Instructional Design in the Face of COVID-19: Learned Lessons and Pending Tasks

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Abstract

Faced with confinement due to COVID-19, educational institutions with face-to-face models had to continue their activities under conditions and with resources not used up to that moment. For this, the institutions formulated and put into operation continuity plans, which involved everything from remote education to hybrids between the latter and online education. Institutions that already had online or hybrid education programs were able to apply that experience to their face-to-face programs, allowing them to respond more quickly than those that did not. The stages of the teaching-learning process that were "adjusted" during this emergency in order to give continuity to educational activities were the last two, namely: the development of instructional material and teaching. In this work, an intervention is proposed in a previous stage of the process, that is, in the instructional design (ID), using the ASSURE model derived from the ADDIE model or approach. This intervention is based on the lessons learned during the pandemic, for the preparation or reformulation of study plans that consider information and communication technologies as a platform to enhance the effectiveness of learning, selecting them and establishing their use strategy from the stage in which the materials are designed, which may be useful considering that even if the students return to the classrooms, a virtual part will be preserved, that is, a hybrid model, in which the face-to-face-virtual ratio will be determined by the educational strategy of the institution.

Keywords: ADDIE, ASSURE, instructional design, teaching-learning process

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1. Introduction

As a result of the COVID-19 pandemic caused by SARS-COV-2, the activities carried out in all areas changed their form, their timing, the resources and methods used, among others, which has had both negative and positive consequences, mainly of the first type. However, although emergent measures had to be taken to continue with the activities, this need also forced to venture into methods not considered until then, given the face-to-face nature of work, education, health, etc.

In the case of education, confinement made it necessary to continue activities from home or on some occasions from the students' workplace. For this, it was used from remote education to hybrids in part remote and in part virtual, environments in which physical spaces were replaced by videoconference rooms.

In the first days of confinement, teachers had to integrate their virtual classrooms with the resources they had and knew about, but the institutions reacted by designing, building and operating programs to address the situation, which included not only communication platforms (Zoom, Microsoft Teams, Google Meet, among others), but also training for its use. Also, and depending on the topic taught by the teachers, many integrated complementary tools or platforms, such as mathematical software, simulation software, digital libraries, vlogs, LMS (learning management system), etc., to their portfolio of instructional instruments.

Thus, the emerging situation forced changes of the same nature in teaching. The changes occurred mainly in the instructional materials and in the presentation of the same with the students, that is, the last two stages of the teaching-learning process were fundamentally modified, considering the evaluation of the students in the last stage.

Although the aforementioned actions have many times satisfactorily resolved the restrictions imposed by confinement, there are also lessons learned that can be applied to earlier stages of the teaching-learning process, particularly from the instructional design, for the achievement of a more effective teaching.

2. The teaching-learning process and instructional design

Without becoming mechanistic, since there is a high degree of soft components involved in teaching-learning, a design, construction, test and operation of it can be carried out as a process, in which one of its stages is the instructional design , which in turn is also a process.

Teaching learning process

Teaching-learning is a process that consists of various interconnected stages, which feed the product of one as an input to the next, while each one takes additional inputs. As a process, all the concepts of systems and process optimization are applicable to it, in addition to the fact that it must be considered that the teaching-learning process is developed in a multidimensional operational framework integrated at least by labor,

administrative, legal and budgetary aspects. All this means that the stages must be ideally coupled to each other and that each of them must have the same robustness, that is, they must be aligned and harmonized in order to achieve good performance.
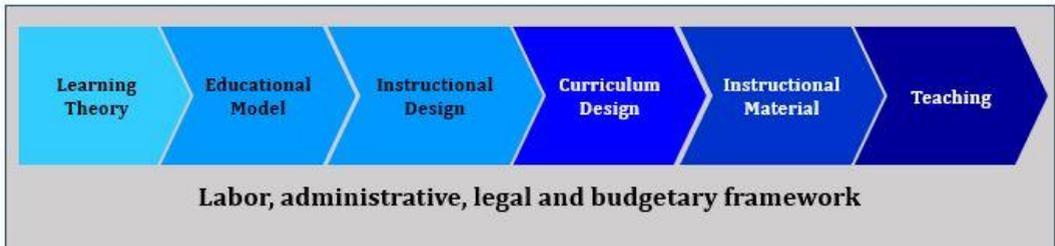

Figure 1. Teaching-Learning Process.

