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Artículos científicos

El reto de la educación 4.0: competencias laborales para el trabajo emergente por la covid-19

The challenge of education 4.0: labour skills for emerging work by covid-19

O desafio da educação 4.0: competências laborais para o trabalho emergente devido a covid-19

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Resumen

La cuarta revolución industrial ha generado grandes cambios en la vida de las personas, principalmente en el ámbito educativo y laboral. Surgen nuevas profesiones y otras desaparecen, de ahí que los sistemas educativos de cada país deban adaptarse a las necesidades para preparar a los futuros profesionistas de un mercado laboral cambiante e incierto. En ese contexto, la educación 4.0 se presenta como un modelo flexible y adaptativo que se caracteriza por apoyarse en las tecnologías de la información y la comunicación y, principalmente, en las tecnologías de la digitalización de la industria 4.0. A esa realidad se le debe sumar que en el año 2020 la pandemia provocada por el virus Sars-CoV2 ha revolucionado y acelerado precisamente el uso de las tecnologías en el desarrollo de los



trabajos y en los procesos formativos de todos los niveles, por lo que en el presente estudio se describen los retos de la educación 4.0 impuestos por la industria 4.0 y por la pandemia. Este artículo, en síntesis, incluye los resultados de una investigación documental sobre las competencias laborales que deben adquirir los estudiantes universitarios para incorporarse y ser competitivos en el desarrollo del trabajo emergente por la covid-19. El método utilizado fue el analítico-deductivo, el cual permitió desarrollar un marco conceptual y contextual, así como analizar la situación del mundo laboral vigente y las directrices sobre el tema de los principales organismos internacionales (Organización Internacional del Trabajo, Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura, Comisión Económica para América Latina y el Caribe, Organización para la Cooperación y el Desarrollo Económicos y la Unión Europea). En conclusión, se puede decir que las competencias necesarias para desenvolverse en este nuevo ámbito son seis: pensamiento crítico y solución de problemas complejos; competencias digitales laborales; competencias socioemocionales para el trabajo 4.0; competencias para el trabajo transdisciplinar; competencias de aprendizaje permanente (saber reaprender), y competencias lingüísticas.

Palabras clave: competencias laborales, covid-19, cuarta revolución industrial, educación 4.0, virus Sars-Cov2.

Abstract

The Fourth Industrial Revolution has generated great changes in people's lives, but mainly in the educational and work environment. New professions arise and others disappear and for this reason, the educational systems of each country must adapt to the needs to prepare future professionals for a changing and uncertain labor market. In this context, education 4.0 is presented as a flexible, adaptive model, which is also characterized by incorporating information and communication technologies and mainly the digitalization technologies of industry 4.0. In addition, in 2020 the pandemic due to the Covid-19 virus has precisely revolutionized and accelerated the use of technologies in the development of jobs and in training processes at all levels. Due to this fact it is essential to analyze what are the new challenges for education 4.0 imposed by industry 4.0 and the pandemic. This article includes the results of a documentary research on the job skills that university students must acquire in order to join and be competitive in the development of emerging work due to Covid-19.



The research method used was the analytical-deductive one, concluding, after the development of a conceptual and contextual framework, the analysis of the current work situation worldwide and the guidelines of the main international organizations (International Labor Organization, United Nations Educational, Scientific and Cultural Organization, Economic Commission for Latin America and the Caribbean, Organization for Economic Cooperation and Development and the European Union),

it could be concluded that the competencies are 6: critical thinking and complex problem solving; Digital job skills; Socio-emotional skills for work 4.0; Competences for transdisciplinary work; Lifelong learning skills (knowing how to relearn) and Language skills.

Keywords: job skills, covid-19, fourth industrial revolution, education 4.0, virus SARS-CoV2.

