Production and (re)invention of teacher training and practice mediated by Open Educational Resources (OER)

Elena Maria Mallmann

Federal University of Santa Maria (UFSM), Santa Maria, Rio Grande do Sul, Brazil

elena.mallmann@ufsm.br

Juliana Sales Jacques

Federal University of Santa Maria (UFSM), Santa Maria, Rio Grande do Sul, Brazil

juliana.jacques@ufsm.br

Abstract: From an exotopic perspective, teaching is a formative process in theoretical-practical learning. In this sense, this article aims to analyze the movements of production and (re)invention of teaching knowledge and practices mediated by Open Educational Resources (OER). To this end, educational action research was carried out between 2022 and 2023 in five courses associated with the Open University of Brazil at the Federal University of Santa Maria. The results show that the practices developed in these formative environments improved knowledge and practices about the cyclical and democratic movement of OER, promoting the critical-reflective exercise necessary for the contexts of the open world and the ethical-aesthetic experience as humanistic training.

Keywords: Open Educational Resources; Teacher training; Teaching knowledge and skills.

Produção e (re)invenção da formação e da prática docente mediadas por Recursos Educacionais Abertos (REA)

Resumo: Sob a ótica exotópica, a docência se produz como processo formativo nas aprendizagens teórico-práticas. Diante disso, objetiva-se, neste artigo, analisar os movimentos de produção e (re)invenção de saberes e fazeres da docência mediados por Recursos Educacionais Abertos (REA). Para tanto, realizou-se pesquisa-ação educacional, entre 2022 e 2023, em cinco cursos vinculados à Universidade Aberta do Brasil junto à Universidade Federal de Santa Maria. Os resultados apontam que as práticas desenvolvidas, nessas ambiências formativas, potencializaram saberes e fazeres sobre o movimento cíclico e democrático dos REA, fomentando o exercício crítico-reflexivo necessário aos contextos do mundo aberto e da experiência ético-estética como formação humanística.

Palavras-chave: Recursos Educacionais Abertos; Formação de professores; Saberes e fazeres docentes.

Producción y (re)invención de la formación y la práctica docente mediada por Recursos Educativos Abiertos (REA)

Resumen: Desde una perspectiva exotópica, la enseñanza se produce como un proceso formativo en el aprendizaje teórico y práctico. Ante ello, el objetivo de este artículo es analizar los movimientos de producción y (re)invención de saberes y acciones docentes mediados por Recursos Educativos Abiertos. Para ello, se llevó a cabo una investigación-acción educativa entre 2022 y 2023 en cinco cursos vinculados a la Universidad Abierta de Brasil en la Universidad Federal de Santa María. Los resultados muestran que las prácticas desarrolladas en estos entornos de formación potenciaron los conocimientos y las acciones sobre el movimiento cíclico y democrático de los REA, fomentando el ejercicio crítico-reflexivo necesario para los contextos del mundo abierto y la experiencia ético-estética como formación humanística.

Palabras clave: Recursos Educativos Abiertos, Formación del profesorado, Conocimiento y práctica docente.

1 TEACHING KNOWLEDGE AND SKILLS: INITIAL CONSIDERATIONS

Which knowledge and skills are necessary for teaching in the face of contemporary social, cultural, economic, and educational configurations increasingly supported by the digital universe and participatory culture? Such a problematization emerges to (re)invent training processes and teaching practices in times of generative artificial intelligence (AI), mass collaboration, network interactions, gamification, platformization (Rivas, 2021), retention and adaptation of materials, production, and sharing of digital content. "Addressing this communication universe in schools is an urgent task since the possibilities are vast, allowing educational processes to be centered on authorship and making the school a producer of knowledge and cultures" (Veloso; Bonilla; Pretto, 2016, p. 44, translated by us).

In this way, it is worth analyzing how these movements, resulting from scientific and technological developments, are present both in the initial and continuing training of teachers and in teaching practices in basic education. There are different understandings between what is prescribed in public education policies and its recontextualization in the contexts of training and teaching practice. Sometimes, they focus on the technological instrumentalization of teachers through ostensive training courses and sometimes on the critical-reflective and ethical-aesthetic integration of technologies, materials, content, and resources (Mallmann, 2023a; 2023b). Open Educational Resources (OER) are located in this critical-emancipatory site of training and practice.

As study, teaching, and research materials, OERs are based on five freedoms known as the 5Rs of openness: reproduction, reuse, review, remix, and redistribution (Willey, 2014). They allow access for research, identification, selection, and incorporation from the public domain and/or permissive licenses for research, learning, teaching, scientific and technological innovation, and cultural creation (Unesco, 2012; 2019). With these potentials, they assert themselves as mechanisms for the promotion of authorship, participatory network culture, and democratization of access to knowledge. In other words, as processes of production and (re)invention of teaching education and practice, the five freedoms of OERs form a field of senses and meanings that highlight the potential of each subject in the process. It is, therefore,

a humanistic conception of education that gives educators a prominent place in the pedagogical production of knowledge mediated by culture, science, technology, and specific contexts.

In this sense, the integration of OER into teacher education and practice requires the production of technological pedagogical knowledge to develop fluency as a critical-emancipatory practice. This has been termed technological-pedagogical fluency (TPF). It is therefore assumed that curricular arrangements and teaching functions consider OER within the broad spectrum of content for teacher training, parameterized by public educational policies and pedagogical projects in institutions. Thus, the investment in the production and (re)invention of teacher training and practice becomes a constant for the legitimate recognition of the social importance of education and the ethical aesthetic commitment of all those involved. According to Oliveira and Moura (2024, p. 17, translated by us), this implies "a pedagogical proposal in which the student is an active agent who, through research, seeks answers, creates hypotheses, reflects, understands, explains, compares situations to get at possible explanations, possibilities and paths to knowledge". In other words, understood not as reproducers of content, not as technicist executors of technological resources and equipment, but through the knowledge and actions that consolidate them as co-authors of the knowledge that circulates in all school environments and the extra-school digital universe.