Source: self made

It is noteworthy that, as a system, it is very important that in order to achieve good performance, each of the stages themselves are evaluated (unit tests), their coupling between them (comprehensive tests) and the feedback of the results to the previous stages for this control circuit. Through these tests, the alignment between the stages, the harmonization of them, and the general performance of the process can be verified and adjusted.
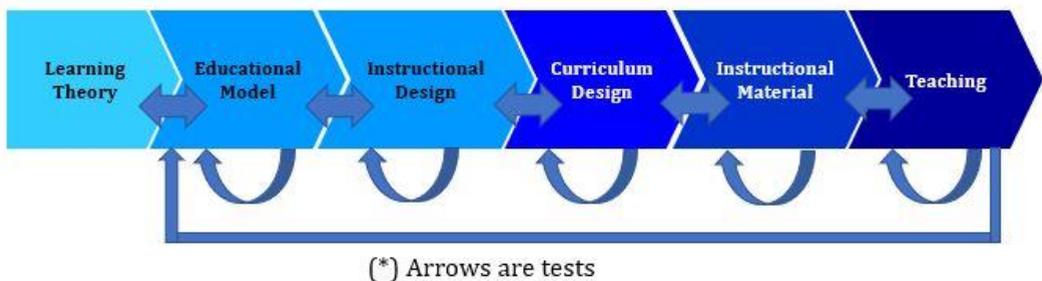

Figure 2. Tests in the Teaching-Learning Process.

Source: self made.

The subject of tests and evaluation deserves a separate treatment, at this point we will only point out that for the efficient performance of the process its review is necessary to ensure the correct coupling and flow between the stages, and to ensure that the achievement of the pedagogical objectives is built in a sustained manner in the different stages.

Instructional design

According to the process, the instructional design is the way in which the educational model formulated by the institution is implemented, it is the materialization of the educational model, so its importance is capital within the process.

Instructional Design (DI) has been widely studied and conceptualized, among many the following concepts stand out, in alphabetical order:

Branch & Kopcha (2014) point out that "instructional design is intended to be an iterative process of planning results, selecting effective strategies for teaching and learning, choosing relevant technologies, identifying educational media, and measuring performance."

Dick, Carey and Carey (2015) consider that instructional design is an umbrella term to include all phases of the instructional systems development process, that is, the design, development, implementation and evaluation of instruction, and that all components they work together to achieve effective instruction.

Reiser & Dempsey (2007) say that "instructional design is a systematic procedure in which educational and training programs are developed and constructed with the intention of achieving a substantial improvement in learning".

For Smith and Ragan (2005), instructional design is "the systematic and reflective process of translating learning and instructional principles into plans for instructional materials, activities, information resources, and assessment".

The Applied Research Laboratory at Penn State University (University of Michigan, 2003) established a four-part concept for instructional design: as a process, as a discipline, as a science, and as a reality. From a process point of view, they define it as "instructional design is the systematic development of instructional specifications using learning and instructional theory to ensure the quality of instruction. Is the entire process of analysis of learning needs and goals and the development of a delivery system to meet those needs". This concept is important because it explicitly mentions the assurance of the quality of instruction, while other authors only leave it implicit in the effectiveness of learning, it also highlights that the use of learning theories and instructional theories in instructional design is emphasized , which implies the work of specialists in the exercise of ID.

Thus, all the authors agree that instructional design is a systematic process that aims to achieve the effectiveness of learning, making use of relevant and pertinent technologies and media, in accordance with the educational model that is being implemented. This stage is where the planning of the strategies and resources to be used in the subsequent stages of the process is most effective.

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Many of the instructional design models are based on ADDIE, even if they do not mention it, since according to Robert Maribe Branch (2009), ADDIE is not a model but a product development paradigm, a concept for the development of instructional design and further notes that it is a guide for the development of educational products and other learning resources. In this way, ADDIE is both a generic model of instructional design for some or a guide to the stages of an instructional design process for others.