Resumo

A quarta revolução industrial gerou grandes mudanças na vida das pessoas, principalmente na educação e no trabalho. Novas profissões surgem e outras desaparecem, portanto os sistemas educacionais de cada país devem se adaptar às necessidades de preparar os futuros profissionais para um mercado de trabalho em mudança e incerto. Neste contexto, a educação 4.0 apresenta-se como um modelo flexível e adaptativo que se caracteriza por contar com as tecnologias de informação e comunicação e, principalmente, com as tecnologias de digitalização da indústria 4.0. A esta realidade acrescenta-se que em 2020 a pandemia provocada pelo vírus Sars-CoV2 precisamente revolucionou e acelerou o uso de tecnologias no desenvolvimento de empregos e nos processos de formação a todos os níveis, pelo que Este estudo descreve os desafios da educação 4.0 impostos pela indústria 4.0 e pela pandemia. Este artigo, em síntese, inclui os resultados de uma pesquisa documental sobre as competências para o trabalho que os estudantes universitários devem adquirir para ingressar e ser competitivo no desenvolvimento de trabalhos emergentes devido ao covid-19. O método utilizado foi o analítico-dedutivo, o que permitiu desenvolver um quadro conceitual e contextual, bem como analisar a situação atual do mercado de trabalho e as diretrizes sobre o tema das principais organizações internacionais (Organização Internacional do Trabalho, Organização das Nações Unidas para a Educação, Ciência e Cultura, Comissão Econômica



para a América Latina e o Caribe, Organização para Cooperação e Desenvolvimento Econômico e União Européia). Concluindo, pode-se dizer que as competências necessárias para funcionar neste novo campo são seis: pensamento crítico e resolução de problemas complexos; competências de trabalho digital; competências socioemocionais para o trabalho 4.0; competências para o trabalho transdisciplinar; competências de aprendizagem ao longo da vida (saber reaprender) e competências linguísticas.

Palavras-chave: competências laborais, covid-19, quarta revolução industrial, educação 4.0, vírus Sars-Cov2.

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Introduction

The fourth industrial revolution - in the context of the current pandemic generated by covid-19 - has caused the ways of working to change drastically, since it has gone from a collaborative work between man-machine to full automation (machine-machine) of production processes. This has caused jobs that can be easily automated by artificial intelligences to be at risk, although it is also true that new professions have emerged (eg, data architect, nanomedical, big data specialists, among others) (Menéndez, 2020) .

In the field of education, covid-19 has also forced us to go from face-to-face to virtual, which is why the need to determine the technological and labor competencies that must be developed to meet the established objectives has grown. In this sense, Galindo (2015) and Gasca (2010) point out that, in principle, the differences between reading in print and digital media should be recognized, while Lombardero (2015) emphasizes that the skills essential to function in the virtual world, they will not necessarily have to be the product of professional training, but can be certifiable in more flexible training environments.

Swain Oropeza (2017) describes industrial revolutions and recognizes that in Mexico there is no progress to adapt these transformations to higher education. For this reason, its curricular proposal, based on challenges for the engineering area, emphasizes on promoting the university-company link and promoting the comprehensive training of the student, especially the development of soft skills (teamwork, leadership, flexibility, among other).

Quiroz and Norzagaray (2017), for their part, develop a quantitative study with the objective of investigating the academic practices of higher education that are carried out with technological devices and tools. The results allow the authors to conclude that the students



show the ability to locate information, but not for its integration or for the generation of their own ideas.

Garay (2017) describes the actions of higher education students to strengthen digital skills that can be used outside of school and how these are incorporated into activities for the participation of student groups and for work 4.0. Echeverría and Martínez (2018) analyze the economic and labor transformations of the flow that the professions will face, which is why they highlight the obligation to cultivate skills such as the following: “a) critical thinking, understanding and analytical skills; b) integrate new media (communication) literacy into educational programs; c) include learning by doing ”(p. 13); likewise, they suggest the consolidation of skills such as emotional intelligence and cognitive flexibility.

For their part, authors such as Irigoín and Vargas (2002) and Menéndez (2020) point out the conception of job competencies and new professions that will be successful in the immediate future, as well as those that will disappear in the near future. In this regard, Ynzunza, Izar, Bocarando, Aguilar and Larios (2018) conclude that the technological transformations associated with Industry 4.0 and smart manufacturing will have positive and negative repercussions on production, which will require educational institutions to training of specialized professionals for the demands of the labor market.

Lahera (2019), on the other hand, considers that digitization will cause massive unemployment, although he also believes that some professions will have to be restructured, which is why he suggests “intervening in training systems and recycling the human factor” (p. 263) , that is, preparing people to adapt to new activities.

