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ARTIGOS

Semiformation and artificial intelligence in teaching[1]

Semiformação e inteligência artificial no ensino[2]

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Abstract:
The aim of this article is to reflect on the use of audiovisual technologies, digital platforms and artificial intelligence software aimed at personalization of teaching. The analysis addresses the use of algorithms aimed at teacher evaluation, defense of educational technology companies, gamification as a strategy to encourage studies and pedagogical proposals that point out skills to be developed by students to prepare them for a market, which is increasingly supported in automated and artificially "intelligent" operating systems. Finally, Critical theoretical analysis that seeks to point out reconfigurations of the semiformation process at the beginning of the 21st century caused by the impacts of the computational instrumentation of education and the digital industrialization of culture. At the end, we sought to point out reconfigurations of the semiformation process in the early 21st century, caused by the computational instrumentalization of education and the digital industrialization of culture.
Keywords: critical theory, artificial intelligence, semiformation

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Resumo:
Este artigo procura refletir sobre tecnologias audiovisuais, plataformas digitais e softwares de inteligência artificial voltados à personalização do ensino. A análise aborda o uso de algoritmos para avaliação de professores, defesa de empresas de tecnologia educacional, gamificação como estratégia para incentivar os estudos e elaboração de propostas pedagógicas que preparem o aluno para um mercado cada vez mais apoiado em sistemas operacionais automatizados e artificialmente "inteligentes". Ao final procurou-se apontar reconfigurações do processo de semiformação no início do século XXI ocasionadas pela instrumentalização computacional da educação e a industrialização digital da cultura.
Palavras-chave: *teoria crítica, inteligência artificial, semiformação*

In an exhibition on art and technology in 1982, Czech-Brazilian philosopher Vilém Flusser presented a text entitled "For a school of the future," where he pointed out two trends for the school in a future dominated by devices that produce technical images. The first trend would be that of a school based on a society that consumes unlimited information, focused mainly on economic interests and governed by a technocratic totalitarianism. In this case, "The school will no longer be a place for teaching and data production. The alternative school will be the place where artificial intelligence will be programmed to run automated machines" (Flusser, 2005, pp. 6-7). The other trend would lead to the construction of a new man, whereby the school would not be limited to the production of pure knowledge, but would incorporate ethical, political and aesthetic models of society, in order to change the world based on human beings. The boundaries between politics, science and the arts would be overcome, so that technicians would be artists and technicians artists, all politically responsible: "Let theory be constantly fertilized by concrete experience, and the latter by theory. Such a school would be a place of wisdom in the Platonic sense, except that everyone would be kings, and machines would be idiots "(Flusser, 2005, p. 7).

What can be seen in the 21st century, beyond Flusserian speculation, is the increasing automation of operations that simulate cognitive processes. Based on the history of digital

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traces, left voluntarily and involuntarily with the constant monitoring of online interactions, software based on artificial intelligence can outline frequencies and regularities in the conduct and habits of individuals, which allows the development of predictive and behavioral monitoring tools. It is thus possible to make compact simulations of likely future versions of people. Berry (2015) points out the strength of these technological models to manipulate subjects' relationships with digitally programmed time. These interventions would encompass the past (stored data), the present (data collected from archives and real-time interactions), and the future (probabilistic projections materialized in constant code updates), so as to mathematically process data capable of finding patterns and deciphering subject predispositions, in some cases even better than themselves. This process may reveal some of the directions for the use of artificial intelligence in education.

The relevance of "machine learning" - a sub-area of artificial intelligence that has been gaining visibility, with increasing investments by many companies - reveals the market value of this type of proposal. For *high tech* capitalism, learning would be accomplished by machines less prone to error than humans and better able to automate the permanent innovation of the production process. And not only from a physical point of view, but also intellectually, in order to meet the flexible demands of real-time consumption, resembling the exemplary worker of the Toyotist[3] model of production. This computational cognition would be able to optimize profits as much or more than the best science-minded human brains:

> *Machine learning* is the scientific method using steroids. It follows the same process of generating, testing and discarding hypotheses. But while a scientist may spend a lifetime creating and testing a few hundred hypotheses, a machine learning system can do the same in a fraction of a second. Machine learning automates discovery. Therefore, it is not surprising that it is revolutionizing science as well as business (Domingos, 2017, p. 37).

