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Metaphors to rethink educational technology in teacher training and work[1]

Metáforas para repensar a tecnologia digital no trabalho e na formação docente

Metáforas para repensar la tecnología digital en la formación y el trabajo docente

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Abstract: This article consists in an essay that discusses the use of metaphors as a means to rethink digital technologies in teacher training and work. Based on the notion of the conceptual metaphor, that is, a mental construct that relates different domains of thought and is expressed in language, the text presents some of the metaphors that are most frequently used to talk about technology, exploring their connections with common forms of conceiving central aspects of the educational process, specifically, "teaching", "learning" and "knowledge".
Taking as foundational the relationship between thought and action implied by conceptual metaphors, the article presents some examples of the use of metaphor in teacher training and work as a way to deconstruct closed conceptions and encourage the development of critical thinking.
Keywords*:* Educational Technology; Conceptual Metaphor; Teacher Training; Teacher work.

Resumo: Este artigo consiste em um ensaio que discute o uso de metáforas como base para repensar a tecnologia digital no trabalho e na formação docente. A partir da noção de metáfora conceitual, isto é, um construto mental que relaciona domínios diferentes do pensamento e se expressa na linguagem, o texto apresenta algumas das expressões metafóricas mais utilizadas para falar da tecnologia, explorando as relações entre elas e delas com as formas comuns de conceber aspectos centrais do processo educativo, especificamente, "ensino", "aprendizagem" e "conhecimento". Tomando como fundante a relação entre pensamento e ação implicada na metáfora conceitual, o artigo apresenta alguns exemplos de utilização da metáfora na formação e no trabalho docentes como forma de desconstruir concepções fechadas e encorajar o desenvolvimento de criticidade.
Palavras-chave*:* Tecnologia Educacional; Metáfora Conceitual; Formação de Professores; Trabalho docente.

Resumen: Este artículo es un ensayo que analiza el uso de metáforas como base para repensar la tecnología digital en la formación y el trabajo docente. Partiendo de la noción de metáfora conceptual como una construcción mental que conecta diferentes dominios del pensamiento y se expresa en el lenguaje, el texto presenta algunas de las expresiones metafóricas más utilizadas para hablar de tecnología, explorando las relaciones entre ellas y sus relaciones con las formas comunes de concebir aspectos centrales del proceso educativo, específicamente, la "enseñanza", el "aprendizaje" y el "conocimiento". Tomando como base la relación entre pensamiento y acción implícita en la metáfora conceptual, el artículo presenta algunos ejemplos del uso de la metáfora en la formación y el trabajo docente como una forma de deconstruir concepciones cerradas y fomentar el desarrollo del pensamiento crítico.
Palabras clave: Tecnología Educativa; Metáfora Conceptual; Formación Docente; Trabajo docente.

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Introduction

Education has been confronted, for decades, by the continuous and accelerated growth of digital technologies, which have been entering practically all sectors of human life, almost always founded upon a "solutionist" conception of technology (Morozov, 2013): a reductionist view that promotes technology as a solution to (all?) human issues. In this context, educational technology has been expanding, as has the set of labels (Selwyn, 2016) or technological waves (Rosado et al., 2019) that make up a long list in which systems based on Artificial Intelligence (AI) appear as the most current item. These labels, however, are generally associated with concerns of a strongly instrumental nature and, thus, almost always lack historical grounding and, frequently, demonstrate little relevance to the multiplicity of educational practices necessary in daily lives marked by diversity and inequality (Rosado; Ferreira; Carvalho, 2017). The "Silicon Valley rhetoric" strongly reverberates in the language used to defend ideas that reduce education to learning (Biesta, 2013). Weller (2015) further criticizes this rhetoric in an analysis that explains ways in which digital artifacts are built as "solutions" to problems of a "broken" education that, thus, needs "innovation" or perhaps a "revolution".

During the covid-19 pandemic, however, education could not escape facing problems that, although obscured by discourses of innovation, pre-date digital technologies, as they are linked to the multiple inequalities that have surrounded it for a long time. In this context, the disruption of digital artifacts in teaching and learning situations, defended as a necessary adaptation of education to what is assumed to be contemporary demands, has proven to be, for many, an absurd idea. Although the pandemic can be understood as "a stage in which digital technologies have become not only protagonists, but, in fact, structuring elements, that is, a condition *sine qua non* for the continuation of *performance*" (Ferreira, 2023, p. 27), the realities of exclusion – not only digital in nature – were painfully evident, as well as the lack of minimal digital literacy also found among young people. Despite the many lessons that were – or could have been - learned at that time, teachers continue to be assigned the task of meeting the needs of generations of so-called digital natives (Prensky, 2001a; 2001b; 2011), a notion already challenged and criticized as a myth without empirical foundation (Selwyn, 2009).

