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Dilemma-based learning methodology

Metodología de aprendizaje basada en dilemas

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ABSTRACT

This article introduces and defines an innovative educational methodology: Dilemma-Based Learning (DBL), which responds to the ethical challenges and dilemmas emerging from the digital context that defines the first half of the 21st century. This methodology demands the weighing of values, contextual interpretation, and decision-making under uncertainty, by presenting students with real or hypothetical complex situations that require critical thinking to be addressed. It focuses on the resolution of dilemmas, as opposed to problems, which involve ethical considerations and call for reasoned arguments, often with contradictory consequences. The ultimate goal of this methodology is the formation of individuals capable of moral deliberation, sensitivity to diversity,

and responsibility toward the common good. DBL provides a framework applicable to various educational or professional levels and contexts and can be used with a wide range of learners.

Keywords. Methodology, ethics, dilemmas, learning, moral reflection

RESUMEN

Este artículo propone y define una metodológica educativa novedosa; el Aprendizaje Basado en Dilemas (ABD), que responde a los desafíos y dilemas éticos que surgen de la aplicación digital en la que estamos inmersos en la primera mitad del siglo XXI. Esta metodología exige una ponderación de valores, una interpretación contextual y una toma de posición ante la incertidumbre, a través del planteamiento a los estudiantes de situaciones reales o teóricas complejas que deben ser resueltas con pensamiento crítico. Se trata de la resolución de dilemas, diferenciándolo de problemas, que implican cuestiones éticas y requieren argumentos razonados, cuyas consecuencias son en ocasiones contradictorias. El objetivo último de esta metodología es la formación de sujetos con capacidad de deliberación moral, sensibilidad ante la diversidad y responsabilidad ante el bien común. El ABD ofrece un marco aplicable a distintos niveles y contextos educativos, o profesionales, en un amplio abanico de estudiantes.

Palabras clave. *Metodología, ética, dilemas, aprendizaje, reflexión moral*

INTRODUCTION

The recent evolution of educational environments, driven by technological, social, and cultural transformations, has exposed the limitations of traditional teaching models centered on content delivery and rote assessment. As noted by De Albéniz-Iturriaga et al. (2021), the post-pandemic context has acted as a catalyst for profound change in education, forcing educators and institutions to reconsider both what and how we teach. Within this changing landscape, there is a growing need for pedagogical methodologies that not only promote meaningful learning but also cultivate critical individuals capable of ethically engaging with an increasingly complex, uncertain, and interdependent world.

The rise of artificial intelligence (AI), big data, automation, climate change, migration, and the tensions between security and freedom are examples of contemporary phenomena that cannot be approached solely through technical competencies. These phenomena give rise to dilemmas that directly challenge citizens' ethical awareness. For this reason, as UNESCO (2021), states, education systems must prepare individuals not only to adapt to change but to actively participate in shaping it, guided by principles of justice, equity, sustainability, and dignity.

One of the most promising responses to these challenges has been the implementation of active learning methodologies such as Problem-Based Learning (PBL) or Project-Based Learning. These approaches shift the focus from teaching to learning, involving students in the resolution of real or simulated situations, encouraging research, collaboration, and critical thinking. However, these strategies often center on problems with technical or procedural solutions and do not always succeed in addressing the ethical and value-based dimensions that now permeate every field of knowledge and human action (Bohorques Marchori, 2025).

In contrast to the aforementioned active methodologies, and as a complement to them, our proposal, DBL, emerges as an innovative and necessary pedagogy that specifically targets those often neglected or marginalized dimensions. Its relevance lies in shifting the focus from "how to solve" to "how to decide" in situations where ethical principles, values, and rights come into conflict. Unlike technical problems, dilemmas have no single correct solution; they require an informed, reflective, and reasoned position. As Friedman & Hendry (2019) argue, ethical dilemmas compel

us to navigate grey areas where normative frameworks fall short and autonomous moral judgment must be exercised. DBL is thus an educational methodology through which students are presented with a dilemma or complex situation with an ethical component, and they are required to make a decision using three essential elements: critical analysis, personal reflection, and decision-making.

In this context, it is essential to distinguish between "problems" and "dilemmas" as two different categories that require distinct pedagogical approaches:

- Problems are situations that, although complex, have correct or optimal solutions based on technical, logical, or methodological procedures. Their resolution involves the application of prior knowledge and specific skills to arrive at an appropriate solution.
- Dilemmas, by contrast, are situations in which one must choose between two or more options, each with significant ethical, moral, or social implications. There is no single or clearly correct answer, and the decision-making process requires deep reflection on conflicting values and principles.

