

# Post COVID-19 Global Macrotrends in the pedagogical practice to achieve Student Outcomes- “ICACIT”

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**Abstract**— The suspension of the on-site educational process due to the temporary lockdown of Educational Institutions provoked scenarios with their due reactions and repercussions of emergency against the Global Crisis as a result of the COVID-19 virus spread. Since Perú is in the midst of this current crisis, the Education sector asked some questions based on ICACIT accreditation model – such as: Which global macrotrends can be applied in the context of a Post COVID-19 pedagogical practices, in order to achieve Student Outcomes (SOs) from ICACIT, the accreditation model? Three categories were identified based on the previous development: I) Global macrotrends related to the Education Sector; II) The Post COVID-19 pedagogical practice, as a role assumed by the professor involved in the different education spaces in accordance with the different didactic approaches (academicist, technological, cultural interpretative, socio-critical and socio-formative); and III) Student Outcomes (SOs) from ICACIT, the accreditation model. Global macrotrends were selected to be applied in The Post COVID-19 pedagogical practice that contribute in the accomplishment of 12 ICACIT SOs and were consequently classified into three areas: i) Cross-cutting Macrotrend (public awareness), ii) the Macrotrend of Post COVID-19 pedagogical practices (Disrupting Education: the assessment of progress, harnessing innovation, multiple senses, co-creation, instant entrepreneurship, the User Experience business-focused model approach for education, and gamification), and iii) the Macrotrend of Support (Networking & Technology).

**Keywords**—COVID-19, global macrotrends, higher education, pedagogical practice, Student Outcomes ICACIT, professor development.

## I. INTRODUCTION

Currently, Perú faces one of the biggest educational crisis as a result of the pandemic produced by the Coronavirus Disease 2019 (COVID-19), transforming the on-site educational system into an e-learning or remote one as a result of the state of emergency. In 2019, the Organization for Economic Cooperation and Development (OECD) claimed that an answer to this current educational crisis will require smart strategic systems that can be adapted to face dynamic challenges; plus, OECD pointed out the relevance of supporting solid investigation systems as well as the development in education, re-designing both the learning and teaching processes. In accordance with the current context, current global macrotrends from the education system – that

can be employed in the Post COVID-19 pedagogical practice in order to achieve Student Outcomes (SOs) from the 2020 ICACIT accreditation model – were chosen; ICACIT (in Spanish: “Institute for the Accreditation and Quality of Computational, Engineering and Technology programs”) [1].

In the last months of the educational emergency provoked by the spread of COVID-19, UNESCO has systematized and broadcasted government initiatives implemented by Latin American educational systems, focused on sharing government planning actions adopted by the different entities from its education sector; as well as, established strategic alliances within those groups and other sectors of interest involved in current scenarios, in order to ensure educational continuity, in the framework of distance learning, based on internet usage and other means of communication [2].

Furthermore, the preparation and the differentiation of specific labor are acquired in the exercise of teamwork and communicative skills within multidisciplinary teams, because a person on his/her own can't have all of the necessary skills and competencies to solve new tasks. For this reason, it is important to consolidate integrated education systems; that is to say, there should be collaboration between universities and the aforementioned industry, where Engineering students can combine both the academic learning experience and the acquisition of a part-time job.

## II. CONTEXTUAL FRAMEWORK

### A. Post-COVID19 Global Macrotrends from the education sector

The current trend consists of a multilevel teaching that is student-oriented and competency-based – with Engineers that are ready to continue – which highlights the need for a change in the educational/professional paradigm, urged by globalization, the fast development of innovative technologies, the social development, the instability and the variability of the contemporary world [3]. The United Nations Educational, Scientific and Cultural Organization, in collaboration with the International Institute for Higher Education in Latin America and the Caribbean, claimed that initiating schooling through a virtual mode isn't such an easy task to achieve, since many countries lacked the preparation for a large-scale disruption like this. The COVID19 pandemic affected roughly 1570 million students in 191 countries, being

23,4 million higher education students, and 1,4 million professors from Latin America and the Caribbean [4].