In this argumentative way, this article aims to analyze the movements of production and (re)invention of pedagogical knowledge and practices mediated by OER. To this end, the first section of this article addresses the concepts and practices inherent in teachers' TPF that promote the integration and authorship of OER in the contexts of teacher education and practice. The second section analyzes the movements of OER integration, produced in the cyclical spiral of educational action research, between 2022 and 2023, in curricular components in five courses linked to the Open University of Brazil at the Federal University of Santa Maria: a) Bachelor's Degree in Portuguese Language and Literature; b) Bachelor's Degree in Pedagogy; c) Specialization in Educational Management; d) Specialization in Teaching Philosophy in High School; and f) Specialization in Agroecology, Rural Education, and Social Innovations.

Then, the final considerations are made in defense of the idea that the integration of OER in teacher training processes opens the way to (co)authorship in teaching practice in basic education, promoting, through an ethical-aesthetic participatory culture: teaching autonomy, peer collaboration, curricular democratization, appreciation of freedom, respect for differences

and plurality of pedagogical conceptions.

2 TECHNOLOGICAL-PEDAGOGICAL FLUENCY (TPF): INDELIBLE KNOWLEDGE AND SKILLS FOR UNDERSTANDING AND PRACTITING THE FIVE FREEDOMS OF OER

Teachers build scientific and technological knowledge in their training processes and teaching practices, in a creative-productive, ethical-aesthetic movement permeated by power relations, political advances or setbacks, curricular designs, and social, economic, and cultural nuances. Thus, the goal is for teacher education and practices to assert themselves as places of production and (re)invention in a context permeated by technologies, networks, and digital content. In this way, they can clearly demarcate criticality and democratic imperatives in the face of the neoliberal impulses of public policies that exalt competitiveness and entrepreneurship (Gonsales; Lima, 2022; Mallmann, 2023a; 2023b).

> Understanding technologies as culture means going well beyond the description of what they are, to include why they are and how they are used, to understand them as objects and practices that are not only material and functional, but also symbolic and aesthetic, with both their meanings and potentials derived from broader cultural spaces. Their incorporation into the school environment begins a dialogue with its context, and what is considered essential in relation to the incorporation of digital technologies in the classroom shifts from technical and operational capacities to engagement in meaningful social practices (Heinsfeld; Pischetola, 2019, p. 6, translated by us).

The production and (re)invention of pedagogical training and practice are driven by the freedom of TPF as a critical-emancipatory practice (Kafai et al., 1999; Mallmann and Schneider, 2021). In education, it is necessary to produce knowledge and actions for understanding, creation, evaluation, and precautionary analysis, that is, action-reflection-action as a constant movement of overcoming naive conceptions/consciousness (Vieira Pinto, 2005; Freire, 1983; 1996). TPF is indelible for the construction of knowledge and actions for critical-emancipatory learning-knowing-being in the educational process in the face of the diversity of contexts, cultures, contents, curricular knowledge, science, pedagogy, technologies, and policies. This critical-emancipatory pedagogical training and practice based on TPF generates collaboration and autonomy, in movements that interpolate and complement the dialectical dynamics between individual work and collective production. In this way, "autonomy, freedom,

and a sense of the future" are produced (Nóvoa; Da Silva; Pilati, 2022, p. 201-202, translated by us).

The TPF assumptions necessary for the production and (re)invention of training and teaching practices mediated by OER are the opening of knowledge as a common good and education as an inaccessible universal right. Therefore, training teachers to teach through the five freedoms of OER (5Rs) allows the dissemination of knowledge as a promotion of social justice, the right to life, and the sharing of universal goods as inalienable human rights. This includes respect for freedoms, including copyright, ethics, and the aesthetics of production and sharing in networks, including the specificities of school knowledge (O'Reilly, 2005; Pretto; Silveira, 2008; Bruns, 2008; Bonk, 2009; Blessinger; Bliss, 2016).

The critical-emancipatory pedagogical knowledge and practices mobilized with TPF around technologies, teaching materials, resources and curricular content generate problematization, decision-making and management in the face of a) the influence of large technology corporations on schools; b) the uncontrolled access and control of school community data by private companies; c) the indiscriminate registration in networks, repositories and platforms; d) the unreasonable collection of fees for the acquisition and maintenance of equipment by the government; e) the "cross-selling" of technical support for equipment, software and hardware; f) the unbridled dissemination of ranking indicators that demarcate historical asymmetries and gaps; g) the commercial interests of textbook publishers; h) the consumerism of resources and materials with reserved copyrights; i) the random execution of proprietary software and hardware; j) the marketing and commercial space for solutions promised as innovative within public institutions; l) public funding for the production of technological-educational solutions that are closed, with reserved and proprietary rights.

Economic, social, and cultural movements are historically linked to the production of humanity through speculative, philosophical, scientific knowledge, and technological creations due to the intrinsic relationships between nature, science, and society (Latour, 1994; 1999; 2000; 2001). In this sense, they require education, policies, schools, managers, and teachers to adopt TPF as a condition for the ethical-aesthetic understanding of the world signified through concepts, human relations, methodologies, curriculum designs, assessment dynamics. In this context, the knowledge and practices of OER and their entire framework of principles of open education, universal access to knowledge, citizen participation, and democratization are included.

The regulatory role of technologies in industrialized societies is increasingly presented today as an agency of artificial programming, automation, and robotization (Rivas, 2021). Therefore, this context has demarcated both the economic fabric and the massification of information and social interactions in digital networks. In this context, TPF is fundamental for producing and (re)inventing pedagogical training and practice, since societies empowered by technologies of economic and social control (Castells, 1999) are those that determine the commodification and platformization of education (Bruns, 2008; Da Silva; Tomio, 2023; Mallmann, 2023a; 2023b).

