TEACHING IN BUSINESS ADMINISTRATION: A CUSTOMIZED PROCESS DRIVEN BY TECHNOLOGICAL INNOVATIONS

ENSEÑANDO ADMINISTRACIÓN DE EMPRESAS: UN PROCESO PERSONALIZADO IMPULSADO POR INNOVACIONES TECNOLÓGICAS

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ABSTRACT

Three technological innovations are challenging higher education learning processes. This paper addresses the implications for these learning processes of interactive digital transformation, artificial intelligence, and content customization. These innovations involve three types of teaching and learning activity processes, digital learning, learning analytics and tailored learning. Our approach suggests relevant implications for carrying out teaching activities in the new scenario characterized by learning anywhere at any time. Furthermore, the digitalization process allows teachers to use data mining techniques to monitor students' activity; this can be used as a basis for customizing delivered content. Last, a question agenda is proposed and further developments are examined based on the three parties involved in the learning process: students, teachers and delivered content.

KEYWORDS

digital learning, learning analytics, tailored learning, artificial intelligence

RESUMEN

Tres innovaciones tecnológicas desafían los procesos de aprendizaje de la educación superior. Este documento aborda las implicaciones para estos procesos de aprendizaje de transformación digital interactiva, inteligencia artificial y personalización de contenido. Estas innovaciones involucran tres tipos de procesos de aprendizaje y enseñanza: aprendizaje digital, análisis de aprendizaje y aprendizaje personalizado. Nuestro enfoque sugiere implicaciones relevantes para llevar a cabo actividades de enseñanza en el nuevo escenario caracterizado por aprender en cualquier lugar, en cualquier momento. Además, el proceso de digitalización permite a los maestros usar técnicas de minería de datos para monitorear la actividad de los estudiantes; Esto se puede utilizar como base para personalizar el contenido entregado. Por último, se propone una agenda de preguntas y se examinan desarrollos adicionales basados en las tres partes involucradas en el proceso de aprendizaje: estudiantes, maestros y contenido.

PALABRAS CLAVE

aprendizaje digital, análisis de aprendizaje, aprendizaje personalizado, inteligencia artificial

INTRODUCTION

The current learning landscape is being driven by three successful innovations that are challenging the information acquisition sources that ultimately shape learning processes. First, digital transformation has evolved from simple content substitution of paper documents into digital repositories, to interactive exchanges where content delivered can be customized based on the search process. Second, artificial intelligence is becoming a driver of the discovery, creation and dissemination of knowledge. Third, content personalization/customization is the new cornerstone of the teaching-learning process.

The digital transformation in teaching involves using digital and virtual environments both as core processes and in blended teaching approaches. The available applications and tools can enhance teachers' effectiveness. These digital and virtual tools allow advantage to be taken of current information technologies (ICT), but their application also involves a shift from synchronous to asynchronous teaching.

Artificial intelligence and its subfields, such as data mining and machine learning (ML), are becoming popular in business practice. However, their impacts on teaching have scarcely been addressed. The growing number of student networks, and the operationalization of teachers' networks, will contribute to a better knowledge of the teaching methods, content and procedures that will derive from the integration of a big data approach into the learning process. We argue that data mining and analysis will shape the way we teach. Furthermore, other technologies, based on physiological responses, such as emotional facial recognition, might have an impact on the assessment of teaching methods.

The standardized learning that has traditionally been delivered to students is being challenged by a customized process driven by teachers' and students'

decisions. This personalized information delivery process is moving toward a morphing approach based on the joint decisions of students and teachers.

The need to address these topics is boosted by the existing gap between instructors and students; this gap has two distinct elements. First, from a technological viewpoint, as students are digital natives they tend to search for information online, while their teachers are not as knowledgeable about, and expert with, new social technologies. Second, horizontal authority is replacing traditional vertical authority, where the teachers had the knowledge and students obtained it only from the teaching materials, procedures and materials chosen by their teachers (e.g. books, software).

The changes outlined above need new thinking. This conceptual paper aims to shed light on the new teaching landscape of the teaching of business administration based on three key issues: the new digital environment, artificial intelligence, and a morphing paradigm. Our lenses focus on teachers and students as users of technological advancements that are designed to teach and learn. We will not focus on universities as corporations. The framework depicted in Figure 1 is based on a recognition of three types of challenging innovations that might shape new learning processes than are based on one, two, or three of those innovations. The interactive digital networks capture the digital learning which is focused on the platform and tools used in teaching. The use of artificial intelligence is termed "learning analytics"; our lenses here are focused on analyzing information obtained from the students and teachers. The delivery of customized content is termed "tailored learning".