[3] Unlike the Taylorist model, in which there is a separation between management, which coordinates the entire production process, and manual labor, with segmentation of tasks and specialization of the work of each worker in only a small part of the production process, in the Toyotist, production model, which appeared in Japan after World War II, the volume produced varies according to market demands and is therefore called the *just in time*, a model that eliminates the concern with the excess of products in stock. This dynamics also favors technological updating by requiring fewer workers - who should not focus only on a part of production, but adapt to the constant flexibilization of work - and demands knowledge about the entire production process from them, with constant updates in their qualifications, so as to master technological advances

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According to this view, permeated by marketing elements, machines would not only be better learners but would enable more effective teaching, individually delimiting the gap and each student's ways of learning. So, ideas which already have been spread by behaviorism, will reappear, now revamped with constructivist touches, proposing at least a partial shift from the teacher's authority to technologies that process learner data. This shift occurs through the progressive replacement of lesson plans and study plans, prepared by teachers, for lesson plans and personalized studies via algorithms and artificial intelligence techniques. In other words, personalized by statistical tools that automate part of the choice, organization and prescription of the content to be taught according to the specific educational needs of each student.

The learning needs themselves would be diagnosed through data analysis algorithms collected in the interactions between the student and the platforms on which educational computer programs operate. The focus then shifts to the learning produced by the interaction between the student and the digitized teaching material. The teacher is left with a secondary role, helping to fill in any gaps and residual spreadsheets in the automated learning process.

Teaching computational automation implies in not only the replacement of the teacher's presence by educational technologies, but also the adoption of digital processes that condition learning skills inside and outside the classroom. This is the case with reading and writing habits themselves. Digital platforms are organized to fragment reading, given the ease with which by simply clicking or tapping we move almost instantly from a totally different content to bombarding the reader with a flood of audio-visual stimuli and diverse information, but mainly advertising. Such fragmentation favors an inattentive and impoverished reading from the point of view of critical elaboration, an aspect that is further strengthened by the ease of simultaneous exposure of the reader to different screens, shifting his attention in short intervals between, for example, the smartphone, the laptop, the tablet and the television. As much as students may find themselves isolated in a library or private setting, the courses currently offered by online platforms tend to emphasize study anytime, anywhere.

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The priority given to the means of online information transmission in digitized teaching ended up imposing the hypertext structure, absorbed by materials, activities and network exercises that associate multiple paths and content combinatorial possibilities. The ease of moving quickly from one content to another, beyond format issues - short texts, photos, videos, music and "educational" games - contributes to the devaluation of the sequential and linear reading habit of a text from the beginning to the end. Türcke (2010, p. 285) emphasizes how audiovisual technologies have been transforming our reading habits:

> Now, reading and writing still belong to elementary cultural techniques. Nevertheless, it is undeniable that the ink pales in every image shock. It does not draw closer, being pushed as every imaginary shock does. One has to lean on what is written and decipher its lines published in series, and this can only be achieved through continuous and evident practice, whereas when imagery shocks become its neighbors, it becomes as stressful as a Sunday drive for the usual driver. […] In order to be supported, in general, the deciphering of the concepts and of the written lines, the presence of a gap in the form of a graph or small images becomes increasingly urgent. They belong to the silent assumptions of every print design that without this gap, no one has the concentration and persistence to read a text from the start to finish, line by line. The reading procedure, not only the procedure of flipping through a magazine, but also the scientific one, resembles zapping, which has become normal in front of the screen.

In addition to the competition between written texts and technical images in virtual space, digital teaching programming emphasizes the similarity between learning and the playfulness of video games. Gamification has become the term used to refer to the application of game principles, mechanics, and design to arouse and encourage learners' interest in achieving professional, educational, or even personal goals. The use of these techniques is primarily intended to engage people in seeking resolutions to abstract problems. Among the resources used are: rankings, scores, challenges with increasing levels of difficulty, rewards, badges and structuring of cooperative, competitive and exploratory logics. With a simple language familiar to new generations, notions related to game architecture are imported for thinking motivational strategies in work and teaching environments.

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In the case of education, technology developer companies, such as Geekie[4], defend the potential of gamification to motivate students to solve problems with autonomy and creativity in dynamic and interactive environments. This gamification process, with varied narratives, scenarios and characters, would encourage students to join resources and skills to give purpose to the information received, using it to overcome obstacles encountered in learning. For Geekie, such pedagogical tools act as relevant support in the fight against traditional truancy in Brazilian high schools. Gamified classes would be more attractive, contextualized and fruitful for students, helping them to absorb the content addressed (Lorenzoni, 2016).