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In a more extreme position, the promises around AI have made ideas of improves efficiencies in education more tangible (Selwyn, 2014), beginning with the replacement (partial or total) of humans, a trend strongly reflected in national educational policies (in Brazil) for some time (Barreto, 2009; 2017).

In this context, teaching work is framed in terms of demands which can prove to be quite perverse, since much of what is posed as a response to them involves the use of artifacts produced not from pedagogical considerations, but from marketing concerns. Teachers are asked for "fluency" in the use of objects that, due to the way this industry operates, solidify interests that do not consider education in human terms. "Training" centered on instrumental aspects of these artifacts proliferate rapidly as new releases emerge in a highly competitive market. Thus, teachers are called upon to increase their "efficiency", inhabiting a world in which time becomes a "raw material that is consumed like oil and that is therefore becoming increasingly valuable" (Rosa, 2022, p. 27).

In this scenario, images and conceptions relevant to technology and its presence in educational contexts circulate as metaphors, understood as linguistic expressions of mappings between different domains of thought, that is, concrete manifestations of conceptual metaphors (Lakoff; Johnson, 2002[1980]). Conceptual metaphors are also present to support forms accepted as "common sense" when dealing with educational issues. Metaphors of educational technology, in particular, are associated with artifacts predominantly originating from Computer Science developed in Anglophone countries. Since the appropriation in one context, of metaphors originated in another implies a transmission of cultures (Oncins-Martínez, 2014), it is essential to question such metaphors and their consequences, as well as the processes implicit to their appropriation.

This article discusses the use of conceptual metaphor as a basis for critically rethinking teacher education and work, to provide opportunities for situations in which the focus on what is *human* in training can be maintained, resisting impositions manufactured in order to promote values other than those of Education. In this sense, the next section presents a more in-depth discussion of conceptual metaphors, followed by an exploration of specific metaphors of educational technology, as well as the relationships between these metaphors and ways in which they are commonly used to frame central elements of the educational process, specifically, "teaching", "learning" and "knowledge". This is followed by a presentation of some creative uses of metaphor as a means to deconstruct crystallized conceptions expressed in everyday speech around the relationship between technology and education and thus guide pedagogical thinking and practice.

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Conceptual metaphors

As already suggested, conceptual metaphors constitute mappings between different domains of thought that define ways of perceiving, thinking and relating to the world (Lakoff; Johnson, 2002[1980]). Connecting a source domain to a target domain, they enable understanding of more abstract notions from a concrete and, according to Lakoff and Johnson (2002[1980]), bodily foundation, sustaining human development, acculturation and intellectual growth. In this manner, conceptual metaphors offer a basis for cognition that is lexicalized, or rather, which is expressed but not situated in the domain of language.

From this perspective, conceptual metaphors guide perception, conceptualization, and action. The significant power of metaphors (as well as similes and metonymies) to explain or clarify new ideas from something already known explains their traditional use in pedagogical practice, which dates, at least, from classical antiquity (Lemgruber; Oliveira, 2011). However, in their linguistic expression, they do not constitute mere stylistic resources, but rather powerful argumentative elements whose effectiveness lies, above all, in their naturalization. When one metaphorical expression is chosen in place of another, certain modes of describing objects of the world are mobilized that represent specific ways of identifying, classifying and evaluating these objects.

In addition to the semantic function, metaphorical expressions perform a pragmatic function, that is, they are linguistic expressions used with the aim of influencing and convincing, often in subtle ways (Charteris-Black, 2004). They operate as powerful argumentative techniques, as they present ideas and objects in a specific light that emphasizes some aspects while obscuring others. In this way, metaphorical expressions often convey tacit conceptions, beliefs and values, playing a fundamental role in the structuring and disseminating certain points of view. Conceptual metaphors also determine forms of belonging and otherness (Davies; Harré, 1990). Crucially, as Fairclough (1992) suggests, tensions between distinct discursive practices influence ways to metaphorize experience, and different ways of metaphorizing reality can foster conflict and transformation, as well as encourage new modes of resistance.