The remainder of this paper is organized as follows. First, we outline the implications of the aforementioned changes in teaching business administration. Then we provide some examples of good practice. Last, we discuss a research agenda and propose further developments.

Figure 1. Challenging innovations and new types of learning process.
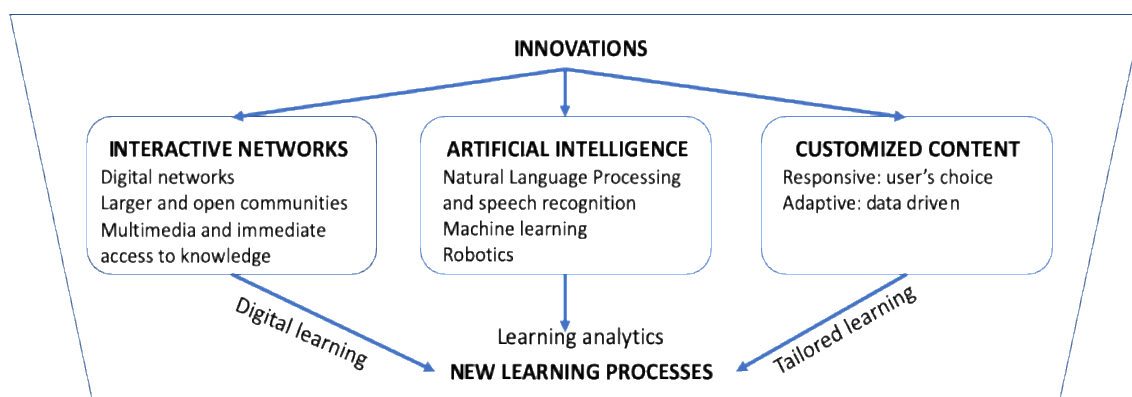
INTERACTIVE DIGITAL NETWORKS

Higher education has evolved worldwide since the medieval age. The term university comes from the Latin word "universitas", used to refer to a community of people, ideas, and objects oriented toward knowledge transfer. The "magistri" (i.e. teachers) and the "discipuli" (i.e. learners) were part of a community that worked as a circle that transferred knowledge from experts to novices. The *discipuli* were a limited number of participants, regarded as an elite, based at a particular location,

and associated with a specialized circle recognized as a university. The objects may have been the manuscripts, procedures and oral content that served to transfer knowledge/ideas to this group of people. The three main radical changes inspired by the evolution of universities (Mora, 1991) can be outlined as follows.

The first radical change evident in today's landscape is that communities are essentially digital networks. But what really has changed is that the community is now defined by a new space dimension and different roles. Today, space is not limited to a physical location, as in the old universities where teaching was based on an inner circle, rather we have open communities where knowledge flows from multiple sources. Furthermore, participants come from outside the inner circle. Indeed, information technologies facilitate data gathering from circles far distant from any one particular location (Bigne, et al. 2019). Therefore, the roles of the *magistri* (e.g. experts) and the *discipuli* have evolved into two forms. First, teachers can come from other communities not only through physical mobility, but also through information technologies, including digital tools and virtual reality. Second, the role of the teacher has been substituted by horizontal learning, where others (not necessarily "experts") may transfer knowledge. In these cases, experts from other locations, peers, and non-accredited experts share videos, comments, and teaching documents stored in digital repositories (not the physical libraries associated with one location). The exclusive role of the teacher as a knowledge-transferring expert has now changed due to the appearance of a myriad of other "instructors", some of them even unknown. Furthermore, the teacher's role as a guide for gathering, choosing, and sharing information has been taken over by search browsers (e.g. algorithms).

Virtual reality opens new windows for teaching options in three ways (for a review, see Liu et al. 2017). First, students may access on-demand classes from teachers from other locations and be virtually present in their classrooms or gain experience and learning skills in a simulated workplace. Second, avatars may be embedded in case studies and take decisions with simulated impacts on businesses. Last, students can use augmented, virtual reality or mixed reality resources (details and resources here https://www.classvr.com/school-curriculum-content-subjects/). Virtual reality enhances experiences, such as field trips, business games, operations, manufacturing, technology use, and personal skills development, to name a few. As an example, the Stanford Graduate School of Business has implemented certificate programs, one in corporate innovation and one in personal leadership through the VR platform VirBELA (install it here https://www.virbela.com/). Commercial platforms, such as https://engagevr.io/, allow educators and companies to host meetings, classes and events.

