



Teaching in Design Thinking Mode

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Abstract

This work aims to optimize the student experience through design thinking. within the framework of the reconfiguration of the classical teaching model. It is about applying Design thinking to design courses by teachers (upstream) and by students (downstream). This opens the way to learning through solving real problems and developing an integrated and comprehensive teaching management that deals with the whole academic process in design mode from the design of the course by the teacher to the final evaluation including the activities carried out by the students in design mode. To do this, an experiment has been conducted in two Tunisian universities through applying the Design Thinking mode in teaching.

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1. Introduction

Design thinking has started to integrate higher education. It's based on a learner-centred process which highlights the learner's needs, emotions, desires and experiences.

In order to identify the best practices in design thinking which best fit higher education, we are led to exploit the IDEO method, which is based on an iterative process which main objective is to understand the students' behaviours by going through the stages of inspiration, ideation and implementation.

Inspired by the IDEO method, we have selected the following problematic which consists in studying the role of Design Thinking in the optimization of the student experience. Our problematic leads to the following research questions: How can Design Thinking be a tool for pedagogical innovation? And more specifically, what is the impact of using Design Thinking on the student experience?

In this article, we propose to apply these stages in the choice of tools, activities, courses scenarios and classroom design. It is therefore a question of experimenting design thinking and testing a new experience with students from two Tunisian higher education institutions, following which we seek to know to what extent the design method could contribute to improving and developing learning experiences and renovating our teaching practices.

We try to demonstrate that the design mode is not only used in the context of innovation or design but can be applied in active and playful learning that stimulates creativity,

communication skills and teamwork. We seek to bring out an innovative model of active pedagogy that allows reconsidering the teaching method, taking into account the needs of teachers and students.

We will therefore proceed in three steps. First, we will present the theoretical framework of design thinking and its different stages. Then, we will detail the experience of applying design thinking in education. Finally, we will present the obtained results and the main contributions, limits and research perspectives.

2. Theoretical framework

Design Thinking is derived from the designer's methodology: it involves observing the needs of the final user of the product or service in order to design and create the solution that will best fit his expectations.

a. 2.1 Definition of Design Thinking

Design thinking (DT) is a new tool that originated in the world of architects, urban planners and engineers in the late 1960s. This way of thinking has also entered the world of education in order to help guide and change the various educational practices.

Design Thinking is at the same time an approach, a method and a process of innovation.

Kelley (2016) defines design thinking as an innovation strategy based on user needs in order to find solutions to real

problems related to the economic and the social world.

As for the economist and sociologist Herbert A. Simon (2017), he considers Design Thinking a way of thinking.

Tim Brown (2009) (current CEO of IDEO) defines the vocation of Design Thinking by bringing together the needs and desires of the user, the technological possibilities, and the economic objectives of the company.

Today, design thinking is popularized as an innovation approach

2.2 The characteristics of Design Thinking:

- Design thinking is an iterative approach based on trial and error learning that is more responsive to frequent changes and capable of addressing problems in a flexible and dynamic manner. This approach is based on a process that creates, tests and revises until the final result is satisfactory. It allows us to place great importance on the definition of the problem according to the experience, trying to improve the prototyped idea in order to better meet the needs of the users.
- It is a user-centred approach in that it seeks to know and understand users in order to find meaningful and sustainable
- solutions that meet their needs and improve the quality of their lives.
- Similarly, Design Thinking is an empathetic approach. According to the IDEO method, design thinking is “the ability to intuitively put

oneself in the place of the other and to feel his same feelings.

- Design thinking is considered a collaborative approach in that it requires an interdisciplinary spirit of collaboration between designers from different specialties and fields. The ideal team is composed of thinkers, decision makers and directors.

2.3 The approach of Design Thinking

There are different ways to represent the Design Thinking approach. The number of Design Thinking stages may vary according to the schools or companies adopting it. However, once we have mastered the concept, we can decide for ourselves the number of stages and their duration that best suits our context. We present below the most known stages:

- ✓ The approach of Rolf Faste (7 stages);
- ✓ The approach of Nielsen Norman Group (6 stages);
- ✓ The approach of D-School and Jeremy Gutsche (5 stages);
- ✓ The approach of Google (5 days);
- ✓ The approach of Tim Brown (according to IDEO) (3 stages).

