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INTEGRATING PROJECT-BASED LEARNING IN A QUALITY MANAGEMENT COURSE: IMPLEMENTATION PROCESS AND STUDENTS' PERCEPTION

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Abstract. Contemporary students are no longer interested in traditional courses based on the transmission and memorization of theoretical knowledge. Instead, they are looking to apply this knowledge and become more operational in order to facilitate their professional integration. In response to these evolving dynamics, teachers are compelled to develop new teaching practices and introduce effective approaches that encourage students to take an active role in their learning process. One notable approach to addressing these needs is Project-Based Learning (PBL). This research presents a case study of using PBL as a pedagogical method in higher education. It aims to integrate the PBL approach into a Quality Management course and then evaluate its effectiveness and effects as perceived by students. The methods employed were document analysis and a questionnaire survey. The results showed that the PBL approach was implemented in five main steps: identification, design and planning, group constitution, realization, and evaluation. This approach was perceived as effective regarding the activities provided and the teacher's role, and had positive effects on helping students improve some life skills such as creativity, autonomy, communication and decision-making. However, weaknesses were reported, including a lack of time and insufficient collaboration within groups.

Keywords: *document analysis; effectiveness; effects; implementation process; perception; Project-Based Learning (PBL); quality management course; questionnaire survey*.

JEL Classification: I21; I23

INTRODUCTION

Students of the 21st century, also known as the "*Digital Generation*" (i.e., regular and intensive users of technology), are not interested in courses of yesteryear in which they play a passive role. They prefer courses where they can actively apply knowledge and participate in the learning process rather than only listening and memorizing information through typical lecture courses (Ranmechai & Poonputta, 2023). This is what is known as the shift from "*learning by memorization*" to "*learning by doing*" (Cintang et al., 2018). As a result, teachers are required to adapt and develop their teaching approaches and strategies. They

have to promote active learning methods and experiment with new and innovative practices and techniques that engage learners and allow them to be active in the classroom and learn through their experiences (Mohammed, 2017). This choice must be made with great care because it directly influences the levels of engagement and motivation of students (Chhabra & Gawande, 2023).

Among the active pedagogical methods that can be used is Project-Based Learning (PBL). It is a collaborative learning approach (Chhabra & Gawande, 2023) defined as "*application and integration of a body of knowledge and skills in the realization of a work*" (Chamberland et al., 2011). It enables the knowledge and skills acquired to be applied (Lasauskiene & Rauduvaite, 2015) through the realization of a project in a group.

PBL can be used in any discipline and at most levels (Asan & Haliloglu, 2005). Indeed, several researchers have studied the implementation of PBL in different contexts and various fields. It has been applied in primary and middle schools (Aldabbus, 2018; Cintang, Setyowati, & Handayani, 2018; Mutakinati, Anwari, & & Kumano, 2018), in secondary education (Chhabra & Gawande, 2023) and in higher education (Defeng et al., 2015; Mohammed, 2017; Rincon-Forero & Rico-Bautista, 2019). In higher education (which is the level the study is interested in), PBL has been applied in various disciplines such as environmental education (Genc, 2015; Lazar & Faciu, 2019), teaching translation (Defeng, Chunling, & Yuanjian, 2015), music education (Lasauskiene & Rauduvaite, 2015), occupational health education (Dehdashti et al., 2013), project management education (Marnewick, 2023), etc.

Through a literature review, the author identified a lack of studies concerning the application of PBL in management education. However, the utilization of the PBL approach in this field is crucial for engaging students in real-world activities and allowing them to practice the strategies of the discipline (Boss & Krauss, 2022). Also, it enhances, according to the literature, their team spirit, their sense of organization and responsibility, and their decision-making, which are the main skills that good managers need. The interest in our research stemmed from this lack in the literature.

This study experimented with PBL as a pedagogical approach in a quality management course as part of management education. The approach was deemed an appropriate method to help students better understand the concepts and the overall structure of a Quality Management System (QMS). Nevertheless, there is no standard process to follow for implementing the PBL approach. The literature suggests various steps that should be adapted depending on the context and the specific objectives of the course (Defeng et al., 2015; Aldabbus, 2018; Lazar & Faciu, 2019; Chhabra & Gawande, 2023). The purpose of the current study was then both: to develop an approach for the implementation of PBL and to examine its effectiveness and its impact on students. The question that guided the methodology of the study was formulated as follows**: "*How was the PBL approach implemented and perceived by the students?*"** Thus, the following sub-questions were developed: *How was the PBL approach integrated into the course? How was its effectiveness perceived? What effects were observed in students? What were the strengths and weaknesses of the experience?*

To respond to these questions, two methods were used, namely: document analysis and a questionnaire survey conducted among 37 master's students in management.

This article was organized into five principal sections: (1) a review of existing literature that synthesized studies regarding the implementation of the PBL approach and defined the fundamental concepts involved; (2) an overview of the Algerian context, emphasizing the initiatives taken by the government to enhance educational practices; (3) a presentation of the research methodology; (4) a presentation of the results outlining the PBL implementation process and the data obtained from the questionnaire survey; (5) a discussion of the findings, contrasting them with pertinent literature.