Educational discourses are rich in metaphorical expressions that have already been "demetaphorized" and thus naturalized. For example, some metaphors support commodified conceptions of education: education is spoken of as a *market*, classes or education itself are a *delivery*, and the curriculum is conceived as *content* that can be *packaged*. In fact, as technological infrastructure expands and occupies new social spaces, images and conceptions of artifacts are

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disseminated as metaphors. Also, more recently, possibilities of automation (replacing human actions with the "action" of machines) circulate in association with emerging cutting–edge technologies based on artificial intelligence techniques. Such metaphors support a conception of education as a product, associated, in an extreme position, with a perspective of processes and actors as pieces of a machine, instead of agents involved in dynamic and complex relationships, as discussed below.

Metaphors in combination

One of the most common educational technology metaphors – perhaps the most common and already widely in use to reference systems that integrate AI and *Big Data* (Ferreira et al, 2020 – - is the *tool*. Questioning the idea, Ferreira and Lemgruber (2018, p. 10) recall that:

> Tools are usually conceived of as objects that enable, support or facilitate the performance of certain tasks. The hammer and the screwdriver are two everyday examples of tools thus understood. Both are artifacts that have their own purposes, reflected in specific design projects and brought to life in specific materialities – forms, materials and dimensions particular to the tasks in which it is imagined that they will be used. They adapt to these tasks, and they adapt to the hands of those who will use them. They lend themselves to maintenance activities, construction and the creation of new objects, from the assembly of mass-produced contemporary furniture to the art of stone sculpture. Tools, in this conception, support actions necessary to solve practical problems, as well as, potentially, actions in more creative processes.

The everyday uses of the term "tool" in educational discourses, with regard to technologies, support two ideas that need to be questioned: on the one hand, they imply that there is something wrong with education that can be "fixed" with the use of technologies, especially digital, constituting a form of use consistent with the idea of a "broken education" identified in the discourses of the technology industry; on the other, it is suggested that the objects called tools (educational, pedagogical, etc.) are neutral, and, as such, regardless of their provenance, history, and original purposes, mere appropriations, especially by teachers, are sufficient to make them useful or productive in educational terms. The issue with this metaphor is that an instrumental and neutral vision of technology is implied (Feenberg, 2002), consistent with the solutionist perspective supported by industry and salvationist visions of technology, which tend to be marked by a strong technological determinism (Noble, 1997). From perspectives in which artifacts are understood as deeply political objects (Winner, 1986; Feenberg, 1999) – in other words, objects in which choices and decisions are made that extrapolate what

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would be purely technical and, thus, need to be thought of in a contextualized way and in terms of questions of power –, the expression "neutral tool" would be a contradiction in terms to be questioned, not simply hidden by the abandonment of the adjective. However, hegemonic discourses around technology, which disseminate the idea that every technological artifact can have its uses subverted through well-intentioned insurgencies, that they can be repositioned, without major repercussions, to fulfill the role of mere tools, end up reinforcing the idea of technological neutrality.

Other metaphors of educational technology not only complement, but, in fact, build upon these ideas. For example, metaphors of educational resources as *pieces* of puzzles or *pieces* of Lego, used since the 1990s to describe the then "visionary" learning objects (LO) (Wiley, 2002) and, subsequently, the Open Educational Resources (OER) (Ferreira, 2012), refer to the conceptual metaphor of *parts* or *components*. Regarding OA, OER and educational resources in general, there is a lot of talk around "objects" - texts, software, audiovisual, media, etc. – that could be reused in contexts other than those of their original creation and use. Thus, the metaphor sustains a perspective of education as something decontextualized, a-cultural and ahistorical (Ferreira, 2012), as something that can be planned in the same terms in which engineering projects. This is consistent with the metaphor of education as *engineering*, as articulated by Hlynka and Nelson (1991).

Engineering logic is based on the premise that complex problems can be solved from their fragmentation into smaller problems. Thus, a problem that is difficult to deal with is converted into a set of parts that can be modeled and considered in isolation, attempting to create partial solutions that can then be combined to solve the original problem. In this regard, some form of *standardization* is essential. Standardization has the great advantage of enabling significant economies of scale. In other words, standardization is a strategy that lends itself to solving, in economic ways, problems of a logistical and/or financial order. Crucially, the history of Computing is permeated by the idea of standardization as the necessary basis for its development, but "breakthroughs" are achieved from debates and often through political maneuvers (Ceruzzi, 2003; Nielsson, 2010), which illustrates the deeply political nature of technology.