Table 1. Stages of the ADDIE Model.

Stage	Description
A (Analyze)	It consists fundamentally in identifying the target student, determining the instructional goals, determining the human and technological requirements, and creating the project management plan.
D (Design)	Based on the elements obtained in the design stage, the strategies for the other stages are determined, instructional objectives, performance objectives, test instruments and performance metrics are generated.
D (Develop)	Generate learning resources and validate their performance
I (Implement)	Prepare teachers, students, and in the case of electronic learning prepare electronic platforms to ensure their continuity and performance
E (Evaluate)	Qualify the quality and performance of the instructional products based on the criteria and metrics that have been established in the design stage

Source: self made.

Based on ADDIE, as a model or as a development paradigm, many models have been built that attend to the particularities of the various learning environments, whether face-to-face, virtual, hybrid, or special cases of them, such as the flipped classroom. The following models stand out among many:

Dick and Carey model. It is a systemic approach to instructional design (Dick, Carey & Carey, 2015) based on the assumption that there is a direct relationship between the stimulus and the response elicited in the student, the stimulus being the teaching materials and the response being the learning of these materials by the student, while the purpose of the stages is to create the conditions for that relationship to be established. The nine stages of this model are: identifying instructional goals; conduct instructional analysis; initial behaviors and characteristics of the students; performance objectives; elements of evidence contrasted against criteria; instructional strategy; instructional materials, design and development of formative assessment; and, design and development of the summative evaluation.

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The Gagné and Briggs 14-step model is instrumented by the well-known nine training events. This is a systemic model, organized with the structure of information processing (Gagné, Briggs, Wager, 1992). Relevant work because many other models take up Gagné's instructional events as a guide for the instructional stage.

Rapid Prototyping Model. In accordance with the agile methodologies so in force today, faster and more flexible instructional design models have been developed, but they also have disadvantages such as sometimes little depth or low focus on the aspects they deal with. One such case is the Rapid Prototyping Model by Tripp and Bichelmeyer (1990) which is based on the construction of individual lessons rather than the entire curriculum. The stages of this model are: perform a need analysis; construct a prototype; utilize the prototype to perform research; and, install the final system.

ASSURE model

In the context of this work, the ASSURE model, developed under the ADDIE approach by Heinich, Molenda, Rusell and Smaldino (1999) and formulated to ensure the effective use of instructional media, is particularly applicable due to the recommendation made to incorporate the resources of information and communication technologies from the instructional design stage of the teaching-learning process, even when it transitions to a hybrid or even face-to-face stage.

The acronyms are the acronym for Analyze learners; State objectives; Select methods, media and materials; Utilize technology media and materials; Require learner participation; Evalue and revise.

Table 2. Stages of the ASSURE Model

Stage	Description
A (Analyze the characteristics of the students)	It is the identification of the characteristics of the students to guide the development of the instructional material according to those characteristics.
S (Establish Standards and Goals)	It is the specification of what students should be able to do as a result of instruction.
S (Select strategies, technology, media and materials)	It is about the ideal selection of these elements to achieve the learning objectives.
U (Use technology, media and materials)	It is the planning and use of resources to hook the student with the material that is being delivered.
R (Require the student's response)	It consists of planning how to achieve the participation of the student and the group in the learning process, given all the previous stages.

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E (Evaluation and Review)	The impact of teaching on students is evaluated, determining if the learning objectives were achieved. The results are used to make a review of all the elements put into play, strategies, technology, means and materials.

Source: self made.

ASSURE is based on ADDIE not as a model, but as a development paradigm because the stages do not correspond one by one, but they agree that they are a development methodology that goes from the analysis of the characteristics of the students, to the evaluation and review of the achievement of the learning objectives, with a progression of stages of strategies and plans of construction of materials and their use.