As previously stated, in DBL, there is no single correct resolution, as is often the case in PBL. Instead, DBL requires students, individually or in teams, to analyze a complex situation, identify the underlying dilemma, and consider various perspectives in their decision-making. It is not a question of finding a "correct" answer to a problem but rather of navigating between two or more equally valid courses of action. In doing so, students are compelled to reflect on their own values and beliefs and to make a decision based on personal analysis, even when conclusions may be contradictory. This methodology therefore fosters not only critical thinking but also the capacity to address complex or subjective problems, to develop decision-making skills, and to make choices that do not necessarily have objective or universally agreed-upon answers.

This distinction is crucial, as many traditional educational methodologies focus on problem-solving while neglecting training in ethical decision-making and critical moral reflection. DBL emerges as a response to this need, offering a framework for students to develop critical thinking, empathy, and ethical judgment as they face complex situations without obvious or predetermined solutions.

In this regard, DBL aligns with a transformative vision of education, where the goal is not merely the acquisition of knowledge, but the development of individuals capable of moral deliberation, sensitivity to diversity, and responsibility toward the common good. This methodology places students in real or hypothetical dilemma scenarios that require them to confront different points of view, evaluate consequences, and make well-reasoned ethical decisions. In the words of Jobin et al. (2019), ethics can no longer be an afterthought, in the field of AI or elsewhere, but must be a central competence in the design, implementation, and use of any innovation. One of the greatest pedagogical benefits of DBL is that it allows students to work in an integrated manner on cognitive, communicative, social, and ethical competencies, thereby strengthening the development of moral judgment, ethical autonomy, and deliberative moral formation.

Moreover, this methodology fosters the construction of meaningful knowledge through cognitive and moral conflict, promotes the development of critical thinking and empathy, and strengthens the ability to argue from a standpoint of respect and plurality. It places the student at the center of the educational process not only as a learner but as a moral subject capable of deliberating on conflicting values and acting accordingly. Thus, DBL not only develops academic competencies but also the ability to act with integrity and responsibility in ethically complex contexts, supporting a deep and sustained process of deliberative moral formation. In line with Nussbaum (2016) proposals, DBL also enables the integration of emotional dimensions into ethical reasoning, thereby strengthening empathy, moral imagination, and the construction of an ethical and deliberative citizenship.

Likewise, DBL responds to a specific need in today's educational landscape: equipping students with tools to navigate the moral complexity of the digital world. The impact of technologies such as AI in education, healthcare, and culture has raised questions that cannot be answered by

algorithms alone. Can an AI make decisions in sensitive domains such as education or justice? What happens to authorship in works generated by automated systems? Should privacy be prioritized over public security? These questions, all of them dilemmas, cannot be resolved through technical procedures alone but demand a reflective ethical framework. As demonstrated by Buolamwini & Gebru (2018), biases in facial recognition systems expose the need for such ethical analysis.

For all these reasons, DBL is not a passing trend or a supplemental strategy, it is a structural pedagogical proposal that addresses the challenges of ethical and digital citizenship in the 21st century. It does not seek to replace existing active learning methodologies but to deepen them from a humanistic perspective. In the face of increasing automation and the risk of dehumanization, DBL places the human being at the center, as a moral subject capable of thinking critically, feeling empathetically, and acting responsibly.

This article is structured as follows: the first section introduces the current educational context and the need for methodologies focused on ethical decision-making; the second presents the theoretical foundations of DBL; the third outlines its pedagogical grounding; the fourth describes the methodology, its objectives, fields of application, and stages; and finally, conclusions and references are provided.

THEORETICAL FOUNDATION

The evolution of active learning methodologies has been one of the most significant transformations in contemporary pedagogical landscapes. As society moves toward increasingly complex, dynamic, and ethically challenging contexts, traditional models, centered on repetition, memorization, and unidirectional instruction, have lost effectiveness in shaping students into critical and engaged citizens. From the early 20th century to the present, various active methodologies have emerged in response to this challenge, promoting student agency, contextualized knowledge, and collaborative knowledge construction.

