. The dissemination of network logic will change education, in its structure and ways of existing. As open structures capable of unlimited expansion, integrating new nodes that share the same communication codes, networks become viable through the collective and connected action of human and non-human agents in permanent transformation. They generate the future "collective force of creation/action", as presented by Respondent no. 3, "with the help of interactive practices built in networks of sociabilities" that will transform the ways in which education happens, how it is done. It is worth adding that the potential of the networks can change (and indeed is already changing) methodologies, teaching practices, uses of pedagogical resources, and teaching and learning mechanisms, even in non-connected contexts.

The future of Innovation in Education and student protagonism

The 21st century brings us closer to experi-

encing of one of Paulo Freire's major educational premises: autonomy in formative processes, which is only possible when students are the protagonists of learning processes – this is widely referred to in Brazilian Education studies as *student protagonism*. Towards that end, experiencing the future of innovation in education in a connected and networked society demands constant decision-making, the active exercise of creativity, and differentiated initiatives that promote actions and practices that encourage student protagonism.

If education is to effectively implement practices imbued with Freirean dialectics, the active methodologies proposed by Gardner, and the concept of cognitive ecology idealized by Maturana, we must endeavor to achieve a "teaching-learning process that features the student as the protagonist, with diversification of strategies to provide opportunities for different ways of learning" (1.1).

Optimizing the diverse potential of human cognitive capacity, working towards a contextualized, meaningful, and innovative education that fosters the development of educational practices aimed at *onlife* education requires that formative actions allow for interaction and collaboration among all participants, with didactic actions based on the logics of the networked digital environment and therefore able to enhance hybrid learning schemes that explore the creative, innovative, authoring, and collaborative power of students and teachers. New competencies emerge from student protagonism dynamics: students are effectively the authors of creative practices that optimize the learning process. These practices are recognized in the context experienced with peers.

From this standpoint, the practice of innovation should promote "the customization of the teaching process with a mix of pedagogical and didactic possibilities – which in the context of digital culture present hypertextuality as a force for the development of contextualized, meaningful, and expanded learning" (NONATO; SALES, 2020, p. 145). In other words, the goal is to encourage a change in managerial attitudes, dynamics, acts, and procedures and, consequently, the transformation of education beyond methods, techniques, and models.

Hence, thinking about the future of innovation in education means thinking about the future of education in a context characterized by constant change, autonomous technological immersion by the students, and a need for continuous teacher training so that teachers can propose hybrid, creative teaching and learning, with transformative possibilities based on student and professor protagonism.

The Future of Innovation in Education and technologies

To discuss the future of innovation in education, we must recall the social relevance of Education in society throughout time. Far beyond improving employability prospects, the major concern of all levels and modes of education is to foster social inclusion, to broaden students' citizenship conditions so that they may be active participants of their contemporary social and economic contexts.

Education's primary commitment is, therefore, to people and to contemporary society, with its mutations and transformations. Innovation in Education is in a mutually conditioning relationship with the movements and changes in society, technologies, and culture. In a time permeated by networks and digital technologies, the future of innovation is committed, as stated by one of our respondents, to new forms of autonomous and participatory learning – with or without schools – through the "possibilities afforded by countless digital technological devices and how they promote educative action based on a different perspective on time/space" (13.3).

Therefore, the future of innovation in education and technologies is directly related to networked living, according to Schlemmer *et al.* (2021, p. 25), in that it brings people and digital devices together in the same set, in

collaboration "so that human and technology are no longer separate entities. The 'computer room' is in our heads, at the palm of our hands, in our way of acting, arguing, and thinking". The future lies in the effective experience of humans' full potential as a social technology, connected to people and to their relationships.

Innovative, networked education, that is, "linked, connected (*On*) to life (*LIFE*), based on the problematizations of today's world" (SCHLEMMER *et al.*, 2021, p. 25). This outlook is not limited to technology itself; it involves renewing the dynamics of teachers' work, as well as the school and the entire educational system. It is not just about having access to a computer, but instead about bringing networked living to schools or to new learning spaces, in whatever shape or form; in short, it is about getting to experience the potential of connected digital technologies in both online and offline educational processes.

Final thoughts – technologies and the meanings of innovation in education

In sum, innovation is not an ahistorical, common-sense term. Rather, it is a human process of change that leads to the creation of new realities, and it is strongly tied to the needs of each age, each context.