The second radical change comes from the upscaling of knowledge to larger communities. The small inner knowledge circles that existed in medieval times have been replaced by an increased number of universities and a massively increased number of students who access knowledge driven by a social and democratic political approach. The elite group has been replaced by a huge group that not only acquires knowledge, but also creates and shares it with other communities.

The third radical change is driven by multimedia and immediate access to knowledge anywhere at any time, through mobile technologies and the Internet. The old knowledge-transfer approach worked as an on-site event (e.g. a class) where teachers transferred knowledge to the best of their abilities. However, to transfer knowledge or explain any concept today, the current teacher might use a video with rich, well-constructed content (e.g. multimedia), with no interference based on time

and his/her personal capabilities on the day of performing a class. The content might be tailored to the different levels, backgrounds, and origins of the students in a focused attempt to customize the learning process. Furthermore, access to lesson learning materials is no longer associated with the location of the community or physical space or time. They might come from multiple locations and be accessed at different times, even repeatedly. So-called ubiquitous learning enhances the learning process anywhere and anytime (for a review, see Virtanen et al. 2018). Furthermore, asynchronous learning allows content to be updated dynamically. Accordingly, the traditional lesson taught on one day at one location to the best of the teacher's capabilities has now been substituted by a blend of sources and multimedia content, available at any time, location, and which can be repeatedly viewed; this is unaffected by the personal status of the teacher. Moreover, the lesson can be continuously updated over time with new material unavailable when the original session was scheduled by the teaching institution.

ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) applications in education are now a significantly important research topic (Popenici and Kerr 2017; Zawacki-Richter et al. 2019). AI covers multiple application subfields, from natural language processing, speech recognition, machine learning, and robotics that elicit different applications (Zawacki-Richter et al. 2019).

Natural language processing and speech recognition are excellent student assessment and guidance tools, which have taken three directions. First, the available tools allow teachers to assess not only content but also the emotional (e.g. sentiment analysis) and trust dimensions of digitalized responses (e.g. in an essay). Moreover, new developments allow automated grading. Second, through voice assistant tools, or intelligent assistants, and chatbots, students can source answers to doubts or clarifications, check that their answers are correct, and arrange appointments with their teachers, to mention only a few of their basic applications. Students may also use AI to generate text – see https://talktotransformer.com/. Third, AI might help teachers improve their lesson materials by identifying frequently asked questions.

Machine learning, or advanced statistical analysis, involves the use of artificial neural networks and related big data analysis tools. These statistics require huge amounts of data that can be obtained by sharing academic data on non-privacy issues. This is already achieved through human intervention using external examiners and group assessment based on the top-medium-lowest grades. By adopting the collaborative approach of the digital community discussed in the previous section, teachers can access huge data sets and apply machine learning to define academic content. Furthermore, based on evidence from multiple case studies, machine learning methods can provide answers to questions in case study decision-making settings. In addition, they might recommend personalized content.

Last, robotics can help the learning process. The Personal Robots Group at MIT has developed teaching robots, such as Tega (videos at https://www.youtube.com/user/PersonalRobotsGroup/videos).

AI systems were classified by Kaplan and Haenlein (2019) into three groups: analytical AI; human-inspired AI, which can measure if students are paying attention by analyzing facial expressions, or if they are cheating in exams; and

humanized AI, typically robots that combine various software in a humanized version that exhibits aspects of human intelligence (Rust and Huang 2014). Future applications and developments in teaching as a service can be analyzed through Huang and Rust's (2018) theory of AI job replacement. This theory proposes that service tasks can be disaggregated into four intelligence types. Job replacement will take place first for mechanical tasks, then for analytical tasks, followed by intuitive tasks and, last, empathetic tasks.