One of the pioneering approaches was the project method (Kilpatrick, 1926). In this model, learning is structured around a meaningful project that students plan, develop, and present autonomously. This methodology facilitates the integration of knowledge, decision-making, and practical resolution of real-world situations. Its philosophical basis lies in pragmatism and constructivism, promoting learning grounded in experience and reflective action (Calvopiña Cerna & Pucuji Guanoluisa, 2024). However, prior literature cautions that, without careful scaffolding and alignment, project-based learning (PBL) can dilute intended learning objectives and may not elicit explicit ethical reasoning in student decision-making (Blumenfeld et al., 1991; Colby & Sullivan, 2008; Prince, 2004; Sweller et al., 2007). In our design we address these concerns by making ethical outcomes explicit, using a structured rubric, and requiring stakeholder-oriented communication of decisions.

During the 1960s and 1970s, PBL gained momentum, particularly in medical education, most notably at McMaster University in Canada. This approach presents students with an open-ended problem that they must analyze, research, and solve collaboratively, fostering critical thinking, self-regulated learning, and teamwork (Hmelo-Silver, 2004). While PBL represents a methodological advancement by centering the process on inquiry, it typically focuses on technical problem-solving rather than moral or value-laden dimensions. Solutions are often sought based on criteria of effectiveness or functionality, without necessarily questioning their ethical legitimacy or social impact.

Another widely used methodology in higher education is the case method, originally developed at Harvard Law School and later adopted by business schools. It involves the analysis of real or simulated situations containing complex conflicts with multiple variables and stakeholders. Students interpret facts, identify alternatives, and make justified decisions. While this method

incorporates elements of deliberation and positional judgment, its ultimate purpose is often strategic or instrumental, aiming for the most efficient or successful decision rather than a morally evaluated one (Estrada Cuzcano & Alfaro Mendives, 2015).

In more recent times, Challenge-Based Learning (CBL) has gained traction, confronting students with real-world professional or social challenges. It emphasizes innovative problem-solving through design processes, creativity, and research. This methodology seeks to bridge the gap between school and life, promoting disruptive thinking and agile resolution. However, CBL often prioritizes technical competence over ethical reflection. As Posso Pacheco et al. (2023) point out, the "challenge" is framed as a problem to be overcome, with little attention paid to the moral dilemmas involved, such as environmental impact, equity, or the rights of those affected.

In contrast, Service-Learning (SL) is a methodology in which the ethical dimension becomes more explicit. Students engage in real community service activities while simultaneously developing academic competencies, thereby linking knowledge with social responsibility. Studies such as Maldonado-Rojas & Toro-Opazo (2020) have shown that SL fosters empathy, engagement, and critical consciousness. However, its effectiveness depends greatly on the type of activity implemented. In many cases, the reflective component is overshadowed by operational aspects, and the ethical complexity of decisions is addressed only tangentially or reactively.

This overview of the main active learning methodologies reveals a consistent trend: while all of them shift the focus from teaching to active learning, very few structurally address the development of ethical competence and moral judgment. In most cases, students' decisions fall within a problem-solving logic rather than one of dilemma deliberation. As Friedman & Hendry (2019) argue, this distinction is crucial: whereas problems can be solved using technical knowledge or predefined procedures, dilemmas require the weighing of values, contextual interpretation, and decision-making amid uncertainty.

It is precisely in this gap that DBL positions itself. This methodology is characterized by placing ethical reflection at the center of the educational process, especially in situations that have no single correct solution and where any decision entails moral consequences. Rather than seeking an "optimal" or functional answer, DBL invites students to analyze conflicts involving rights, interests, and principles, and to develop skills such as critical reasoning, empathy, active listening, and respect for diverse perspectives. The aim is not to train students to merely "solve" but to "decide responsibly."

In a world increasingly shaped by ethical dilemmas, from the use of AI in education to decisions about sustainability, privacy, or social justice, there is an urgent need for a methodology that teaches students to live and act with ethical awareness. As Jobin et al. (2019) argue, ethics can no longer be an add-on in education but must serve as a transversal axis across all disciplines and contexts. DBL addresses this educational need not as an alternative to existing active learning methodologies but as an evolution that complements and deepens them from a humanistic perspective. Where project-based learning fosters autonomy, DBL brings ethical discernment; where PBL cultivates critical thinking, DBL adds moral sensitivity; where SL promotes social engagement, DBL introduces deliberation.

In this sense, DBL draws on elements from various earlier methodologies such as the case method developed at Harvard, as well as Problem-Based Learning and experiential learning as proposed by David Kolb, who defined learning as "the process whereby knowledge is created through the transformation of experience" (Kolb, 1984). It also builds on collaborative learning approaches aligned with the theories of Vygotsky and Elizabeth Cohen, both of whom emphasized the role of dialogue and cooperation in the development of knowledge.

