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ENGINEERING AND TRAINING OF ADULT TEACHERS: NOTIONS IN JEAN-MARIE BARBIER[1]

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ABSTRACT: This theoretical-reflective study aimed to contextualize educational engineering, based on Jean-Marie Barbier's theoretical notions, with the training of adult teachers. Thus, the text clarifies the notion of engineering training, considering the design and evaluation of educational interventions in the workplace and adults' social life aiming for learning; describes educational intervention as the articulation of two cultures that do not intercross (engineering and pedagogy), but that become interconnected by a third one, the training culture; and illustrates the engineering training cycle in four phases. In all these moments, we contextualize the author's theoretical approaches regarding the training of adult teachers. Among the identified interfaces, the training culture stands out, as it reinforces two essential aspects of the teacher training process: the conception (by themselves and by trainers) of this subject as an adult who has life and professional experiences and the perspective of school as a privileged educational space for their training and professionalization (with no distinction between them). Therefore, our reflection adds value to the current thought on adult teacher training, focusing on the culture of training and transformation, aiming at teachers' continuous development and strengthening teacher professionalization in the current social, professional, and political fights.

Keywords: educational engineering, teachers' education, education of adult teachers, teacher professionalization.

ENGENHARIA E FORMAÇÃO DE ADULTOS PROFESSORES: NOÇÕES EM JEAN-MARIE BARBIER

RESUMO: Este estudo de caráter teórico-reflexivo tem por objetivo contextualizar a engenharia em formação, a partir das noções de Jean-Marie Barbier, na perspectiva da formação de adultos professores. Desse modo, clarifica a noção de engenharia em formação, considerada a concepção e a avaliação de intervenções educativas nos espaços-tempos do trabalho e da vida social de adultos, visando aprendizagens; descreve a intervenção educativa como a articulação de duas culturas que não se cruzam (engenharia e pedagogia), mas que passam a ser interconectadas por uma terceira, a cultura da formação; e ilustra o ciclo da engenharia em formação em quatro fases. Em todos esses momentos, são empreendidos movimentos de contextualização das abordagens do autor com a formação de professores enquanto adultos. Das interfaces identificadas, destaca-se a cultura da formação, por reforçar dois aspectos essenciais para o processo formativo docente: a concepção (por si e pelos formadores) desse sujeito como pessoa adulta, ativa e protagonista, com experiências de vida e profissão; e a perspectiva da escola como espaço educativo privilegiado para sua formação e profissionalização (sem distinções entre estas). Portanto, esta reflexão agrega valor ao pensamento atual no campo da formação do adulto professor com foco na cultura de (trans)formação, visando o desenvolvimento contínuo de professores e o fortalecimento da profissionalização docente no embate socioprofissional e político contemporâneo.

Palavras-chave: engenharia em formação, formação de professores, formação do adulto professor, profissionalização docente.

INGENIERÍA Y FORMACIÓN DE ADULTOS PROFESORES: NOCIONES EN JEAN-MARIE BARBIER

RESUMEN: Este estudio de carácter teórico-reflexivo tuvo como objetivo contextualizar la ingeniería en formación con la formación de profesores adultos, a partir de las nociones de Jean-Marie Barbier. De esta forma, aclara la noción de ingeniería en formación, considerada la concepción y evaluación de intervenciones educativas en los espacios-tiempo del trabajo y de la vida social de los adultos con el objetivo de proporcionar aprendizaje; describe la intervención educativa como la articulación de dos culturas que no se cruzan (la ingeniería y la pedagogía), pero que se complementan con una tercera, la cultura de la formación; e ilustra el ciclo de ingeniería en formación en cuatro fases. En todos estos momentos se emprendieron movimientos de contextualización de los planteamientos teóricos del autor con la formación de profesores adultos. De las interfaces identificadas, se destaca la cultura de la formación, ya que refuerza dos aspectos esenciales para el proceso de formación docente, la concepción (por si mismos y por los formadores) de este sujeto como una persona adulta, activa y protagonista que tiene experiencias de vida y profesión, y la perspectiva de la escuela como espacio educativo privilegiado para su formación y profesionalización (sin distinción entre ellas). Por lo tanto, agrega valor al pensamiento actual en el campo de formación del adulto profesor, centrándose en la cultura de (trans)formación, visando el desarrollo continuo de los docentes y el fortalecimiento de la profesionalización docente en el conflicto socio-profesional y político contemporáneo.

Palabras clave: ingeniería en formación, formación de profesores, formación del adulto profesor, profesionalización docente.

INTRODUCTION

At the end of the 20th century, in Western countries, professional movements seek to renew the epistemological foundations of the teaching profession (Nóvoa, 1992; Tardif, 2012, 2013), establishing teaching as a job and establishing a professional statute. In this way, efforts are concentrated on developing and implementing the main characteristics of professional knowledge in practice and teacher training.

In Brazil, the trajectory of the constitution of the teaching profession is highlighted by discursive and sociopolitical attacks. According to Ferreira Jr. and Bittar (2006), during the years of authoritarianism of the military dictatorship, rapid and profound transformations led to the proletarianization of teachers, a crisis of identity, and training aligeiradas with serious cultural consequences in the field of degrees.

