CASE METHOD IN THE TEACHING-LEARNING PROCESS IN HIGHER EDUCATION: A PEDAGOGICAL INNOVATION IN TRANSITION

EL MÉTODO DE CASOS EN EL PROCESO DE ENSEÑANZA-APRENDIZAJE EN LA EDUCACIÓN SUPERIOR: UNA INNOVACIÓN PEDAGÓGICA EN TRANSICIÓN

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Case Method in the Teaching-Learning Process in Higher Education: A Pedagogical Innovation in Transition

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ABSTRACT

This article analyzes the key elements of the case method to propose a clear delimitation of its development and application, thus optimizing its use in various educational contexts. The case method has been widely implemented in higher education as a pedagogical strategy that facilitates the acquisition of competencies through real or hypothetical situations. This approach allows students to apply theoretical knowledge in practical contexts, promoting critical thinking and decision-making in collaborative environments. Although traditionally used in areas such as law and medicine, its potential in other disciplines, such as physical-mathematical and chemical-biological sciences, has not yet been fully explored. The correct implementation of the case method involves a careful design of teaching materials, as well as ongoing teacher training to maximize its effectiveness in different educational contexts.

Keywords: case method, higher education, competencies, collaborative learning, critical thinking

El Método de Casos en el Proceso de Enseñanza-Aprendizaje en la Educación Superior: Una Innovación Pedagógica en Transición

RESUMEN

Este artículo analiza los elementos clave del método de casos para proponer una delimitación clara de su desarrollo y aplicación, optimizando así su uso en diversos contextos educativos. El método de casos ha sido ampliamente implementado en la educación superior como una estrategia pedagógica que facilita la adquisición de competencias a través de situaciones reales o hipotéticas. Este enfoque permite a los estudiantes aplicar el conocimiento teórico en contextos prácticos, promoviendo el pensamiento crítico y la toma de decisiones en entornos colaborativos. Aunque tradicionalmente ha sido utilizado en áreas como derecho y medicina, su potencial en otras disciplinas, como las ciencias físico-matemáticas y químico-biológicas, aún no ha sido plenamente explorado. La correcta implementación del método de casos implica un diseño cuidadoso de los materiales didácticos, así como la capacitación continua del profesorado para maximizar su efectividad en distintos contextos educativos.

Palabras clave: método de casos, educación superior, competencias, aprendizaje colaborativo, pensamiento crítico

INTRODUCTION

The revolution in the development of knowledge and skills, as a result of globalization and the rapid advancement of information and communication technologies (ICT) (López, 2023; Guzmán, 2023), is palpable. Around the world, countries with education systems open to change have responded favorably to the use of these new tools. In contrast, traditional educational models are at risk of becoming obsolete as they fail to consider factors recently introduced into society, such as increased professional competition, technological advances, global interconnectivity, and the growing interdisciplinarity of knowledge areas (Esteves et al., 2020; Khoo et al., 2018; Orozco et al., 2018).

In the educational field, cases as a teaching resource are defined as structured situations with a real or hypothetical background that allow students to make decisions regarding a specific circumstance. This enables the practical application of acquired knowledge while exchanging ideas with peers (Ylarri, 2012; Svalenius & Stjernquist, 2005). The case method has been implemented in higher education across various disciplines and has proven to be a useful tool in developing competencies in practical contexts (Guerrero & Mateo, 2021).

In this regard, it is important to highlight that there are controversies surrounding the definitions of methodologies such as case studies, the case method, and problem- based learning. Although they present significant differences, they are often used interchangeably with similar terms (Arias et al., 2008). Therefore, this article analyzes the elements of the case method to propose a clear delineation of its development and application, facilitating its implementation and promoting the defined use of terms. This, in turn, will favor the integration of scientific knowledge into the case methodology.

DEVELOPMENT

Teaching Methods in Higher Education

Human beings are hyper-complex individuals, and education serves various purposes, which directly depend on the needs and paradigms of the context in which they are situated. The goal is to prepare individuals to harmoniously coexist with others within the same society. According to Morales et al. (2019), education is founded on three principles: understanding, interpretation, and significance.