1. LITERATURE REVIEW

Active pedagogy is an approach that caters to the needs of today's students, as its name suggests, by actively involving them in the learning process. According to (Chamberland, Lavoie, & Marquis, 2011), the pedagogical approach can be chosen by taking into account two main dimensions: *the degree of control over learning* and *the group organization*. Indeed, the approach can be teacher-centred or student-centred concerning the former dimension and individualized or group-centred concerning the latter dimension. Thus, active pedagogy is both a student-centred and group-centred approach (i.e., the student and group work are at the centre of the learning process). It is defined as "*a combination of instructional techniques that allow students to participate in learning and teaching activities, to become responsible for their own learning, and to establish connections between ideas by analysing, synthesizing, and evaluating*" (Gogus, 2012). It aims to make students both active and responsible in the learning process. Project-Based Learning (PBL) is one of the methods used in active pedagogy as it directs the students' active role in learning (Cintang et al., 2018).

1.1. Project-Based Learning (PBL)

In the literature, various definitions of PBL as a learning approach exist. The expression comprises two keywords: "project" and "learning". A project is "*a complex task that is based on challenging questions or problems and culminates in realistic products or presentations*" (Jones et al., 1997). It must be made under particular time constraints (Defeng et al., 2015). Learning in higher education is defined as "*a process of active understanding and building up of meanings and skills*" (Lasauskiene & Rauduvaite, 2015). From these two definitions, PBL can be conceptualized as a process of acquiring knowledge and skills through the completion of a complex and time-bound task, leading to deliverables.

PBL is defined as "*a comprehensive perspective focused on teaching by engaging students in investigation. Within this framework, students pursue solutions to nontrivial problems by asking and refining questions, debating ideas, making predictions, designing plans and/or experiments, collecting and analysing data, drawing conclusions, communicating their ideas and findings to others, asking new questions, and creating artefacts*" (Blumenfeld et al., 1991). This

definition explains the concept of the PBL approach and highlights its main advantages. Although it dates back to the 90s, it is still referred to in recent publications. PBL is, therefore, an active and dynamic learning approach (Chhabra & Gawande, 2023), which is student-centred, providing them with the opportunity to take part in the learning environment and making them take responsibility for their own learning (Ergül & Kargın, 2013).

Implementing the PBL approach is a challenging task for every teacher as it requires changes in major aspects, including learning strategies and the roles of both teachers and students in the learning process (Rogers et al., 2011). Indeed, the role of teachers is transforming from content providers to learning coordinators (Defeng, et al., 2015). Teachers are no longer the main source of information dominating most of the talk time in class (Aldabbus, 2008). In the PBL approach, they spend less time lecturing and leading and more time planning, observing, listening, coaching, and facilitating (Defeng et al., 2015). Students, on their part, become more independent and responsible in their learning (Aldabbus, 2018). They work collaboratively in groups to answer a driving question, solve problems that matter to them, or tackle a challenge with the aim of creating an end product (Boss & Krauss, 2007; Bell, 2010). In other words, the PBL approach transfers the responsibility of learning from teachers to students (Grant, 2011). Both actors must assume a more active role and a greater shared commitment (De Los Rios et al., 2010).

When implementing the PBL approach, it is important to give students enough freedom to voice their opinion and choose how to proceed (Defeng, Chunling, & Yuanjian, 2015). They should be encouraged to use their ideas in designing the project, decide on materials to be used, choose sources of information, as well as determine how to present the end product (Aldabbus, 2018). In this phase, technology plays an important role. It is integrated as a tool for discovery, collaboration, and communication, taking learners to places they couldn't otherwise go and helping teachers achieve essential learning goals (Boss & Krauss, 2007). During the implementation process, the role of teachers is to tutor and monitor the activities of students while they complete the project (Lazar & Faciu, 2019; Chhabra & Gawande, 2023). They should observe the difficulties faced by students (Cintang et al., 2018) and make sure that students have sufficient time and opportunities to practice skills such as effective communication, using technology, critical thinking, and problem-solving (Aldabbus, 2018). Additionally, teachers must evaluate progress and provide feedback on project activities that have been achieved (Chhabra & Gawande, 2023). Students then revise and modify their work based on the feedback received from their teachers and peers (Aldabbus, 2018). In the end, the activities and results of projects that have been carried out are evaluated and reflected upon (Chhabra & Gawande, 2023). Presenting the end product to a public audience is considered the main motivation for students to work hard and feel proud of what they have done. Thus, students should be encouraged as much as possible to display their projects, talk about them to other people and answer their questions (Aldabbus, 2018).