In light of this, in the middle of the 1<sup>st</sup> semester of 2020, Trends Shaping Education Spotlight 21 and Ipsos Macrotrends have pointed out that education should analyze and adopt certain Global Macrotrends (GMTs), such as: GMT.1) Public awareness; GMT.2) Progress assessment GMT.3) Co-creation; GMT.4) UX-focused teaching: The User Experience-focused model approach for education (UX) is an approach that prioritizes student’s needs, in accordance with the experience of every professor, making interaction and communication simple and easy by helping to overcome challenges; GMT.5) Gamification; GMT.6) Harnessing innovation; GMT.7) Instant entrepreneurship and GMT.8) Networking & Technology; fundamental for the creation of new environments (both artificial and human) of communication, establishing those tools as new ways of interaction, based on innovative digital solutions for education [5].

### B. Pedagogical practice

In 2020, OECD targeted three aspects that professors should consider in order to ensure the continuity of a high-quality educational service: (a) Cognitive skills, in reference to cognitive skills, processing, creativity and knowledge; (b) Interpersonal skills that include teamwork skills and leadership, and (c) Intrapersonal skills, oriented to intellectual openness, work ethic, responsibility and self-efficacy [6]. GMT. 1) It becomes necessary to focus the professor’s role in aspects such as: the promotion of democracy and social justice from democratic participation in the context of equal opportunity, recognizing cultural values in accordance with cultural diversity, with inclusion and respect of the different lifestyles, with inherent co-responsibility to new scenarios, for learning achievement [7].

GMT.7) As far as the professor’s role concerns, he/she must promote self-regulated and autonomous learning strategies in flexible working environments, ensuring a student autonomous, active and self-regulating participation [8]. For the GMT.6) and GMT.8), it’s fundamental to develop the field, known as The Learning Analytics (LA), which allows to obtain information regarding the interaction between professors and students with virtual learning environments and the use of technology tools that support the teaching-learning process [9].

The GMT.3) Collaborative approaches ought to be utilized in order to allow a wider range of action and contributions made in that regard [10]. When talking about the GMT.2) and GMT.4), it has to be taken into account that teaching practice increases in quality when there’s a proposal of continuous improvement that fosters the systematization and communication of experiences from the university professor, based on the following strategies: permanent specialized accompaniment, the collaborative work between peers, and the promotion of teaching innovation [11].

Finally, the GMT.5) Gamification, which is significantly supported on the use of ICTs (TICs in Spanish), is important in regard of the educational transformation as a learning strategy, since the student is able to make knowledge his/her own (besides the use of mobile devices or informatic equipment), which increases the motivation and leads to a better understanding, as well as their focus, through the

promotion of critical thinking and creativity, this being quite a very versatile strategy for professors while teaching [12].

### C. Student Outcomes (SOs) of the accreditation model “ICACIT 2020”

In Perú, there are organizations and companies fully-dedicated to the acknowledgment of quality at the national and international levels, such as ICACIT. This counts with quality standards based on their accreditation model, called “ICACIT 2020” (9 criteria). The study of Criterion 3 has been researched. There are 12 SOs that “describe what students are expected to know and be able to do while graduating”. The SOs are related to skills, knowledge and behavior acquired by students throughout their process during the program”, which promotes innovation in higher education [13]. “Table I” presents the SOs, grouped in such a way that they can be considered as the 4 pillars of education according to The Delors Report [14].

TABLE I. STUDENT OUTCOMES FROM ICACIT 2020 – DELORS EDUCATION PILARS

Results for learning to know (a) Engineering Knowledge (b) Research	Results for learning to be (d) Individual and Team Work (f) Ethics (g) Communications (i) Lifelong Learning	Results for learning to do (e) Problem Analysis (c) Design and Solution Development (l) Project Management
<b>Results for learning to live together or cross-cutting results</b> (h) Sustainability and Environment (j) Engineering and Society (k) Use of Modern Tools		

In the socio-formative model and the competency-based approach, the SOs can also be classified by general competencies that articulate SOs. To that effect, the 4 pillars of education and the 3 competencies that cover the SOs, should be taken into account while developing the pedagogical practice in the current scenario, articulating said actions with Post COVID-19 education macrotrends [15].