The rapid transformation of society directly impacts the production and validity of knowledge, making both its generation and obsolescence equally relevant (Tejeda, 2000).

A teaching method, according to Lores and Matos (2017), is defined as "the sequence of actions, activities, or operations carried out by the instructor that reflect the nature of the academic forms of process organization to achieve teaching objectives" (p. 29).

Teaching methods differ from teaching strategies in that they focus on the steps to be followed during knowledge transmission, while teaching strategies aim to plan and design the content to be delivered. In the teaching-learning process, educators constantly need to find different strategies to convey certain types of knowledge to students. To achieve this, they rely on various teaching methods, each offering distinct advantages depending on the learning objective (Montes de Oca & Machado, 2011). The development of competencies in higher education has made it imperative to select the most effective teaching methods to achieve specific educational objectives (Alcoba, 2013).

Several countries have adopted significant measures to ensure that educational systems adapt to current changes driven by technological advancements. For example, they have implemented policies aimed at updating educational models and creating conditions that enable students to acquire the skills needed to thrive in an ever-evolving technological environment (Torres, 2020; Facundo, 2004).

Although progress in implementing these measures may vary by country, there is a clear global recognition of the need for forward-thinking education that not only impacts the world but also prepares students for present-day challenges. It is true that, despite structural changes in educational models, such as redesigns or student-centered learning, there has been institutional or policy-level oversight regarding what student's need in the classroom. This has resulted in the lack of use of teaching methods essential for developing their competencies (Gómez & Valdés, 2019; Orozco et al., 2018).

Teachers are key players in the educational process, and although reforms may be implemented by decree, it is essential to provide ongoing support and training for educators so they can adapt to and fully leverage new approaches and educational resources (Valencia & Vargas, 2022; Gómez et al., 2021; Garbizo et al., 2020). Additionally, each teaching method follows the guidelines set by a specific educational model, which carries its own unique perspectives (Rosell & Paneque, 2009). Before delving into the origins of the case methodology, the following section will briefly address some of the main models currently in use.

Behaviorist Model

Skinner proposed that learning occurs as a result of behavioral changes generated by a stimulus-response process within the educational environment (Posso et al., 2020). Behaviorism emerged in response to the workforce's requirements for a higher degree of technical knowledge, where learning is acquired through experiential training. It developed in Latin America during the 1960s (Román et al., 2021). Personality became one of the key elements of behaviorism; according to Skinner and Hullin's ideas, it is defined as a set of measurable, observable, and controllable characteristics of individuals (Urday, 2020). From a behavioral perspective, teaching is understood as a structured experience that can be guided by principles of operant conditioning. The goal is for individuals to acquire a broad range of behaviors that benefit them in the future and help them adapt to various social needs (González, 2004). Learning in the behaviorist model is linked to responses to stimuli, where constant repetition leads to improvements in processes. In this model, learning is conceived as a linear accumulation of information, disregarding cognitive processes (León, 2021). The study focus of behaviorism excludes the idea of studying consciousness and emphasizes the study of stimulus-response relationships, which give rise to new observable behaviors (Padras, 2018; Posso et al., 2020).

The behaviorist model in education is based on implementing a learning process accompanied by stimuli and reinforcements to obtain positive responses from students, using a rigid learning structure that is then quantified (Posso et al., 2020). In opposition to behaviorism, the cognitive approach emerged, which is primarily based on human knowledge. It places greater importance on the individual rather than the stimuli provided to them to elicit responses (Larios, 2022).

Traditional Model

The traditional model originates from scholasticism, where the teacher is responsible for determining and organizing what should be learned, acting as a guiding figure to whom obedience is owed. The teaching method was uniform for all students, prioritizing memorization of content over comprehension and analysis (Galván & Siado, 2021). The traditional model is triangular, widely accepted in pedagogy, suggesting that education is a relationship among three elements: the teacher, the student, and the subject matter (Gimeno, 1989). This perspective seeks to expand knowledge through teacher-led instruction, where the teacher is qualified to deliver their expertise.