CUSTOMIZED CONTENT

The academic content of any teaching module is driven by the expertise of the teacher and is chosen based on students' previous knowledge. As a result, module content remains homogeneous and serves as a basis for further modules to follow. Furthermore, teachers tend to schedule module lessons sequentially to achieve a bundle of learning goals. This approach dominates the way teachers choose and teach academic content. This approach is characterized by a massive student enrollment in modules and an assumption that the learners all have equal skills and levels of preparation. However, this is not the case in postgraduate education (e.g. MBA) and it was not the case in the medieval age, when the small communities of *discipuli* learned from the *magistri* different skills at different times.

Current information technologies provide good opportunities to develop personalized learning even in massive courses. Furthermore, individualized assessments may be boosted. The essence of the personalized learning process is the individualization of teaching to the learner's needs. Personalized learning is divided into the responsive and the adaptive (Bulger 2016). Responsive systems involve choosing a custom interface, within-subject learning paths, and content; adaptive systems are based on data-driven learning processes, derived from machine learning, that adapt content to students' skills and achievements. Adaptive learning involves customizing the learning experience by making dynamic changes based on interactions with and input provided by the student (Somyürek 2015).

New personalization paradigms are being developed in different digitalized contexts, such as music and website content. Overall, they are based on user choices (i.e. responsive method) or data-driven by an algorithm (i.e. adaptive method). Chung, Rust, and Wedel (2009) implemented a system that automatically downloads personalized MP3 song playlists based on customer behavior. Website searches are content driven. Banners are placed based on previous searches. One of the most interesting contributions is based on the so-called morphing paradigm applied to websites. Hauser et al. (2009) classified cognitive styles from clickstream data to provide customized content. As academic content is increasingly digitalized, the process of tailoring content to the audience can benefit from these approaches.

Massive Open Online Courses (MOOCs) are a good example of the implementation of personalized content; this implementation is possible due to the availability of huge quantities of data about the learners, flexible learning, and learner-teacher interdependence (Sunar et al. 2015). Indeed, the intelligent MOOC (iMOOC) platform reflects the adaptive MOOC model, which is based on platforms such as Moodle (see Sein-Echaluce et al. 2016). The proposed i-MOOC is based on self-assessment training, adaptation of content to students'

learning speed, adaptation of learning to different profiles/skills/interests, contributing and sharing resources among sets of users with common interests/profiles, adapting learning to acquired knowledge and monitoring students' progress.

Students' blogs that provide answers to exercises (e.g. in case studies) also constitute a great opportunity to look at personalization, in two ways. First, teachers and students might take the opportunity to review their course assignments in an integrative piece of information. Second, interactive posts, suggestions, comments from peers, and teacher feedback might be useful for improving shared knowledge, or even for raising different viewpoints. The interrelated nature of students' blogs also allows teachers to make overall assessments of students' progress, and even detect gaps/topics that might be addressed, rather than just deliver independent exercises in each teaching session.

AGENDA AND FURTHER DEVELOPMENTS

The future of learning will be developed through three main dimensions: technological developments and implementation; teachers' competencies and skills; and tailored content.

The technological developments in teaching were initiated in different fields for different purposes; they have come from information technologies, statistics, computer science, and related fields. These developments have been implemented in education as learning analytics [for an updated review, see the special issue of the *British Journal of Educational Technology* on Learning Analytics and AI 2019, 50 (6)], machine learning techniques, artificial intelligence and robotics. Developers and publishers are creating platforms for adaptive learning, and new developments are appearing based on learning management systems. The review of these platforms is beyond the scope of this paper.

Teachers' competencies and skills have to be addressed. Typically, most teachers have been educated to implement on-site teaching, and when they have moved into e-teaching they have tended to use previous cognitive schemas based on synchronous and real-time teaching. The bundle of new skills is large. Bigne et al. (2019) summarized them into the following five areas: 1) information and data literacy, 2) communication and collaboration, 3) digital content creation, 4) safety, and 5) problem solving. Furthermore, as these authors noted, the new generation of students are digital natives who are quite familiar with the digital setting and social media. This teacher-student gap may cause boredom, frustration and, more importantly, an absence of engagement with the subject and the teacher that will ultimately lead learners to search for alternative information sources.