In fact, in Comenius' *Didática Magna* (2011[1657]), written by the so-called "father" of contemporary education, this logic is present in metaphorical expressions involving batch production and manufacturing (of loaves, of bricks, etc.), as well as in the idea of didachography, developed as an analogy between teaching and the printing press of the author's time. As Mumford (1970, p. 102) suggests, in fact, "Comenius's conception of education is entirely based on the requirements for mass production." Thus, in modern terms,

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the democratic model education of proposed by Comenius can be said to be based on notions of standardization, efficiency and economy of scale, which constitute precisely what underpins much of the rhetoric around the use of technologies in education, including technologies with AI (Ferreira; Lemgruber; Cabrera, 2023).

Consistent with Mumford's perspective, Mazzotti (2024, p.83) suggests that Comenius' goal was "to standardize [teaching] work according to common goals through a common procedure, by homogenizing school supplies (books and other material), and by organizing a process that ensures maximum production with minimal costs". Thus, we inherit a "technologized" education model of a capitalist order (Mazzotti, 2024), which seems well represented in Figure 1. In it, a "didactic machine" is interposed between teacher and students, that is, there is a specific place – of mediation, of a pedagogical nature, between subjects – for technology. In association with such a place for technology, the image also suggests specific positions and roles for these subjects, related to specific conceptions of teaching and learning: learners "receive" or "absorb" what the teacher "transmits" or "passes". Also, what is "passed" or "transmitted" is the knowledge "contained" in books, in other words, the "content".

The conceptual metaphor of *filling* (Ferreira, 2023) may have variable linguistic expressions – for example, the student as a blank sheet in Comenius' didacography; the "empty" mind in Freire's metaphor of banking education (1987) – but it also frames, in the figure, the relationship between teacher and students, shown as "receivers" or "receptacles". As a whole, the scene is reminiscent of the popular maxim "a place for each thing, each thing in its place": an arrangement in which each element must be well situated and integrated effectively and thus do its part to promote greater efficiency in what the ensemble proposes to perform. It is a machinic arrangement that, in Mumford's terms (1967, p.11), embodies the logic of the megamachine, that is, an "archetypal machine composed of human parts".

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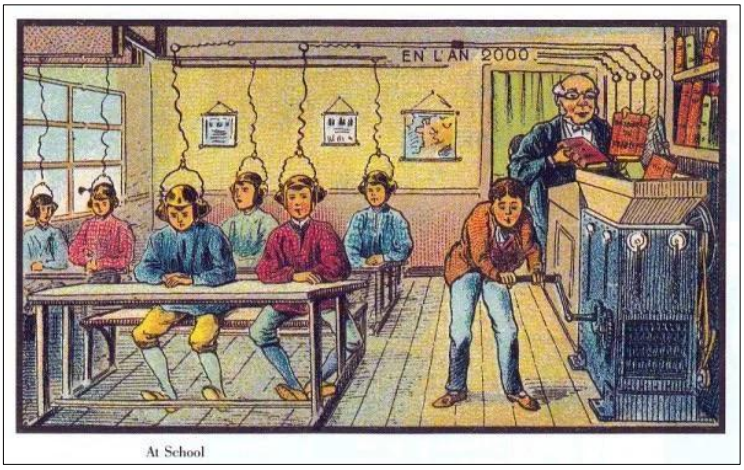
Figure 1 – *En l'an 2000*



Source: Wikimedia (available at: https://en.wikipedia.org/wiki/En_L%27An_2000. Accessed on: 25 Jul. 2025)

Thus, the existing articulations between metaphors of educational technology and metaphors used to conceive other aspects of the educational process, especially the processes of teaching and learning, which are associated with specific conceptions of the roles of the teacher and the learner, are made explicit. These associations have important implications for teaching, since teachers' actions are related to their conceptions and values, even if these are not specified. For example, the use of the term "content" to talk about curriculum brings with it a specific conception of teaching and learning that is inconsistent with what, on the surface of speech, can be presented as a "student-centered" process, because the metaphor of *filling*, which emphasizes the process of "knowledge transfer", i.e. *content transmission*, continues to guide teachers' thoughts and practices. This makes it extremely difficult to envisage pedagogical approaches that differ from the traditional lecture, which also has a place in education, although amid a greater variety of ways of organizing pedagogical action in order to open up new opportunities for learning experiences which may, perhaps, be richer, more varied and meaningful.