In this particular case, ASSURE is used because in the stages Select methods, media and materials and Utilize technology media and materials it is possible to determine from the instructional design the materials to be used later, as well as the means and the ways of using them (see figure 3).
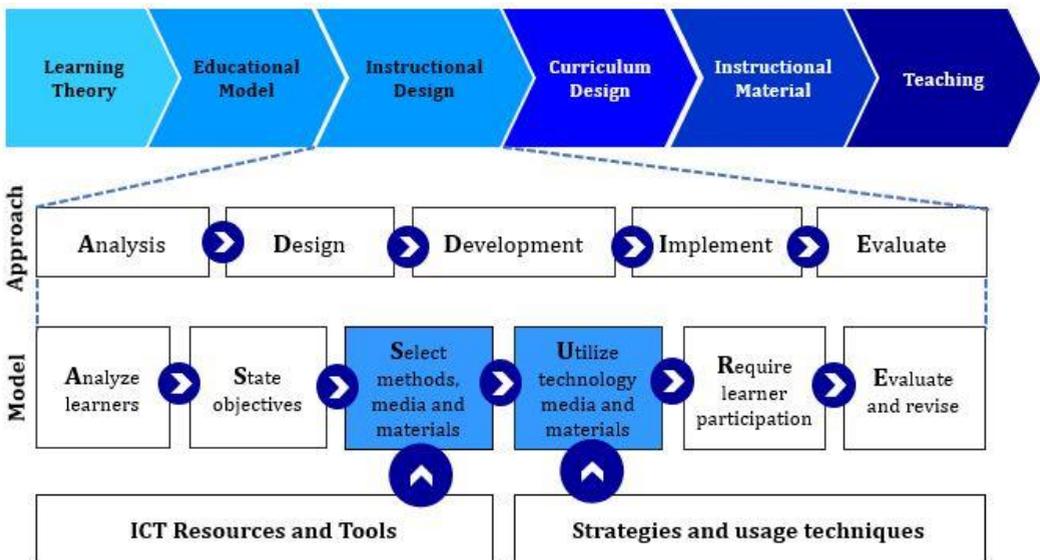

Figure 3. ADDIE-ASSURE and applicable ICT resources

Source: self made.

As with all resources used in education, the proper selection is as important as the correct use of them, but in the case of technological resources it is even more critical because at the same time they have to have the maximum impact on learning. Other aspects of economic, technical and use are also presented, such as, for example, the possibility of accessing them given their price, compatibility with other systems and

platforms of the institution, and mastery of their management. All this, coupled with the strategy and technique with which they are used.

3. Methodology

From the experience lived during the COVID-19 pandemic, the authors of this document revisited their previous works regarding the systemic approach to online education (Quiroz and Muñoz 2019) (Quiroz and Muñoz 2020), contrasting against those advances the actions that were have carried out during it. For this, the strategies and actions taken by various higher education institutions in Mexico, both public and private, were investigated and through interviews with professors and students their opinion was obtained about the dynamics used and the results obtained.

The findings of this research are the lessons learned that can be used to improve the performance of the teaching-learning process, even with a partial or total return to the face-to-face modality.

4. Analysis and development

Considering that the pandemic was an emergent situation for which no one was prepared, the institutions reacted according to the available resources and previous experience in hybrid and online modalities. For this, most of the institutions developed contingency plans for the continuity of teaching activities.

In the first days, the teachers communicated with their students to have sessions through the free videoconferencing services offered by various platforms (such as Zoom and Google) and later in a more organized and formal way once the emerging plans, such as the PEER (Programa Emergente de Enseñanza Remota) of the Universidad Autónoma Metropolitana, which considered hiring collaboration platforms at the institutional level (such as Zoom, Microsoft Team for Education, Google Classroom with Google Suite, among the most popular), as well as an intense training program, not only on the use of computer tools, but also on their use in the context of the educational model of the institution.