With re-democratization, educational paths were redirected by the Federal Constitution of 1988, establishing a vision of teachers as professionals to be hired through public competition (Weber, 2003). In 1996, with the approval of the National Education Guidelines and Bases Law 9,394/96 (Brazil, 1996), higher education education became one of the important requirements for the professional practice of teaching in basic education.

The tensions surrounding teaching did not disappear after the dictatorship. Despite advances in public policies, conflicts lasted for many years until the regulation of essential aspects of the profession, such as the establishment of a national salary base for public teaching professionals in basic education, which only occurred in 2008 (Brasil, 2008). However, after thirty years, other battles remain alive and necessary. The history of the teaching profession makes it appear that teachers are constantly fighting against subordination and in favor of regulating the profession (Dias; Gabriel, 2021).

In recent years, a series of national curricular reformulations have demonstrated attacks to invalidate acquired achievements. The Common National Base for the Initial Training of Basic Education Teachers (BNC-Formação-*Base Nacional Comum para a Formação Inicial de Professores da Educação Básica*), based on the assumptions of skills development and established by Resolution CNE/CP nº 2 of December 20, 2019 (Brazil, 2019), materializes signs of setbacks. In this document, contradictory discourses about the constitution of teaching as a profession are visualized (Dias; Gabriel, 2021), and, once again, the representative meanings of professionalization and teacher training are in disputed territory.

Teacher training is at the core of discussions about definitions and decisions related to teacher professionalization. For more than three decades, Jean-Marie Barbier[2] has worked and developed studies considering and intersecting these two categories: adult training and professionalization. For the scholar, the spaces-times of work/profession are endowed with meanings for the actors involved in them, which enables training devices related to these contexts (Barbier, 2013). In this way, through decontextualization-recontextualization movements, it is possible to correlate the scholar's theoretical approaches with the training of adult teachers.

In the book *Training of Adults and Professionals: Trends and Challenges*, Barbier (2013) dedicates the fourth chapter to the development of the relationships between engineering and training, emerging

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the notion of "engineering in training", a set of actions and tasks that design and evaluate educational interventions constructed for the specificities of a situation. Applying this concept to Education, the author reinforces that the purpose of organized and interventional activities is the emergence of new learning by adults.

Given the above, we aim to contextualize engineering in training based on Barbier's theoretical notions, from the perspective of adult teacher training. In days of threats to society's democratic projects, weakening of public space, and criticism of the training, productive and creative potential of public schools and universities (Dias; Gabriel, 2021; Nóvoa, 2019), it is strategically viable and powerful to nurture notions and training practices focused on the culture of (trans)formation, aiming at the continuous development of teachers and the strengthening of teaching professionalization in the socio-professional and political clash.

The study has a theoretical-reflective nature, guided by Gonzáles Rey (2010) on the production of theory in the articulation of different categories and with the capacity to generate intelligibility about what is intended to be known in the research. Therefore, it is a significant contribution that adds value to current thinking in the field of adult teacher training, having been mobilized by the participation of its authors in the discipline "Special Topics in Education I – Youth and Adult Education", in the Doctorate course in Education from the Postgraduate Program in Education (PPGEd) at the Federal University of Piauí (UFPI), and through discussions on the subject of education for young people and adults at the Interdisciplinary Center for Research in Curricular Practices and Professional Training of Education (NIPPC), also from UFPI.

Therefore, in addition to this introduction, the text shows initial notions about engineering in training, based on Barbier (2013), and weaves the first contextualizations with the training of adult teachers. Then, educational intervention is described as an articulation of cultures that do not intersect (engineering and pedagogy), but which become interconnected by a third one, the culture of training. In this opportunity, the educational intervention is related to the training of adult teachers. The subsequent section discusses the engineering cycle in training in four phases and its interfaces with the training of adult teachers. In the end, final considerations are made by the authors regarding the object of study.

INITIAL NOTIONS ABOUT ENGINEERING IN TRAINING AND TRAINING OF ADULT TEACHERS

Understanding engineering in training has as its starting point the two categories that make up the term: engineering and training. Therefore, based on Barbier (2013), these categories will be initially addressed in their particularities. However, as they are explained, they unfold into other relevant key concepts, which, when articulated, result in the clarification of the notion of engineering training.

The meaning of engineering applied to the field of adult training needs to be clarified, as it is not always clear, resulting in confusing interpretations. In this way, engineering is understood as the set of activities that design and evaluate interventions in a specific situation, to achieve a certain result. In this case, the interventions consist of operations, devices, programs, or systems organized neatly around the aforementioned specificities.

Training is an intentional intervention on learning and identity constructions, making it possible to classify it into three types of actions: a) certifying and qualifying action, which expresses the

adult's qualification to exercise a given profession before their admission into the profession; b) professional and social development action, which contributes to the improvement of practices after occupying a professional position; and c) insertion action, which organizes professional training activities in the targeted/possible spaces of activity.