Once the teaching method is implemented, the question of its effectiveness and effects arises. In the literature, there is no universally accepted definition of

effective teaching (Paulsen, 2002). However, some synonyms are used to define effectiveness, such as "*satisfaction"*, "*transfer*" and "*application*" (Maloney et al., 2011; Noesgaard & Ørngreen, 2015). The ISO 9000:2015 standard defines effectiveness as the "*extent to which planned activities are realized and planned results are achieved*". In this study, effectiveness referred to students' satisfaction with the activities carried out and the results achieved. Regarding the effects, the literature shows that PBL implies numerous effects on students' progress. Indeed, its contribution to the (self-) development of learners' general and subject competencies has been widely acknowledged (Lasauskiene & Rauduvaite, 2015). PBL is not limited to providing students with content knowledge but further develops their psychomotor and social skills (Aldabbus, 2018), such as research skills, teamwork and collaboration skills, interpersonal communication skills, summarizing and presentation skills, negotiation skills, critical thinking, problem-solving, creativity, autonomy, and decision-making (De Los Rios et al., 2010; Defeng et al., 2015; Lasauskiene & Rauduvaite, 2015; Mohammed, 2017; Aldabbus, 2018). The development of these skills, among others, has been demonstrated by numerous research studies. These skills are highly recommended for long-life learning (Aldabbus, 2018).

1.2. Application of PBL in Quality Management Course

The concept of quality is linked to the ability to satisfy customers and stakeholders. For a company, it is a culture that inspires and guides behaviour, attitudes, actions, and processes to deliver value through the satisfaction of stakeholder requirements (Bazinet et al., 2015). The concept of quality can be used in various fields to mean that a product, a service or a system meets the requirements of customers and other stakeholders, as well as those of standards and regulations. As part of a quality management course, this study is interested in quality at the organizational level through the implementation of a Quality Management System (QMS).

Implementing a QMS is a process of change and reorganization. It means managing interactive processes, subsystems, procedures and resources needed to deliver value to all relevant stakeholders and to realize products, achievements or results (Bazinet et al., 2015). The most popular standard for quality management is ISO 9001, elaborated by the International Organization for Standardization. It is an international standard that specifies the requirements for a QMS and can be applied to any organization, regardless of its size or sector of activity. Organizations that comply with the standard have the assurance of providing products and services that will meet the needs and expectations of their customers, as well as the relevant legal and regulatory requirements (Betegon et al., 2021). Implementing a QMS involves carrying out a series of activities to ensure compliance with ISO 9001 requirements. Some authors have analysed and proposed different methodologies for implementing a QMS based on ISO 9001 (Ortiz-Rangel, 2021). However, there is no single model for implementing a QMS. Each organization plans its approach according to its own context and resources. In the context of the course examined in this study, which aimed to teach students how to implement a QMS, the author

referred to the methodology outlined in the module's syllabus and enhanced it based on practical experience in the field of quality management.

In the literature, very few studies have experimented with the PBL approach to teach how to implement a QMS. Some studies have focused on the impact of PBL on students' knowledge in Quality and Lean and Six Sigma courses (Kanigolla et al., 2014; 2013; Cudney & Kanigolla, 2014). These courses come under the heading of quality; however, they were part of engineering education. PBL was applied in these engineering courses with the aim of solving production and process flow problems to improve product quality. In addition, the study of (Rincon-Forero & Rico-Bautista, 2019) focused on the application of the PBL approach in a quality management course. However, this course was part of pharmacy education, and the PBL implemented was aligned with the competency model of the technology training program in the pharmacy regency. Moreover, the study by (Taib et al., 2017) focused on the application of problem-based learning in the QMS course. Problem-based learning is also a collaborative learning approach in which students are asked to solve problems. In this study, they were asked to solve problems related to QMS deliverables. Results revealed increased student performance and satisfaction with the teaching method.

Research applying PBL in a quality management course as part of management education currently does not exist. The author did not find any studies that apply PBL to implement a QMS. Existing studies predominantly focus on quality from an engineering rather than an organizational perspective. The present research filled this gap in the literature, thereby contributing to its originality.

2. PBL IN ALGERIAN CONTEXT

Few studies have focused on the implementation of the PBL approach in the Algerian context. There are more studies in the education sector, like the studies of (Baghoussi & El Ouchdi, 2019; Belmekki & Baghzou, 2022), than in the higher education sector, such as the study of (Belagra et al., 2014). Indeed, the Algerian education sector officially adopted the Competency-Based Approach (CBA), which incorporates the PBL approach, in 2002. As a result, curricula have been revised to integrate this new approach into course books (Belmekki & Baghzou, 2022). This reform aimed to make learning more relevant and realistic for students (Baghoussi & El Ouchdi, 2019). In contrast to the education sector, the higher education sector has not explicitly announced the adoption of PBL or similar active approaches. However, cooperative learning was given high priority in university reforms (Belagra et al., 2014).

Within this framework, several initiatives have been put in place to enhance higher education and teaching practices. Indeed, the LMD system (Licence-Master-Doctorate), adopted in 2003, marks a turning point in the development of Algerian higher education. It introduced quality assurance requirements in all Algerian institutions in 2010. Thus, the National Reference for Quality Assurance in Higher Education (RNAQES) was published in 2016 and revised in 2023. The updated version places emphasis on the continuous training of teachers, adaptation and development of teaching approaches, availability of appropriate technological

resources, and regular monitoring of student success. The National Reference encourages a reassessment of higher education strategy, focusing on developing the skills and abilities that the socio-economic world demands of its future professionals.