Evaluation, however, is minimally active and conducted through examinations to demonstrate the student's acquired knowledge (Bernate et al., 2020). Key teaching resources characterizing this model include textbooks as the main source of information for students and the teacher's descriptive discourse, which is always oral.

In summary, this model's educational process is highly institutionalized, formalized, and results-oriented (Waisburd & Erdmenger, 2007). Traditional schools emerged in 17th-century Europe as an expression of modernity alongside the rise of the bourgeoisie. Traditional pedagogy has been predominant in most educational institutions over time (Vives, 2016). Tortajada et al. (2009) identify this model with characteristics such as prioritizing knowledge, relying on lecture-based teaching methods, student passivity, teachers as content experts who primarily transmit information, curriculum planning exclusively managed by the teacher, class notes as the sole information source, and evaluation methods strictly limited to exams focusing on memorization of knowledge.

Cognitivist Model

This model corresponds to a positivist school framework focused on learning processes that lead to behavioral changes. It is more individualistic, with learning seen as a cognitive process (Olmedo & Farrerons, 2017). The cognitivist model aligns with modern philosophy and its associated scientific-industrial culture. However, despite advocating for a competency-based curriculum, it emphasizes academic information transmission during learning sessions rather than focusing on the development of skills by students (Barrientos, 2018).

Constructivist Model

The origins of constructivism can be traced back to philosophical ideas from centuries ago, such as those of Vico and Kant in the 18th century, or even the ideas of the ancient Greeks (Ortiz, 2015). It is considered the most influential model in the didactic field of science (Olmedo & Farrerons, 2017). This model is classified among self- structuring educational models as it integrates various perspectives on what is or is not considered constructivism (Gomez et al., 2019). Yosa and Moya (2019) argue that in the constructivist model, knowledge is constructed, moving away from mere reproduction. Constructed knowledge results from the learner's direct activity, enabling them to derive meaning from their personal engagements (Esteban, 2001).

The constructivist model shifts away from viewing teachers and students as mere mechanical reproducers of information and begins to focus on the subject's active and internal intellectual processes. Here, knowledge is no longer interpreted as a mere copy of reality but as a human construction, shaped by the tools available to interact with the environment (León, 2021). This approach allows students to formulate their hypotheses and make their own decisions, emphasizing that the individual internalizes information and therefore learns at their own pace (Yoza & Moya, 2019).

Humanist Model

Humanization is the practice undertaken by the oppressed to liberate themselves through awareness and the need for self-determination (Del Carmen, 2013). The humanist approach in education seeks to move educators away from using education as a tool for manipulating students and, instead, transforms students into co- investigators who engage in dialogue with their teachers, leading to greater awareness. Influenced by Freire, humanism encourages individuals to employ strategies that help them achieve personal goals, guiding them toward self-actualization. Humanism does not aim to impose a predefined life path; rather, it encourages students to discover what they deem most appropriate for themselves. Thus, projects are a construct of the individual rather than a goal dictated by institutions (Saavedra & López, 2022).

According to Patiño (2012), humanism is committed to educating students with all universal human values, fostering dialogue with all ideological perspectives, and instilling a strong sense of social justice.

Critical-Social Model

In this model, skills are developed through reflective critical thinking, which aims to cultivate autonomous citizens by building knowledge based on everyday life, rooted in social values, and selecting positions in diverse situations (León, 2021). Two main approaches prevail in this model: reflection on practice and critical stances on social issues. Additionally, there are two types of strategies: teaching, where the teacher facilitates mediation processes, and learning, in which students, upon reaching a certain level of maturity, can develop their own stances and learning processes aligned with the required educational level (Alcaraz & Alcaraz, 2021).

This approach contrasts with the behaviorist model, which is characterized by content memorization and expects predictable responses from students (León, 2021).