Teenagers used to spending much of their time in front of screens, social networks, games, TV channels and movies really tend to have a harder time focusing on traditional classes and can learn better when the learning process relies on elements that come from games. Resources that help attract attention and motivate students are already used for students with special needs. These resources may actually improve performance in assessments such as the National High School Exam (ENEM), but we must bear in mind that the increased use of computing in the educational space makes all the elements attributed to traditional education even more unbearable for the student. Contact with written texts is gradually diminished and the usual annotations that reinforce selective repetition sedimentation, as well as the concentrated listening of abstract conceptual thoughts, without the support of graphs, images and videos, are eliminated. All of these activities that are swept aside are yielding to digital platforms designed to connect people, produce sensitive immersion in virtual environments, and ensure interactive learning with content customized by algorithms. For school managers, such mechanisms provide interaction data that can be transformed into spreadsheets and assessments, enabling them to monitor and quantify teacher and student performance, attendance, and activity. As Sadin points out (2017, p. 141):

[4] Geekie is a Brazilian company, founded in 2011, which develops digital education applications and platforms. The company's products are mainly aimed at high schools and, more specifically, the preparation for the National High School Exam (Enem). Geekie was the official simulator platform in the Enem Hour program, launched in 2016 by the Ministry of Education (MEC) in partnership with the Social Service Industry (Sesi), reaching about 5 million students. The company was also the only accredited adaptive learning platform in the 2013 MEC Guide to Educational Technologies, as well as being included in the Innovative Proposals Database on Basic Assessment of the National Institute for Educational Studies and Research (Inep) (Lorenzoni, 2016).

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> This enlargement of the phenomenon of *the gamificagion of existence* implies in the generalized principle of *playful and parameterized simulation*, as the necessary preamble for the experiences lived without blows and, what is supposed, to have its fullest intensity. "A Video game is not only a metaphor for the way the information goes across us, but an incitement to the question in practice, the experimentation of new definitions of oneself. Which *Sims*[5] player, after a game session, did not consider his own life as a set of parameters to satisfy? That which has no number has no name, that which has no number does not exist[6].

Thinking about the function of artificial intelligence in games, we can glimpse the dimension attributed to the use of game resources in education. Artificial intelligence is involved in the production of interactions that arouse players' interest and engagement in overcoming the proposed challenges. Its main function is to produce a playful and immersive effect, providing challenges with varying levels of adaptation, neither too easy nor too difficult, so as to interweave effort and fun, making the player/student enjoy themselves while striving to perform the scheduled task. The use of gamification in teaching is one of the faces of the production and diffusion of culture in times of digital capitalism:

> The school hopes, by confusing schooling and consumption, to enter the business world more efficiently as it makes students consumers of a lesson commodity that promises exchange value and non-stressful, fun and routine work as access to knowledge. Behind this arrangement of school subjects, the possibilities of formative content disappear. This comes in the meantime as strange and intimidating: the contents of the cultural tradition would be no more than made available to the market, once transformed within the cultural industry (Gruschka, 2008, p. 177)[7].

With the global spread of online connections between electronic devices and the progressive digitization of communication and information technologies, the dimension of enlightenment in 21st century capitalism ultimately drives the convergence between semi-formation[8] and instrumental rationality. A convergent movement that intensifies the impact of the semiformative process on experience, as Adorno (2010, p. 33) pointed out:

[5] Sims is a computer and video game where you have to manage the life of avatars through commands that guide the character to build a house, get a job, buy goods, clean rooms, eat, have fun, exercise- go to the bathroom, sleep and relate to other virtual characters. During the simulation, the player needs to track bars that indicate the amount of energy, hygiene, job satisfaction, and love affinity with other characters.

[6] Translation of citation from Spanish.

[7] Translation of citation

[8] Adorno (2010, p. 9) points out that formation (*Bildung)* "is nothing more than culture taken from the side of its subjective appropriation". However, with the processes of identification and standardization present in the industrialization of culture in capitalist societies, formation becomes "semiformation" (*Halbbildung*), understood as "the spirit conquered by the fetish character of the commodity" (Adorno, 2010, p. 25). In this sense, this text seeks to reflect on some of the configurations taken by the semiformation process at the beginning of the 21st century.