In this sense, the movements of production and (re)invention of knowledge and actions of teacher training and practice mediated by OER generate a wealth of theoretical-practical knowledge, that is, pedagogical-technological knowledge as critical-emancipatory practice. Educational professionals, in any teaching or management role, must progressively build TPF to actively insert themselves in the action-reflection-action dynamic that generates humanistic training, announced and anchored in movements of training and teaching practices mediated by OER. For Da Silva and Tomio (2023, p. 205, translated by us), "thinking about this model of school organization from the perspective of digital culture implies new ways of doing teaching work".

The principle advocated is the initial and ongoing training of critical and reflective teachers to be aware of the place of their profession in the world and of all the constraints, conflicts, and correlations of forces that permeate it. In Freire's precepts (Freire, 1983; 1996), the understanding of being and being in the world is materialized in the transcendence of naive consciousness to critical consciousness. From this, a condition of incompleteness and search for being more is assumed. In this perspective, teaching constitutes a combative action against the market movements of education against the interests that harm teaching autonomy and continually make the teaching profession precarious.

The point of interest in this debate is, therefore, the production and (re)invention of teaching training and practice mediated by the five freedoms of OER (5R) as critical-emancipatory matrices. Thus, the TPF around each of the freedoms of OER promotes and values teaching as a site of creation, that is, co-authorship, as an ethical-aesthetic act, in the arenas of struggle for: a) teaching autonomy; b) the production and updating of content and not the mere reproduction of standardized and mass-distributed materials; c) the non-replication of practices instrumentalized in corporate training actions in school contexts; d) the

recontextualization of the prescribed curriculum, taking into account the real needs of the school; e) the promotion of a participatory culture among peers, collaboration and sharing of materials in a network.

Thus, recognizing the social importance of education implies a careful and problematizing look at the knowledge and practices of teaching. This necessarily includes both initial and ongoing training processes. Such knowledge and practices are not exclusive and peculiar to courses, curricula, institutions, or specific policies. They are constructed in the process and entanglement of cultures, contexts, historical contingencies, intersubjectivities, and human relations.

3 ACTION-REFLECTION-ACTION FOR PRODUCTION AND (RE)INVENTION OF TEACHING TRAINING AND PRACTICE

The cyclical processes of educational action research shape teacher training and practice to the extent that they enable retrospective and prospective dynamics of action-reflection-action. Based on the critical-emancipatory orientation of TPF, agencies that produce and reinforce the (re)invention of teaching training and practice mediated by OER are emphasized. Thus, from the perspective of the foundations of educational action research, teaching practice itself is pedagogical, that is, it is formative and mobilizing for change. From this perspective, every human being has "the role of subject of the production of his intelligence about the world and not only that of recipient of what is transmitted to them" (Freire, 1996, p. 178, translated by us). Action-reflection-action takes place in concrete reality and gradually transforms it. Therefore, "destiny is not a given, but something that must be done and from whose responsibility we cannot exempt ourselves" (Freire, 2015, p. 52, translated by us).

Understanding, interpreting, and producing the (re)invention of teaching generates changes in educational and social realities. This is because teaching knowledge and practices combine different social voices constructed in the community but at the same time maintain the principles of authorship as a discursive singularity that constitutes each human being (Bakhtin; Volochínov, 2006; Bakhtin, 2011). The critical-emancipatory foundation of action research is achieved through problematizing dialogue and collaboration, which highlights the different social voices that are powerful for the construction of positions and actions. Therefore, the knowledge   and practices of teacher training and

practice are responsible and responsive acts (Bakhtin, 2010). The creative and transformative potential (Alarcão, 2001) of producing and (re)inventing teaching requires an ethical and aesthetic commitment that implies awareness because

> in humanistic education, as in aesthetic experience, the relationship with the subject is such that in it one turns to oneself, one is led to oneself. And this does not happen through imitation. [...] Because education is not about learning something. It is not about not knowing something at the beginning and knowing it at the end. It is not an external relationship with what is learned, in which learning leaves the subject unchanged (Larrosa, 2003, p. 52, translated by us).

Therefore, the 5Rs of OER are pillars of production and (re)invention. And not the mere reproduction of teaching as a generative, formative process in itself that requires "focused attention" to make it

> the world seems open. [...] There is no human experience that is not mediated by form, and culture is precisely a set of mediation schemes, a set of forms that delimit and profile things, people, and even ourselves. Culture, and especially language, is something that opens the world to us (Larrosa, 2003, p. 49, translated by us).

In this international movement of education, culture, and open knowledge, the production and (re)invention of training and teaching have been constructed through the 5Rs of OER. The cycles of educational action research are developed in co-authorship and collaboration with teachers in training contexts linked to the program of the Open University of Brazil at the Federal University of Santa Maria. It involved two teacher-researchers, 10 tutors, and 572 teachers in training, considered as enrolled students.

Here are analyzed data from courses produced between 2022 and 2023, in courses of Bachelor's Degree in Letras/Portuguese and Literature, Bachelor's Degree in Pedagogy, Specialization in Educational Management, Specialization in Teaching Philosophy in High School and Specialization in Agroecology, Rural Education and Social Innovations. The curricular components were respectively: a) Authorship and co-authorship of Open Educational Resources (OER) in educational practice (60 hours); b) Information and Communication Technologies applied to education (60 hours); c) Public Policies and Educational Management (60 hours); d) Methodology of Teaching Philosophy (40 hours); e) Introduction to Distance Education (60 hours).

We understand action research as intentionally planned and recontextualized actions based on the   demands of the context of practice. Such

movements are sustained by dialogical relations with theory. Therefore, they do not occur in improvisation but in action-reflection-action shared by "participants in social situations to improve the rationality and justice of their social or educational practices, as well as their understanding of these practices and the situations in which they take place" (Kemmis; Mctaggart, 1988, p. 9, translated by us).