In order to draw the stages of Design Thinking, we propose to follow Tim Brown's approach (according to IDEO) which is a simple and relevant approach for a first experience. This process is provided by Tim Brown in his book “Change by design”. It identifies three main stages named respectively “inspiration”, “ideation” and “iteration”. IDEO presents the concept of Design

Thinking in 3 major stages illustrated as shown in the following figure:

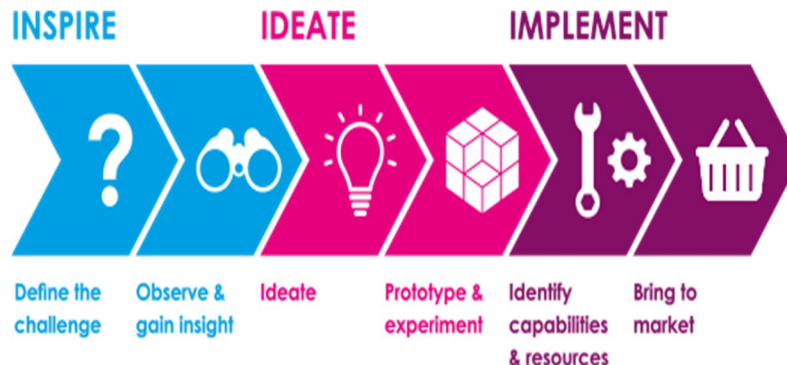


Fig. 1: Design Thinking according to IDEO

2.3.1 The inspiration phase

It's the phase of identifying the user's problem and the situation that could be improved through observation of the context and behaviours. This first step consists of studying the user to whom we are addressing in order to identify his or her needs, problems or opportunities for action. To do this, various qualitative methods of investigation are preferred, such as non-directive interviews, observation, participant observation, immersion, mapping, generative methods, etc.

2.3.2 The ideation phase

During this stage, the focus is on generating ideas within groups, developing

and testing them, and imagining new solutions to the problem that has been posed from the beginning. To do this, we have used creativity and visual thinking methods based on drawings, diagrams, and brainstorming sessions that alternate a “divergence phase” during which the team generates new ideas

without censorship, and a “convergence

phase” during which the ideas are selected and prioritized.

2.3.3 The iteration or implementation phase

During this last stage of the process, a prototype is created and tested. This is a key step that allows the team to start experimenting drafts of the product or service being developed.

As from this point on, the team tries to repeat the previous stages of the process in loops or “iterations” until the expected result is obtained. The objective of this stage is not to confirm the imagined solution but rather to improve the original idea through considering the users. Thus, we end up making prototypes that are closer and closer to the expected result, until we obtain a solution that is both functional and validated by the users.

3. The empirical part

3.1 Study Description and population selection

For the elaboration of this study, we have decided to work on two complementary experiences, namely: The use of Design thinking by university teachers in the design of their active pedagogy and the invitation of students to apply the Design Thinking method in their learning activities.

To do this, we have prepared two surveys in two higher education institutions: the first seeks to determine the needs of the students to better satisfy them on the one hand and to improve the quality of teaching on the other hand. As for the second, it seeks to measure the degree of acceptance of the design method and its impact on the acquisition and development of their skills.

3.1.1 The field of study application

In our experience, the field of application of Design Thinking in higher education covers the following topics:

- ✓ The use of Design Thinking as a teaching method.
- ✓ The design of the training programs at the university.
- ✓ The design of the courses adapted to the needs of students.
- ✓ The layout of premises and management of equipment for training according to design thinking.
- ✓ Time management.
- ✓ Management of teaching groups.
- ✓ Learning in the form of projects requiring multidisciplinary understanding and research integrating trials, which is

intrinsic to design thinking.

3.1.2 Description of the 1st experience

In order to carry out this project, we have used design thinking as a tool for co-designing the course to optimize the student experience by applying it to students during the second semester of the academic year 2021/2022 in a new course: "Personal Branding and Networking". In the following, we will describe the stages of the experience:

- Empathy: Developing empathy towards students is essential to understand their expectations and their priorities. Data has been collected at the beginning of the semester through group interviews with students and a survey. The empathy phase allowed us to integrate the students' needs into the proposed solution.
- Synthesis of the problem: At this level, it is a matter of classifying and synthesizing the results obtained
- during the empathy stage (observation- inspiration) in order to provide a
- definition of the problem to address and to implement the actions necessary for a better satisfaction of the student.
- Ideation: The objective of ideation is to explore several diverse ideas. Thanks to the design team, composed of two professional experts and three teachers, we have generated a set of innovative ideas in order to conceive

pedagogical methods allowing the optimization of the experience lived by the students and thus guaranteeing the pedagogical effectiveness. Hence, the idea of complementing the theoretical part of the course with a practical part in the form of a challenge including workshops.