From this perspective, considerations on the uses of digital technologies continue to be consistent with the scheme in Figure 1, which represents the relationship between teacher and student as something always mediated by technology. Thus, it is not surprising that, in practice, uses of digital artifacts tend to be reduced to the adoption of objects that *interpose* themselves between teacher and students, for example, screen projectors, educational software and virtual learning environments, although the same logic remains in apparently more sophisticated embodiments. The de-socialization of education from its assumed personalization, which promotes a focus on interaction between learner and "content" without teacher intervention, gains momentum with the

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increasing use of AI (Selwyn et al. 2023). However, this is not something necessarily "new", but a trend with historical roots that are revealed from the analysis of metaphorical expressions used daily.

Creative uses of metaphors

The discussion presented above suggests that thinking exclusively about "uses" of artifacts, as shallow "training" for the "integration" of technologies in educational contexts tends to promote, is an unsatisfactory approach that, in reality, contributes to reproduce ideas and practices that need to be reviewed. Questioning educational technology in respect to its *foundations* is necessary, an idea illustrated in Figure 2. Just as, in the case of technology, questioning its neutrality is essential, so is going beyond the idea of artifacts as established and inevitable, thus developing new forms of "criticality" (Ferreira, 2023). Rethinking teaching processes beyond the "pedagogization" of "content", as well as learning beyond its purely mental aspects is equally fundamental (Bannell; Mizrahi; Ferreira, 2021). The issue is not only how to promote 'innovation' as a fundamentally technocratic policy, but promoting transformation when necessary and according to directions appropriate to people and the contexts in which they live. Basically, it is vital to contextualize the discussion of educational technology more broadly, which includes thinking about education beyond learning.

In other words, it is important to remember the functions of education beyond the idea of education as qualification – training for the labor market (Biesta, 2015): subjectivation and socialization. In this sense, the image represents, in outline, paths to questions that go beyond the usual "what-to-do-with-new-artifacts", which tend to enter education promoted by their manufacturers as the "solution" to some invented problem or, often, as a "solution in search of a problem" (Selwyn, 2017, p. 92). For example, lately there has been talk about the use of AI platforms for the automatic correction of texts produced by students: here, asking which platforms to use or how to use them is insufficient, the first question is *why* they should be used. To avoid the trap of the inevitability of digital artifacts in education (Selwyn, 2017), it is necessary to note that the discourses that intend to sell them are always accompanied by justifications that demand attention. In the case mentioned, we need to ask why it is necessary for the teacher to delegate the correction of student productions to a machine, when student writing is, in fact, a valuable resource, a channel that supports an essential pedagogical dialogue. If the teacher has more work to correct than his time allows and thus makes "mistakes" or is "unfair", perhaps we should have more teachers leading smaller classes, for example.

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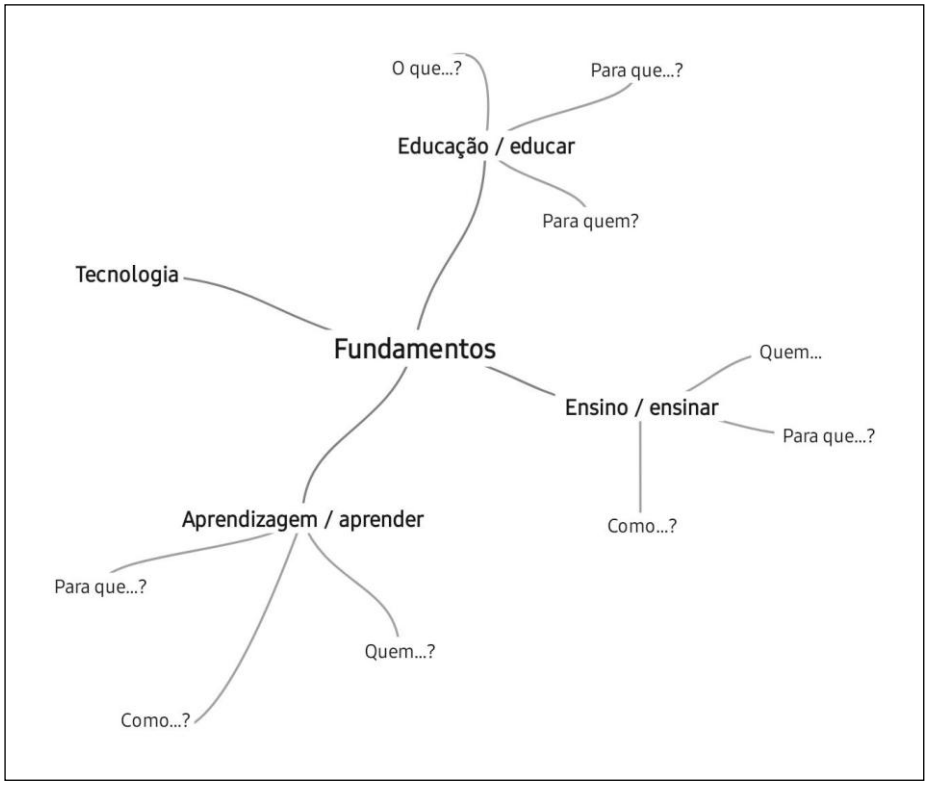
Figure 2 - Outline of fundamental topics for discussion of technology in education