As can be seen, the coincidences of the different works reviewed show a concern for the onslaught of change and the role of higher education to address the development of the skills required to face the new conditions.

Now, although the previous opinions are very relevant, it should be noted that no studies were found on the skills required to face the labor market disrupted by covid-19. This issue, therefore, is particularly important in the midst of a new reality that requires drastic changes, hence the following research questions have been established: what is the challenge of education 4.0 in the face of the pandemic caused by covid-19 ? And what are the skills that the labor market must develop to face the needs imposed by Industry 4.0 and the pandemic?

One of the hypotheses raised was that the already determined generic and disciplinary competences must have an extension to now face the technological revolution, because at present to be a successful professional, not only knowledge, skills and disciplinary skills are needed, but also skills digital, idiomatic, socio-emotional, etc. In short, the verb relearn will be the key pillar to avoid being outdated in new specialized jobs, especially in those where digital is predominant.

Objectives

The general objective of this research was to determine what are the challenges of education 4.0—in the context of the pandemic—to adequately train university students, so that they can join a completely changing labor market. To achieve this purpose, the following specific objectives were established:

Show that there is a coincidence in competencies for emerging work determined by the main international organizations, which study work and its effects, and have issued guidelines.

Analyze each of the competencies that are considered essential to face work in the fourth industrial revolution and determine which are required within the change that has been generated at work during the period of the pandemic.

Methodology

The results presented in this article correspond to the conclusions of a documentary and descriptive research, developed based on the analytical-deductive method. To do this, first the current environment in the world is reviewed, as well as the consequences of the fourth industrial revolution and the pandemic generated by covid-19. This descriptive part configures the contextual framework that serves as the basis for understanding the problems facing job training today.

Subsequently, following the deductive method, various concepts are analyzed, such as industry 4.0, education 4.0, competences, among others, which are interwoven in the research forming a conceptual framework that has a double objective: on the one hand, to fix the position of the authors in relation to these issues and, on the other hand, delimit the vision with which the treatment of the analyzed information should be understood.



Due to the fact that it is a doctrinal investigation - whose state of affairs showed that the main international organizations have issued guidelines before the pandemic on the course that vocational training should follow to respond to labor needs, and in monitoring of the deductive method— it is shown that the skills that are being required for the transformation of work are the same as those required to go from face-to-face to home office or telework.

Results

This article offers results that are presented in a discussion made up of four sections: the first focuses on the context of the pandemic generated by covid-19. The second lays the foundation for understanding the fourth industrial revolution and education 4.0. The third analyzes the changes caused in the world of work by industry 4.0 and by covid-19. These first three sections serve as the basis to verify that the challenge of education 4.0 is to train professionals with job skills for the fourth industrial revolution, and for the emerging work due to the covid-19, the subject of the fourth section.

The greatest contribution of the research was to determine that the greatest challenge of education 4.0 in times of the pandemic and the fourth industrial revolution is to achieve the acquisition of the following skills for emerging work: critical thinking and complex problem solving, digital skills labor, socio-emotional skills for work 4.0, skills for transdisciplinary work, lifelong learning skills (knowing how to relearn) and language skills.

Context of the pandemic caused by covid-19

The World Health Organization (WHO) (2020) establishes that covid-19 is an infectious disease caused by a strain of coronavirus ¹ recently discovered. Both this new virus and the disease it causes were unknown before the outbreak broke out in China in December 2019.

In March 2020, the WHO explained that due to the increase in infections by the Sars-CoV2 virus, the need arose to categorize the disease as a pandemic, a reason that forced all

¹ Los coronavirus son una extensa familia de virus que pueden causar enfermedades tanto en animales como en humanos. En los humanos, se sabe que varios coronavirus causan infecciones respiratorias que pueden ir desde el resfriado común hasta enfermedades más graves, como el síndrome respiratorio de Oriente Medio (MERS) y el síndrome respiratorio agudo severo (SRAS).



countries to take immediate action (Pan American Organization of Health, [PAHO] 2020), such as the temporary closure of work sources that were not considered essential, as well as the suspension of face-to-face classes, so digital strategies had to be designed to finish the school year.