## III. METHODOLOGY

The present investigation inquired: Which global macrotrends can be used in the Post COVID-19 pedagogical practice, to contribute to the achievement of SOs from ICACIT accreditation model? For that purpose, the General Goal (GG) establishes general macrotrends that can be employed the Post COVID-19 pedagogical practice to achieve the SOs from ICACIT accreditation model. An empirical study with a descriptive level was applied, framed in the Qualitative and Quantitative Research Paradigm.

### A. Categories and subcategories

If we take the current literature – regarding global macrotrends linked to the education system – into account, three categories can be identified: I) Global macrotrends, that consider global trends related to the education sector; II) Post COVID-19 pedagogical practice, understood as the role assumed by the professor in the different education spaces aligned with the didactic approaches (academicist, technology, cultural interpretative, sociocritical and socio-formative); and, III) Student Outcomes (SOs) from ICACIT accreditation model comprehends 12 subcategories: a)

Engineering Knowledge, b) Research, c) Design and Solution Development, d) Individual and Team Work, e) Problem Analysis, f) Ethics, g) Communications, h) Sustainability and Environment, i) Lifelong Learning, j) Engineering and Society, k) Use of Modern Tools and l) Project Management.

*B. Design and processing of information*

The instruments to gather information were developed according to the Specific Goals. In that regard, it is shown that to get the SG1 (Category I) a documentary analysis technique was utilized through a matrix of documents, which contains specialized information of current global macro-trends. The latter was reduced by selecting education sector-only trends. In order to identify global macro-trends that could be applied in the Post COVID-19 teaching practice, OECD’s 2020 Methodology was taken into consideration [16]. The aforementioned examines four (4) indicators to create awareness about the influence of macro-trends in the education sector. These are: a) Tools for rigorous thinking, b) Education sector scope, c) Lines of educational research, and d) Teaching practice. In relation to this, macro-trends that contribute to the last indicator were analyzed. For developing the SG2 (category II), a matrix of documents – that contains curricular approaches and different roles assumed by professors who relate to these – was designed. A reduction of the said matrix was done, considering the Post COVID-19 pedagogical practice that contribute to the achievement of SOs – ICACIT.

For developing the SG3 (category III), 51 criteria were elaborated in accordance with the Student Outcome (SOs) from ICACIT accreditation model, which were related to global macro-trends to determine their level of contribution, in a quantitative manner, through a value scale that considered Tobon’s definition of levels of the socio-formative approach by competencies (developed in 2017), as it is shown in “Table II”.

TABLE II. LEVELS FOR THE SCALE OF ASSESSMENT OF TOBON’S SOCIOFORMATIVE COMPETENCIES APPROACH (2017)

Levels for the assessment scale adapted from Tobon’s assessment instruments (2017)	
Very low level (0% - 25%)	Not related to criteria.
Low level (26% - 50%)	Is related to some elements of the criteria.
Medium level (51% - 75%)	It is related to essential and basic elements of the criteria.
Very high (76% - 100%)	It is related to essential elements of the criteria, achieving a quality impact.

Furthermore, it was used a matrix of triangulation by Stake and Forbes [17]-[18], to give a proper answer in relation to the SG3, regarding the teaching roles that contribute to the achievement of SOs from ICACIT accreditation model, and the macro-trends linked to the Post COVID-19 pedagogical practice.