However, DBL distinguishes itself from these methodologies by shifting its focus from merely solving a problem to choosing between ethically valid but potentially conflicting options. This deliberative ethical dimension is the defining feature that sets DBL apart from other active approaches.

Ultimately, DBL enables students to confront real-world complexity with a reflective, dialogical, and engaged mindset. It prepares them not only to act, but to act wisely recognizing that many decisions in life cannot be resolved through formulas, but require ethical judgment, integrity, and responsibility.

Consistent with the foregoing, empirical evidence on active learning approaches shows systematic improvements in student performance (Freeman et al., 2014; Hake, 1998; Prince, 2004) and narrows achievement gaps (Theobald et al., 2020). In business education, studies in accounting and economics (Cagliesi & Ghanei, 2022; Riley & Ward, 2017) report higher exam scores, higher pass rates, and enhanced learning experiences. Because DBL also introduces a deliberative dimension, explicit reasoning about values, trade-offs, and consequences, it is reasonable to expect gains in the assessed components of argumentation and decision-making, which we examine empirically in the analysis that follows.

PEDAGOGICAL FOUNDATION

DBL is grounded in various pedagogical theories that have driven the shift in education from a content-transmission model toward a more active, reflective, and ethically oriented conception of learning. This methodology finds its roots, first and foremost, in constructivist theory, as developed by Jean Piaget and Lev Vygotsky. Piaget argued that knowledge is actively constructed by the learner through processes of assimilation and accommodation, in a continual cognitive equilibrium in relation to their environment (Piaget, 2005). From this perspective, learning involves an internal reorganization of thought, which is fostered when the student encounters situations of cognitive disequilibrium. Ethical dilemmas posed in DBL create exactly this type of tension, as they lack clear or singular solutions, forcing the student to reconstruct their own mental frameworks.

Vygotsky, in turn, contributed the concepts of the zone of proximal development and the importance of language as a mediator of thought. For him, learning is essentially a social phenomenon that occurs through interaction with others, particularly in cooperative and dialogical contexts (Vygotsky & Cole, 1978). DBL aligns closely with this view by promoting collective analysis of ethical dilemmas, where students compare viewpoints, argue their positions, and construct meaning collaboratively. In this way, the dialogical and social components of learning become essential pathways for the development of moral judgment.

Along these lines, DBL also connects with David Ausubel's theory of meaningful learning, which emphasizes that new knowledge must be substantially and non-arbitrarily integrated into the learner's existing cognitive structure. According to Ausubel et al. (1978), learning becomes meaningful when it relates to the student's prior knowledge and personal frame of reference. By presenting ethical dilemmas linked to current and relevant topics, such as AI, sustainability, or human rights, DBL facilitates this anchoring between new content and students' own experiences and values, thus promoting deeper and more enduring internalization of knowledge.

DBL also resonates with David Kolb's experiential learning theory, which centers the transformation of experience as the foundation of learning. It draws on aspects of the case method, popularized in business schools such as Harvard, where argumentative discussion of real-world situations is valued. Lawrence Kohlberg, in turn, highlighted the importance of moral debate in the development of ethical judgment, an essential component of DBL. Otley & Berry (1994) also acknowledged that case studies can be used across different methodologies.

Although DBL shares certain similarities with PBL, it is crucial to distinguish between the two. While PBL focuses on resolving technical or conceptual problems, DBL requires the weighing of values, contextual interpretation, and making decisions amid uncertainty.

Moreover, DBL organically incorporates the principles of cooperative learning, developed by scholars such as David and Roger Johnson and Robert Slavin. These theories argue that learning is enhanced in contexts of positive interdependence, individual accountability, and structured group

work (Johnson & Johnson, 1987; Slavin, 1995). Group analysis of dilemmas activates these principles by encouraging ethical discussion among peers, respect for diverse opinions, and the development of argumentative, collaborative, and empathetic skills. Rather than aiming at a correct answer, DBL promotes an ethics of dialogue, where the process of deliberation is itself a formative goal.

Collectively, these theoretical traditions converge in advocating for a student-centered educational model, one that emphasizes the relevance of context and experience in meaning-making, and recognizes the social, ethical, and emotional dimensions of knowledge. DBL integrates all these components into a methodology that not only aims to transmit content, but to form citizens capable of thinking critically, deliberating ethically, and acting responsibly in complex and morally ambiguous real-world contexts. In a global scenario where ethical dilemmas are increasingly present in everyday life, DBL stands as a pedagogically relevant and ethically necessary proposal, consistent with the best traditions of contemporary education and committed to the holistic development of the human being.