In addition, since 2016, a pedagogical training program has been launched for all newly recruited higher education teachers. This training program, provided in blended learning (online and in-class), aims to develop teachers' skills in designing course materials, animation techniques, and pedagogical monitoring. Moreover, in 2021, the Algerian government set up an action plan to implement an overall program aimed at stimulating the country's economic growth. Its actions include, among others, graduate employability and training-employment match, as well as the development of soft skills (Amghar et al., 2023).

All these mechanisms and actions testify to a government's determination to modernize teaching practices, focusing on the learner.

3. RESEARCH METHODOLOGY

The purpose of this study was twofold: to implement the PBL approach and to evaluate its effectiveness and impacts as perceived by students. Subsequently, two main methods were employed: document analysis and a questionnaire survey.

3.1. Document Analysis

Document analysis is a qualitative research method that involves a systematic approach to reviewing and evaluating both printed and electronic documents. It requires the analysis and interpretation of data in order to derive meaning, gain understanding, and acquire empirical knowledge (Bowen, 2009).

This study conducted a thorough review of relevant literature to understand the PBL methodology and identify the steps for its implementation. It employed content analysis to examine the articles and propose a PBL approach.

3.2. Questionnaire Survey

Participants

The study took place in a pilot institution in Algeria and involved a group of 37 master's students in management during the academic year 2022/2023. The master's students had different educational backgrounds, mainly in the areas of business and management. They were enrolled in the Quality Management course as part of their first-year master's program.

Data collection tool

The questionnaire used in this study consisted of 22 statements inspired by the literature. It was designed to investigate students' perceptions of the effectiveness and effects of the PBL approach. The questionnaire comprised two sections. The first section included 13 items assessing the "Effectiveness of the PBL implementation process" using a 3-point scale (1 = No, 2 = Not really, 3 = Yes). These items focused on the conduct of the PBL experience, including proposed

activities, group work, and the teacher's role. The second section included 9 items assessing the "Effects of the PBL approach" using a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). These items focused on the main skills developed by students.

Data collection and analysis

Students were asked to evaluate their PBL experience by completing a post-course survey. The teacher informed students about the study's objectives and obtained informed consent from all participants. Confidentiality and anonymity were strictly maintained.

For data analysis, descriptive statistics were employed to summarize and interpret the collected data. Moreover, the reliability and significance of the results were tested.

4. RESULTS

4.1. PBL Implementation Process

The PBL approach was implemented in five main steps: (1) identification, (2) design and planning, (3) group constitution, (4) realization and (5) evaluation. Figure 1 represents the result of the document analysis method. It synthesized the PBL implementation process in the Quality Management course.

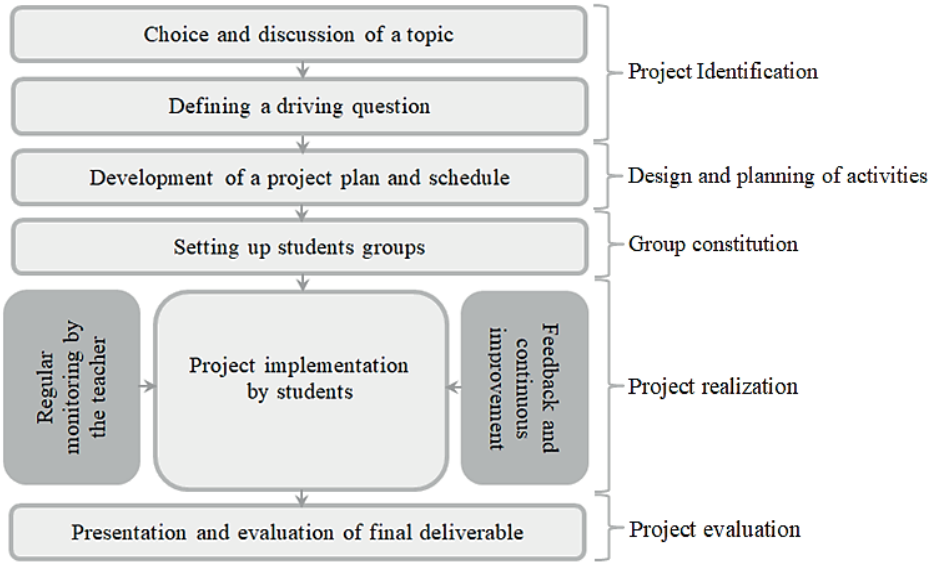

Fig. 1. Essential steps of PBL (Developed by the author based on literature).

The course was taught for 6 hours a week, for 6 weeks. It aimed to enable students to understand the concepts of quality management and the requirements of the ISO 9001:2015 standard and to master the steps involved in implementing a QMS. To achieve these goals, the teacher allocated 3 hours per week to cover quality concepts, standardization, and ISO 9001 requirements. The remaining 3

hours were devoted to the application of the PBL approach. All these details have been incorporated into the course syllabus.

In March 2023, the teacher began the experiment with the PBL approach, which lasted approximately a month and a half. Students were expected to work in small groups, complete simulated projects, prepare deliverables, produce a final report, and then present their results.