The idea of intervention is observed, at the same time, in the understanding of engineering and training. Therefore, the articulation of these perceptions results in the conception of educational intervention, understood as the organization of activities organized around the intention of provoking/promoting learning. In this sense, learning is understood as a change in patterns, routines, or habits in people's activities, valued by themselves and/or their social environment. In this context, the professional space is a prominent social environment in the training and professionalization of adults.

Given this, the notion of engineering in training is interpreted as the conception and evaluation of educational interventions in the space-times of social life and work, aiming at learning. It is the articulation of two cultures (engineering and pedagogy) that do not necessarily intersect, but that have had their oppositions relativized over time and through the implementation of the training culture to its principles.

Along these lines, designing and evaluating interventions require knowledge of the cultures of educational actions since each one, in its way, constitutes different intellectual contexts for engineering activities. Box 1 organizes and summarizes the characteristics of the three cultures presented by Barbier (2013) and also correlates them with the corresponding type of engineering in adult training.

Box 1 – Cultures of educational actions

-	Teaching culture	Training Culture	Skills development culture
Central reference in the design of educational intervention	Notion of knowledge	Notion of capacity (knowledge, know-how, and know-to-be)	Notion of skills
Definition of learning	Around the domain of knowledge	Around the construction of new capabilities applicable to situations at work and in social life	Around the production of goods/services and the development of skills invested in it
Dominant intention of the educational intervention	Transmission of knowledge by the teacher	Organization of learning situations by the trainer	Transformation of the action and the actor accompanied by a tutor, coach, or other type of companion
Space-time of educational intervention	Organized by communication logic, face-to-face and/or distance learning	Organized as an educational space in the production of skills transferable to situations other than training itself	Organized in real actions of the subject, in work situations
Target audience representation	Students predisposed to the appropriation of knowledge	Active subject in training, self-educating	Practical, operated, and eventually reflective professionals
Type of correlated engineering	Didactic engineering	Training engineering	Engineering professionalization or skills development

Source: Created by the authors based on Barbier (2013).

Teaching culture is commonly applied in school and university education systems, corresponding to didactic engineering practices in course planning, didactic sequences/scripts, and educational software, among other possibilities that focus on representation (by the teacher) and appropriation (by the student) of knowledge.

Meanwhile, the culture of skills development is implicated in the job market and refers to the process of continuous transformation of individual and/or collective skills and, consequently, activities that can be measured based on the performances (of the target audience) observed (by companions) in practices. This culture culminates in the engineering of professionalization, or the development of skills, expressed in the development of professionalization trajectories, organization of work activities, learning paths, and similar actions.

The culture of training is of interest to engineering in training, as its focus is the subject in training and the situations in which he/she finds himself/herself, establishing explicit connections between the space-time of educational interventions and the environment of the adult's professional activity, which provides the formation of meanings by/for the actors involved, making it meaningful. Therefore, the activities organized (by the trainer) seek to transform capabilities (of the subjects in training) that, based on decontextualization-recontextualization movements, can be used in situations different from the training situation, whether at work or in social life.

Given this perspective, the starting point for adult training in engineering training is, in addition to the individual, the work/profession environment, making it a context of training and professionalization. In educational interventions, the life story previously constructed by the subject is still considered, capable of mobilizing engagement and the production of meanings by those involved.

Having presented the basic notions about engineering in training, in Barbier (2013), we then contextualize these concepts by relating them to the training of adult teachers. Roughly speaking, it could be said that engineering in training, from the perspective of this text, would be the conception and evaluation of educational interventions, that is the organization of activities organized around the intention of provoking/promoting teacher learning. This understanding would not be wrong, but it would culminate in a simplistic perception. Therefore, a reflection is developed subsidized by movements of decontextualization-recontextualization, in which the theoretical approach initially assumed here had assumptions extracted from its context of origin (adult education in general) to later be contextualized with the field/object of specific study (training of adult teachers).

Commonly, the teacher training process is divided into two: initial and continued. Approaching the ideas of Barbier (2013), initial training can be thought of as a qualifying and certifying action, in which the sets of knowledge necessary to exercise a profession are pre-established. In this area, the clashes surrounding BNC-Formação (Brazil, 2019) are currently found, regarding the curricular guidelines that evoke development through skills, further distancing the training trajectories from a training culture, since it becomes imperative the development of skills translated into professional knowledge, practice, and engagement.

The discussions that permeate the conceptualization of skills linked to the teaching image are historical, permanent, and broad, covering social, political, cultural, and educational dimensions, but on many occasions, contradict educational assumptions and the complex and dynamic nature of the profession (Bastos; Boscarioli, 2021). For this reason, the approach to skill-based learning in teacher training is not popular and, according to Dias and Gabriel (2021), it is still permeated with instrumentalist, individualist, and market logic.

Insertion actions (Barbier, 2013) can be associated with initial training. In the context of teacher training, they can be interpreted as supervised internships, teaching initiation programs, teaching or pedagogical residencies, among other professional training activities in the targeted/possible areas of activity. For Nóvoa (2019), these moments, despite lacking review, studies, and strengthening practices, are significant in the process of becoming a teacher, as they are found in the transition between the end of training and the beginning of the profession. However, the author goes further: he proposes the creation of a third institutional place for teacher training within universities, "a common home for training and the profession".