➤ **Prototyping- tests:** The goal of this stage is to build prototypes illustrating the ideas proposed in the ideation stage. We have experimented with the course composed of a theoretical part and an empirical part in the form of a three-step challenge. Each step includes a workshop to explain the required work and the evaluation criteria. With the help of our expert partners, we have noted our observations of the achievements and skills developed by the students during the whole experimentation period. A comparative table summarizing the results of the students has been established in order to decide the winner of the challenge.

At the end of the semester, we have conducted group interviews with the students to get feedback and draw lessons for future similar experiences.

3.1.3 Description of the 2nd experience

We have encouraged the students to use Design Thinking in the learning process. This experience is different from the classical

approach in that Design Thinking differs from the linear process in that it is non-directive, iterative, and outward oriented. In design thinking, the student follows an active process that uses a method combining both the analytical and the intuitive thinking.

While preparing the activities assigned to them, students are required to use both the creative and the analytical modes of reasoning using sometimes divergent and sometimes convergent thinking.

Through our experience, we have introduced different students of different specialties and levels to the use of design thinking in problem solving (exercise, TD, TP, discussion, workshop, etc.), always seeking to integrate a plus-value in their results, while using human-centred empathy that relies on innovation, collaboration and creativity to solve a multitude of social and/or environmental problems.

Alongside the content of the taught subjects during the second semester and in order to conduct our experiment, we have implicitly addressed new notions that proved important for the feasibility of our experiment namely:

- The culture of design thinking
- Inspiration, ideation and implementation
- Prototyping and users tests

Table 1: Characteristics of a training session in mode design thinking

Number of learners per group	Number of groups	Duration of a training session in mode design /action
Between 3 and 5	5 groups per class	30 minutes per session

The trainings are developed in the form of workshops by adopting a participatory approach. The teacher plays the role of a companion or coach who is implicitly involved during the activity while leaving the students free to form their teams and designate their leaders.

The courses in design mode that we have taught are related to the subjects of the second semester of the academic year 2022 delivered from the department of economic sciences and management and covering different specialties as shown in table N.2

Table 2: Characteristics of the sample

The topics covered during the training

Department	Courses	Type of course	Nber of classes	Nber of Students
Economic Sciences and Management	Factory Layout Techniques	PC**	01	17
	Management of Warehouses	IC*	01	17
	Introduction to Quality	PC	03	G1 :18 G2 :17 G3 :18
	Career Management and Professional Orientation	IC	01	15
Total				102

*IC: Integrated Course

**PC : Practical courses

include:

- ✓ Designing a new warehouse that meets the requirements of Industry 4.0;
- ✓ The redesign of factories, the location of their training courses in order to adapt them to the requirements of the modern approach to factory layout;
- ✓ The design of a quality product among the existing products;
- ✓ The design of a quality service among the services currently offered;
- ✓ The creation of a scenario (writing, staging and presentation) that describes a disagreement related to the theme of quality while seeking to find a compromise that tends towards the resolution of the situation;
- ✓ The design of a skills assessment that adapts to the needs of the individual and the company at once;
- ✓ The design of a mental map of a modern "reinvented" career management.

Throughout our experience, we have used design thinking as a problem-solving methodology, while positioning ourselves at the intersection of art and science in the activities that were given to students during the 2nd semester. This allowed us to reinforce the creative process in the students in order to respond to strategic organizational issues, without distinction of application fields.

In order to provide an adequate response that best meets the needs of the users, students are required to use empathy throughout the process as a fundamental condition for the

success of the project or their activity.

We have led the student to adopt Design Thinking in the completion of the activities that have been assigned to them in the 2nd

semester.

Our experience consists in conducting workshops within student teams with a user-centred approach while respecting the steps of the design thinking process. The teaching of each subject is developed in the form of workshops and by adopting a participative approach.

We have ensured that each problem is treated by several groups (intergroup) to have a multitude of ways to bring an answer. The search for the final solution thus focuses on the members of the other groups as fictitious users. The response to the users' needs is thus free from internal constraints.

The activities are designed in the form of small projects raising a precise problem to which each group of students will bring a creative answer. Creativity is expressed through moments of divergence (openness to the enrichment of ideas) and convergence (selection of possibilities) at each stage.