The teacher proceeded as follows.

Step 1: Project identification

The project consisted of implementing a QMS for a company operating in a given sector. The project idea was the same, but the deliverables differed according to the chosen company. In the first session of the course, the teacher gave a brief presentation and explanation of the project to the whole class and explained the principles of the PBL approach. The main question that guided the project was: *How to develop the various documents of a QMS which provide evidence of compliance with the requirements of ISO 9001V2015?*

In the theoretical course, the QMS implementation steps were addressed and explained, and the development of the document corresponding to each step was carried out as part of the project.

Step 2: Design and planning of activities

The project activities were designed. They consisted of 10 steps for implementing a QMS. The students had to work on various deliverables for the project. This would allow them to see how a QMS is implemented in the real world. A schedule was arranged (Table 1) to complete the project, with about one month and a half devoted to its completion, at a rate of 3 hours per week of in-class monitoring.

Table 1. Weekly Project Activities (The Author's Study)

Week	Activities	Duration (in class), h
1	Choice and presentation of the company (products and organization chart)	1.5
	Defining the missions and responsibilities of each member of the team	1.5
2	Drawing up an evaluation grid for choosing an independent consultant	1.5
	Drawing up a diagnostic report	1.5
3	Drawing up an action plan	1.5
	Drawing up a SWOT matrix (Strengths, Weaknesses, Opportunities & Threats)	1.5
4	Establishing a list of stakeholders and their requirements	1.5
	Drawing up a quality policy	1.5
5	Defining quality system scope	1.5
	Drawing up a process map	1.5
6	Drawing up a process sheet	1.5
	Drawing up a procedure	1.5

Step 3: Group constitution and project selection

Students were categorized into small groups to collaboratively realize projects. Seven (7) groups were formed using self-selection, where students chose their own group members. There were seven groups of varying sizes (between 4 and 6

members per group). Each group chose a company and mapped out its action plan. They chose companies operating in various sectors, including cosmetics, agri-food, pharmaceuticals, textiles, training and design.

A list of all projects was drawn up by the teacher for follow-up purposes. The teacher asked the students to specify roles and distribute tasks to be undertaken by each team member to ensure equal engagement in the project for all students.

Step 4: Project realization

Students worked in teams using various resources and methods. They had enough freedom for their choices about how to carry out the project. They could use the internet, theses, books, or any other source of information. They were even encouraged to visit companies that had implemented QMS to learn from their practices.

During the entire project, the teacher monitored the activities of students and played a role as a mentor and facilitator. The teacher responded to questions and guided different teams. Feedback was provided by the teacher to each of the groups in the generated tracking to promptly clarify doubts. The teacher and students met twice a week to discuss their projects and address any constraints encountered. The teacher was also available on other weekdays to respond to students' concerns, either in his office or by email.

Step 5: Project evaluation

The course ended in mid-April, but the presentations were scheduled for the beginning of May 2023. An additional three weeks were granted to finalize the projects. The day before the presentation, the final works were sent to the teacher by the groups' representatives. Each group had to send its final work, which presented the project approach in PowerPoint format and the various deliverables in Word/Excel or PDF format.

All groups made an oral presentation of their final product to their peers and a jury. The jury comprised the teacher, a teacher in Quality Management, and an external quality expert. Groups were given between 10 and 15 minutes to present their project. They were evaluated and scored based on an evaluation grid drawn up by the jury members. Criteria included: *the final report, oral presentation, deliverables, and answers given*. Additionally, the jury evaluated some necessary skills, such as *group dynamics (member involvement)* and the *ability to defend own ideas*. This enabled students to reflect on their overall performances.

As the teacher was obligated to do a written exam at the end of the course, project notes were taken as tutorial notes.

4.2. Students' Perception of Effectiveness and Effects

The questionnaire demonstrated reliability, as indicated by Cronbach's coefficients, $\alpha = 0.729$ and $\alpha = 0.741$, suggesting internal consistency and reliability for the scales used in the two parts assessing effectiveness and effects, respectively.

Effectiveness of the PBL implementation process

Table 2 and Figure 2 present results concerning the students' perceptions of the effectiveness of the PBL implementation process.

Table 2. Effectiveness of PBL Implementation Process (The Author's Study)

Items	Responses		
	Yes	Not really	No
I1. Project objectives were clear and well-defined	34	2	1
I2. Project activities had clear goals and instructions	32	4	1
I3. The group had freedom in the way it carried out the project	23	12	2
I4. The time allocated to activities was appropriate	23	9	5
I5. Group members' abilities were equal (homogeneous groups)	17	11	9
I6. Roles within the group were distributed among members	22	10	5
I7. All members collaborated and were involved in carrying out the project	19	9	9
I8. Group members respected each other	24	9	4
I9. The teacher acted as facilitator and advisor	34	3	-
I10. The teacher was available to answer questions or solve problems encountered by students	35	2	-
I11. The teacher was attentive to the activities of all groups	31	6	-
I12. The final result was the fruit of a joint effort	22	13	2
I13. At the end of the project, constructive and useful feedback was given to the students	32	3	2