METHODOLOGY DESCRIPTION

In education, regardless of level, it is crucial to establish an effective learning methodology that enables students to acquire the intended knowledge, skills, and competencies efficiently. Every methodology involves various stages, typically beginning with the definition of learning objectives and concluding with the assessment of achieved outcomes. This section presents a theoretical overview of the proposed DBL methodology.

Objectives

The fundamental goal of DBL is to promote students' critical analysis and ethical personal reflection. Thus, we can distinguish between general and specific objectives.

Among the general objectives, we find the development of critical skills such as analysis, evaluation of information, and decision-making in real or hypothetical problems; the promotion of critical thinking and reflection on possible solutions to the dilemmas presented.

Among the specific objectives, we would include teaching the identification and analysis of dilemmas; the evaluation of different options and the making of complex decisions based on their own analyses and value systems. In addition, DBL promotes teamwork, constructive discussion or debate, and helps students connect with real life or situations that may later arise in their professional practice.

Context of application

DBL is a methodology applicable to different contexts, not only educational but also professional, from studies in secondary education to university education and even in the field of vocational training.

In secondary education, it could be applied to all kinds of subjects, especially those in the humanities, such as social sciences, philosophy, and ethics. However, with the emergence of artificial intelligence, its application is increasingly relevant in the sciences. In vocational training, DBL could be applied in areas of management, leadership, and decision-making. Regarding university education, the implementation of DBL is ideal as an interdisciplinary methodology and can be applied to various subjects within the same degree or across different degrees such as business administration, law, medicine, engineering, and ethics. The possibility of applying it in different languages should also be considered.

Regarding the number of students with whom to implement this methodology, it is not a determining factor, as it can be applied to both small groups and large groups, at any level of education, with or without prior knowledge, depending on the complexity of the subject.

In terms of application in professional practice, it could be used in various professions such as health and medicine (clinical decision-making or resolution of ethical dilemmas or complex case management), law and justice (judicial decision-making or in legal practice), business and management (team management and conflict resolution), and even in politics for the management of public policies and political decision-making.

Phases of the DBL methodology

Depending on the contexts, the areas or subjects in which it is applied, and the objectives pursued, this learning methodology can follow different phases, the most common being the following:

1. Definition of objectives
2. Presentation of the general case and contextualization
3. Identification of the dilemma and information analysis
4. Decision-making
5. Reflection on what has been learned
6. Evaluation

Below, the implementation phases of the methodology are explained in detail.

1. The first phase consists of defining the objectives:

The implementation of the methodology begins with the clear determination of the educational objectives to be achieved. This initial phase is fundamental to guide all subsequent didactic decisions. It is necessary to define the teaching-learning focus and set goals that consider the development of cognitive, attitudinal, and procedural competencies.

The objectives must be aligned with the educational level of the students, the field of knowledge, the available resources, and the expected learning outcomes. Furthermore, it is advisable to distinguish between general objectives, which define the overall purpose of the didactic intervention, and specific objectives, which specify concrete and observable learning outcomes. This precision will allow for coherent evaluation and will facilitate the monitoring of the process by both teachers and students.

2. Secondly, presentation of the case/dilemma and contextualization.

Once the objectives have been defined, the next step is to present the case or dilemma situation. This must be properly contextualized, whether in a real or hypothetical setting, but always plausible and relevant to the corresponding disciplinary area. Contextualization is key to giving meaning to the dilemma, generating interest among students, and facilitating identification with the stakeholders involved.

The case must be presented clearly, outlining the essential facts without explicitly resolving the conflict. The dilemma should not be imposed but rather emerge naturally from the case through attentive reading and deep understanding of the context. The aim of this phase is to place students within a framework of action that simulates a professional, civic, or moral experience in which their decisions will have real or symbolic consequences.

3. The third phase consists of identifying the dilemma and analyzing the information

In this phase, students must precisely identify the dilemma or dilemmas posed by the case. From there, they begin an analysis of the available information, contrasting data, consulting normative, theoretical, or jurisprudential sources, and formulating the necessary questions to guide decision-making.

The analysis must be conducted from a comprehensive perspective, considering not only technical or legal aspects but also ethical, social, or professional implications. The teacher's role in this stage is to facilitate access to relevant sources, guide the formulation of pertinent questions, and ensure the analysis is carried out in an argumentative and rigorous manner.