While accompanying the students, we were sure that each activity fit the Design Thinking process by following the 3 distinct and successive phases as follows:

- ✓ **Inspiration:** understanding the needs and aspirations of users (students from other groups, from the same or different classes, external users) ;
- ✓ **Ideation:** imagine with the members of other groups within and between classes or external users innovative solutions perfectly adapted to the needs.

- ✓ **Implementation:** make a prototype and then test it directly with members of other intra and inter class groups or external users to get their feedback before implementation.

3.2 Analysis of the study data

3.2.1 Analysis of the results of the 1st experience

Referring to the first survey, we find that at

In general, what teaching techniques do you prefer?

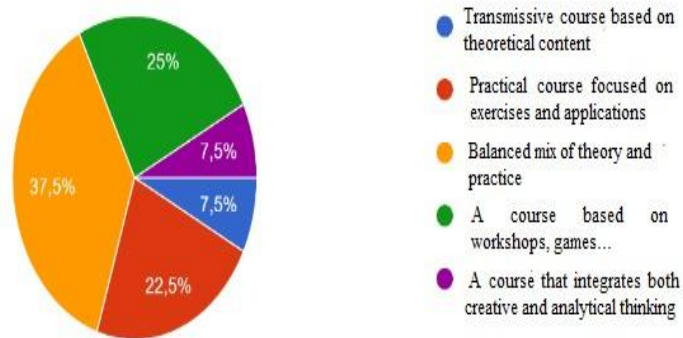


Fig. 2: The preferred pedagogical techniques

Referring to the feedback of the students participating in the first experience of using Design Thinking in designing the content adapted to the needs of the students, we notice

that 77.5% of the surveyed students stated that they are satisfied with this course in a challenge mode (Figure 3).

At the end of the semester, how would you rate your satisfaction with this course (skills acquired, new knowledge...)?

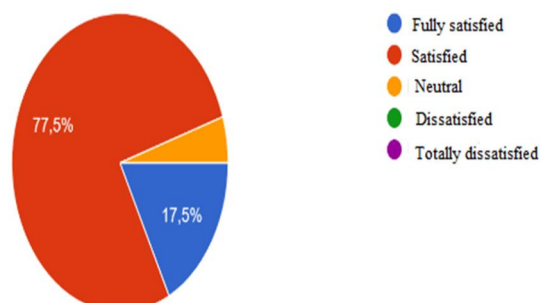


Fig. 3: The degree of satisfaction

The group interviews revealed that the majority of the students have developed competitive spirit (90%) and new soft and digital skills (88%). They have similarly appreciated the workshops (65%) and the fact that the challenge has been reached (61%).

They suggest more workshops and personalized coaching and they even volunteer to accompany the students of the following promotions, which proves their enhanced skills following the training. They aim to maintain the enhanced skills over time and to mobilize their skills in new situations.

3.2.2 Analysis of the results of the 2nd experience :

Design thinking is an action-oriented method. Throughour survey, we seek to find out to what extent design thinking could improve the students' learning and develop their skills.

To answer our question, we have employed case studies and feedback. We have similarly used critical spirit in order to test the degree of student acceptance and satisfaction with the new method and to study the impact of Design Thinking on pedagogy.

3.2.2.1 The satisfaction level with Design Thinking

The results of the survey reveal that the level of student satisfaction with the performance of Design Thinking is relatively high (77.4%) compared to only 6% of the students who express dissatisfaction. Thus, the majority of the students call for the application of design thinking in higher education.

Evaluate your level of satisfaction with the performance of the design thinking method (degree of understanding...)

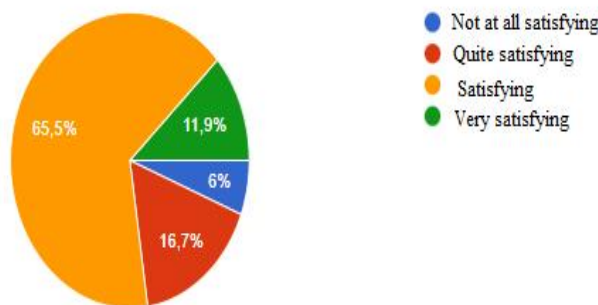


Fig. 4. The satisfaction level

83.3% of the students find that the course with which they experienced the use of design thinking resulted in the achievement of the course objectives and express a high level of satisfaction with

the performance of the design thinking method (degree of understanding, ease of use, etc.).

What is the percentage of courses with which the use of design thinking has resulted in the achievement of objectives?