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> Experience - the continuity of consciousness in which the nonexistent remains and in which exercise and association underlie a tradition in the individual - is replaced by a punctual, disconnected, interchangeable and ephemeral informational state that is known to be blurred in the next instant due to other information. Instead of the *temps durée*, a connection of relatively unison living that leads to judgment, there is a 'That's it' without judgment, similar to the words of those travelers who, from the train, give names to all the places they flash past; the wheel factory or a cement plant, the new barracks, ready to give inconsequential answers to any question. Semiformation is a weakness in relation to time, memory, the only mediation that consciously carries out that experience synthesis that portrayed the cultural formation in other times. It is no coincidence that semiculture makes a fuss about its bad memory, proud of its multiple occupations and the consequent overload" Adorno, 2010, p. 33)[9].

Increased exposure to this digital reality tends to absorb the cognitive and emotional energy of individuals in the effort to adapt to the economic demands of *high tech* capitalism. In this context, a new configuration of cultural industry, produced by networked computer programs aimed at automating complex data processing, emerges as a hegemonic trend in education. Such reality trains people to resemble, in terms of skills and competences, the digital goods they use, gradually automating even their intellectual productions according to the consumption parameters of the cultural industry.

The demand for people and institutions is increasing with the aid of algorithms, which are capable of rapidly processing a huge amount of information, finding standard data, which are imperceptible to human sensitivity, in the mass of data, analyzing these patterns with great precision and, based on these analyzes, probabilistically prescribing the best actions to take in a given situation.

The potential and problems of algorithmic models can already be perceived in the educational field. O'Neil (2016) reports the case of the IMPACT program, developed by education reformer Michelle Rhee and implemented in Washington, D.C. in 2009 to improve the performance of lower-income city schools. IMPACT has been aided by an algorithm developed by Policy Research, a mathematical consulting firm, aimed at measuring educational progress by calculating students' advances and declines in language and math learning. Scoring was based on value-added modeling that sought to measure the teacher's contribution to improving or worsening the grades of the students they taught. The authority of the numbers would supposedly allow a clearer and more unbiased assessment of human affections, giving more freedom to school administrators who would not have their personal relationship with

[9] Translation of citation

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teachers affected. However, a well-evaluated teacher whose work was recognized by managers, peers, parents and students could be fired based on the score of the statistical evaluation system. The problem is pointed out by O'Neil, who stresses the complexity of evaluating a person's potential through algorithms.

Variation in student performance from year to year can be due to a variety of factors, such as family, financial, peer relationship or health issue problems, among others. It is restrictive to assign the variation in performance to the teacher, especially by limiting this assessment to approximately 25 students, whereas for a good statistical model capable of comparing exceptions and anomalies, it would be necessary to take into account thousands, or even millions of randomly selected students. In addition, a feedback system would be required to indicate errors and flaws in the statistical model so that it could be refined and corrected. Two hundred and six teachers were fired because of low scores and discouraged from knowing the criteria that led to job loss, because the justification lay in their exclusive reliance on the complex calculations performed by the algorithm's "black box." In addition to the dismissal of low-scoring teachers, bonuses of up to $ 8,000 were also offered to teachers and administrators from high-scoring schools.

O'Neill (2016) reports the case of a dismissed teacher, who was well evaluated by peers and parents. The teacher had received fourth graders with advanced reading levels, with above-average grade histories in the districts where they came from. However, in practice, students had difficulty reading simple sentences. Some time later, investigations by the *Washington Post* and *USA Today* revealed a high presence of erasures on student tests in a group of schools that included the school where most of the students, who had been received by the dismissed teacher, came from. Even though there was evidence that the drop in grades had not been caused by the teacher's work - the fourth grade students' inflated grade, the erasures and the encouragement for teachers to falsify grades (due to fear of job loss or the possibility of receiving bonuses) - what counted in the end was the statistical probability presented by the automated system, which indicated the teacher's poor performance. The professional, with good recommendations from her former coworkers, quickly got a new job, while the school she was fired from lost a well-rated professional by parents, colleagues and principals.