The Development of Competencies in Higher Education

The word "competence" has two meanings: one related to competing and its outcomes, and another focused on being proficient in a specific skill. The latter has been used in the workplace since the 20th century, where it was discovered that outstanding employees combine knowledge, skills, and values. In education, the concept was adopted to design curricula that prepare students to apply learning in complex situations. In 1998, UNESCO advocated for competency-based educational plans following four pillars: learning to know, to do, to live together, and to be (Frade, 2007).

Competencies refer to people's ability to perform tasks well through particular skills required for specific activities (Bratianu et al., 2020). Competency-based education is a systematic approach to understanding and developing skills, focusing on what students can accomplish or produce at the end of a stage. This determination considers specific functions and tasks (Obaya et al., 2011).

Similarly, Martínez et al. (2012) highlight that the goal of competency-based education is to develop comprehensive skills, enabling individuals to learn, unlearn, and adapt to changing circumstances throughout their lives. However, this approach has faced criticism, primarily due to concerns that institutions might become mere vocational training centers. Additionally, competencies could jeopardize the integrity of the scientific-cultural knowledge taught at universities (Villa, 2020).

In higher education, competency development underscores the importance of case- based learning. This approach provides specific strategies for training specialists while addressing the multidisciplinary challenges of the labor market. This method considers family, social, and community factors, helping students apply their knowledge in real situations and make informed decisions, thus enhancing their preparedness to face professional challenges (Fernández et al., 2017).

Competency-based education originated from society's labor needs, requiring schools to adapt how knowledge is conveyed to align more closely with the workforce and social demands. Competencies aim to shift individuals from passive, routine learning toward developing critical evaluation skills and creatively resolving conflicts within their specific contexts (Corral, 2021).

In this context, evaluations for this methodology are based on gathering evidence of individual student performance. This process determines whether students are competent or not and simultaneously identifies and strengthens areas where they are not yet considered proficient (García et al., 2010).

Competencies are classified into three types: instrumental competencies, which include skills enabling professional proficiency; interpersonal competéncies, which promote understanding others' emotions and achieving common goals through collaboration; and systemic competencies, which empower individuals to improve existing systems and design new ones (Lizitza & Sheepshanks, 2020).

From Traditional Educational Models to Competency-Based Education: A Pedagogical Innovation

When it comes to teaching methods, we find that there is no consensus on their definition and no unified terminology among them, which contributes to confusion when using certain concepts, employing them interchangeably, and, more seriously, implementing them. In his proposal, Alcoba (2012) seeks to unify concepts related to teaching methods in order to distinguish them appropriately, which is a significant step forward. However, it is important to conduct a thorough review of methods that were omitted or deemed equivalent despite their inherent differences. For example, in the method we aim to explore further in this review, a confusion was identified between the terms "case study" and "study of cases." Although both terms have been used interchangeably, they actually present important differences. As Pérez and Aneas (2014) state: "Case study, also frequently referred to as case analysis, focuses on the object of study (the case), whereas the case method uses the case as a teaching object" (p.1).

Yin (2014) defines case study as "empirical inquiry that uses multiple sources of knowledge to investigate a current phenomenon within its real-life context, where the boundaries between the phenomenon and its context are not clearly defined" (p.14). Case study is not a teaching method per se but can be classified as an empirical scientific method, being a type of qualitative research whose results can contribute to the process of analysis, reflection, and debate among researchers (Ramírez & Hervis, 2019; Villarreal & Landeta, 2010). This clarification of both terms illustrates the importance of clearly defining the characteristics of the method being referred to, to avoid future confusion. During the teaching-learning process, it is essential for the teacher to be aware of the particularities of the teaching methods they plan to implement in the classroom. In this way, they can make the most of their advantages and mitigate their limitations (Canta & Quesada, 2021).