From the governmental actions of each country, a couple of questions that involve the two focal points for the present work emerge. The first is that many of the sources of employment considered non-essential had to adapt to telework, which was not so new for some countries; However, for developing nations, implementing this modality seriously complicated working conditions, since the lack of certain tools (such as access to a computer and the internet), caring for children, the elderly and sick family members, as well as coexistence in confinement they put the emotional stability of the entire population to the test, especially of female workers due to gender stereotypes.

Second, the pandemic forced the teaching of classes by digital means. This fact was a challenge for teachers and students, since both needed to have technological skills to perform effectively on the platforms. In short, the pandemic served to expose the shortcomings of health systems, companies in general, and educational centers in particular.

Fourth industrial revolution and education 4.0

The term industry 4.0 was used officially for the first time in 2011 to refer to a model that is based, eminently, on the application of new technologies within production processes in order to make them automata, intelligent and efficient. Although it is risky to offer a single definition for this concept (Castresna, 2015), its main elements can be mentioned, which are listed below:

1. New organizational model: This breaks the traditional schemes of working between people or human-machine interaction. Now the scheme is characterized, mainly, by the machine-machine relationship without human intervention (Mendizábal and López, 2018).
2. Automated systems: To achieve an automated system, two very important aspects are involved: digitization and the internet of things.
3. Information and communication technologies (ICT): ICTs are a fundamental factor for the development of automatic systems in the fourth industrial revolution, as they are “the technologies that are needed for the management and transformation of



information” (Sánchez, 2008, p. 156) [italics added]. That is to say, they are the conductive means by which an action is intended to be carried out, that is, computers, programs, etc., that allow the creation, modification and storage of information.

4. Efficient production: In this fourth industrial revolution, the main objective is the production of goods or services in less time and cost, but with a higher quality to benefit companies and customers; however, it should be noted that the worker may be one of the main affected.
5. Direct customer interaction: A point that characterizes this fourth industrial revolution is the direct intervention of the customer in the production process of the good and / or service (on-demand economy), since from the comfort of your home — and thank you to the use of ICT - you can order the product according to the characteristics you want. This allows not only to consider the individual wishes of the customer, but also to develop completely new industrial products and business models.

We can therefore affirm that industry 4.0 requires a new organizational model, hence Deloitte (2019) explains the following:

The fourth industrial revolution is the social, economic and political phenomenon characterized by constant change and the generation of new forms of production, consumption, communication and teaching-learning, among others, based on the use of digitalization technologies. , that impact human beings in their daily lives (how we relate, work and live) (p. 3).

As can be inferred from the previous paragraphs, this technological revolution and the situation caused by covid-19 have caused most of the labor fields (including education) to be restructured, which is why education institutions today must prepare professionals who have specific skills to function successfully in immediate reality.

In this sense, the Organization for Economic Cooperation and Development (OECD) (2019) suggests de-professionalization and work-based learning to train citizens who can develop the knowledge, attitudes and values they need throughout life. Here the education-work binomial based on the main trends of innovation and change takes on vital importance. The 4.0 model, therefore, should promote the rescue of the elements of traditional education to combine them with the emerging advances and the proposals of 21st century science (Fundación Mapfre, 2019).



Education 4.0, then, is a training proposal that has the intention of preparing the professionals of the future with the skills that will allow them to access the jobs that are emerging as a result of the transformations in the world of work (Universidad Autónoma del Estado de Morelos [UAEM], 2020). This model is flexible, adaptive and is characterized because it relies on ICT and mainly on artificial intelligence, data analytics, gamification, among others (Cataldi and Dominighini, 2015).

Changes at work

As mentioned above, the world of work is undergoing a strong change, so the disappearance and emergence of some professions is predicted.

Professions that will disappear

The World Economic Forum (WEF) (2018) in its publication Future of jobs established that as a result of automation in production processes, 75 million jobs will be eliminated worldwide by 2025. Professions that are closely related to automated jobs or that its functions can be automated in a simple way and carried out by a machine through artificial intelligence will be the first to disappear. Some of them are mentioned below:

- Travel agents, since nowadays anyone can book their vacations from the comfort of their homes, without the need for an intermediary to take care of it.
- Call center employees: The machines will be those that occupy these positions in the short term, since the functions of this position are easily automated.
- Postman: Mail services will be severely reduced by e-mail.
- Banking executives: A not too distant reality, since at the moment customer service centers controlled by machines have been introduced throughout the country, which are programmed to solve the main problems that a banking user may have with their account.
- Translators: Just open an application to translate a document in any language.
- Cabin workers in parking lots, cinemas, tollbooths, supermarkets, among others. A machine is already capable of carrying out the collection activity automatically.