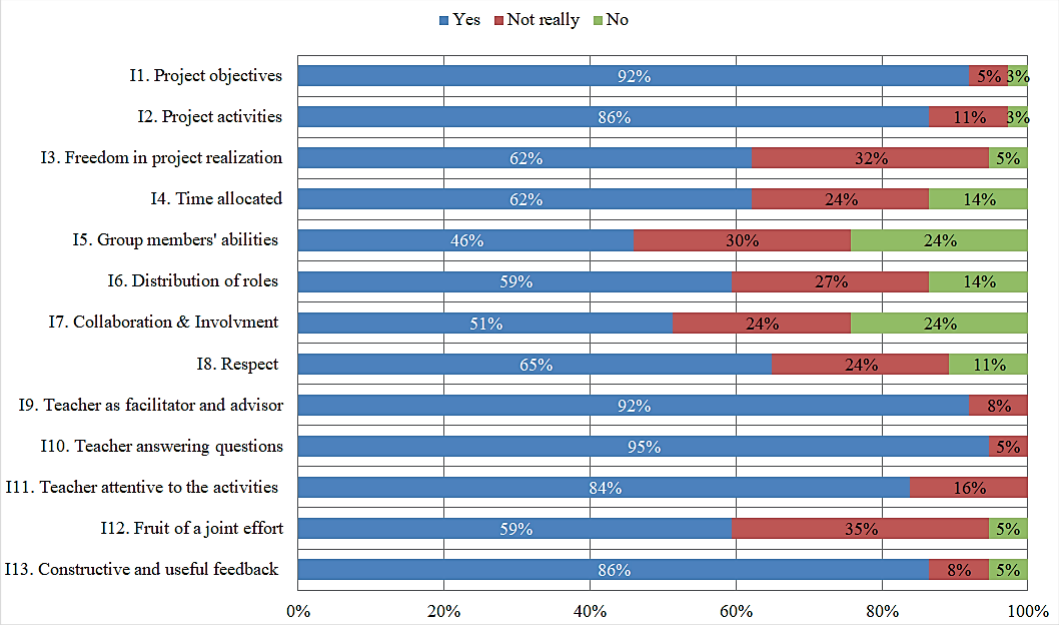

Fig. 2. Effectiveness of the PBL implementation process (the author's study).

The results indicated that students held positive perceptions about the PBL experience. They agreed that the PBL was effective. To test whether student's perceptions differed significantly, a one-sample t-test at a significance level of $\alpha = 0.05$ was used after checking the normality of the collected data (using the Kolmogorov–Smirnov test). Statistical analysis revealed that students' perceptions

differed significantly ($t = 13.585$ and $p < 0.05$). Tests were performed using SPSS v26.

The results indicated that project objectives were clear and well-defined and that activities had clear goals and instructions, with 92 % and 86 % agreeing, respectively. Additionally, students declared that groups had freedom in the way they carried out the projects, with 62 % in agreement. Moreover, the time allocated to activities was judged appropriate by the majority of students (62 %). However, 38 % of respondents felt that the time allocated was insufficient, with responses varying between "Not really" (24 %) and "No" (14 %).

Furthermore, positive responses were also evident regarding collaboration between group members, albeit with relatively average agreement rates. More than half of the respondents indicated that group members respected each other (65 %). Additionally, students reported that roles within the groups were distributed among members, all members collaborated and were involved in carrying out the project, and the final result was the fruit of a joint effort, with agreement rates of 59 %, 51 %, and 59 %, respectively. However, less than half of the respondents (46 %) indicated that group members' abilities were equal (homogeneous groups). For 54 %, this was not the case, with responses varying between "Not really" (30 %) and "Not" (24 %).

In terms of the teacher's role, the results showed strong agreement rates. Students indicated that the teacher acted as a facilitator and advisor, was available to answer questions or solve problems encountered by students, and was attentive to the activities of all groups, with agreement rates of 92 %, 95 %, and 84 %, respectively. The final question regarding constructive and useful feedback given to the students also resulted in a positive agreement rate (86 %).

Effects of the PBL approach

Table 3 and Figure 3 present results concerning the students' perceptions of the effects of the PBL approach.

The results indicated that students agreed that the PBL had positive effects. To test whether students' perceptions differed significantly, a one-sample t-test at a significance level of $\alpha = 0.05$ was used after checking the normality of the collected data (using the Kolmogorov–Smirnov test). Statistical analysis revealed that students' perceptions of PBL effects differed significantly ($t = 13.402$ and $p < 0.05$).

The results indicated that PBL fostered a satisfying learning experience with an agreement rate of 86 % (combining the rates for "Strongly agree" and "Agree"). Moreover, students confirmed that the PBL approach generated interest in quality management education and developed quality management skills, with agreement rates of 84 % and 97 %, respectively. Additionally, students affirmed that PBL created a positive learning environment with an agreement rate of 81 %. Regarding the effects of the PBL approach on the enhancement of certain life skills, students indicated that working on projects helped them develop creativity (59 %), reflection and critical thinking (73 %), autonomy (70 %), decision-making (70 %), and expressiveness (86 %).