Several initiatives are being undertaken to prepare teachers for this new landscape. The EU-Funded Erasmus+/Strategic Partnerships project "Future-proof your classroom – teaching skills 2030" is a cornerstone. It consists of eight-module courses to prepare teachers. Through a free of charge cBook (computer book) and an iLab, the modules address the following topics: the teacher's role in 2030; communications in on-campus classes; designing on-campus training; creation and use of e-learning materials; teaching with social networks; writing skills for the web; teaching in virtual classrooms, and developing blended learning courses. For more details, see https://teaching2030.eu/projekt/

Beyond technical and educational needs, the key question for teachers is what academic content to choose to deliver in their courses. As previously noted, on-site sequential content delivered weekly to students no longer exists in digital learning. This is because there are multiple students, multiple teachers and multiple content sources. In the digital context, students cannot be considered as a single class unit. Indeed, the students following the academic content may have different backgrounds, origins, attendance times, no homogenous progress, and may even want to be graded at different points. In addition, the role of the teacher is no longer exclusive. Indeed, students can obtain explanations from other teachers, their peers, or even non-accredited teachers. Students will learn the material delivered in modules at different speeds. The immediacy of the tools in the digital context ensures questions are addressed but the answers given might come from unaccredited sources and create confusion.

The above insights into choosing the right content raise several issues. We now raise some questions that must be addressed by instructors teaching modules taught in the digital age. Our view is built on a comparison with traditional weekly scheduled face-to-face classes. Furthermore, it integrates students, teachers and content that reflects the relationships between the three dimensions. This interrelated approach is depicted in Figure 2 that shows the three dimensions and summarizes the key issues.

The status of the current students in the digital context is characterized by the following issues.

To whom? Digital teaching is massive and, therefore, students will have different backgrounds in terms of their previous cultural, knowledge, skills dimensions and grading systems.

With whom? Teaching is developed under an open network basis where students interact within the module but also elsewhere with non-accredited teachers. It is noteworthy that a shift from vertical teaching to horizontal learning based on peers or non-accredited teachers is emerging.

When and speed? Learning activities are asynchronous in terms of interaction with academic content and the progress of each student.

Attendance. Space is not limited to a physical location, rather it is open worldwide. Virtual reality might elicit feelings of telepresence in different spaces, and with teachers. From another perspective, there would be value in discovering who are the influencers on students' social media sites (see Litterio et al. 2017).

Teachers may use new tools in their teaching roles. These tools and their roles can be summarized as follows.

Digital competences. Teachers' skills in the new digital and interactive landscape; preparing, choosing, delivering content and interacting with students. A further issue is their personal availability to interact with and assess students.

Who actually teaches? The different sources of information available online are challenging the learning process. A basic search on YouTube on "SPSS" provides a huge number of tutorials from IBM, MOOCs from universities, videos uploaded by graduates or even by students. Indeed, platforms such as R platform for statistical computing (https://www.r-project.org/) are based on collaborative learning.

Types of instructor. Teaching can be decomposed into different roles and levels; teaching, practices, grading and administration. Online tutors, chatbots (e.g. https://snatchbot.me/education), automated quizzes, interactive learning tools, and automated grading tools are just basic examples. Furthermore, more

developed robots might take over some interactions with students, and learning analytics and machine learning techniques might provide customized content.

Figure 2. An integrative view of the key questions to be addressed in digital higher education.
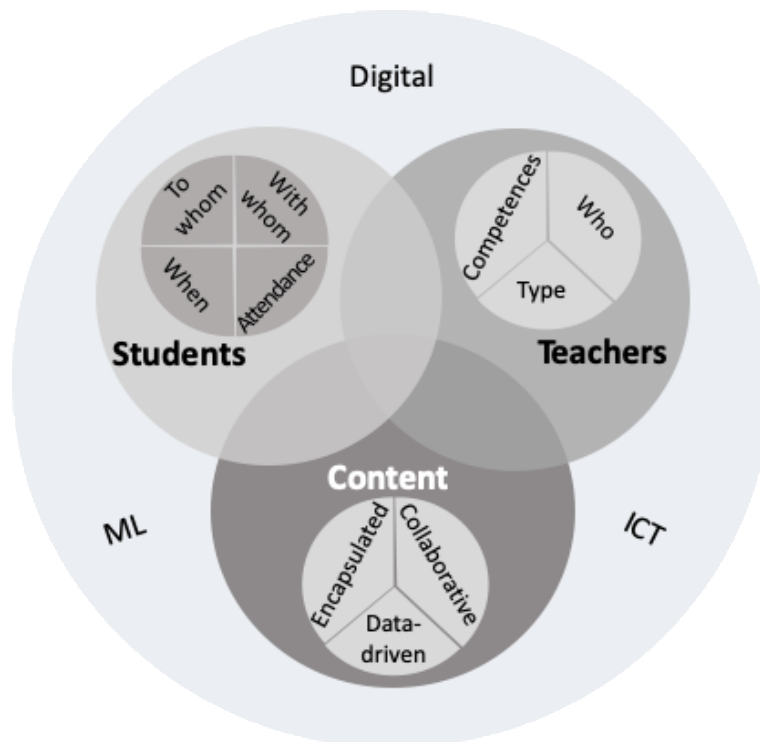
As previously noted the key question in the new learning process is how to choose the right academic content and how to deliver it to the students. This decision is affected, as we have discussed, by students and teachers. As is illustrated in Figure 2 their interrelationships are evident. Types of customized content are now summarized.