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Algorithms developed by programmers and statisticians automate numerous complex calculations and operations, establishing complicated correlations that often operate in a veiled fashion, giving the false impression that they reflect unquestionable cause and effect relationships. However, because they are not free from the influence of human values present in reality, algorithms can be permeated by stereotypes, biases and injustices. These systems, called "weapons of mathematical destruction" by O'Neil (2016) end up being self-reinforced by their classification capacity, probabilistic prediction and cost "optimization". This is due, in the public area, to the political benefits of using statistical data to show that the problems that these data supposedly help define are being solved by the very evaluation parameters of the statistical model, such as the dismissal of the teacher. In the private sector, these models give companies the power to identify and manipulate potential customers, increasing revenue and helping to exploit and manipulate workers, reducing production costs. Well-evaluated and rewarded workers tend to unthinkingly believe that what they do should be valued. Due to the opacity of the algorithms and their decision criteria, rarely is an audit carried out to correct possible model evaluation errors that, however profitable, may be ruining lives.

For the most part, computationally automated mathematical systems end up highlighting economic inequalities by harming those already handicapped by low incomes and by increasing the benefits of high-income people. A young man from a poor neighborhood on the outskirts may be denied loans to pursue his studies because he is considered a high-risk borrower; or more likely to be arrested by the police, as algorithms that direct policing, tend to define criteria that indirectly track poverty; or those who find it harder to find a job, because many companies that select candidates use automatic resume selectors to avoid people living in certain locations. Algorithms are also used by employers to identify customer movement and to modify employees' working hours as required, which results in increased worker strain, who are constantly obliged to adapt to flexible hours.

That which is most likely is not always more correct, but for algorithms this does not matter; Numbers have the final say and transform economic probabilities into measures of punctuation, evaluation, and fairness. Algorithm-based custom advertisements try to get everything they can out of each one. American universities, for example, target online ads to low-income people, prompting these citizens to buy loans that they cannot afford, to start courses they cannot finish. Dropouts for these universities are hardly a problem, as agreements with the government guarantee the payment of the courses. The whole burden of debt is placed

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on exploited young people, who were convinced by the misleading advertising from these for-profit educational institutions (O'Neil, 2016).

The short circuits generated in education due to the demands for efficiency, speed, productivity and competitiveness, which make humans disposable in relation to machines, are felt by the medicalization epidemic of students diagnosed with depression, anxiety, attention deficit and hyperactivity. Many teachers, family members and students feel unprepared to deal with their own and others' emotional conflicts. Parents and teachers find themselves victims of the same diagnosis as their children and students, unable to reconcile the demands of their professional and personal life, without time to elaborate on their sadness, anxieties and frustrations. Powerless in the face of the historical and social conditions that produce their suffering and unaware of the subjective motivations that help produce such symptoms, these parents and teachers try to control their biological reactions by appealing to the use of medicine. Suffering is anesthetized not only to cope with the demands of working life but also to be distracted by consumer activities.

Technology also acts in education as the remedy for mental illness under the lens of psychiatry. It helps to control immediate physiological reactions without interfering with the historical, social and subjective causes of the disease. On digital platforms, students tend to be more active, engaged, lively and alert. Exercises can take the form of games, and no matter what the content, everything can be adapted and formatted according to the student's motivations, no matter if it is a story text or a philosophical concept. Any content can be presented in didactic schemes using videos and images. You no longer have to go to the classroom to hear a teacher's lecture, and if you do, you do not need to pay attention, because it is very likely that the class is being recorded and available to everyone to be heard at home, in the midst of everyday tasks, jumping or accelerating the less flashy moments of speech. Machines certainly adapt to this dynamics better than a teacher. Algorithms that simulate automated and intelligent learning produce a kind of symbiosis between the student's way of learning and the way the machine learns like the student learns. Thus, the school gradually ceases to be a space of critical self-reflection and momentary distancing from the contradictions and conflicts of everyday life. It surrenders to the force of adaptation, to the immediate demands of reality, weakening its

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antagonistic position to what is already given by the social mode of operation. This ambiguity that technology attacks is emphasized by Adorno when he states that the educational process, while aiming to adapt the student to society, helps to form forces that resist the simple adaptation to the ills of the present, trying to transform him:

> Education would be powerless and ideological if it ignored the goal of adaptation and did not prepare men to guide themselves in the world. But it would be equally questionable if it remained thus, producing nothing but *well-adjusted people*, as a result of which an existing situation imposes itself exactly on what is worse. (Adorno, 1995, p. 143)[10].

Faced with an education that highlights the role of adapting students to a world dominated by computer technologies, it is important to redeem the critical reflection that unveils contradictions and resists the unreflected participation in the savagery and injustice that persists in society despite all technological advances.