Source: Author, 2025

As suggested, critical metaphorical analysis (Charteris-Black, 2004) can assist in revealing conceptions already in circulation, and, in order to foster productive discussions, this does not need to be done from a specialized study of *corpora*. An interesting way to arrive at metaphors already in circulation is with automatic metaphor generators (of which there are many), especially those that are based on language models (the *Large Language Models*, LLMs), such as ChatGPT. According to Bender et al. (2021), these technologies consist of "stochastic parrots", as "a language model is a system that sews, randomly, sequences of linguistic forms observed in its vast training datasets, according to probabilistic information about how they combine, but *without any reference to meaning*" (*ibid.* p. 617; emphasis added). In this way, it is possible to work with already existing metaphors, since unusual combinations of words cannot be expected to appear frequently (except in cases of "hallucination", that is, cases when an AI platform returns text with factual errors to the user).

For example, Figure 3 shows a screenshot of material generated on the AI platform EasyPeasy, which offers, among its products, a metaphor generator based on a combination of LLMs. Each of the metaphors shown in the image (*conductor*, *flashlight*,

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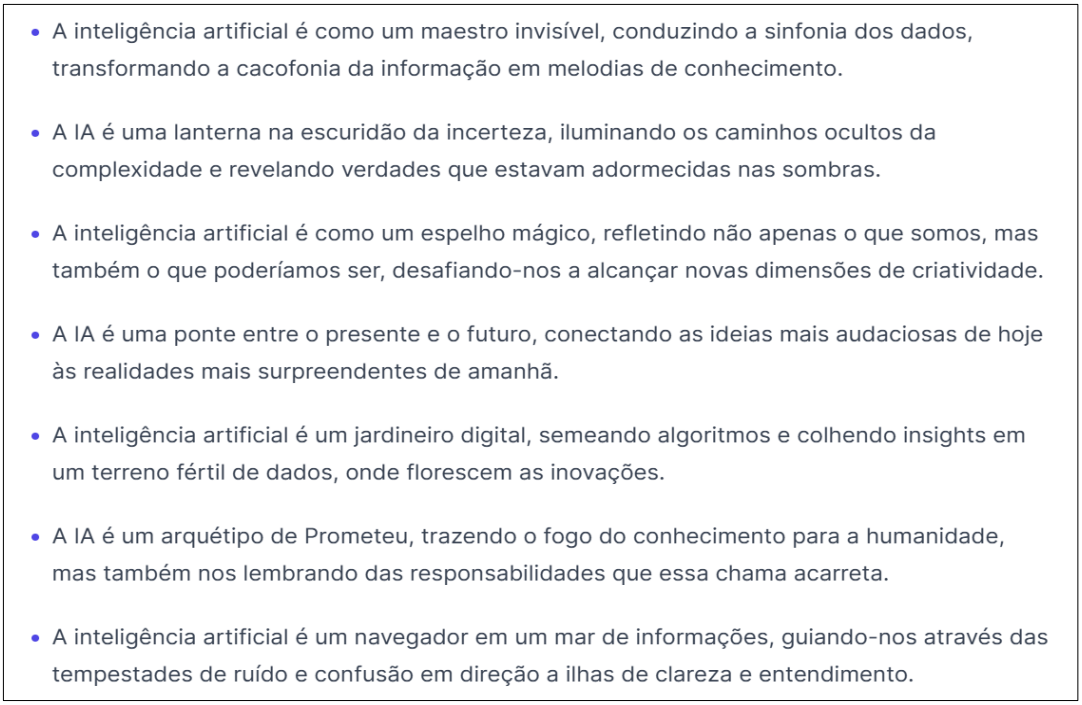
bridge, *mirror*, *gardener*, *archetype*, *navigator*) provides a basis for interesting discussions about AI, taken as an example of a target concept in the prompt used. It is worth noting that in three metaphorical expressions (*conductor*, *gardener* and *navigator*), different forms of subjectivation of AI are suggested, that is, the conceptual metaphor of *IA as a subject*. Others (*flashlight*, *bridge* and *mirror*) refer to the conceptual metaphor of *tool*, consistent with the results obtained by Ferreira et al. (2020). These metaphorical expressions can, in fact, be easily found on the web (in blogs, news and texts that address the subject), the main source of the data used to "train" currently existing language models. Thus, reflecting on aspects often found in discourses on AI is possible, including inconsistent (or incorrect) appropriations of concepts (for example, the Jungian concept of "archetype", which figures in one of the metaphors shown in the image). Also noteworthy is the lack of elements that refer to the materiality of AI, whose backstage includes the exploitation of human beings, the precariousness of their work, the theft of their intellectual property and the invasion of their privacy, in a context in which the substantial greed of an industry prevails over its significant costs – including environmental costs – which are not openly listed or properly accounted for (Crawford, 2021). These (and other) observations about metaphorical expressions, combined with the use of supporting texts, can generate rich discussions.