Regarding continuing education, this is similar to professional and social development actions (Barbier, 2013), being the most common engineering environments in adult training. In the current Brazilian scenario, continuing education can be seen at a high level in the structuring of educational interventions mobilized by the culture of training since teachers are already practicing their profession, located in a privileged space for the development of both training and profession (Bernardo; Vasconcellos, 2021; Garcia, 1992; Nóvoa, 1992, 2019).

Engineering in training is based on this principle: work and social environments as educational spaces-times. Applying to teacher training, the challenge is to conceive the school as an educational space, where working and training are not distinct activities (Nóvoa, 1992). In this way, bridges must be established between the university and schools to "[...] think of the undergraduate course as a progressive process of acquiring a professional dimension [...]" (Nóvoa, 2019, p. 201) and include basic education teachers in the learning and professional socialization process.

From another perspective of the initial notions and correlated with the present object of study, Passeggi (2016) highlights the need to raise questions, until then little spoken, about the conception of the subject that guides what has been called training. The author emphasizes that little is still known about the training of teachers as adults in training. This can be justified based on what, on another occasion, Barbier (2012) clarified: despite traditionally being for adults, teacher training is concentrated in the educational system, in which teaching cultures that privilege actions qualifiers and certifiers, a social function different from what is applied to adults and that generally has the improvement and construction of new capabilities as its main purposes.

In this sense, by having the active subject and the work and social environments as the principle of educational interventions, notions of engineering in training are visualized with potential contributions to recognizing and conceiving the teacher as an adult in training, a person with experience and capacity to reflect on themselves and equipped with narratives about the school. In this scenario, the educational intervention can be presented as the encounter between subjects and situations – predominantly linked to their life stories –, capable of mobilizing engagement and meanings by those involved. This is a must among theorists in the areas of teacher training and adult education (Freire, 1996; Garcia, 1992; Nóvoa, 1992, 2019; Passeggi, 2016).

EDUCATIONAL INTERVENTION: ARTICULATING CULTURES

Engineering in training, as a structuring of actions, devices, and learning opportunities for adults, manifests through the design and evaluation of educational intervention. This is the articulation of two different cultures that do not intersect: engineering and pedagogy. The first is represented by the

engineer, who works in the world of machines and follows parameters of rationality and Cartesian logic, using sciences considered hard, exact, or natural. The second is represented by the pedagogue, a professional who works in the human world and all its nuances, considering different rationalities and logic, using human and social sciences (Barbier, 2013). Thus, the question arises: how do cultures belonging to two distinct worlds interconnect for the design and evaluation of educational intervention?

Therefore, a third culture is visualized that articulates engineering and pedagogy: the culture of training, represented by the subjects of training inserted in the social and work world and by the exercise of decontextualization-recontextualization of their experiences, which seeks the logic of transformation.

In this sense, engineering in training appropriates the knowledge of these areas and the knowledge of the subjects to construct learning opportunities. From engineering, we extract the perspectives of tailored demand, the completeness of a project for specific purposes, the intellectuality of the actions of conceiving and evaluating (designing) a work, and the rationalization of activities concerning a given situation. When contextualized with the training of adult teachers, these perspectives can be confused with the dimension of technical rationality.

Due to its association with traditional teaching and banking education, technical rationality is obscure in the field of teacher training and considered as opposed to the development of a reflective praxis (Nóvoa, 1992), as it summarizes an uncritical and reproductivist stance. Logically, it is not acceptable to remain merely at the instrumental level but it is believed that it is not viable to completely abandon scientific theories and techniques. Contreras (2002), who outlines a powerful critique of technical rationality, elucidates the professionalization of teaching also constituted by the technical domain understood as teaching knowledge. Thus, the path is to establish or provide critical relationships between technical and specialized knowledge with the knowledge of reflective practices.

Therefore, using engineering notions intertwined with educational intervention concerns the necessary knowledge about needs assessment, definition of objectives, planning/elaboration of projects, and evaluation of results, without neglecting the conception of the subject of training (the adult teacher) with its complexities, dynamics, experiences, and values. This is how educational space-times for the production of new knowledge (knowledge, know-how, and know-to-be) can be constructed by the apprentice in training and transferable to situations other than the training. From this perspective, it is similar to the methodical rigor formulated by the pedagogy of autonomy, in which the student becomes the real subject of the construction and reconstruction of the knowledge taught (Freire, 1996) to carry out reinterpretations of what has been learned and apply them in other realities and in the worlds to which it belongs.

From pedagogy and its culture, engineering in training adopts the educational foundations of teaching-learning and is related to the constitution of one's being and identity. This aspect is what differentiates it from other types of engineering, as the focus/object/result of its intervention is learning; thus, it adds an educational nature. Pedagogy brings the critical reflexivity necessary for its articulation with engineering, since, as a science of education, its purpose is the reflective and transformative clarification of educational action, discussing the possible mediations between theory and practice (Franco, 2003), making a trajectory from technical rationality to critical, reflective, emancipatory and formative practical rationality.