Proposals for education in times of artificial intelligence

Among the proposals for education, at a time dominated by automated processes and artificial intelligence techniques, those that advocate updating the educational model according to market demands stand out. Tercek (2015), a renowned executive linked to the creation of interactive content for digital platforms, in his book *Vaporized: solid strategies for success in a dematerialized world*, states that universities still resist adapting to the process of digital evaporation that has been going on in various communication media and in culture and economy diffusion. This resistance is interpreted as a delay in relation to the trends of the new times.

Joseph E. Aoun, a linguist and dean of Northeastern University, however, upholds in the book *Robot-proof: higher education in the age of artificial intelligence,* the need to educate students for skills and competencies that enable them to keep up with technological automation, replacing the demands of old jobs and career models with the new demands of a robotic, software and artificial intelligence driven economy. These new skills would require a college education that

[10] Translation of citation.

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would go beyond the priority given to undergraduate and postgraduate students in order to drive the development of lifelong learning as well.

Facing an increasingly digital and technological future, Aoun (2017) argues that education should focus on the intertwining of three types of literacy that will foster the skills required by new jobs:

- *Data Literacy:* Preparing students to read, analyze, interpret, and use a wide range of data, such as big data (large set of stored data), guiding the constant flow and bombardment of information on their digital devices, and by extracting their social, economic, political and cultural meanings and contexts from this information.
- *Technological Literacy:* Providing students with an understanding of the coding, programming language, and engineering principles upon which digital machines and programs work.
- *Human literacy:* preparing students for the social environment. While data literacy would show us the "how," human literacy would teach us the "why." It would involve teaching liberal arts, social and digital arts, as well as design. In a world where the boundaries between technology and humanity are blurring, even an engineer needs to develop human interfaces, and a programmer needs to be able to tell stories.

In addition to these competencies, Aoun (2017) considers that the growth of the digital economy will make the development of four cognitive skills, or meta-skills, essential to work in complex systems.

1. *Critical thinking:* the ability to rationally analyze ideas and apply them skillfully. Aoun (2017) understands that critical thinking involves the rational examination of different layers of a given phenomenon, context, or situation, with respect to not only quantifiable, but also latent and intuitive aspects — for example, historical, motivational, and emotional influences in a person's decision making. Human critical thinking goes beyond the power of machines, which account only for the quantifiable layers of phenomena and facts that can be understood by asking yes and no questions.
2. *Systemic thinking:* the ability to establish correlations between different functions, situations and contexts, breaking away from strictly domain-bound thinking, integrating distinct fields of knowledge in the holistic view of companies, subjects and equipment.

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Aoun (2017) points out that machines can even work with correlations between complex system variables, but find it difficult to imagine how to transport data and conclusions from one field of knowledge to another - for example, by transposing models from climate data evaluation to models from other areas, such as economics, law or social science, Systematic thinking would give you the strength to think about complexity, the relationships between details and the whole, and to handle multiple lines of thought to find an original solution to a problem.

3. *Entrepreneurship:* capacity for initiative, elaboration, innovation and implementation of projects, services and new business. This is a fundamental characteristic for professionals to distinguish themselves in a job market, which is increasingly permeated by machines and digital environments. Instead of being surprised by the automation and replacement of their job positions, it is more profitable for people to invest in personal projects that create new jobs, which are in demand by this economy. Employees who want to remain employed will have to continually innovate their work in order to continue adding value to the company to which they belong.

4. *Cultural Agility:* The ability to make decisions in the different and even conflicting contexts of a culturally diverse economy, successfully acting in cross-cultural situations. Aoun (2017) stresses the limits of machine guidelines and responses and artificial intelligence to contextual aspects of the environment, such as variations in a stranger's vocal tone and body language in an unexpected situation. Artificial intelligence could, for example, give the precise meaning of a businessman's words, but could not strike a deal while analyzing, interpreting, and responding to unspoken meanings, subtexts, and cultural assumptions present in the attitude of business meeting participants.