Table 3. Effects of the PBL Approach (The Author's Study)

Items	Responses					Agreement rate
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	
I14. The approach fostered a satisfying learning experience	22	10	4	-	1	86 %
I15. The approach has generated interest in quality management education	17	14	6	-	-	84 %
I16. The approach developed quality management skills	26	10		1	-	97 %
I17. The approach created a positive learning environment	19	11	5	2	-	81 %
I18. The approach fostered student creativity	13	9	11	3	1	59 %
I19. The approach fostered reflection and critical thinking among students	10	17	8	1	1	73 %
I20. The approach developed students' autonomy	11	15	7	2	2	70 %
I21. The approach developed students' decision-making skills	15	11	7	4	-	70 %
I22. The approach developed students' ability to express themselves	15	17	4	-	1	86 %

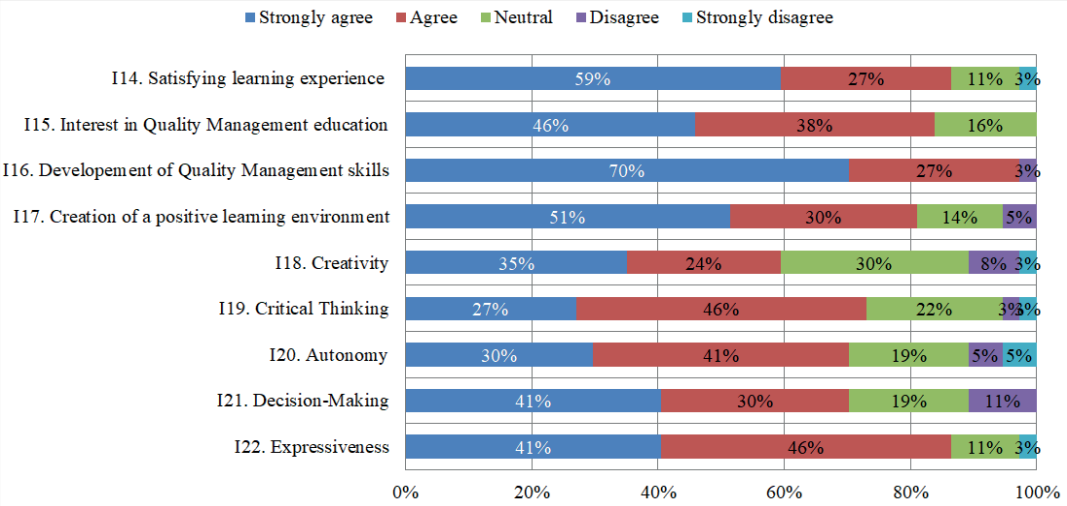

Fig. 3. Effects of the PBL approach (the author's study).

5. ANALYSIS AND DISCUSSION

In this research, the effectiveness and effects of the PBL approach applied in a quality management course were investigated. The results highlighted a positive and encouraging experience in PBL teaching.

Regarding the implementation process, a five-step approach was developed based on the analysis of the literature (Defeng et al., 2015; Aldabbus, 2018; Lazar & Faciu, 2019; Chhabra & Gawande, 2023). After identifying the project and

defining the guiding question, a schedule was established, and groups were formed. Students were categorized into seven groups of varying sizes (between 4 and 6 members per group). Indeed, the literature suggests ensuring that groups are neither too large nor too small. According to (Rau & Heyl, 1990), smaller groups (of three) have less diversity and may lack the divergent thinking styles and varied expertise that are essential to collective decision-making. Conversely, in larger groups, it is difficult to ensure that all members participate. (Mohammed, 2017) suggested that the number of students in each group should be commensurate with the complexity of the project. During the implementation of the project, the teacher monitored students' activities and acted as a mentor and facilitator. In the end, the projects were evaluated as suggested by the literature (Chhabra & Gawande, 2023). The evaluation was objective, based on well-defined criteria and carried out by a jury of specialists.

After describing the implementation process, a quantitative study was conducted to answer the research questions, focusing on students' perceptions of effectiveness and effects. The results revealed that the application of the PBL approach in the Quality Management course was effective and had positive effects. Indeed, students generally agreed with most of the statements, although some disagreement was noted.

Regarding the effectiveness, students found the process to be effective in terms of the objectives and activities proposed (I1, I2, I3) and the role played by the teacher (I9, I10, I11). Effectively, they confirmed that the objectives and instructions were clear, and they testified to the freedom that was given to them to carry out projects. They also confirmed that the teacher was there to guide them and point them in the right direction. Several possible explanations can be discerned. The teacher, in fact, has been trained in the application of the PBL approach. She completed the training course for new recruits to higher education and other training courses on pedagogical approaches. Additionally, she had practical experience in setting up a QMS. Thus, she had a clear idea of the project, enabling her to establish precise objectives and instructions and guide student work without imposing restrictions. Furthermore, she facilitated the work and provided guidance to the students throughout the realization of the projects. Teacher experience and training were the key factors in the success of the experiment. The literature, indeed, showed that the lack of these two elements hindered the application of the PBL approach (Lasauskiene & Rauduvaite, 2015; Cintang et al., 2018).