4. Fourth, decision-making

The decision-making phase represents the core of the methodology. At this stage, the student, either individually or as part of a team, must take a position regarding the dilemma, justify it with solid reasoning, and contrast it with other possible alternatives. The aim is not to find a single correct solution, but rather to reason, justify, and assess the consequences of the different possible choices.

It is important that the chosen decision be supported by ethical principles, legal norms, or technical criteria applicable to the case. For this, students need to understand the complexity of the dilemma and be able to weigh the various interests at stake. This stage promotes the development of critical judgment, argumentative skills, and autonomous decision-making.

5. As part of the reflection phase, students can assess what they have learned

The reflection phase is an essential stage in the development of Dilemma-Based Learning, as it allows students to consolidate the knowledge acquired throughout the process, become aware of their personal and academic development, and establish connections between the analyzed case and similar situations that may arise in their professional or civic lives. This reflection should cover both the content addressed and the process followed, with a particular emphasis on the ethical aspects involved.

At this stage, students are encouraged to share their conclusions and arguments either orally or in writing, individually or through group representatives. This final communication contributes to the development of synthesis, argumentation, and critical expression skills. Furthermore, the presentation of different viewpoints encourages dialogue, respect for diversity of opinion, and recognition of the complexity inherent in ethical dilemmas.

To support reflective thinking and ensure that ethical aspects are not overshadowed by merely technical or normative considerations, the teacher may provide a structured table to help organize ideas and deepen the analysis of possible decisions. This tool allows students to visualize and compare different alternatives, evaluating their benefits, risks, ethical implications, and consequences for the various stakeholders involved.

6. Finally, the evaluation phase

At this stage, both the process and the learning outcomes are evaluated. This evaluation should be consistent with the objectives set at the beginning and may include both individual and group instruments. The use of rubrics is recommended to assess not only the adopted decision but also the quality of reasoning, depth of analysis, participation in collaborative work, and capacity for reflection.

The evaluation may include different dimensions:

- Technical (conceptual and normative mastery)
- Ethical (identification and application of principles)
- Procedural (analysis and decision-making strategies)
- Attitudinal (respect, responsibility, active listening)

This phase closes the learning cycle by assessing whether the intended objectives have been achieved and provides useful feedback to improve future implementations.

A possible evaluation rubric might be:

Table 1. Possible evaluation rubric

Evaluation criteria	Excellent (4)	Good (3)	Acceptable (2)	Insufficient (1)
Understanding of the case and the dilemma	Demonstrates a deep understanding of the case, clearly identifies the main dilemma and related sub-dilemmas.	Understands the case and adequately recognizes the main dilemma, though with limited depth.	Partially understands the case; identifies the dilemma ambiguously or imprecisely.	Shows poor understanding of the case; fails to identify the dilemma or does so incorrectly.
Information analysis	Critically analyzes the available information, includes relevant sources, and formulates well-founded, relevant questions.	Uses the provided information, formulates some appropriate questions, and consults suggested sources.	The analysis is superficial, with few questions posed or limited use of sources.	Fails to adequately analyze the information or consult relevant sources.
Justification of the decision made	The decision is solidly argued, based on norms, values, and thoroughly analyzed consequences.	The decision is well-reasoned, though it could go deeper into consequences or the ethical and normative framework.	The decision is weakly justified, with underdeveloped arguments or based on personal opinions.	The decision lacks justification or is based on incorrect premises.
Ethical reflection	Clearly and deeply integrates ethical aspects of the dilemma, rigorously identifying ethical principles and conflicts.	Includes the most relevant ethical aspects, though without deep analysis of the principles involved.	Mentions ethical elements but lacks argumentative development or a clear connection to the decision made.	Does not adequately incorporate ethical reflection or addresses it superficially.

Source: Own elaboration

Based on the table above, the scoring scale would be:

Table 2. Scoring scale

Score range	Performance level
15 – 16 points	Excellent
13 – 14 points	Good
10 – 12 points	Acceptable
< 10 points	Insufficient

Source: Own elaboration.

EXAMPLE OF CLASSROOM IMPLEMENTATION

To illustrate the applicability of this methodology across different contexts, we present a classroom implementation using DBL, following the phases outlined in the previous section. This pilot exercise was conducted in November in the course Social Responsibility and Ethics within the Bachelor's Degree in Industrial Organization Engineering (fourth year, 4.5 ECTS, compulsory, semester 1). The course develops, among others, competencies CP03 (ethics and social responsibility in engineering/management) and CPT01–CPT08 (critical thinking, communication, leadership, cooperation, and decision-making in VUCA environments (Volatility, Uncertainty, Complexity, and Ambiguity)) and is assessed using the rubric in Table 1, integrated with both in-person and out-of-class assessments.