IV. RESULTS AND DISCUSSION

*A. Global Macro-trends related to the pedagogical practice*

In accordance with 4 indicators by OECD (tools for rigorous thinking, educational sector scope, lines of educational research, and teaching practice), 10 macro-trends related to the education sector were obtained [19]-[20]. Nonetheless, for effects of the analysis, they were grouped as follows, according to “Table III”:

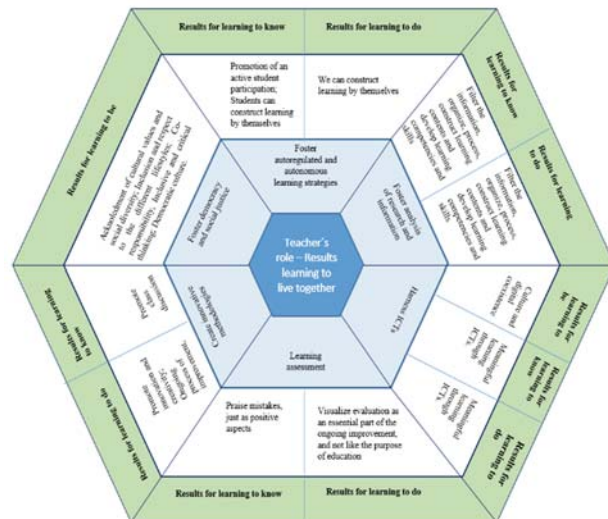
TABLE III. GLOBAL MACROTRENDS THAT COULD BE IMPLEMENTED IN THE PEDAGOGICAL PRACTICE

Cross-cutting macro-trends: Public awareness	
Macro-trend in the pedagogical practice Disrupting education	<ul style="list-style-type: none"> <li>- Assessment of progress</li> <li>- Co-creation</li> <li>- UX-focused education (Multiple senses)</li> <li>- Gamification</li> <li>- Harness innovation</li> <li>- Instantaneous entrepreneurship</li> </ul>
Macro-trend of Support: Networking and technology	

*B. Post COVID-19 pedagogical practices that contribute to the achievement of SOs from ICACIT accreditation model*

It was evident that teaching roles generated by curriculum approaches (such as the academicist and the technology one) don’t contribute to the development of SOs. Whereas, roles promoted by the cultural interpretative, sociocritical and socio-formative curriculum approaches, contribute significantly to the achievement of SOs. In that sense, it is shown that the professor’s role: “Foster democracy and social justice” is related to the SO to learning to be, which comprehends: the SOs, d, f, g, i. Likewise, as a result of the analysis it is shown that all of the SOs to learning to know: a, b; and learning to do: e, c, and l; develop with the professor’s roles themselves, which are: Foster autoregulated and autonomous learning strategies, Foster analysis of research and information, Harness ICTs, evaluate learning and Create innovative methodologies. Finally, the SOs to learning to live together (Sustainability and Environment, Engineering and Society, and Use of Modern Tools) are fostered with the aforementioned (6) professor’s roles (See “Table IV”).

TABLE IV. POST COVID-19 PEDAGOGICAL PRACTICES TO ACHIEVE STUDENT OUTCOMES FROM 2020 ICACIT MODEL OF ACCREDITATION



*C. Global macro-trends that could be implemented in the Post COVID-19 pedagogical practice to contribute to the achievement of Student Outcomes – 2020 ICACIT*

To respond to SG3, it has been necessary, on the one hand, to identify the level of incidence of macro-trends in the development and acquisition of the 12 ICACIT 2020 SOs; and on the other, mention what roles the engineering professor should assume in pedagogical practice according to the macro



trends that contribute to the achievement of these SOs. 51 criteria have been established, where essential elements of the SOs are extracted to analyze them in the light of pedagogical macro trends. For this, a four (4) level assessment scale has been made: very low, low, medium and high. (See Table II). The macro trends of Co-creation and instant Entrepreneurship achieve a high level of relationship, since they include essential elements (criteria) of the SOs, achieving quality impact. Teaching macro trends UX focused education, Harness innovation and Networking and technologies, manage to relate to essential and basic elements (criteria) of the SOs. This places them at a medium level. The macro trends of public awareness and Gamification are located at the low level, since it manages to relate to some elements of the SOs. The progress assessment macro trend has achieved a very low level of relationship. This study shows that the professor must orient his pedagogical practice according to the SOs that he intends to develop (See “Table V”).