New professions

Due to the vertiginous advancement of technology, in the near future there will be vacancies, for example, in the field of data architecture, a discipline that will be in charge of designing strategies for companies' database systems and standards of operations, programming and security (Federal Student Aid, nd). Likewise, a commerce manager, who will specialize in the company's "electronic commerce or online store with the aim of making it grow" (Blanco, July 19, 2018, para. 15). In short, new jobs can be divided into the following categories:

- Humanizing functions: Those jobs that are focused on emotional intelligence and interpersonal relationships may be more valuable in this technological age (Linkedin, 2017).
- Data science, engineering and machine learning jobs: There will be a great growth in job sources focused on the application of this type of exact science in order to improve and build new machines (Linkedin, 2017).
- Artificial intelligence trainers and trainers: This field will be aimed at those people who are widely trained to develop the communicative language of machines, capable of correcting problems that arise and keeping the artificial intelligences that are developed updated (Linkedin, 2017).
- Traditional professions with new ways of working: Traditional jobs will be merged with new technologies, which will allow a better performance in activities; for example, in the field of health, doctors will have to handle the new robots that perform more precise surgeries.
- New ways of working: Thanks to communication via the Internet, the opportunity has been opened to promote teleworking.

Labor competencies for the fourth industrial revolution and emerging work due to covid-19

This topic has been divided into three sections: labor competencies, challenges of education 4.0, and competencies for emerging work in times of the fourth industrial revolution and covid-19.



Labor competencies

From the constructivist pedagogical approach, the definition of competence has its origin in the works of Piaget, Bruner, Vygotsky and Ausbel. Perrenoud (2004) synthesizes the proposals of the aforementioned theorists and sees the competences as the capacities that mobilize resources (knowledge, values and attitudes) that, if they are connected to each other, allow attention to the problems faced so much in daily life as in the environments of social interaction.

The emphasis in the development of competencies is based on the involvement of the learner, hence the notion of meaningful learning is recovered from Ausbel (1990), which is achieved when new knowledge is related to the student's previous experience. That is, it is recognized that for learning to take place, information processing is required based on the experience of the learner and, eventually, for what he learns.

Competencies are classified in various ways; in some cases the dichotomy between hard and soft is offered, although in other cases they are organized into disciplinary, generic and transversal. These are transferred to different life situations, including professional performance.

In this order of ideas, professional competences (Galdeano and Valiente, 2010) are the product of the different training processes with the intervention of educational institutions; The purpose is to achieve a relevant preparation for insertion in the work environment. Regarding labor competencies, the International Labor Organization (cited by Irigoien and Vargas, 2002) mentions the following:

[They focus on] the social construction of meaningful and useful learning for productive performance in a real work situation that is obtained not only through instruction, but also - and to a large extent - through experiential learning in concrete situations of work (p. 10).

Labor competencies, therefore, are focused on learning destined to the performance of the activity for which the subject is instructed, so situational and context learning is privileged for the application of the skills and abilities that are sought to be promoted. The European Higher Education Area - through the Bologna Declaration (1999) - tried to reach agreements between European ministers to develop and implement in their countries homologous degree systems for postgraduate levels in order to promote mobility, job opportunities and competitiveness of educational systems credits. In the Bologna Declaration (1999) the



alignment of this initiative with the economic proposal of globalization and a reiterated discourse on quality in education is undeniable.

Now, labor competencies in the fourth industrial revolution have also been classified not only as hard skills or hard skills -vital for the performance of a profession-, but also as soft skills or soft skills -essential to develop our personality traits, communication, language, personal habits, etc.—. Therefore, the labor competencies for the fourth industrial revolution can be conceived as those that have to do directly with the basic skills and the needs of practical application of professional knowledge in the current social and labor environment, where new generated challenges are imposed, in this specific case, due to covid-19.