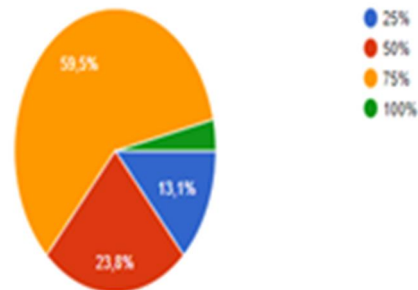


Fig. 5: The percentage of courses that resulted in the achievement of objective

The experience of students applying design thinking in their learning process was accepted and appreciated at a high rate as long as it fit their needs.

3.2.2.2 The encountered difficulties during the experience

We find that the students who are moderately or not satisfied with this teaching experience are mostly the students who encounter difficulties in following the course in design

thinking mode which we try to explain as follows:

Among the three main difficulties cited by the students, we note the following: The delicacy of the empathy phase, which is around 68.1%, followed by the lack of mastery of prototyping tools (42.6%) and the length of the Design Thinking process (38.3%).

What is the percentage of courses with which the use of design thinking has resulted in the achievement of objectives?

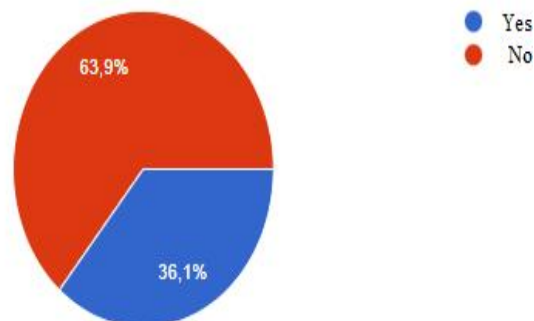


Fig. 6: The difficulties related to Design Thinking

What are the difficulties encountered?

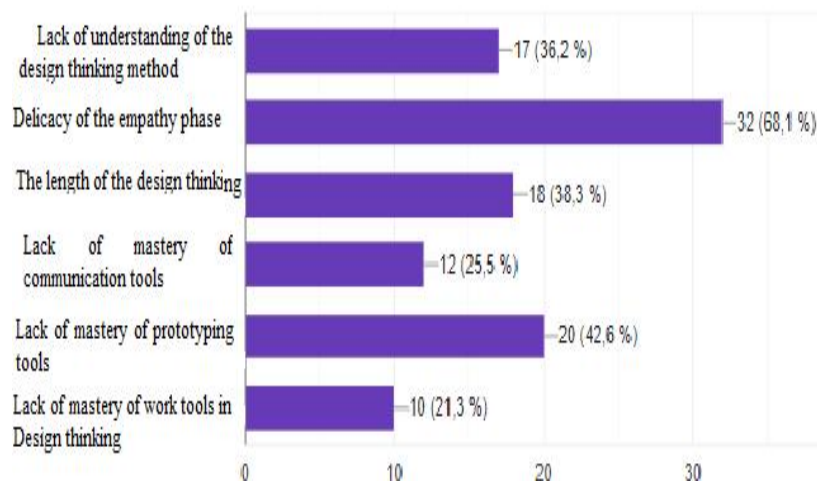
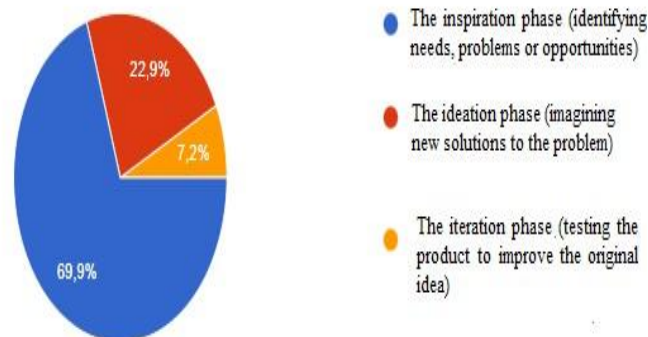


Fig. 7: List of difficulties related to Design thinking course

The failures can be considered as learning

The survey reveals that 69.9% of the

What is the phase that you find the most challenging of all the steps in the design process?



opportunities knowing that the needs of the learners are taken into account from the beginning of the experience and that we expect continuous improvements while following the third phase of iteration or implementation.

At this level, our main objective would be to reduce the difficulties encountered by the student while using Design Thinking.