TABLE V. GLOBAL MACROTRENDS, PROFESSOR’S ROLE IN THE PEDAGOGICAL PRACTICE AND ICACIT SOS

Professor's role	Cross-cutting Macro trend	Macro trend in the pedagogical practice						Macro trend of Support	Student Outcomes from 2020 ICACIT
	Public awareness	Assessment of progress	Co-creation	Education focused on the UX (Multiple roles)	Gamification	Harness innovation	Instantaneous entrepreneurship	Networking and Technology	
Foster democracy and social justice	Teach democratic citizenship implies student participation; Encourage minorities to choose STEM courses (Science, Technology, Engineering and Math)							Digital coexistence	Results for learning to be together
Foster autogulated and autonomous learning strategies, autonomous and autogulate				Design meaningful learning experiences for Students; Know students interests and needs			Instill autonomous work entrepreneurship; Prepare the So to be their own bosses (autoregulation)		Results for learning to know Results for learning to do Results for learning to live together
Foster analysis of research and information						Plan learning experiences in an interdisciplinary and multidisciplinary manner		Foster the use of tools for remote collaboration	Results for learning to know Results for learning to do Results for learning to live together
Harness ICTs	Provide spaces to students so they can construct their own voices and communicate that through digital media		Use social media and build "safe" online communities		Utilize Dynamic applications and stimuli for assignments		Foster collaborative learning in real-time	Ensure cyber safety; Utilize platforms of online streaming, augmented virtual reality; Robotics and Artificial Intelligence	Results for learning to be together Results for learning to know; Results for learning to do Results for learning to live together
Learning assessment		Design of pedagogical measures to guarantee formal education that is evaluative and summative; Give feedback in the learning process without considering space or time as obstacles; Learn from mistakes and failures			Highlight Students progress in an effective way in real-time			Highlight So progress in an effective way in real-time	Results for learning to know Results for learning to do Results for learning to live together
Create innovative methodologies		Document pedagogical changes from evaluation and its impact	Create collaborative work between professors and students; Foster collective knowledge	Add value to the pedagogical practice from the innovation and creation of strategies that generate meaningful learning experiences	Design learning experiences, and considering tools dedicated to gamification.	Identify which strategies have worked and which ones haven't, and for what groups. Reformulate the pedagogical practice as a result of reflection.		Identify the possible innovative digital solutions to be applied for teaching	Results for learning to know Results for learning to do Results for learning to live together

## V. CONCLUSIONS AND FUTURE WORK

The macro trends constitute a global perspective of the education sector that contributes to the rethinking of pedagogic practice, and with this, to the configuration for the development of knowledge, in such a way that innovation can be seized, with the support of networking and technology. Likewise, it weights co-creation and instantaneous entrepreneurship, considering both harnessing innovation and the application of the design process of UX-focused education. The professor is conceived as an agent that encourages students, designing meaningful learning experiences. It is projected that he/she deconstructs the term

“evaluation” to structure it as part of the ongoing improvement of learning. Finally, global macro trends to be used in the Post COVID-19 pedagogic practice that contribute to the achievement of the 12 SOs from ICACIT accreditation model, can be classified into three areas: Cross-cutting macro trend (public awareness); pedagogic practice (Disrupting Education) and the Macro trend of Support (Networking and Technology). In that sense, it is claimed that global macro trends set Post COVID-19 pedagogical practices in such way that they can enhance the teaching and learning strategies designed and planned in order to contribute to the achievement of SOs from ICACIT accreditation model.