Although universities adapt to changing times by employing innovation strategies, it is urgent to present to the university community—professors and students—the necessity of a culture based

on pedagogical innovation (Macanchí Pico et al., 2020). It is worth mentioning that breaking the inertia of a traditional education model, which is based on passive and transmissive learning where a large number of students are assigned to a single instructor, resulting in a significant reduction in interaction between students and the professor (Feyen, 2020), requires efforts in innovation. Continuing education under a traditional model limits students in developing skills for professional practice within globalization, distancing itself from Freire's humanistic vision of the student as the person who understands why they want to be educated (Galván & Siado, 2021; Pinto, 2004). In a study conducted by Sein et al. (2021), comparing the characteristics of passive students, researchers surveyed teachers, with the following dominant responses about students: "Studies only a few days before the exam" and "Only wants to pass, has no interest in learning." This type of learning contrasts with an active model in which professors maintain constant interaction with students, fostering deeper critical thinking (O'Grady et al., 2013).

In contrast, competency-based education is a strategy aimed at developing capacities, skills, and knowledge in a practical context, along with its demonstration (Hodge et al., 2020). Although the competency-based model has been around the world for some time, the traditional model still predominates in most university classrooms (Rosario et al., 2020; Jiménez et al., 2020; Orozco et al., 2018; Guzmán, 2017).

It is considered highly favorable that there is currently greater interest in transitioning from traditional education to competency-based education at the higher education level; however, one of the multiple challenges faced by teachers is implementing educational strategies consistent with this approach. A clear example is that, due to the level of specialization in higher education, it is common for the majority of teachers, who are experts in their field, to lack pedagogical training, thus creating inconsistencies between educational models, curricula, and employed educational strategies (Rivera, 2020; Malpica, 2021).

In competency-based learning, the use of simulators is one of the educational strategies that has gained importance due to the use of virtual classrooms during the COVID-19 pandemic (Díaz, 2020; Pregrowska et al., 2021). Simulation can be developed either in a real form (e.g., object or person) or virtual form (e.g., document, tool, or model).

The type of document simulation is generated from the information provided to the individual to make a decision or produce a result. Within this definition falls the implementation of cases (Chernikova et al., 2020).

The Case as a Pedagogical Tool

This case method began to be used as early as 1870 at the Harvard Law School and was later implemented in the first half of the 20th century at its business and medical schools (Servant, 2019). The case method consists of analyzing real or imaginary but plausible situations that pose a problem to be solved, so that the student applies previously acquired knowledge to find a solution and discuss it in a group (Khimmataliev et al., 2021; Guerrero & Mateo, 2021). As an educational strategy, it allows students to reinforce learned knowledge while becoming acquainted with situations they might face in their professional fields (Argandoña et al., 2018; Valderrama et al., 2016).

However, the case method also has its limitations depending on the area of knowledge where it is implemented. For example, in business education at Harvard Business School, there remains a debate regarding its viability; critics argue that it focuses on short-term decision-making, disregarding broader aspects of the problem such as social, political, and economic factors (Lusoli, 2020). Articles on the subject have reported the use of the case method in university programs such as medicine, nursing, dentistry, business, law, and psychology. Meanwhile, in programs in fields such as chemical-biological and physical-mathematical sciences, its implementation has been more limited or undocumented, being mainly concentrated in health and social sciences (Yang et al., 2024; Sartania et al., 2022; Wu et al., 2023; Tran & Herzig, 2023; Dong et al., 2022; Gholami et al., 2021; Cen et al., 2021; Kaur et al., 2020; Lusoli, 2020; Servant, 2019).

In the literature, the terms "case method" and "case study" are sometimes used interchangeably to refer to the same methodology (Morán et al., 2020; Popil, 2011; Alcoba, 2012). However, as mentioned earlier, according to Pérez and Aneas (2014), these are concepts that, in essence, can be defined completely differently. One interpretation is that the "case study" is a research methodology that uses the case as the object of study (Ramírez & Hervis, 2019). On the other hand, the "case method" is a teaching method that employs the case as a didactic element for the application of knowledge.