Nóvoa (1992) already stated the need to think about teacher training based on a fundamental reflection on the teaching profession. Given this perspective, when considering the space of the

profession as a privileged locus for the training and professionalization of adults, engineering in training opens up spaces for the resumption of the school institution as an environment of participated, collective, continuous, contextualized, thought-out (self)training based on the needs of teachers, sponsored by school management projects and, mainly, implemented in the relationship with students.

From the perspective of the notions of pedagogy intertwined with educational intervention, its applications in the reflective investigation of human conditions and social and work spaces for the organization of educational actions are understood, which, endowed with pedagogical intentions, also subsidize and guide the survey of needs, definition of objectives, planning/elaboration of projects and evaluation of results.

The culture of training, as the third culture that constitutes educational intervention, enables dialogue between diverse models of knowledge and training, allowing the existence of a theoretical-practical balance between technique and reflexivity in the design and evaluation of training processes. In addition to this primary function, it also has its representations (the trainer and the subject of training) and logic (transformation).

The trainer is the emblematic figure (Barbier, 2013), the scholar does not detail the nuances surrounding the adult trainer. For a few moments, it appears that he/she does not present as someone who designs and evaluates educational interventions, implying that these actions are concentrated in the hands of those who "do" the engineering in training, while the trainer assumes the role of intervenor. Because it is engineering, in which, commonly, some plan and evaluate an object/product/expected result, while others execute the plan, the dominant perspective is the trainer with the role of mediator of previously conceived learning situations and, at the moment, later, evaluated by those who designed them.

This logic clashes when seeking to correlate with teacher training because teaching autonomy is defended. According to Contreras (2002), the conception-execution separation tends to subtract this autonomy, taking the form of teaching packages produced by people outside the educational and training space and the loss of control and purpose of the teaching work. In this sense, the author outlines autonomy at a democratic level, in the combination of professional and social plans, in which educational institutions and teachers are joint creators of educational actions. Returning to engineering in training, perhaps this is the crucial point to be clarified and implemented when contextualized with adult teachers.

However, the importance of the trainer in the training culture is clear, as he/she organizes learning situations to facilitate the movement of decontextualization-recontextualization. In this process, reference activities and life and work experiences of the subjects in training are contextualized in/with the training reference space, that is, there is a decontextualization of prior knowledge so they can be recontextualized in this space-time. Thus, through these learning situations, notions of capacity (knowledge, know-how, and know-to-be) are (re)constructed, which will also be recontextualized in other situations of social life and work.

The expected result of this cyclical movement is based on the logic of transformation: of production and producers; the operation and operators; of practice and practitioners; of actions and actors. If added to the development of critical consciousness, the perception of the subject's relationship with society, in sociopolitical dimensions, and the correlation of cause and circumstance of facts in empirical existence (Freire, 1982), it is possible that emancipations will emerge from this movement. This is because, as seen in Paulo Freire's learning cycle identified in Finger and Asún (2003), it starts from a thematic universe correlated to the life and work of adults, identifying and codifying (contextualizing) themes for understanding and application in a relationship of freedom with the world.

Given these perspectives, the role of the trainer is also decisive in the course of adult teacher training. It is required that critical consciousness is mobilized by/in teachers who train adult teachers so that they can also encourage emancipatory movements in the constitution and professionalization of these subjects. Passeggi (2016) warns that the university essentially trains adults but an imbroglio ensues when teachers do not consider themselves nor are considered to be trainers of adult teachers.

At this point, there is an urgent need to advance the understanding of the relationships established between these subjects in training and the training process (Passeggi, 2016), focusing on the teacher and their experiences, so that their identities are recognized, living and working conditions in the design and evaluation of the educational intervention designed for the training of adult teachers from the perspective of engineering in training.

ENGINEERING CYCLE IN TRAINING AND INTERFACES WITH ADULT TEACHER TRAINING

Engineering in training structures operations, devices, programs, or systems organized for the training of adults (Barbier, 2013). Teacher training is concerned with structuring times and spaces for training meetings to take place (Bernardo; Vasconcellos, 2021) and with building environments conducive to pedagogical experimentation (Nóvoa, 2019). By establishing interfaces between these two theoretical categories, engineering training can be chosen as an alternative for planning and evaluating training actions for adult teachers.

From this perspective, the engineering cycle in training was identified, illustrated, and described, based on the notions of Barbier (2013), and was subsequently contextualized with the object of study of this work. Thus, four phases constitute the cyclical process (Figure 1), which has this character because every educational intervention is the result of dominant activities, tasks, and/or functions that occur repeatedly within each phase, or even more significant because there is complete feedback between the phases within the structure.