Current social training and education needs are both echoed and fostered by the advanced possibilities of digital technologies. However, those technologies are not yet available to all citizens, especially in Brazil. As access to technology increases, the situation of the digitally excluded grows bleaker. Boto *et al.* (2020, p. 14) stress that "most of the school population does not have access to high-bandwidth internet", which makes it difficult to believe in one-fits-all school education, or that everyone is equally positioned to benefit from innovation in education.

Innovation in education is conditioned to the full use of emerging technologies as a political instrument of inclusion that can overcome inequalities in the education of citizens who are aware of and integrated into current and future social and economic contexts. Digital technologies make it possible to offer open curricula, self-managed training, and different forms of collective learning that, in conjunction with the formal education offered by institutions, can open up to innovative and necessary learning.

Digital culture cannot be shaped by the traditional paradigms presented in school curricula and education. Since the genesis of the modern school, school structures and curricula have reproduced the hegemonic knowledge of the dominant classes and social groups. The fast-paced innovations in technology are pushing schools at all levels to break away from this inequitable model. The school is challenged to promote its *digital enculturation*, an expression coined by Nonato *et al.* (2021) to designate the process by which digital culture is assimilated into school life and becomes an integral part of its culture.

It is no longer acceptable for the curriculum of neither students nor teachers to be crystalized, standardized, or distanced from reality. Teachers must be prepared to think, to plan, to regard the school as a social space for training, innovation, and social inclusion, and to recognize themselves as a key element in this process; to remain in dialogue, to participate in networks, to be open to exchanges and changes, in search of new ways of learning and, consequently, of teaching. The use of digital networks has long afforded the possibility of tearing down the physical walls of schools, and now that this has been accomplished during the pandemic (even if in a makeshift manner), change is irreversible.

It is time to rebuild the school in a different, innovative way, breaking away from prejudices and inequalities. Just as technology is not restricted to the computer lab/room, learning does not take place exclusively in a classroom.

We learn from life and in life. The more teachers acknowledge this, and use it in their favor, the better for them and their students. This is innovation.

REFERENCES

AMARAL, E. D. **Tecnologia e Inovação**. Montes Claros, MG: Instituto Federal do Norte de Minas Gerais, 2015. Retrieved from: http://ead.ifnmg.edu.br/uploads/documentos/kLA159du7E.pdf on Jul. 22nd, 2021.

ANDRADE, T. de. Inovação e ciências sociais: em busca de novos referenciais. **Revista Brasileira de Ciências Sociais** [*online*], v. 20, n. 58, p. 145-156, 2005. Retrieved from: https://doi.org/10.1590/S0102-69092005000200007 on Jul. 12th, 2021.

BABBIE, Earl. **Métodos de Pesquisas de Survey**. Tradução Guilherme Cezarino. Belo Horizonte: Ed. UFMG, 1999.

BOTO, C.; SANTOS, V. M.; SILVA, V. B.; OLIVEIRA, Z. V. (org.) **A escola pública em crise:** inflexões, apagamentos e desafios. São Paulo: FEUSP, 2020.

BRAUN, V.; CLARKE, V.; BOULTON, E.; DAVEY, L.; McEvoy, C. A pesquisa online como ferramenta de pesquisa qualitativa. **International Journal of Social Research Methodology**, v. 1, n. 14, 2020. Retrieved from: https://doi.org/10.1080/13645579.2020.1805550 on Jul. 22nd, 2021.

CARDOSO, A. P. P. O. **Inovar com a investigação-ação**: desafios para a formação de professores. Coimbra, Portugal: Imprensa da Universidade de Coimbra, 2014.

CASTELLS, M. **A galáxia da Internet**: reflexões sobre a internet, os negócios e a sociedade. Rio de Janeiro: Jorge Zahar, 2003.

CHARMAZ, K. Grounded Theory as an Emergent Method. *In*: HESSE-BIBER, S. N.; P. LEAVY, P. (org.). **Handbook of Emergent Methods**. New York: The Guilford Press, 2008, p. 155-172.

CHRISTENSEN, C. **O dilema da inovação**: quando as novas tecnologias levam empresas ao fracasso. São Paulo: M. Books, 2012.

COUTO, E. S. Pedagogias das conexões: produções de conteúdos e redes de compartilhamento. *In*: SALES, Mary V. S. (org.) **Tecnologias Digitais, Redes e Educação:** perspectivas contemporâneas. Salvador: EDUFBA, 2020, p. 57-78.