It should be noted that given the teachers' preferences, some institutions hired more than one platform, for example, Microsoft Teams as primary and Zoom as secondary, in accordance with the institution's "computer culture", since some already had institutional contracts with companies such as Microsoft or Google. It is also worth mentioning that there were many barriers both of a technological and operational nature, some students have had to participate in class from their cell phones because they do not have a computer, communication problems on internet channels are frequent, the price of the plans data is high and the management of the applications has not been easy for everyone. A separate mention is the use of tools for the development of instructional material, while the use of electronic presenters (MS PowerPoint, Google Slides, etc.) is very broad, in this pandemic teachers and students have ventured into the use of other presentation tools, content creation, mathematical

software and simulation software, among others, which means that they have increased their knowledge and ability to use other technologies that they had not explored before, or were not sufficiently used.

With the aforementioned resources, plus some others already available, but not sufficiently exploited, the teachers created virtual classrooms that often resulted in remote teaching classrooms with online education elements (see figure 4).
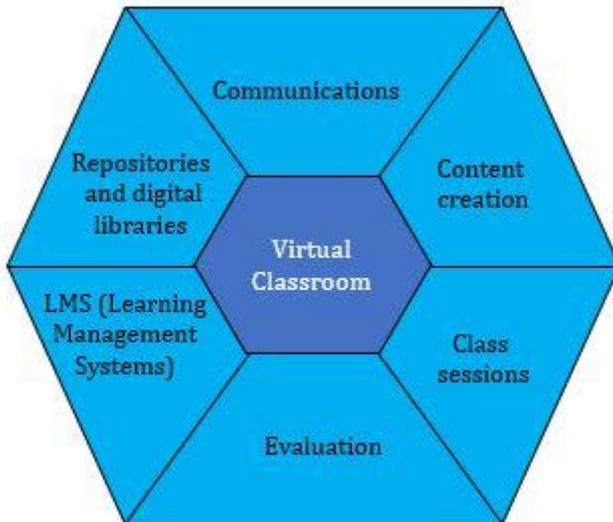

Figure 4. Virtual Classroom model during pandemic.

Source: self made.

Although this experience has been full of challenges to solve, there have also been achievements for all those involved in this process:

By teachers

- Knowledge and mastery of communication platforms

- Knowledge and mastery of authoring tools

- Knowledge and use of learning management systems (LMS, Learning Management System)

- Experience in new pedagogical strategies supported with ICT

For the students

- Knowledge of digital resources for their learning (libraries, repositories)

- Knowledge and use of learning management systems (LMS)

• Skills to attend remote learning

By institutions

- • Knowledge of the areas of opportunity for the reinforcement, updating or learning of the digital skills of their community

- • Identification of the requirements of technological platforms to face the new reality

- • Concern to incorporate the appropriate use of ICT in their teaching-learning processes

In this regard, it stands out that knowledge and mastery of information and communication technologies applied to education will allow them to be selected, and their proper use indicated, from the stages prior to the development and delivery of instructional material, that is, from the instructional design (see figure 5), setting this in the corresponding instructional matrix.
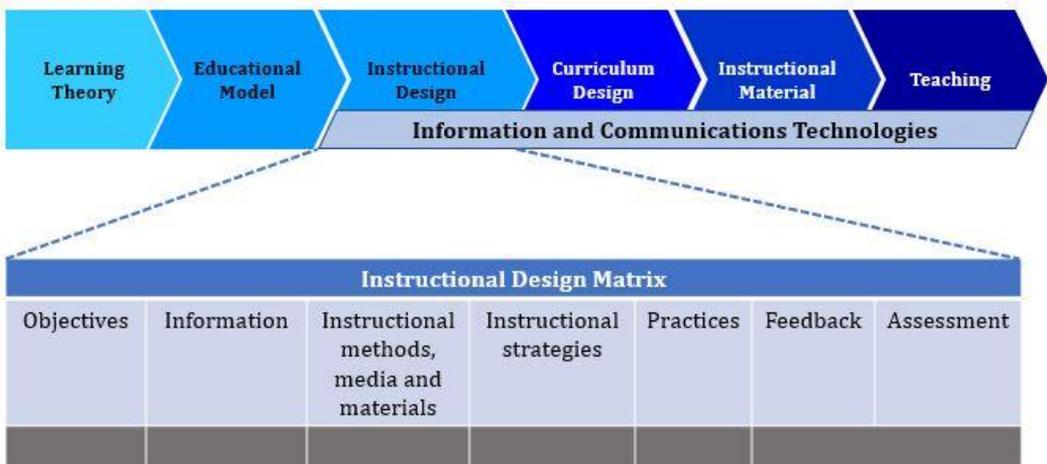

Figure 5. Determination and use of ICT from the ID.