These competencies require, as a starting point, the skills established in the study plans (that is, knowing how to learn, self-knowledge, mathematical competencies, etc.), as well as the skills set for work in each discipline (lawyers need verbal and written legal argumentation skills; doctors need to know and understand the functioning of the human body, etc.). However, today the skills to function in the world of the fourth industrial revolution are also essential, which will allow greater success in the labor market.

In this sense, international organizations such as the International Labor Organization, the United Nations Educational, Scientific and Cultural Organization, the Economic Commission for Latin America and the Caribbean, the Organization for Economic Cooperation and Development and the European Union have developed research on the competences and skills that must be had to be able to face the work of the future. Table 1 shows those that show similarities:



Tabla 1. Competencias laborales para la cuarta revolución industrial

Organismo	Denominación	Categorías de competencias o habilidades
Organización para la Cooperación y el Desarrollo Económico*	Habilidades y competencias del siglo XXI para los aprendices del nuevo milenio	<ul style="list-style-type: none"> • Competencias cognitivas: alfabetización y aritmética. • Competencias técnicas (específicas del sector u ocupación). • Socioemocionales. Trabajo en equipo y comunicación.
Organización de las Naciones Unidas**	Dinámicas de apropiación de las TIC	<ul style="list-style-type: none"> • Habilidades cognitivas: Pensamiento creativo, reflexivo, racional y vinculante; comunicación y colaboración, y competencias laborales de la industria 4.0. • Habilidades digitales: Uso de las tecnologías para elaborar y compartir información. • Habilidades curriculares.
Unesco***	Competencias futuras para la industria 4.0	<ul style="list-style-type: none"> • Aprendiendo a lo largo de la vida: Saber aprender. • Autoexigencia. • Enfrentar lo conocido y desconocido. • Uso interactivo de diversas herramientas y recursos (intelectuales, religiosos, culturales, lingüísticos). • Interactuar con el mundo. • Competencia que permita ser personas locales y globales. • Flexibilidad de alfabetización. • Competencia transdisciplinaria: Comprensión de varias disciplinas.
Organización Internacional del Trabajo****	Competencias laborales futuras	<ul style="list-style-type: none"> • Habilidad de creación de sentido. • Inteligencia social. • Pensamiento innovador y adaptativo. • Capacidades interculturales. • Pensamiento computacional. • Alfabetización en los nuevos medios.

		<ul style="list-style-type: none"> • Interdisciplina. • Mentalidad diseñadora. • Administración de la carga cognoscitiva. • Colaboración virtual.
Banco Interamericano de Desarrollo****	Habilidades híbridas <i>soft-hard</i>	<ul style="list-style-type: none"> • Comprenden habilidades socioemocionales, habilidades cognitivas y habilidades académicas. • Comprenden habilidades de ocupación, habilidades en el sector y habilidades en la empresa.

Fuente: Elaboración personal a partir de *OCDE, *Habilidades y competencias del siglo XXI para los aprendices del nuevo milenio en los países de la OCDE*; **Sunkel *et al.*, *La integración de las tecnologías digitales en las escuelas de América Latina y el Caribe*, Chile: Naciones Unidas; *** Mmantsetsa *et al.*, *Future competences and the future of curriculum: United Nations Educational e International Bureau of Education* (traducción personal); ****Catalano, *Tecnología, innovación y competencias ocupacionales en la sociedad del conocimiento*, Argentina: Organización Internacional del Trabajo. *****BID, *Industria 4.0: fabricando el futuro*. Argentina: BID.

Challenges of education 4.0

The implementation of new processes in any field requires overcoming certain challenges in order to meet its objective. In this sense, the pandemic caused by the Sars-CoV2 virus, as well as the fourth industrial revolution, have imposed the challenge of transforming our academic training into a 4.0 education, for which the following initiatives should be promoted:

- Transformation of educational centers: Curricula and infrastructure must be updated and modernized to meet new ways of teaching that responds to the needs of Industry 4.0.
- Training of teaching and administrative staff of educational institutions: The training of teachers will promote learning by competencies in a multimodal environment.
- Changes in the learning methodology: The implementation of dual training will allow students to put into practice the theoretical knowledge acquired in the workplace.