Encapsulated multimedia content can be developed by teachers both in small pieces, such as the YouTube video explaining Porter's Five Forces approach, issued by Harvard Business School, with Porter presenting examples of the market forces (https://www.youtube.com/watch?v=mYF2_FBCvXw), or in encapsulated modules of a full content on a topic, such as a MOOC course on customer analytics taught by Wharton scholars (https://www.coursera.org/learn/wharton-customer-analytics).

Collaborative tools. Collaboration is common in traditional learning; instructors jointly develop content, such as PowerPoint presentations, exercises, case studies and other academic material. In digital learning this process is boosted by the involvement of a larger, remote community, using complementary resources based on specialization, or capabilities such as closeness to the market. By extending the resource-based approach (Barney, 1991) into teaching, resources and capabilities can be successfully merged by teachers from different universities to teach international business. For instance, to prepare a field study, it would be logical to use a locally-based teacher who can be considered as non-

substitutable in a resource-based approach. Another will have access to specific software for content analysis, unavailable at other locations, and a third might be more comfortable dealing with conceptual foundations. Blogs and social media connect people with similar interests. Closed collaborative tools (i.e., with access restricted to teachers) might be used to share resolved case studies, quizzes, exams, resources, and other related material among teachers.

Data-driven content. Artificial intelligence and machine learning techniques can help in behavioral analysis (i.e. successful quizzes) and might provide advanced content adapted to students who have progressed to a higher level. Conversely, students failing to attend the classes or make progress can be automatically targeted with new exercises to improve their knowledge. This form of customized content is challenging for both teachers and learners.

CONCLUSIONS

This study has examined the implications of three innovations now challenging learning processes in higher education. First, the digital transformation based on immediate interaction dominates the current learning process at different levels. Some universities use platforms to upload academic content and then modulate interaction type from a low (e.g. by acting just as a repository) to a higher level with advanced interventions. Whatever the case, digital transformation and its related ICT tools have changed the way teachers and students develop their activities. Proper integration will be needed to accommodate common daily life activities into courses, both blended and fully digitalized modules.

Second, the digitization process leads to data availability in the digital environment. This data can be transformed into metrics on students' performance through learning analytics. Thus, useful information can be obtained from text mining about time spent, last time of connection, frequency times, successful answers to quizzes, which can be transformed into actions. More interestingly, simple rules (e.g. sending students reminders to encourage attendance when they have been inactive for more than x days) can be automated. Advanced artificial intelligence methods might help teachers categorize and predict behaviors based on students' data. Therefore, learning analytics and advanced machine learning methods are becoming drivers of the discovery, creation and dissemination of knowledge about learning activities.

Last, content personalization or customization is the most challenging factor in the teaching-learning process. The overall purpose is to adapt the layout and content to the students. It is affected both by teachers' and students' decisions. This personalized information-delivery process is moving toward a morphing approach based on the joint decisions of students and teachers.

Our integrative view has been translated into three interrelated types of learning process, digital learning, learning analytics and tailored learning. These three types of learning process can be implemented at different levels and their length will depend on the teachers' skills and commitment to ICT.

Implementing a new learning process will involve addressing in the initial phase multiple questions which will affect the content delivered to the students. As Figure 2 depicts, learning in the new scenario involves students, teachers, and content. We have proposed a question agenda based on an integrative view of the three elements and their interrelationships.

Further developments might be addressed in two ways. First, research needs to be undertaken to test the usefulness of our proposals for accomplishing the desired learning outcomes. Second, international quality agencies should integrate these new types of learning process into their standards.

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