Following the process described above, the phases of the proposed methodology are:

1. Definition of objectives

The overarching aim was to develop ethical judgment applied to management decisions, involving trade-offs among productivity, safety, privacy, regulatory compliance, and corporate reputation. The specific objectives pursued in this exercise were to:

- Identify ethical dilemmas in operations and HR decisions.
- Analyze regulations and risks (privacy/data protection, Occupational Health and Safety (OHS), labor relations), as well as economic and reputational impacts.
- Deliberate and reach a reasoned decision, including an implementation plan and control measures.
- Communicate the decision to stakeholders (management, works council, compliance), defending the chosen position with evidence.

2. Presentation of the general case and contextualization

In this second stage, the instructor presents the case to be addressed and provides students with all the information needed to work through it.

Case.

The setting is an assembly company with 250 employees working across three shifts. Over the past twelve months, the plant has experienced a moderate accident rate and a growing number of unplanned stoppages, which has reduced Overall Equipment Effectiveness (OEE) to 89% (–2 percentage points relative to the group target). The Operations Department proposes implementing an AI-based monitoring system (cameras on the line plus wearables) that is expected to yield +2 percentage points in OEE and a reduction in accidents. The HR/OHS department views the proposal positively, whereas the works council warns of potential invasions of privacy, algorithmic bias, and strain on the workplace climate. The Compliance function requires guarantees of legal compliance and data minimization, and several strategic clients have introduced ESG (Environmental, Social, and Governance) requirements in their supplier audits.

Students receive a four-page briefing that includes a business overview and value chain, a stakeholder map, operational metrics (OEE, accident rate, incidents and near misses, turnover, absenteeism), internal policies on CSR, OHS, and data governance, and a summary of key risks and opportunities.

The session begins with a 20-minute activation: a brief recap of CSR/ESG, professional ethics, and managerial decision-making, followed by a whole-class debrief to share prior experiences in operations and industrial safety.

3. Identification of the dilemma and information analysis

After the presentation, teams of 4–5 students have 45–60 minutes to refine the dilemma and analyze the available information.

Dilemma.

Should the company implement the AI-based monitoring system to improve safety and productivity, accepting restrictions on privacy and potential bias, or should it prioritize less intrusive alternatives (work redesign, training, incentives) even if the expected short-term impact is smaller?

Once the case and dilemma have been set out, the instructor explains the team-based workflow (45–60 minutes). Each group is asked to:

- Enumerate the values in conflict: safety and well-being vs. privacy, dignity, transparency, and justice.
- Quantify key business indicators: OEE, cost per accident, turnover, reputation, and legal risk.
- Define essential safeguards: Data Protection Impact Assessment (DPIA), anonymization/pseudonymization, limits on disciplinary use of data, worker/union participation, bias audits and periodic reviews, and data minimization with short retention periods.
- Explore alternatives: less intrusive technologies, ergonomic/work redesign, training, lean–kaizen incentives, or area-level pilots with pre/post evaluation.

For the analysis, students have access to a course folder with internal policies and relevant standards, as well as an assessment rubric (Table 1).

4. Decision-making

Each team must formulate a justified and feasible decision, present it in a 2–3 page brief, and defend it in a 5-minute role-play before “Management” and the “Works Council.” The brief must include:

- Ethics–business matrix of impacts on people, operations, and reputation, with success criteria and residual risks.
- Conditions for adoption (purpose limited to safety/ergonomics; governance committee with workforce representation; bias audits; internal transparency; monitoring indicators, etc.).
- Implementation plan: roles and responsibilities, timeline, cost–benefit, KPIs (accidents, OEE, turnover, workplace climate, privacy complaints).
- Non-intrusive Plan B with an estimated impact.

5. Reflection on what has been learned

In the next stage, each student completes a one-page individual journal in which they make explicit the values prioritized and the conditions under which they would revise their decision, the uncertainties that remain, and how the learning translates to their future professional role in engineering or operations. As support, the instructor provides a comparative table of alternatives that synthesizes benefits, risks, and affected principles, thereby reinforcing ethical deliberation.

6. Evaluation

The activity is integrated into the course assessment with the following weights:

Table 3. Evaluation criteria of the assignment

Component	Weight in the final grade
Team report	25 %
Oral defense	15 %
Individual reflective journal	10 %
Assessment rubric (Table 1)	50 %

Source: Own elaboration.