In the dialogue between theory and practice, we organize our teaching actions in terms of the ascending spiral cycles (Figure 1): (re)planning, action, observation, and reflection.

Figure 1 - Action research cycles
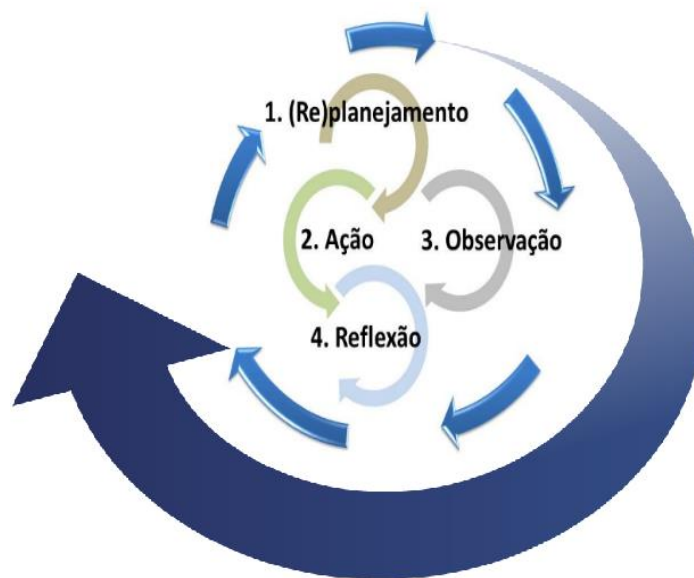
Source: Jacques (2017, p. 107).

In this context, we present the theoretical-practical teaching movements in each cycle of the action research developed (Chart 1).

Chart 1 - Theoretical-practical movements in each cycle

1) (re)planning - began with the organization of each curricular component, in the selection of resources and activities consistent with the OER movement. When we identified extreme situations, such as the absence of open teaching materials on the subjects of the units or distorted understandings about the culture of using materials with closed licenses, we replanned our practices.
2) action - focused on research and definition of materials, operationalization of resources and study activities in Moodle, defining tools such as: files, pages, web links, tasks, forums, wikis, glossaries and assessment laboratory. It included interaction with students, both in informative dialogic movements via messages and reflective in the feedback of study activities.

3) observation - permeated all planning and action movements. Observation records were recorded in different spaces and times: notes in digital files, audio sharing among teachers and teachers and their tutors about doubts, student questions and extreme situations experienced in the disciplines, records in doubt forums and Moodle discussion forums.
4) reflection – this was part of all the other cycles. In planning, reflective analysis of resources and activities was essential for decisions that were consistent with the OER movement and the dialogic perspective that we focused on throughout the disciplines. In action, we reflected on the extreme situations diagnosed and sought, in collaboration with students and tutors, possible viable solutions. Observation was present in planning and action, through which we reflected on limits, challenges and advances. In this reflective movement, we produced meanings for teaching practices and critically analyzed our work in integrating OER into teacher training.

Source: From the authors.

We argue that the integration of OER strengthens humanistic education and ethical-aesthetic experience, permeating the various curricular contents directed by public policies with the principles of democratization, appreciation of freedom, respect for differences, and the universal right to knowledge, culture, and education. In today's world, which is increasingly challenging due to the forces challenged by the presence of technologies and media interactions, teaching cannot avoid understanding the socio-technical framework and its humanitarian provocations. Therefore, as Alarcão (2001, p. 15, translated by us) argues, "the change that schools need is a paradigmatic change," which means "breaking the cages so that students can learn the art of flight. But for this to happen, the schools that prepare educators must be the experience of flight itself" (Alves, 2018b, p. 4, translated by us). In the action research contexts analyzed, this became possible through the creation of curricula and targeted content programs, as is the case with the discipline: Authorship and co-authorship of Open Educational Resources (OER) in educational practices.

Furthermore, curricular studies in subjects, as demonstrated by the curriculum of the subject: Information and Communication Technologies Applied to Education, when oriented towards a critical view of technologies in schools, are a fertile field for the production and (re)invention of teaching mediated by the practice of the five freedoms (5Rs) of OER.

Furthermore, in subjects where OER are not a specific curricular focus, their foundations, policies, and principles are directly related to the critical understanding of digital education, communication and network interaction, content, and digital platforms. This is the case of the subject: Introduction to Distance Education and its Technologies. In other words,

OER, permeating open concepts of knowledge production essential to teachers, includes knowledge about copyright, ethics, the Internet, websites, portals, repositories, digital inclusion, research systems, open licenses, data security, platformization, BigTechs, among others.

In the other curricular components, the knowledge and practices of production and (re)invention of teaching mediated by OER are transversalized as supplementary materials, guidelines, suggestions, tutorials, references to repositories, statements in study activities, and evaluation criteria. It is as in the example of the study activity for the subject: Public Policies and Educational Management, of the Specialization Course in Educational Management, in which, in the stages, the integralization of OER principles is described and indicated, such as the respect of authorship, the indication of sources and references, the indication of repositories for the research of open resources, and the insertion of the Creative Commons seal.

Therefore, based on these examples, it is clear that the production and (re)invention of teaching is constituted by the dialogical relations between existing knowledge and the unknown that permeate the fields of teaching. Thus, the gradual construction of TPF around these principles situates teacher training and practice as places of inquiry, (re)creation, autonomy, criticality, and emancipation. "The art of thinking is the bridge to the unknown. Therefore, as important as learning how to use existing tools, which can be learned mechanically, is the art of constructing new tools" (Alves, 2018a, p. 26, translated by us). In other words, pedagogical knowledge and practices of producing and adapting curricular content, parameterized by public policies, permeate the times and spaces of teaching and are constants of the teaching profession, that is, presupposed knowledge and actions.