It is also essential to highlight the difference between the "case method" and the "clinical case report," as the latter is mainly oriented towards medical record-keeping and diagnosis rather than teaching (Alonso, 2023; Alpi & Evans, 2019). Historically, the "clinical case report" predates the "case method," with records of the former dating back over 3,000 years (Pineda et al., 2018). It is used as a way of recording facts in the medical field, especially when they are rare or exceptional in nature (Ganesan, 2022; Vera, 2019).

The "clinical case" can be defined as the description of a specific patient, which includes the illness, relevant history, and the patient's progress (Camacho et al., 2002). This differs from what other authors like Vera (2019) describe, who defines the "clinical case report" as: "A type of biomedical publication that provides a detailed report of symptoms, signs, results of auxiliary studies, treatment, treatment complications, and follow-up of an individual patient, structured under a brief logical and rational description. Emphasis is placed on discussing the unique characteristic for which it was reported" (p.65).

Some authors agree on the definitions of "clinical case report" and "case report" (Rison, 2013; Carey, 2010; Simpson & Griggs, 1985); however, there are also authors who use the term "clinical case" as a synonym for the aforementioned terms (Andreu et al., 2018; Castro, 2018). For the purposes of an application analysis in education, we propose making a distinction based on Nissen and Wynn (2012), defining the "clinical case" as: "the illness or clinical phenomenon in question" (p.1), and the "clinical case report" or "case report" as: "A detailed description of the experience of a single patient" (p.2). In this context, the use of the "clinical case report" can be employed to extract information from the "clinical case" of interest and thus use it in the "case method." In fact, universities around the world use "clinical case reports" in medical or nursing education (Gholami et al., 2021; Cen et al., 2021).

The implementation of the case method in the health field is not limited to discussing the content of a "clinical case report." This approach focuses on the details of the patient's individual problem and often on how to address unusual problematic situations that require developing an appropriate treatment plan (Im, 2022; de Jorge & de Jorge, 2020; Servant, 2019; Nissen & Wynn, 2014; Máynez et al., 2014; Crang & Stjernquist, 2007).

Although cases as a pedagogical strategy share common characteristics—such as simulating plausible situations and verbally representing reality, with the underlying purpose of conveying the complexity, uncertainty, and authenticity of real life—they take on a variety of forms. Nonetheless, cases can be classified into different types based on a diversity of attributes, such as their progression, resolution, focus, scope, and learning objectives, among other relevant variables. Jonassen (2006), drawing on Merseth (1994), proposes a classification that organizes the types of case usage based on the degree of understanding required. Table 1 offers a synthesis of this classification.

Table 1. Classification of cases according to Jonassen (2006) and Merseth (1994).

Level	Use type	Description
Level 1	Cases as Examples or analogies	Examples and analogies are essential in teaching, as they assist students in creating conceptual models. to understand specific problems. While a single example can be helpful, multiple examples enhance knowledge transfer, although students often only remember examples with superficial characteristics.
Level 2	Cases as analogs (Case- Based Reasoning).	Students solve problems by retrieving previous cases from their memory. Case libraries, indexed by common elements, allow students to learn from past experiences, which enhances their performance in problem-solving skills.
Level 3	Case study method.	It is the most common application of case-based learning, where students analyze narratives of previous problems. Guided by questions, students evaluate the situation, the processes, and the solutions adopted by others. The analysis is conducted ex post facto, and the primary objective is to foster discussions in authentic contexts that require the application of knowledge. This approach has been shown to be more effective than traditional teaching methods in terms of theoretical understanding and knowledge application.
Level 4	Cases as Problems to solve.	Cases are used to represent problems that students must solve, providing background information and instructional support. Examples include anchored instruction, goal- based scenarios, and problem-based learning. Anchored instruction uses video scenarios to present complex problems, while goal-based scenarios involve students as active participants who must achieve goals in realistic contexts. Problem-based learning replaces traditional teaching approaches with authentic problems that integrate content into practice..
Level 5	Student-constructed cases.	It involves the creation of cases by students, where they are given control over the learning environment. Students actively participate by designing and developing their own cases, which requires a deeper understanding of the content. Through authorship, students establish personal connections and perspectives, enhancing their engagement with the learning process. This approach allows them to become designers of their own learning experiences, rather than mere consumers of information.