- Access to the Internet and technological means: Having the Internet and technological means open the way for students to interact with the most important elements of the digital age, certainly in conjunction with the training given in classrooms.
- Acquisition of competencies for emergent work: It should be noted that the concept of competence incorporates the appropriate set of knowledge (knowledge) and the skills and abilities (know-how) that a person has developed to use in each situation. It also includes the conditions of the individual and his dispositions to action with the attitudinal and evaluative components (knowing how to be).

Labor competencies for emerging work in times of the fourth industrial revolution and covid-19

Based on what is stated in the previous sections, it can be ensured that the greatest challenge of education 4.0 in times of covid-19 is to train future professionals with skills such as those referred to below to successfully fulfill the assigned tasks:

1. Critical thinking and complex problem solving: This demands the ability to interpret, analyze, evaluate, make inferences, explain and clarify meanings, so it is based on logical reasoning and conscience to respect and refute (when necessary) the points of view of others in a changing work context (Fundación Omar Dengo [FOD], 2005).
2. Digital labor competencies: They are linked to the critical and safe use of information society technologies for work, free time and communication. This means the development of basic ICT skills, such as the use of computers to retrieve, evaluate, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the internet.
3. Socio-emotional competences for work 4.0: They are the set of behaviors, attitudes, traits and personal values that contain the ability to mobilize knowledge, skills, abilities and attitudes necessary to regulate one's own emotions in situations of social, work and digital interaction. During confinement it is particularly important to have them, as they allow emotional resilience while remaining productive despite adversity.

4. Competencies for transdisciplinary work: They are the set of scientific and non-scientific knowledge, knowledge and skills that tend to develop the natural aptitude in professionals to recognize their unity in the disciplines, through the organization and articulation of knowledge dispersed in the natural sciences, in human sciences, in order to understand the unity and diversity of everything that concerns the human being to be able to apply it in changing work activities (Tobón, 2013).
5. Lifelong learning skills (knowing how to relearn): It is the regenerative ability to reinvent oneself to adapt to new professional demands (OECD, 2019). This includes from constant self-study to returning to universities to reinvent the learned profession and adapt to work 4.0.
6. Linguistic competences: In this regard, the Common European Framework of Reference for languages establishes that linguistic competence is “the ability to express and interpret thoughts, feelings and events both orally and in writing (listening, speaking, reading, writing) , and to interact linguistically in a foreign language appropriately in innovative work contexts ”(European Commission, 2004, p. 4). The above has to do with specific training in a technical and specialized language.

However, the main challenge in developing these skills lies in inequality and in the quality of education that over the years has generated a gap that is difficult to reduce. For example, the results of the PISA 2019 test carried out by the OECD show that half of Mexicans do not reach sufficient levels to function in society: specifically, 45% do not achieve sufficient learning in reading, 56% in mathematics and 47 % in science (Ortega, December 3, 2019).

Likewise, and based on a report presented by the Mexican Institute for Competitiveness, only a third of the urban population between the ages of 14 and 55 has some knowledge of the English language. In fact, of those who say they know the language, only four out of 100 can read and understand it, and two out of 100 can speak and write it very well (Instituto Mexicano para la Competitividad [IMCO], 2015).



Conclusions

The arrival of the fourth industrial revolution and the covid-19 pandemic will generate in the short term a great change in all areas of life, which will cause the emergence of an adaptation process that must be promoted from educational areas, spaces that must provide the necessary tools for women and men to function successfully in emerging labor markets.

This, of course, will require the development of competencies mainly linked to Industry 4.0, that is, skills to manipulate digital devices, critical thinking for the solution of complex problems, socio-emotional competencies for work 4.0, competencies for transdisciplinary work, competencies of lifelong learning (knowing how to relearn) and language skills.

In short, it is necessary to bet on the training of professions and occupations typical of the digital world; However, it should also be taken into account what Portella (September 28, 2018) pointed out when he emphasizes that “78% of Mexican 18-year-old students are not interested in science, and 50% of graduates choose between 9 careers, only one of them (industrial engineering) related to science, technology, engineering and mathematics ”(para. 2). This shows that highly demanding careers are being ignored in the future labor market, so inquiries should be made that focus on analyzing this phenomenon in order to promote a change in attitude in the new generations.

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