Source: self made.

ICT for a successful incorporation into instructional design must meet the following goals:

a) Assist in the achievement of pedagogical objectives

b) Create effective and engaging learning experiences based on knowledge of how people learn

c) Contribute to educational quality

Educational quality is a subject of wide discussion, without definition and consensus, but in the case of e-learning, various protocols and methodologies agree that the

achievement of educational quality depends on four elements: equipment (teachers and technicians), design of learning, content and technology (see figure 6).
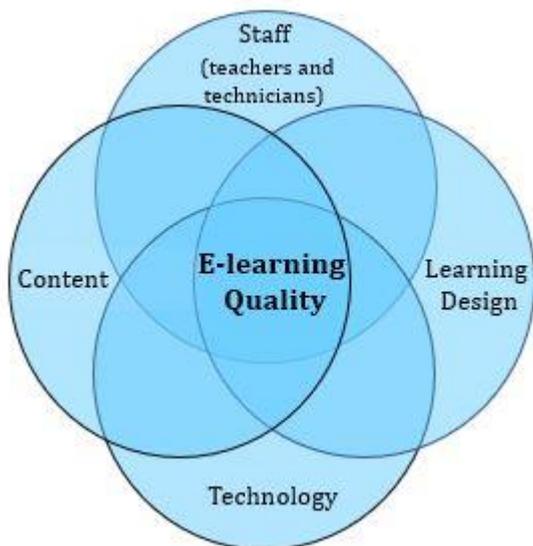

Figure 6. Quality of e-learning

Source: self made.

In the case of remote or virtual education during the pandemic, this model is also applicable for educational quality, since it has been seen that the favorable opinions of students have occurred when teachers have achieved the appropriate mix of these elements (Peñaloza and Hernández, coordinators, 2021), although it must be considered that the learning design does not begin with the preparation and delivery of the instructional material, but from the instructional design itself.

5. Conclusions

The design and construction of the instructional design process requires systematic, comprehensive and careful planning, because it is the forge from which the educational programs that represent the educational offer of an institution arise or the training programs that will affect the competitiveness and performance of an organization.

If instructional design models are compared with software development models, a great parallel will be found between them, so it is not surprising then that some are similar to the waterfall development model and its variants, and there are already based in agile methodologies, such as SCRUM. And that, consequently, when

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developing new systems development methodologies, these can serve as a reference for new models of instructional design.

The circumstances of confinement and the need to give continuity to the academic activities of educational institutions were the driving force behind the transformation in the teaching-learning process, but this transformation can be deepened by incorporating these new knowledge and experiences from the instructional design.

6. Final reflection

Although a good teacher is irreplaceable because he not only teaches, but also inspires and guides, his work can be supported by the lessons learned during confinement for the best use of time and the enrichment of teaching.

Based on what has been gained in the period of confinement, in particular in the domain of platforms, tools and strategies for effective instruction, either remotely or virtually, it can be recommended that this impact not only remain in the development stages of instructional material and teaching, but rather that in the constant updating of the revision of the study plans and programs, or even in the revision of the educational model, carried out by the institutions, information and communication technologies are integrated, to more effective instruction, impacting on the higher levels of the learning objectives (Bloom's Taxonomy revised from 2001) and on the most memorable activities of Edgar Dale's learning pyramid.

The proposed incorporation of what was learned during confinement in the instructional design of study plans and programs will require collegiate work for the formulation of proposals, which must take care, on the one hand, of their correct alignment with the current educational model, and on the other. professors' academic freedom. These proposals, whether of adaptation or modification, will go to the commissions of the collegiate bodies for their approval and wait for the appropriate moment to put them into operation. Thus, the path is not fast, nor is it easy, but it will be the way to take advantage of the knowledge and new skills developed in institutions, as well as in teachers and students, from the beginning.

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