Both Tercek (2015) and Aoun (2017) agree that there should not be a full digitization of the educational model, as it is more efficient to develop a hybrid model that combines what is good in traditional physical universities with the new demands of the digital world. Both authors, however, defend the entrance of technology in the classroom and the adaptation of teaching to the economic demands of the labor market as a way of reducing student resistance. Even when arguing in favor of culture and critical thinking, Aoun (2017) does so by identifying elements demanded by employers in these characteristic, not emphasizing at any moment that

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such thinking could reflect on the contradictions and savagery present in the capitalist system. His proposals do not think on the possibility that criticism gives to the thought of thinking against its own systematizations; indeed, for Aoun (2017), criticism and culture are linked to the systematization of knowledge and entrepreneurship, that is, it is an analytical and pragmatic criticism, aimed at social adaptation, devoid of the dialectical character of resistance to a closed systematization that ultimately leads to the replacement of man by a machine. The dialectical criticism movement does not ignore these conceptual systems, but seeks to use the structuring force and the particular contents of a given system to show its contradictions:

> From a distance, dialectics would need to be characterized as the effort raised to self-awareness to let it become permeable. On the other hand, the specialized argument degenerates into technique of experts without concepts in the midst of the concept, as it today expands academically into the so-called analytic philosophy that can be learned and copied by robots. The immanently argumentative is legitimate when it is receptive to the integrated reality of the system in order to gather its own strength against it (Adorno, 2009, p. 33)[11].

For Aoun (2017), routine and repetitive activities should be avoided in education, as these may be performed in the future by artificial intelligence. But critical theorists, such as Türcke, move in the opposite direction, considering the importance of the school reestablishing, in its formative process, the repetition exercises left to the machines, rearticulating spaces and moments dedicated to ritualistic activities that strengthen students' cognitive abilities of retention, memorization, imagination, representation and abstraction. Thus, schools and teachers still facing the thoughtless and rash use of technologies in the classroom would represent the last forces of resistance to economic impositions that seek to reduce education to the training of workers for professions that value technology to the disadvantage of man himself:

> Learning to retain and having free time for it is the basis of all training. Educators and teachers who practice common rhythms and rituals with great patience and calmness, who along this path spend common time with the children entrusted to them; who refuse to adapt the class to television entertainment standards with continual change of method; who reduce computer use to the minimum necessary; who rehearse small plays with the children, presenting a repertoire of verses, rhymes, proverbs, poems to them, which are learnt off by heart but with thoughtfulness and understanding; who do not use spreadsheets permanently, but make students carefully record the essentials in a notebook: they are members of today's resistance. Copying texts and formulas, once a very common sign of authoritarian schools, suddenly becomes, in the face of the general agitation of the screen, a measure of motor, affective and

[11] Translation of citation.

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> mental concentration, an examination of the conscience, perhaps even a form of devotion (Türcke, 2016, p. 25).[12]

It is essential to think about the possibilities and contradictions of the hybridization between the physical and the digital in education, but not to encourage technological use, but to preserve what in traditional teaching can still act as a driver of critical thinking about present problems, antagonisms and conflicts present in society. In this sense, returning to Walter Benjamin's image, it is up to the critical teacher, facing the scant reflexive excitement with the technological modernization of education, to apply the hand brake, rehearsing with the students, patiently and repeatedly, exercises that make them capable of performing and repeating, calmly and carefully, experiences that increase sensitivity and the capacity for conceptual abstraction. In this formative process, thought should not be autonomous only in appearance, but really prepared to think to itself in the confrontation with the specific content of each object, going beyond consumerist immediacy and dependence on technical images and predetermined categories where it is enough to fit into everything that is presented.

The economic pressures for educational computational instrumentalization, for the computerized administrative control of educational institutions and for the digital industrialization of culture - which in the field of education is becoming increasingly didactic, when not "gamified" in virtual learning platforms - end up weaken the thinking process and make it dependent on preprocessed content by digital devices. Theoretical and critical reflections today mean a persistent and difficult intellectual effort of resistance to the fast pace of operation and innovation of high-tech capitalism; this is at a time when technological automation makes people unwilling to persist for a long time in a single activity, constantly exposing them to successive informational data, in a flow that favors impatience, immediacy and intolerance to frustration.

Forming a persistent thought, as a self-critical mirror of reason, requires confronting it not only with its processes of desensitization and indifference to suffering, but also requires unveiling the unpleasant and cumbersome facets encrypted in the algorithms that digitally instrument culture. For this to happen, education needs to go beyond what is programmed, giving visibility to what does not appear in the computer interfaces: the economic, political and

[12] Translation of citation.

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social contradictions hidden in the black boxes of the devices. In this way, criticism may still negatively rescue the emancipatory possibilities contained in digital technologies.

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