Concerning the time allocated to different activities (I4), a noteworthy percentage of respondents felt that the allocated time was insufficient. One explanation could be that students had to work on two deliverables during the week. Some were relatively straightforward, while others, like the process sheet and procedure, required more time. Additionally, students had a busy weekly schedule with other coursework to complete. The time factor should not be ignored, as it has a direct impact on the perceived effectiveness of the approach. Indeed, the literature suggested that insufficient time allocation was often a difficulty encountered when applying PBL (Genc, 2015; Lasauskiene & Rauduvaite, 2015; Cintang et al., 2018; Aldabbus, 2018).

Regarding collaboration between group members, students confirmed that roles were well distributed, and there was respect among members (I6 and I8). The author emphasized that the students had to divide their tasks to draw up the third project deliverable (see Table 1: Missions and Responsibilities of each Team Member) and to present everyone's contribution at the end. Moreover, students considered abilities not to be really equal, and they did not agree on everyone's involvement and collaboration (I5 and I7), with 54 % and 49 % disagreeing, respectively. Additionally, 41 % considered that the final result was not the fruit of a joint effort (I12). This result was in line with the qualitative finding obtained by (Genc, 2015), which revealed that group work was problematic. One explanation could be that some members of the groups worked harder than others. The cause could be the presence of "freeloaders", as named by (Mohammed, 2017), who benefited from others' work without making their own contribution. Alternatively, it could be that some students dominated the work and did not allow the other members to take an active role in the project (Aldabbus, 2018). Another explanation, which was a consequence of the first, could be intra-group conflicts that arise when capacities are not equal and one party works harder than the other. In fact, (Dehdashti et al., 2013) stated that students may face conflicts in intra-group discussions and decision-making in the course of team PBL. It seemed that the origin of the problem was the self-selection of group members, which was probably based on friendship rather than ability.

Regarding the effects of the approach, students perceive positive effects from the approach. They confirmed that they had a satisfactory learning experience (I14), which aligns with the finding of (Mohammed, 2017). Additionally, they confirmed that the approach has generated interest in quality management education and has developed quality management skills (I15 and I16). This is consistent with the literature, which has shown that PBL increases learning interest (De Los Rios et al., 2010; Lasauskiene & Rauduvaite, 2015; Chhabra & Gawande, 2023). Effectively, during the regular follow-up and final evaluation, an evolution of students in terms of the acquisition of knowledge in quality management was observed.

Additionally, students indicated that working on projects had helped them develop their creativity, reflection, critical thinking, autonomy, decision-making, and expressiveness (I18, I19, I20, I21, I22). Indeed, the freedom they were given reinforced their autonomy and encouraged them to seek out information, analyse and synthesize it, to think critically and to take decisions. Additionally, the final works demonstrated a discernible creativity manifested in both structural composition and the presentation of information and deliverables. During the final presentations, it was noticed that the students made good progress in their oral expression and conveying their ideas and points of view. These findings aligned with previous studies (De Los Rios et al., 2010; Kanigolla et al., 2013; 2014; Defeng et al., 2015; Lasauskiene & Rauduvaite, 2015; Mohammed, 2017; Aldabbus, 2018).

All these results supported the idea that the PBL approach was effectively used in the quality management learning process and has had positive effects.

As a limitation of our study, it was conducted within a single institution and with a small sample size (37 students). In fact, due to pedagogical considerations, the sample size was restricted, as it consisted of a class with a limited number of

students. Nevertheless, this research adopted an exploratory approach and did not aim for generalization of findings. Furthermore, working with large samples would have been difficult, given that educational intervention processes require considerable effort (Chhabra & Gawande, 2023).

CONCLUSIONS

The results of this research highlighted a positive and encouraging experience in PBL teaching. Firstly, the PBL implemented approach was effective. Secondly, there was a positive effect on students' satisfaction and enhancement of some life skills. These findings hold value and relevance for teachers interested in implementing the PBL approach in quality management or similar courses.

The main strength of the experience was the training and experience of the teacher, who took on the role of a coach and facilitated the application of the approach. As for the negative points, they were mainly the lack of collaboration between group members and the time allocated to realize the activities. However, the experience was beneficial in all cases. Indeed, the positive feedback was a motivating factor that satisfied us and encouraged continuous improvement. As for the negative feedback, it encouraged us to question ourselves and further develop our didactic and managerial skills (Lasauskiene & Rauduvaite, 2015) by rethinking our coaching methods to improve future group dynamics and collaboration.

From the research perspective, a qualitative study using interviews, for example, should be conducted to gain a better understanding of the perception of students and their views. Moreover, a quantitative study could be carried out to examine in depth the effects of PBL and its impact on the development of life skills among students.

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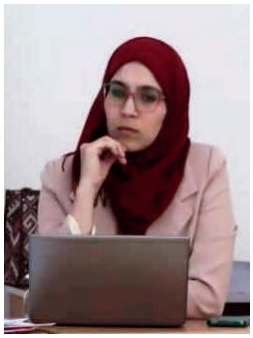

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