Figure 1 – Engineering cycle in training
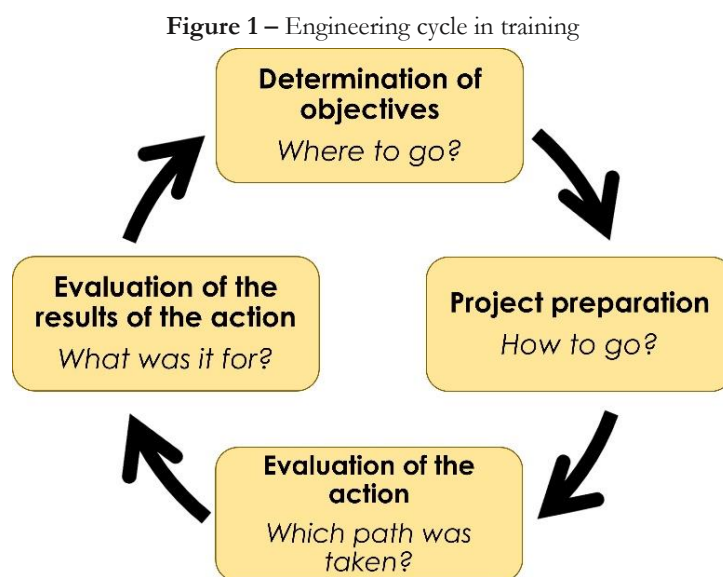
Source: Created by the authors based on Barbier (2013).

The objective determination phase is the starting point for designing the intervention and making decisions about where you want to go with the training proposal (Where to go?). At this point, the tasks are to identify the demanding situations, describe the potential participating subjects, and formulate the diagnosis that justifies the need for training and guides the definition of the objectives of the educational intervention. Then, representations are produced regarding what is expected from the target audience or the subject in training, as we prefer to call it here, and the expected transformations. These expectations will subsidize actions that are capable of being carried out by the subjects during and at the end of the intervention, based on their reality and building knowledge for work or life.

Therefore, a reference to professional or life situations that lead to resorting to educational intervention is presupposed to achieve the objectives. In this sense, such activities must focus on the transformations desired by organizations and the subject in training, which may result in the establishment of agreements or commitments between the parties. In this context, the construction of objectives involves identifying, together with the subjects, the activities and learning carried out during their professional and personal trajectories, as well as those that they wish to carry out. Therefore, based on reports, experiences from interested parties, and appreciation of the scenario, the training objectives are drawn up.

Three levels of objectives are distinguished: 1) beyond the subject, with institutional or social purposes; 2) to carry out their activities at work; and 3) for self-development, for development at work or in social life. Barbier exemplifies:

> In the case, for example, of analysis of the needs in a training carried out for police officers, the first level of objectives is located in the domain of security of goods or people (for example, reducing aggression in a residential area), the second will be related to professional activities (for example, control of situations of confrontation with delinquents), the third is in the field of relevant capabilities (for example, knowledge of the mechanisms of delinquency, knowledge of civil rules, control of reactions and emotions in communication situation) (Barbier, 2013, p. 130).

In the case narrated, we observed that it starts from a broad and socially constituted objective, going through work and reaching the training of the subject. With this, we do not intend to hierarchize or establish scales of values between the objectives; on the contrary, these are intrinsic, since, for them to be fully done, there is a relationship of interdependence.

Regarding the project preparation phase, the need to build professional trajectories stands out, understood as organizations of activities over time, which encourage individuals to develop and use their full potential and previous experiences to develop new learning.

Such activities can be structured in the form of a script, project, or intervention proposal, which can undergo adjustments along the way. To this end, it is necessary to carry out, at this stage, an estimate of the material and human resources necessary for its operation, considering financial and time limitations. Therefore, the tasks of this phase consist of identifying and choosing strategies, developing techniques and methods, and also identifying mobilized resources, to determine priorities, identifying the functional context, and defining the organization of the educational intervention.

The development of tasks presupposes a resumption of the objectives since from them, the desired learning will be hierarchized to align with the reality of the organization and the subjects, tracing the path (How to go?) to achieve what is desired (Where to go?), based on the survey carried out previously and the objectives.

The evaluation phase of the actions in progress involves identifying effective development (Which path has been taken?) and the immediate results of the intervention. It involves building a retrospective image of the process and evaluating it according to the objectives, analyzing whether the path taken corresponds to what was expected.

Internal evaluation is the main task of this phase, which has the function of producing information on the development of the educational intervention from the project's point of view and building a value judgment about it, within it, and through dialogues. From this perspective, information research can be carried out by applying tests, questionnaires, or conducting interviews. The value judgment, despite being more complex, can be supported by the progress statement made by the subjects or by the performance measurement of the participants at the beginning and end of the action.

To implement this stage, it is proposed to develop criteria that allow and have the functionality to make a value judgment on the educational intervention and understand whether it was successful. For this, following the cyclical movement, returning to the project is essential; resuming the planned activities and analyzing the construction of meanings about them is what will allow us to perceive the potentialities and weaknesses that occurred in the course toward the objectives.

The phase of evaluating the results of the action, also called transfer evaluation, is external and its function is to produce information about the transformations in the situation that mobilized the educational intervention and to make a value judgment about its usefulness (What was it for?). At this point, questions are raised about the contributions of the intervention to changes in the needs initially raised and about the transformations that have occurred in work and social life.