In the realm of the unknown, there is an awakening of critical awareness of the arenas of contestation into which teaching is inserted: contests between understandings of teaching knowledge itself, considered fundamental to the profession; curricular contests that determine the place of each area of knowledge in educational processes; forces that operate evaluation policies and define, quantitatively and through standardized tests, the quality of education; contests between groups in both micro and macro politics that regulate teaching practice and emanate discourses of accountability and blame on teachers for the success or failure of education.

Such conflicts make the profession rigid, placing it within the framework of the mere reproduction of teaching or creative situations, sustained by the implementation of the prescriptions provided in the basic curricular documents, textbooks, mass-distributed manuals,

and the unbridled acquisition of proprietary platforms, software, and hardware. Critical awareness, in this context, consists of understanding the role and place that teaching occupies in a humanistic and emancipatory education that operates in the transformation of subjects for the subsequent transformation of the world. This requires an understanding of the social system in which the school is embedded and its impact on teaching practice, student performance, and management actions. Furthermore, it presupposes the evaluation of the technological infrastructure of school environments to recontextualize the prescriptions and materialize them according to the real needs of the social actors that constitute them.

This movement of recontextualization of the prescribed strengthens creative networks of curricular organization and adaptation of the content to be taught in the contexts of practices. Such acts are possible because the focus is on the authorship of OER as the basis of teaching practice, and, therefore, essential in teacher training. Integrating OER into training processes creates environments that are different in terms of assumptions, curricula, methodologies, technologies, assessment and aimed at problem-solving, action-reflection-action, and mobilizing the close theory-practice dynamic. As Nóvoa, Da Silva and Pilati (2022, p. 201-202, translated by us) argue:

> The transformation of schools essentially involves the creation of new educational environments [...] It is not worth waiting for major educational or curricular reforms. It is worth creating the conditions for schools and teachers to develop their projects and dynamics with autonomy, freedom and a sense of the future. [...] The best thing we can do is to give schools and teachers the autonomy and freedom to build distinct and diverse educational projects.

In this context, the construction of the TPF for the integration of OER, which aims to promote the production and (re)invention of teaching training and practice, is in line with the logic of transforming education, creating new environments with conditions for teachers to develop (co)authorship, collaboration in networks and citizen participation. In other words, it breaks with the instrumentalizing activities and technical training that incessantly maintain the naive logic centered on marketing tools for users/executors who do not understand the processes and functioning of software, hardware, and platforms. The central principle for transforming education is to transform knowledge and action, aligning them with the five freedoms of OER.

Therefore, the planning and action of teaching are not centered on the mere presentation of content but on the dialogic discursive action between teachers and students, whose knowledge production is constituted by the different social voices in the debate, that is, in oral,

written, and multimodal authorship processes. Teaching authorship requires the ethical-aesthetic design of teaching-learning situations of curricular content. The potential of OER in teacher education lies precisely in awakening the understanding that,

> on the Internet, we find educational resources in different formats, made available with open licenses and in closed format, requiring teachers to have the knowledge to find, differentiate and know how to use each resource" (Mazzardo; Nobre, 2020, p. 165, translated by us).

From this perspective, the repertoire of knowledge mediation includes, in addition to knowledge about the use of technological tools, knowledge that goes beyond instrumentalization and technicality. It presupposes an understanding of the "logic of creating the commons" (Veloso; Bonilla; Pretto, 2016, p. 45, translated by us), that is, the common good for all, the right to access knowledge, regardless of the condition of each subject in the world.

To materialize the provisions of the right to education, it is necessary to overcome the numerous barriers of inequality, which requires investments in access to basic and higher education, but above all, the permanence of students in these formative contexts and the successful completion of their studies. As Apple (2006) argues, knowledge is unequally distributed across social and economic classes. Some have access only to knowledge restricted to them according to their social, economic, and cultural position, while other groups have access to sophisticated repertoires, excellent infrastructures, and economically favorable study conditions.

In agreement with Belletat, Pimenta and Lima (2021, p. 5, translated by us), the urgency of "initial teacher training as a critical-reflective intellectual as a possibility of transgression" is defended. In other words, training processes that promote a militant, "emancipated and authoritative professionalization of basic education teachers" (Belletat; Pimenta; Lima, 2021, p. 5, translated by us), whose practices break down the barriers of inequality and promote social justice.

In this formative path, in all curricular components of this educational action research, planning, and development of study resources and activities were carried out in the Virtual Teaching-Learning Environment (VTLE), institutional Moodle, considering (Chart 2):

Chart 2 - Knowledge and skills developed in the curricular components of educational action research

1) knowledge about the universe of OER and its potential for curricular democratization in

Basic Education;
2) analysis of current public policies regarding prescribed discourses on the integration of OER in teacher training and in the Basic Education curriculum;
3) debate on teaching authorship as an act inherent to the profession and the basis for the critical, intellectual, autonomous and emancipatory construction of teaching;
4) creative contexts of teaching materials based on the principles of open authorship;
5) overcoming cultural practices, established in school environments, of appropriation and sharing of materials with closed licenses;
6) knowledge of copyright, use of third-party works and open licensing;
7) OER research practice in online repositories;
8) knowledge about the types of open licenses and their permissive actions;
9) knowledge about where and how to share OER, analyzing the licenses and terms of use of the repositories;
10) selection of OER according to the area of teaching activity, analyzing the rigor and scientific quality of the content of the selected OER;
11) assessment of the limits and possibilities of the OER selected to promote teaching and learning in the curricular component to which the resource is linked;
12) analysis of whether the selected OER was produced in ethical acts (does it present scientific rigor in relation to the content? does it comply with the principles of openness of OER?) and aesthetic acts (does it present the target audience? does it clearly describe its purpose and the pedagogical actions that can be developed when integrating them into the didactic plans?);
13) production of OER in accordance with the ethical-aesthetic principles of the cyclical opening movement: - choice of the OER theme, based on the curricular contents of Basic Education, in the teacher's area of activity; - definition of the textual genre (oral, written, multimodal) and the technologies necessary for the production of the OER; - consideration of the specificities of an educational resource, that is, with a linguistic repertoire, organization and didactic time suitable for teaching and learning; - presentation of the detailed description of the resource, with information on the license of use, target audience, year and stage of Basic Education for which it is intended and possible dialogues with other areas of knowledge; - characteristic of openness, mainly, with regard to freedom of adaptation; - composition of the OER with materials whose licenses are consistent with the license adopted in the final product. That is, to be an OER, all the elements (videos, images, audios, texts, among the different textual genres) that constitute it, in form and content, must comply with the principles of openness.
14) development of TPF based on selection, integration, co-authorship and sharing of OER.