Figure 3 – Screenshot of an automatic metaphor generator screen



Source: Easy.Peasy.AI (accessed on: 20 May. 2025)

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In a more creative line, it is also possible to support reflection from new metaphors that can open horizons to conceive the role of specific artifacts and their implications in educational practice (Weller, 2022). The strangeness that can be caused by combinations of domains can be instrumental to the development of critical thinking and imagination. The random assignment of elements between predetermined lists of source domains and target domains, created in the context of group work, would be another way of using metaphors to rethink certain labels of educational technology. Source domains can be selected from individual participant choices or through some general guidance in a playful work environment.[3] In this case, as in the previous proposal, the discussion needs to explore not only what concerns technology exclusively, but also the possible conceptions arising for the other foundations suggested in Figure 2, especially the conceptions of teaching and learning, as well as the roles of the actors involved in these processes.

Final remarks

This article discussed some possibilities of using metaphors as a basis for reflecting on digital technology in education. Taking the notion of conceptual metaphor (Lakoff; Johnson, 2002[1980]) as its central theoretical axis, the article presented some everyday metaphorical expressions, indicating how these expressions, taken together, point to a specific way of thinking about education. The article illustrated possibilities of metaphors as elements of pedagogical approaches that value creativity and the development of critical thinking, considering the importance of training teachers who can resist the takeover of the profession that is supported, in part, by closed and reductionist conceptions of what is involved in education.

The text also suggests that the metaphors discussed – as well as the ways of thinking associated with them – seem to have significant historical roots, to which attention must be paid. Now, with "innovation" by technology being massively promoted, it is essential to point out that innovation for innovation's sake does not constitute a sufficiently productive logic as the overall guidance to teacher training and work, in part because what is presented as "new", in fact, is not always so. Despite the optimism

[3] The following link leads to an online automated generator that does this type of assignment: https://code.cog.dog/edtech/. In this case, the artifact does not use AI, but two predefined sets as a target domain (various types of educational technologies) and target domains that, in reality, reveal the choices and interests of the programmer himself (for example, making tracks, knitting and other unusual activities and not directly related to educational technology).

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surrounding the many novelties in terms of artifacts and the luminous visions for the future of education that the educational technology industry offers, we cannot ignore the past nor, above all, the present, as Selwyn (2022) reminds us. We need alternative forms of future, which diverge from the "common sense" solutionism that, unfortunately, tends to guide considerations of the role of digital technology in education. Unveiling and reflecting on these ideas, taking metaphorical expressions as a starting point to support the development and promotion of educational technologies, may be a path.

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