The assessment rubric presented in the theoretical framework is applied, evaluating understanding of the case, quality of analysis, ethical and legal argumentation, and the capacity for critical reflection and communication.

Results and feedback were communicated in a follow-up session, highlighting strengths and areas for improvement, especially the ability to justify decisions beyond purely technical reasoning and to consider values, consequences, and social implications.

Given its cognitive and evaluative demands, DBL is particularly suitable for advanced undergraduate courses (third–fourth year). In earlier years, we recommend scaled-down dilemmas with stronger scaffolding; in master's programs, cases can be deepened with advanced business metrics.

Observed learning outcomes

The application of DBL in the course Social Responsibility and Ethics (fourth year, 4.5 ECTS, compulsory) showed that structured dilemma analysis translates complex theoretical frameworks into experiential managerial decision-making processes. Beyond critical thinking, students integrated operational metrics (OEE, accident rates), ESG criteria, and compliance requirements to justify decisions with implications for people and business results. Formatively, the activity strengthened ethical autonomy, practical judgment, and stakeholder communication (Management, Works Council, Compliance).

Sample and context. Class size: n = 23 students (9 women; 14 men; 1 repeating student). Compulsory fourth-year course. Aggregated historical benchmark over three prior cohorts (approx. n = 63).

Evidence of learning (triangulating report, oral defense, and journal):

91% showed an accurate identification of the values in conflict and the business constraints; 88% effectively integrated the legal–ethical–social–operational dimensions, considering safety, privacy, and productivity; 100% of teams justified their proposals with ethical/legal references and management indicators (OEE, incident rate, turnover). Regarding implementation and control, 74% proposed an operational plan with KPIs and a realistic timeline, and 61% added a non-intrusive Plan B. In the oral defense, 83% demonstrated effective communication tailored to Management, the Works Council, and Compliance. Finally, 86% linked their decision to personal values and organizational consequences, making explicit both uncertainties and the conditions under which they would revise their stance.

Estimated academic impact on final outcomes.

— Final grade average: 7.60/10 vs. 6.90/10 in the historical benchmark.

— By sex: women +0.90; men +0.60.

— Repeating student: +1.20 points.

— Share of grades ≥ 8/10 in DBL-linked components: 48% vs. 30% historically.

Methodologically, the comparison with prior cohorts suggests a moderate and consistent improvement. These findings indicate that students learned not only to think in a critical way by exercising deliberative competence applied to operations and HR decisions with reputational and legal implications, but also to apply ethical reasoning consistently across different managerial

contexts. The learning objectives were achieved, especially in critical thinking, argumentation, ethical reflection, and decision-making under managerial constraints. DBL appears transferable to other areas (operations, HR, compliance, supply chain) and well-suited to advanced courses in which students have the technical foundation to weigh values alongside business outcomes. We propose replication in future cohorts and the incorporation of a quasi-experimental design to refine the impact estimate.

DISCUSSION AND CONCLUSIONS

The incorporation of DBL within the framework of active methodologies represents a substantial evolution in contemporary educational approaches, particularly regarding the development of ethical judgment, deliberative capacity, and the holistic formation of students. Unlike established methodologies such as PBL or the case method, DBL does not seek an optimal solution from a technical standpoint, but rather informed and reflective decision-making in the face of value conflicts, an ethical dimension rarely systematized in traditional models.

In comparative terms, DBL recovers and deepens aspects of various previous pedagogical approaches: from constructivism, it draws the emphasis on active knowledge construction; from experiential learning, the value of personal transformation through meaningful situations; from collaborative learning, the importance of dialogue and interdependence; and from service learning, the link between academic knowledge and social commitment. However, its distinctive feature lies in placing ethical conflict and moral deliberation at the core of the learning process, an important innovation in today's educational landscape, increasingly shaped by dilemmas arising from digitalization, AI, and sustainability.

The methodological approach described in this article provides a framework applicable to various educational levels and contexts, with concrete examples in fields such as law and engineering. Nevertheless, one of the main challenges of DBL lies in its proper implementation: designing authentic dilemmas, fostering rigorous debate without falling into polarization, and assessing decision-making processes where there is no single “correct” answer. These challenges demand specific teacher training and an educational culture that values critical thinking and diverse perspectives.

In a global context marked by complexity, uncertainty, and value conflicts, DBL emerges as a methodology with high potential for educating citizens capable of acting with integrity, sound judgment, and responsibility.

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