Source: From the authors.

In this spiral, cyclical organization, action research permeated the observation, (re)planning, action, and reflection of our own practices as teachers training other teachers. We committed ourselves to rethinking and reinventing training based on our own work in each curricular component, considering that "if teachers occupy a central position in educational reforms (at least in terms of official discourses), teacher educators would consequently be the pillars of new educational reforms" (Mizukami, 2005, p. 6, translated by us).

Throughout 2022 and 2023, in addition to integrating OER into the teaching of content inherent to the subject programs, students were included in the universe of research on OER, identification, analysis, authorship, and sharing in repositories. Teaching-learning situations were created that would allow overcoming the main difficulties of teachers (already trained or in training): understanding the differences between resources available online and OER, as argued by Mazzardo and Nobre (2020). "The lack of

knowledge about copyright and open licenses leads to the mistake of considering what is available online as having permission to copy, redistribute, and create derivative works" (Mazzardo; Nobre, 2020, p. 177, translated by us).

The study activities in the different curricular components included the research, identification, selection, evaluation, and authorship of OER, strengthening the improvement of TPF. This is because "when we act on an educational resource, we build and acquire FTP in its integration in different teaching-learning situations" (Schneider et al., 2020, p. 93, translated by us). This presupposes a set of knowledge and practices of teaching: a) scientific-technological knowledge; b) understanding of the foundations of education; c) knowledge of the basic education curriculum in its different stages; d) study and critical analysis of curricular policies - their contexts of influence, production, and practice; e) understanding of democratic movements in school and classroom management; f) understanding of the social, economic and cultural contexts that permeate the school community and are reflected within its walls; g) understanding of the space-time of curriculum; f) understanding of the social, economic and cultural contexts that permeate the school community and are reflected within the school walls; g) understanding of the space-time of curricular theories and practices for the humanistic and emancipatory formation of subjects; h) understanding of education as a place of salvation and social construction.

However, the knowledge required for teaching - as a place of ethical-aesthetic creation - is not static, nor is it located or transferred. Rather, it is produced in the dialectic between theory and practice, in the interlocution of the different voices that constitute the discursive webs of teaching, and in the recontextualization and reinvention of pedagogical practices. As Tardif (2000, p. 7, translated by us) states, "professional knowledge, both in its theoretical foundations and practical consequences, is evolutionary and progressive and therefore requires continuous and ongoing training. Therefore, it requires a constant movement of updating, since "professional knowledge shares with scientific and technical knowledge the property of being revisable, criticizable and capable of improvement" (Tardif, 2000, p. 7, translated by us).

Thus, the training environments that are the focus of this analysis have promoted knowledge and actions related to the cyclical and democratic movement of OER, promoting TPF as a critical-reflective exercise necessary for the contexts of the open world and the ethical-aesthetic experience as a humanistic formation. Because of this, it is argued that the integration of OER is a way for teaching training and practice to assert themselves as sites of production,

autonomy, authorship, and (re)invention, demarcating criticality and democratic imperatives in the face of the neoliberal impulses of public policies that exalt competitiveness and entrepreneurship.

4. TEACHING KNOWLEDGE AND SKILLS: FINAL CONSIDERATIONS

The discursive webs woven throughout this aesthetic object intertwine notions of the production and (re)invention of teaching training and practice mediated by Open Educational Resources (OER). Investing in technological-pedagogical fluency (TPF) around the core knowledge of open education and OER produces and reinvents teaching training and practice to the extent that it enhances: a) (co-)authorship; b) research; c) curation of teaching materials; d) sharing of good practices; e) collaborative networks; f) interdisciplinarity; g) inclusion; h) the exercise of didactic transposition in planning, selecting, proposing, and evaluating content and learning activities. The culture of indiscriminate use and reproduction of teaching materials with closed property rights, disseminated in schools by commercial publishers, can be problematized by creating spaces-times for investigative, creative, innovative, and critical-emancipatory teaching.

Thus, the argument focused on improving the TPF around the five freedoms (5Rs) of OER to gradually strengthen and promote the transcendence of naive conceptions/consciousness towards a critical-emancipatory consciousness around knowledge, both pedagogical and technological. In the examples of curricular content, materials, and study activities of the highlighted disciplines and courses, numerous training possibilities have been explained, from higher education onwards, demarcating promising territories in teaching practices in basic education. Teachers, in developing the TPF around the five freedoms of OER through research and curation of copies licensed for reuse, revision, remixing, and re-sharing, produce and reinvent their training and practice as a cyclical action-reflection-action.

Among the recognizable and innumerable knowledge and practices of teacher training and practice, it has been clarified that there is an urgent need to study, experience, understand, and produce pedagogical knowledge in societies increasingly permeated by technology, problematizing the mercantilist and technocratic motto also imposed by public policies. In line with critical-emancipatory and humanistic educational concepts, educational institutions cannot

avoid the real debate on the production of humanity mediated by scientific-technological creations. In this sense, the development of the TPF regarding the foundations, principles, and rules of democratizing access to knowledge, civic participation, and ethical aesthetic experiences of OER emerges as the amalgam of critical-emancipatory practice for the social recognition of education.