## REFERENCES

- [1] OECD. (2019, Jan.). Trends Shaping Education 2019. OECD Publishing, Paris. [Online]. Available: <https://n9.cl/gq18h>
- [2] SITEAL-UNESCO. (2020, Jul). Sistematización de respuestas de los sistemas educativos de América Latina a la crisis de la COVID-19. [Online]. Available: <https://n9.cl/oveus>
- [3] R. V. Kupriyanov and I. M. Gorodetskaya, "Global trends in higher education and their impact on engineering training in Russia," 2015 International Conference on Interactive Collaborative Learning (ICL), Florence, 2015, pp. 244-250, doi: 10.1109/ICL.2015.7318033.
- [4] UNESCO-IESALC (2020, Abr). COVID-19 and higher education: Today and tomorrow - Impact analysis, policy responses and recommendations. [Online]. Available: <https://n9.cl/ylyti>
- [5] OCDE (2020, May), "Coronavirus special edition: Back to school", Trends Shaping Education Spotlights , No. 21. <https://n9.cl/97clg>
- [6] OECD. (2020, Mar.). Supporting the continuation of teaching and learning during the COVID-19 Pandemic Annotated resources for online learning. Paris. [Online]. Available: <https://n9.cl/xz2qm>
- [7] G. Belavi and F. J. Murillo. (2020, Jun). Democracy and Social Justice in Schools: Dimensions for Thinking and Improving Educational Practice, REICE, vol. 18, n.º 3, pp. 5-28. Available: <https://n9.cl/yr58>
- [8] M. del C. Pegalajar. (2020, Jun). Individual Learning Strategies in Novels Students of Education, REICE, vol. 18, n.º 3, pp. 29-45.
- [9] A. Avila, S. Baldiris, R. Fabregat and S. Graf. (2020). Evaluation of a learning analytics tool for supporting professors in the creation and evaluation of accessible and quality open educational resources. Revista británica de tecnología educativa. doi:10.1111/bjet.12940.
- [10] L. González-Palacio, et al., "Cocreation of adaptative components for a virtual platform based on learning styles," 2019 14th Iberian Conference on Information Systems and Technologies (CISTI), Coimbra, Portugal, 2019, pp. 1-6, doi: 10.23919/CISTI.2019.8760858.
- [11] J. Agirre et. al. (2013, Feb.). Mejora de la práctica docente – Una experiencia de autoevaluación. [Online]. Available: <https://n9.cl/pch5b>
- [12] D. F. Gonzalez, M. M. Gisbert and R. Fabregat. (2019, Oct). La gamificación como estrategia para el acercamiento de la herencia cultural en Girona. XXII Congreso Internacional EDUTEC 2019.23-25 10/2019. Available: <https://n9.cl/3d1s6>
- [13] ICACIT. (2020, Mar.). Criteria for accrediting engineering programs - 2020 Accreditation Cycle. ICACIT Standard . [Online]. Available: [http://icacit.org.pe/web/archivos/2020\\_ICACIT\\_CAI\\_Criterios.pdf](http://icacit.org.pe/web/archivos/2020_ICACIT_CAI_Criterios.pdf)
- [14] J. Delors, “La educación encierra un tesoro,” Madrid: UNESCO, Santillana, 1996, pp. 96-109.
- [15] J. Morán, “Taller 01: Medición y Evaluación de Resultados del Estudiante,” presented at the Seminario Internacional de Calidad Educativa y Acreditación – ICACIT, Lima, Perú, Jul. 24-25, 2020.
- [16] OECD. (2020, May). Trend Analysis as a Method. Schooling for Tomorrow. Knowledge Bank. [Online]. Available: <https://n9.cl/bcwe1>
- [17] R. Stake, “La triangulación. La investigación con estudio de casos,” 2nd ed., Madrid: Morata, 1999, pp. 85-101.
- [18] R. Heale and D. Forbes, “Understanding triangulation in research. Evidence -Based Nursing,” vol. 16, n.º. 4, pp. 98, 2013.
- [19] IPSOS. (2020, Feb). Global Trends. Understanding Complexity. The UK Trends and Futures Team. [Online]. Available: <https://n9.cl/vwvbrv>
- [20] TRENDHUNTER. (2020). Special Report. The New Normal. [Online]. Available: <https://n9.cl/46dx>