Therefore, the proposed tasks involve the construction of indicators that can be observed and/or measured in the places where the participants work, in real spaces and times, to evaluate the extent to which the interventions contributed to solving existing problems. In this sense, the cyclical nature is materialized when it is necessary, in this phase, to return to the previous phases, going to the initially identified needs and the objectives outlined to appreciate the usefulness of the action on training and/or professionalization reflected throughout the project and the educational actions contained therein.

Having explained the engineering cycle in adult training and its four phases, once again, movements are undertaken to contextualize it with the training of adult teachers to pursue the objective outlined by this theoretical-reflexive construction.

The presentation of the cycle in the four phases is equally divided between the two actions foreseen by engineering in training: 1) conception, with the phases "determination of objectives" and "project preparation"; and 2) evaluation, with the phases "action evaluation" and "action results evaluation". These two actions can be referred to as "planning" and "evaluation" in teacher training, two of its essential elements, which are widely discussed in the educational scenario in its most varied aspects. In this way, the social practice character of education is corroborated and intertwined with the social responsibility of teacher training (Freire, 1996; Libâneo, 2006; Nóvoa, 1992, 2009), as social, political, cultural, and educational dimensions are considered.

Due to its engineering design, the cycle does not include the phase (or phases) of implementing the educational intervention. Once again, the discussion about the conception-execution separation made by Contreras (2002) is brought to the fore, as the object of engineering in training (intervention for learning purposes) is not explicitly considered in the dominant activities that underpinned the development of your cycle. However, it is noteworthy that Barbier (2013) does not

perceive the impossibility of the "engineer in training" also being the participant in the action, becoming a strategy for breaking the conception-execution dichotomy while giving flow for cyclicality in "design-execution-evaluation".

Opposing teacher training phase by phase, begins by determining the objectives. The emphasis is on surveying teacher training needs. Such needs arise from experiences, and aspirations (personal, professional, and social) and are also related to a certain context of the human condition, history, and social sphere (Bandeira, 2014). Therefore, needs of two main types are apprehended: 1) related to work and profession, inserted directly in the context of teaching activity and its purposes; and 2) related to the person of the teacher, inserted in his/her particularities. Therefore, according to Bandeira (2014, p. 56), identifying them "[...] means going through a process of self-knowledge of the teacher, the scenario of the teaching profession, and the emerging social context, among other aspects that this theme can raise".

Diagnosis is a task that can be complex, but is essential for the training of adult teachers, as it contributes to the structuring of training processes consistent with the teaching profession, centered on the daily life of the classroom, close to real problems (Garcia, 1992) and following the desires of those who will become subjects of training, in addition to being able to support decision-making about the objectives to be determined.

According to Libâneo (2006), educational objectives are requirements for teaching work and demonstrate the active positioning of the teacher (trainer or in training) regarding their educational and sociopolitical intentions. They are prepared with the main references being educational legislation, the basic contents of science, and the needs and expectations arising from concrete situations, and can be outlined in general and specific lines.

Returning to the three levels of engineering objectives in training (Barbier, 2013), already mentioned in this section, and also considering notes from Libâneo (2006) and Nóvoa (2009), we can think of broad and general objectives that express the role of training and the school about society, as teacher training must be directly highlighted by the principle of social responsibility. The specific objectives directly address activities in the profession and self-development, for development at work and/or in social life, but, repeatedly, also converge with the principle of social commitment. Together, they constitute where the adult teacher training is intended to go (Where to go?).

Once the objectives and intentions of teacher training have been outlined, based on the notions of engineering in training, we can move on to the project preparation phase, at which point the contents, techniques, and resources that can be mobilized are chosen. At this stage, elements contained in didactic engineering are used (Barbier, 2013) and, consequently didactics itself (Libâneo, 2006), which, through pedagogy, it is also in engineering training as a culture contained in the educational intervention.

In this sense, we highlight the structuring of the training process of the adult teacher, which requires substantiated reflection on the profession (Bernardo; Vasconcellos, 2021; Garcia, 1992; Nóvoa, 1992, 2009, 2019; Passeggi, 2016), so to predict and organize the educational intervention, to be mediated by the figure of the trainer, in spaces-times that mobilize learning. It is important to highlight the importance of not "losing" sight of the objectives at this stage, with all structuring definitions competing for the expected ends and desired transformations.

The evaluation of the action means making efforts to get adults to express their impressions about the intervention, the path taken in the set of actions, and the immediate results obtained through training. As in engineering, the assessment must take place within (beginning, during, and/or end) the

training of adult teachers (Casanova, 2013). At this stage, the teacher must be maintained as the protagonist of training. As Nóvoa (1992) pointed out, this active position must occur at all stages of the process, from conception to evaluation. Therefore, generally, these are the same subjects who were initially consulted about their training needs. Therefore, only they will be able to effectively inform whether the educational intervention met these needs, whether the formative moment met expectations, and whether, in itself, it was capable of causing changes.

It is possible to develop evaluation instruments (Casanova, 2013), but the evaluation should not be limited to this. It is important to have clear, defined, observable, and measurable criteria, even if it is through dialogue, providing experience reports, and declarations of progress. This phase focuses on analyzing the course of actions, content, methods, resources, training devices, and immediate results. Therefore, information is collected for self-assessment of the project, in terms of strengths and/or weaknesses.