Therefore, producing and reinventing teaching presupposes TPF as knowledge about the integration of networked technologies, including the challenges and potentials of OER. This means that teachers need to develop TPF to critically analyze, evaluate, and understand technologies, their developments, impacts, and derivations. By challenging university students - teachers in training - to theoretically understand and practice the five freedoms of OER, the critical-reflective exercise necessary for the contexts of the open world, of ethical-aesthetic experience as humanistic education is promoted.

In this context, the integration of OER in teacher training is an act that responds to the ethical-aesthetic commitment to universalizing access to knowledge. This is because, in the same precepts of Open Education, OER follow the paths of participatory network culture, the promotion of teacher authorship, the (re)distribution of resources, and the recontextualization of pedagogical practices shared among peers. It is, therefore, necessary to focus on the curricular (re)organization of teacher training processes, encouraging the integration of OER in the development of content and its authorship as a principle of teaching in Basic Education. To this end, the fundamental concepts of OER, their freedoms, and the development of FTP are essential theoretical-practical foundations in the repertoire of teaching knowledge and practices to move towards critical-emancipatory teacher professionalization.

REFERENCES

ALARCÃO, I. **Escola reflexiva e nova racionalidade**. Porto Alegre: Artmed Editora, 2001.

ALVES, R. **Lições do velho professor** [livro eletrônico]. Campinas, SP: Papirus, 2018b. Available at: https://elivros.love/ler-online/baixar-livro-licoes-do-velho-professor-rubem-alves-em-epub-pdf-mobi-ou-ler-online#epubcfi(/6/6[titulo.xhtml]!/4/2/1:0). Accessed on: Jan. 15, 2024.

ALVES, R. **A educação dos sentidos**: conversas sobre a aprendizagem e a vida. São Paulo: Planeta do Brasil, 2018a.

APPLE, M. **Ideologia e currículo**. Porto Alegre: Artmed, 2006.

BAKHTIN, M. **Para uma filosofia do ato responsável**. Título original: K filosoffi postupka (1920). [Tradução aos cuidados de Valdemir Miotello e Carlos Alberto Faraco]. São Carlos: Pedro & João Editores, 2010.

BAKHTIN, M. **Estética da criação verbal**. Trad. do Russo por Paulo Bezerra. 6ª ed. São Paulo: Editora WMF Martins Fontes, 2011.

BAKHTIN, M.; VOLOCHÍNOV, V. N. **Marxismo e filosofia da linguagem** (1929). São Paulo: Editora Hucitec, 2006.

BELLETATI, V. C. F.; PIMENTA, S. G.; LIMA, V. B. B. Formar professores intelectuais crítico-reflexivos nos cursos de licenciatura apesar das diretrizes nacionais: transgressões possíveis. **Nuances: Estudos sobre Educação**, Presidente Prudente, v. 32, p. e021026, jan./dez. 2021. Available at: https://revista.fct.unesp.br/index.php/Nuances/article/view/8706. Accessed on: Dec. 18, 2024.

BLESSINGER, P.; BLISS, T. J. Introduction to open education: Towards a human rights heory. 2016. In: P. BLESSINGER, P.; BLISS, T. J. (Orgs). **Open Education**: **International Perspectives in Higher Education**. Cambridge, UK: Open Book Publishers. Available at: https://www.jstor.org/stable/j.ctt1sq5v9n. Accessed on: Jan. 20, 2024.

BONK, C. J. **The world is open**: how web technology is revolutionizing education. San Francisco: Jossey-Bass, 2009.

BRUNS, A. **Blogs, Wikipedia, Second Life, and beyond**: From production to produsage. New York: Peter Lang, 2008.

CASTELLS, M. **A sociedade em rede**. A era da informação: economia, sociedade e cultura. São Paulo: Paz e Terra, 1999.

DA SILVA, A. T.; TOMIO, D. Práticas inovadoras de formação continuada docente e o lugar das tecnologias. **Revista da FAEEBA - Educação e Contemporaneidade**, Salvador, v. 32, n. 69, p. 203-222, jan./mar. 2023. Available at: https://www.revistas.uneb.br/index.php/faeeba/article/view/11618/. Accessed on: Jan. 20, 2024.

FREIRE, P. **Pedagogia do Oprimido**. 12 ed. Rio de Janeiro: Paz e Terra, 1983.

FREIRE, P. **Pedagogia da autonomia**: saberes necessários à prática educativa. São Paulo: Paz e Terra, 1996.

FREIRE, P. **Pedagogia da autonomia**: saberes necessários à prática educativa. 52 ed. Rio de Janeiro: Paz e Terra, 2015.

GONSALES, P.; LIMA, S. H. B. **Educação em um cenário de plataformização e de economia dos dados:** problemas e conceitos. Núcleo de Informação e coordenação do Ponto BR. - São Paulo, SP: Comitê Gestor da Internet no Brasil, 2022.

HEINSFELD, B. D.; PISCHETOLA, M. O discurso sobre tecnologias nas políticas públicas

em educação. **Educação e Pesquisa**, v. 45, p. e205167, 2019. Available at: https://www.revistas.usp.br/ep/article/view/162682. Accessed on: Jan. 13, 2024.

KAFAI, Y. et al. Being Fluent with Information Technology. Washington, DC: The National Academies Press. 1999. Available at: https://nap.nationalacademies.org/catalog/6482/being-fluent-with-information-technology. Accessed on: Dec. 18, 2024.

KEMMIS, S.; MCTAGGART, R. **Cómo planificar la investigación-acción**. Barcelona: Editorial Laertes, 1988.

LARROSA, J. **Pedagogia profana**: danças, piruetas e mascaradas. Belo Horizonte: Autêntica, 2003, 4 ed.

LATOUR, B.. **Jamais fomos modernos**: ensaio de antropologia simétrica. Rio de Janeiro: Editora 34, 1994.