CROS, F. L'innovation en education et en formation. **Revue francaise de pedagogie**, v. 118, p. 127-156, 1997. Retrieved from: https://www.persee.fr/issue/rfp_0556-7807_1997_num_118_1 on Jul. 11th, 2021.

DUBEUX, R. R. **Um balanço da evolução recente das leis de patentes no Brasil:** os efeitos do Acordo TRIPS. Retrieved from: http://jus.com.br/artigos/17269/um-balanco-da-evolucao-recente-das-leis-de-patentes-no-brasil-os-efeitos-do-acordo-trips#ixzz3Xx7EACWi. on Jul. 11th, 2021.

GODIN, B. **Innovation contested**: the idea of innovation over the centuries. New York: Routledge, 2015. Retrieved from: https://www.researchgate.net/publication/318583206_Innovation_and_change_in_networked reality on Jul. 11th, 2021.

JANSSEN, M.; STOOOPENDAAL, A. M. V.; PUTTERS, K. Situated novelty: Introducing a process perspective on the study of innovation, **Research Policy**, v. 44, n. 10, p. 1974-1984, 2015. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0048733315001055 on Jul. 11th, 2021.

KENSKI, V. M. **Tecnologias e Tempo Docente**. Campinas, SP: Papirus, 2013.

KENSKI, Vani M. Redes, Comunidades e Educação. *In*: SALES, Mary V. S. (org.) **Tecnologias Digitais, Redes e Educação**: perspectivas contemporâneas. Salvador: EDUFBA, 2020, p. 17-28.

LATOUR, B. **Reagregando o social**: uma introdução à teoria do ator-rede. Salvador: EDUFBA; Bauru: EDUSC, 2012.

NONATO, E. R. S.; SALES, Mary V. S. Hipertextualidades, Multiletramentos e Cultura Digital: perspectivas na educação contemporânea. *In*: SALES, Mary V. S. (org.) **Tecnologias Digitais, Redes e Educação:** perspectivas contemporâneas. Salvador: EDUFBA, 2020, p. 133-148.

PACHURA, A. Innovation and change in networked reality. **Polish Journal of Management Studies**, v. 15, n. 2, p. 173–182, 2017.

PINSONNEAULT, A.; KRAEMER, K. Survey Research Methodology in Management Information Systems: An Assessment. **Journal of Management Information Systems**, v. 10, n. 2, p. 75-105, 1993.

PLONSKI, G. A. Inovação em transformação. **Estudos Avançados** [online], v. 31, n. 90, p. 7-21, 2017. Retrieved from: https://doi.org/10.1590/s0103-40142017.3190002 on Jul. 22nd, 2021.

SALES, Mary V. S. Práticas pedagógicas inovadoras

no Ensino Superior: perspectivas contemporâneas. *In:* DIAS-TRINDADE, S.; MOREIRA, J.A.; FERREIRA, A. G. **Pedagogias Digitais no Ensino Superior**. Coimbra, Portugal: 2020, p. 105-132.

SCHLEMMER, E.; BACKES, L.; BITTENCOURT, J. R.; PALAGI, A. M. M. (org.). **O habitar do ensinar e do aprender onlife**: vivências na educação contemporânea. São Leopoldo, RS: Casa Leiria, 2021. Retrieved from: http://www.guaritadigital.com.br/casaleiria/acervo/educacao/ohabitar/index.ht ml on Jul. 11th, 2021.

SCHLEMMER, E.; FELICE, M. D.; SERRA, I. M. R. de S. Educação OnLIFE: a dimensão ecológica das arquiteturas digitais de aprendizagem. **Educar em Revista** [online], v. 36, n. 21, dez. 2020. Retrieved from: https://doi.org/10.1590/0104-4060.76120 on Jul. 8th, 2021.

SIBILIA, P. Do confinamento à conexão: as redes infiltram e subvertem os muros escolares. *In*: SALES, Mary V. S. (org.). **Tecnologias Digitais, Redes e Educação:** perspectivas contemporâneas. Salvador: EDUFBA, 2020, p. 29-40.

VALENTE, José A. As tecnologias e as verdadeiras inovações na educação. *In:* ALMEIDA, M. E. B. de; DIAS, P.; SILVA, B. D. da. **Cenários de inovação para a educação na sociedade digital**. São Paulo: Edições Loyola, 2013, p. 35-46.

Received: September 21th 2021
Approved: October 14th 2021