Source: Own elaboration based on Jonassen (2006) and Merseth (1994).

There are other classifications, such as Heath (2015), who categorizes cases based on how they are developed and the objectives they pursue. They differ in the depth of analysis required to address the cases and, at the same time, highlight the benefits for both teachers and students, enriching theoretical, practical, and analytical learning. These cases are interpreted and cited by Ammerman et al. (2012), where they are explained and classified as: incident, antecedent, exercise, complex, and decision. Each of these is briefly described in Table 2.

Table 2. Classification of cases according to Heath (2015).

Incident	It describes a single event and can be used to explain a theory. Since the cases are brief (approximately half a page long), students generally do not need preparation before class. Teachers use this type of case to introduce students to the case method.
Antecedent	Its goal is to convey information in story format. This transforms "dry" information into an engaging read. Students become more motivated and excited when analyzing cases. It can be used to explore specific issues related to the phenomenon being studied.
Exercise	It is used to apply specific techniques and serves as a great tool for performing quantitative analyses. This allows students to work with numerical data from real-world situations in more engaging and interesting ways.
Complex	It is often overloaded with irrelevant data. Therefore, students must be able to distinguish between primary information and complementary or irrelevant information. In this category, defining the main problem is one of the greatest challenges. The embedded issues may be interdependent and presented in a non-linear manner.
Decision	The challenge is to determine which course of action the student would take under the circumstances described in the case. It requires developing an action plan and a variety of viable approaches. Making the decision with the highest likelihood of success is a significant task for the participants as it represents a real-life decision-making situation.

Source: Own elaboration based on Heath (2015).

Case-based learning and problem-based learning: different means to the same end?

Another method related to the case method and often confused with it is problem- based learning (PBL); this is an educational approach in which problems are used to foster learning in a collaborative environment (Yew & Goh, 2016). In PBL, students solve problems collaboratively, identifying the information needed to resolve them and proposing solutions (Hmelo, 2004). This method involves a learning cycle with five key steps: presenting a scenario, identifying the relevant aspects of the problem, generating a hypothesis on how to solve the problem, determining the knowledge needed to address the issue, and applying the new knowledge.

It is important to note that PBL does not require prior experience or understanding of the subject, as its goal is to encourage students to investigate in order to resolve a problem. In contrast, case-based learning (CBL) does require students to have a certain level of prior knowledge, as it aims to put that knowledge into practice (Williams, 2005). The definitions of CBL vary; however, most agree that it is an educational approach focused on the use of cases to connect theory with practice through active participation (Wu et al., 2023; McLean, 2016; Tärnvik, 2007).

CBL and PBL are very similar approaches, as both use stories with problematic situations to encourage students to find solutions, but they have clear differences. In PBL, these stories are employed so that students direct their own learning by solving problems, without direct involvement from teachers, who have minimal interaction and do not guide the discussion (Srinivasan et al., 2007). In general terms, PBL relies on students formulating their learning objectives, conducting individual knowledge searches, and gathering to discuss and compile what they have learned (Tärnvik, 2007).

On the other hand, in CBL, the stories not only provide elements for analysis but also allow students to become familiar with the context to apply prior knowledge. Here, the teacher plays an active role and is responsible for achieving the learning objectives, using guiding questions to keep students focused on key points (Wu et al., 2023; McLean, 2016). When comparing the use of both approaches among postgraduate students at the University of California, the study conducted by Srinivasan et al. (2007) revealed that most preferred CBL. This preference was linked to the perception of a more efficient use of time, rather than opposition to the open-ended exploration proposed by PBL. Additionally, it was noted that PBL might be more beneficial for students with a higher level of experience.