LATOUR, B. **A vida em Laboratório**. São Paulo: Relumé-Dumará, 1999.

LATOUR, B. **Ciência em ação**: como seguir cientistas e engenheiros sociedade afora. São Paulo, UNESP, 2000.

LATOUR, B. A **Esperança de Pandora**: ensaios sobre a realidade dos estudos científicos. Bauru, SP: EDUSC, 2001.

MALLMANN, E. M.; SCHNEIDER, D. da R. Políticas públicas, tecnologias educacionais e Recursos Educacionais Abertos (REA). **Revista Ibero-Americana de Estudos em Educação**, Araraquara, v. 16, n. esp2, p. 1113–1130, 2021. Available at: https://periodicos.fclar.unesp.br/iberoamericana/article/view/15118. Accessed on: Oct. 18, 2024.

MALLMANN, E. M. A Vulgarização da Inovação nas Políticas Públicas e a Hegemonia Proprietária na Plataformização da Educação Pública. **Paradigma**, v. 44, n. 5, 2023a. 542–568. Available at: https://revistaparadigma.com.br/index.php/paradigma/article/view/1516. Accessed on: Oc. 18, 2024.

MALLMANN, E. M. CONJECTURAS TECNOLÓGICAS E FORMATIVAS NAS POLÍTICAS PÚBLICAS EDUCACIONAIS**. Revista Inter-Ação**, Goiânia, v. 48, n. 2, p. 562–582, 2023. Available at: https://revistas.ufg.br/interacao/article/view/74994. Accessed on: Oct. 18, 2024.

MAZZARDO, M.; NOBRE, A. Recursos Educacionais Abertos e as novas formas de produção de material didático. In: MALLMANN, E. M.; JACQUES, J. S. (Org.); REGINATTO, A. (Org.); ALBERTI, T. F. (Orgs.). **REA: teoria e prática**. 1. ed. São Paulo: Pimenta Cultural, 2020. v. 1. 292p. Available at: https://www.pimentacultural.com/livro/rea/. Accessed on: Oct. 18, 2024.

MIZUKAMI, M. da G. N. Aprendizagem da docência: professores formadores. **Revista E-Curriculum**, São Paulo, v. 1, n. 1, p. 1-17, dez. - jul. 2005-2006. Available at: https://revistas.pucsp.br/index.php/curriculum/article/view/3106. Accessed on: Jan. 15, 2024.

NÓVOA, A.; DA SILVA, D. M. S.; PILATI, E. Espaços de formação e prática docente:

entrevista com António Nóvoa. **Em Aberto**. Brasília, v. 35, n. 115, p. 201-206, set./dez, 2022. Available at: http://rbep.inep.gov.br/ojs3/index.php/emaberto/article/view/5414. Accessed on: Jan. 15, 2024.

O'REILLY, T. **What is Web 2.0**: Design patterns and business models for the next generation of software. 2005. Available at: https://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html. Accessed on: Jan. 16, 2024.

OLIVEIRA, D. V.; MOURA, C. de O. S. de. Os desejos pedagógicos do professor na condução do seu fluir tecnológico no Ensino de Ciências. **EmRede - Revista De Educação a Distância**, v. 11, 2024. Available at: https://www.aunirede.org.br/revista/index.php/emrede/article/view/1011. Accessed on: Oct. 10, 2024.

PRETTO, N. L.; SILVEIRA, S.A. (Orgs). **Além das redes de colaboração**: internet, diversidade cultural e tecnologias do poder. Salvador: EDUFBA, 2008.

RIVAS, A. **The Platformization of Education**: A framework to Map the New Directions of Hybrid Education Systems. UNESCO International Bureau of Education, 2021.

SCHNEIDER, D. da R.; MALLMANN, E. M; SCHRAIBER, R. T. Performance pedagógica do tutor na produção de Recursos Educacionais Abertos: reflexões a partir de um curso de formação de professores. In: MALLMANN, E. M.; JACQUES, J. S. (Org.); REGINATTO, A. (Org.); ALBERTI, T. F. (Orgs.). **REA**: **teoria e prática**. 1. ed. São Paulo: Pimenta Cultural, 2020. v. 1. 292p. Available at: https://www.pimentacultural.com/livro/rea/. Accessed on: Oct. 18, 2024.

TARDIF, M. Saberes profissionais dos professores e conhecimentos universitários: elementos para uma epistemologia da prática profissional dos professores e suas consequências em relação à formação para o magistério. **Rev. Bras. Educ.**, Rio de Janeiro, n. 13, p. 5-24, 2000. Available at: http://educa.fcc.org.br/scielo.php?pid=s1413-24782000000100002&script=sci_abstract. Accessed on: Dec. 18, 2024.

UNESCO. **Declaração REA de Paris**. Paris. 2012. Available at: http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/Portuguese_Paris_OER_Declaration.pdf. Accessed on: Jan. 28, 2024.

UNESCO. **Recommendation on Open Educational Resources (OER)**. 40th session. Paris, nov. 2019. Available at: http://portal.unesco.org/en/ev.php-URL_ID=49556&URL_DO=DO_TOPIC&URL_SECTION=201.html. Accessed on: Jan. 28, 2024.

VELOSO, M. M. S. de A.; BONILLA, M. H. S.; PRETTO, N. de L. A cultura da liberdade de criação e o cerceamento tecnológico e normativo: potencialidades para a autoria na educação. **ETD - Educ.Temat. Digit**. Campinas, SP, v.18, n. 1, p. 43-59, jan./abr. 2016.

VIEIRA PINTO, Á. **O conceito de Tecnologia**. Rio de Janeiro: Contraponto, 2005. Vol. II.

WILLEY, D. **The access compromise and the 5th R**. 2014. Available at:

https://opencontent.org/blog/archives/3221. Accessed on: Jan. 30, 2024.