Considering engineering in training, the following phase (evaluation of the results of the action) aims to make a value judgment on the impact of training on the adult teacher, on the transformations in work and social life. It is recognized that measuring these impacts on education requires a long term, in addition to the fact that there are countless other variables capable of interfering with the results. More precisely in the field of teacher training, Casanova (2013) proposes the insertion of a fourth moment for evaluation, to be carried out sometime later and when teachers are already carrying out their professional functions, an alternative way to proceed with evaluating the applicability of training. Coincidentally, engineering in training represents this evaluative phase as external, in the subject's working space-times, and for issuing a judgment on its usefulness.

In this sense, the use of notions of engineering in training can mobilize assessment strategies for longer periods post-training of adult teachers – whether in initial training, such as more consolidated policies for monitoring graduates, or even, with the creation of the third institutional place for training teachers proposed by Nóvoa (2019), as a "common home for training and the profession"; whether in continuing education, with direct monitoring of the transformations that have occurred in the educational space and the professional and social aspects of the teacher.

Also regarding this phase, its relevance in encouraging the analysis of favored changes is reinforced, so that the function of interpreting the meanings, applicability, and uses of adult teacher training can be fulfilled, which are summarized as follows by Casanova:

> Teacher training only makes sense if it can serve the needs of students, teachers, school organizations, and the educational community. This process assumes that teacher training is capable of carrying out a transformative action: in the cognitive, affective, emotional, and operational development of students; in the personal and professional development of teachers; in developing the effectiveness and efficiency of the organization and, also, in the development of the educational community. The different changes that have occurred will have to be analyzed and interpreted (Casanova, 2013, p. 3-4).

Illustrating engineering in training in a cycle corroborates the understanding that evaluation is not the final stage (Libâneo, 2006). In this sense, analyzing the actions and the meanings of their results is essential so that one can continue or re-elaborate projects and training programs for adult teachers, identifying whether the primary needs have been met and/or if new needs arise, restarting/continuing the cycle.

FINAL CONSIDERATIONS

The construction of this theoretical-reflexive study enabled to clarify the notions that permeate the constitution of engineering in training, in Jean-Marie Barbier (2013) – a concept, until then, not very clear. However, based on the evolution of theoretical categories developed in the text and contained in the author's conception, it was possible to be interpreted as the conception and evaluation of educational interventions in the space-times of social life and work, aiming at adult learning. This understanding permeated key concepts, such as engineering, training, educational intervention, learning, and training cultures.

The training cultures proved to be the articulating element of two cultures (engineering and pedagogy) that do not necessarily intersect but constitute engineering in the training. In this sense, the training culture connects and interconnects others to provide the training and professionalization of adults, considering the subject in training and the work environment/profession as space-time in the production of new capabilities (knowledge, know-how and know-to be) transferable to other situations in work and social life.

Illustrating the engineering cycle in training contributed to the visualization of a cyclical process reiterated in four phases: determination of objectives, elaboration of the project, evaluation of the action and evaluation of the results of the action, focusing on the design and evaluation of the educational intervention, but throughout the process, considers the subjects and contexts involved, culminating in new learning and transformation.

The study fulfills its objective by contextualizing the training of adult teachers with the notions of engineering in training, through decontextualization-recontextualization movements, allowing the identification of similarities and distances between them. However, what brings them together comprises possibilities of applying the assumptions of engineering in training with adult teachers and, in broader terms, constitutes theoretical-practical notions with a focus on the culture of (trans)training, aiming at the continuous development of teachers and the strengthening of teaching professionalization in the contemporary socio-professional and political clash.

In summary, from the interfaces perceived and contributing to the training of adult teachers, the culture of training stands out, as it reinforces two essential aspects of their training process: the conception (by themselves and by the trainers) of this subject as an adult, active and protagonist, with life and profession experiences; and the perspective of the school as a privileged educational space for training and professionalization (without distinctions between them).

On the other hand, their gaps, despite being perceived in smaller numbers, require reflections that allow reinterpretations of theoretical elements of engineering in training, enabling their use in teaching training processes. In this aspect, the proposal for separation between "conception-execution" in the structuring of educational intervention stands out, which, in the training of adult teachers, results in the subtraction of autonomy. In cases like these, we suggest the construction of a third way "design-execution-evaluation" to meet the cyclicality seen in engineering training.

Therefore, this study represents a significant contribution that adds value to current thinking in the field of adult teacher training. The reflections undertaken here did not end the theme; on the contrary, they seek to encourage other points, counterpoints, and (re)contextualizations to encourage discussions around the need for recognition of the teacher in training as an adult. Therefore, it is

recommended that this debate be opened and disseminated in higher education institutions, its articulation with schools, and the development of theoretical and empirical studies that mobilize (re)readings and (re)contextualizations of the theme.

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Author 1 – Conceptualization, investigation, methodology, formal analysis, writing.
Author 2 – Conceptualization, investigation, methodology, formal analysis, writing.
Author 3 – Conceptualization, supervision, and validation.

DECLARATION OF CONFLICT OF INTEREST

The authors declare that there is no conflict of interest with this article.