Intentional implementation of the case method

The case method has two approaches to application: in one, students can work with cases designed by an expert in the field; alternatively, they can design a new case themselves, following the required steps for proper development (Morán et al., 2020). The development process can be organized into various stages, in which information is collected, then managed and reorganized, and finally complemented with teaching materials and digital or printed resources. For a case to accurately reflect reality, information must be gathered from the people who were and are involved in the situation used to formulate the case.

However, confidentiality measures must be established with the organization providing the case information, with a commitment that this information will not be disclosed until the organization grants written consent (Heath, 2015).

When analyzing a case in groups, the cognitive load invested by each student is lower compared to individual analysis; however, analytical activities should be supplemented with digital tools that offer interactive advantages, such as the use of images (Daryanes et al., 2023). The study conducted by Aramendi et al. (2014) highlights the tools most valued by students that are applicable to the case method, including traditional strategies such as student presentations and more innovative strategies like computer-based practices, simulations, and role-playing games.

In the case method, students engage in case interpretation exercises, followed by the formulation of hypotheses that they contrast with those proposed by their peers, aiming to achieve the most accurate group analysis (Lara & Gómez, 2020). This process enables students to learn the theory of the subject through the detailed analysis of research, starting from its origin, implications, and contradictions found in group research results (Lara, 2017).

Martínez and Musitu (1994) identified three types of cases based on the learning objectives students need to achieve: (1) Cases focused on descriptive studies; (2) Cases related to problem-solving; and (3) Cases emphasizing the application of principles.

The scenarios presented to students require the analysis and selection of principles and standards that benefit the resolution process. These situations promote the development of deductive thinking, which involves moving from the general aspects of a situation and applying the necessary premises to reach a conclusion that provides the most appropriate response.

For a case to be implemented correctly, active participation is essential, as it fosters successful case discussions. It is also necessary to define clear learning objectives, ensuring proper internalization of those goals. When successfully executed, students develop deeper conceptual understanding and can effectively translate theory into practice (Lyu & Cheng, 2012).

Case design must take into account the student's environment, so that the developed cases create familiarity and foster greater interest in solving them (Tärnvik, A. 2007).

Additionally, it is essential that the learning objectives are both precise and explicit, as the structuring of the case should be oriented towards acquiring knowledge or developing specific competencies, in alignment with the curriculum (Ameta et al., 2020).

CONCLUSION REMARKS

Higher education is at a turning point, where the need to train professionals capable of adapting to an ever-evolving job market, without overlooking formative aspects inherent to being human, calls for a critical review of traditional pedagogical models. While traditional teaching has been fundamental in the transmission of knowledge, the growing complexity of global challenges and the acceleration of social change demand a more dynamic approach focused on competency development.

The case method, by simulating real and complex situations, emerges as a promising strategy to promote active learning and critical thinking. Although its application is common in fields such as medicine or law, its potential in disciplines like natural sciences and physical-mathematical sciences has yet to be fully tapped. To maximize the advantages of the case method, it is essential to tailor it to the specific characteristics of each discipline and develop specialized teaching materials.

It is worth suggesting that the transition to a competency-based educational model should not be abrupt or imposed by decree; rather, it should be gradual and accompanied by a continuous training process for teachers, in which they actively participate as agents of change. Without resorting to sweeping generalizations, university professors, who are highly specialized in their areas of expertise, may exhibit some resistance to change due to their own training, which is often rooted in traditional teaching models. It is essential to acknowledge and value the experience of these educators, while providing them with the necessary tools and support to integrate new pedagogical methodologies into their teaching practices. Ideally, higher education will evolve toward a more holistic approach that prepares students for an increasingly dynamic and complex job market, equipping them not only with professional competencies but also with human values that enable them to engage in reflective dialogues about their own learning. The case method, by fostering experiential learning and collaborative work, stands out as a valuable tool for achieving this goal. It is crucial to continue researching and developing this method to improve its implementation across various disciplines, as well as to encourage collaboration among educators to share experiences and best practices.

The transition to a new educational model must be a gradual and participatory process that involves all educational stakeholders.

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