To do this, we have started by studying their needs through exploiting the answers to the two questions explained below.

students find the inspiration phase the most delicate phase due to the difficulty of identifying the needs of others using empathy, against 22.9% of the students who see the ideation phase as the most delicate phase insofar as the student finds difficulties in imagining new solutions to the problems posed using prototyping.

As for the acceptance of the 3rd phase, we find that only 7.2% of the students declare that the iteration or implementation phase presents a

problem for them to test the product in order to improve the original idea by taking into

account its uses.

Fig. 8: The most delicate phase in Design Process

During their experience of using Design Thinking, students are required to work in groups in class and then complete their work remotely outside of the class. This explains the three major proposals suggested by the learners in descending order of importance as follows:

- Technical problems (59.5%)

- Lack of time (57.1%)
- Difficulty meeting outside of class (47.6%)
- Some students also expressed their expectations of a personalized monitoring (39.3%) to better explain the instructions of the activities.

Name 3 elements of the course in Design mode that could be improved

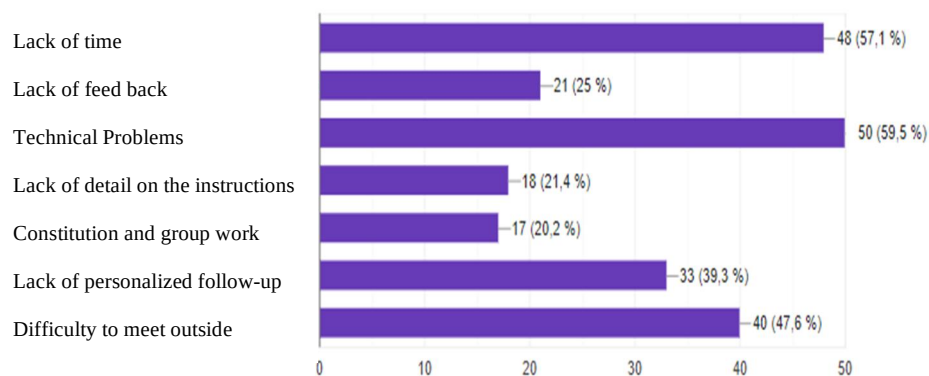


Fig. 9: Areas to be improved

3.2.2.3 The Impact of Design Thinking on Learning:

The survey reveals that Design Thinking has a positive impact on teaching. The impact relates to the following areas:

- The achievement of the result (78.3%),
- The degree of assimilation (73.5%),

- Quality of learning (86.7%),
- Reliability of information (79.5%),
- Time to complete the work (68.7%),
- Group work (77.1%),
- Intra-group interaction (51.8%),
- Intergroup interaction (59%)

Do you think that the course through the Design Thinking method has a positive impact on:

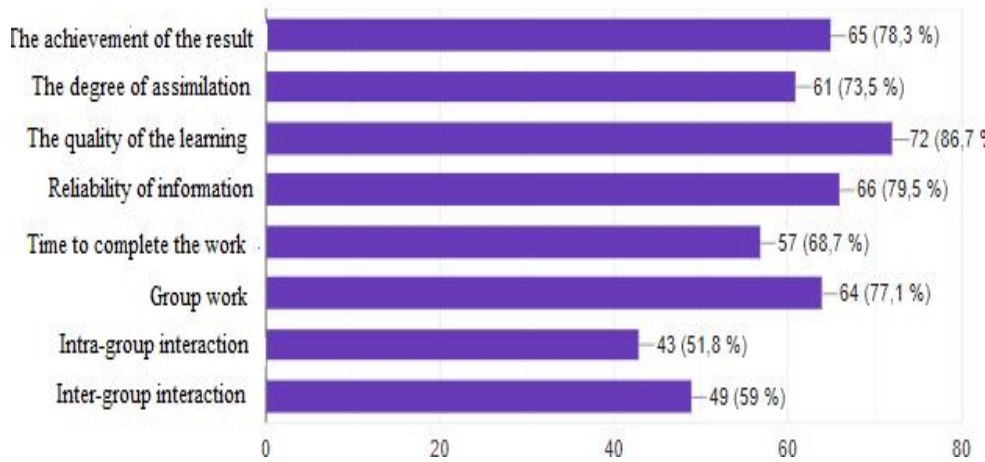


Fig. 10: The Impact of Design Thinking

We add that 63.9% of the students spend less time revising a course facilitated by the design method compared to a traditional

course, which reflects the positive impact of such a method on the learners' learning insofar as it promotes the acquisition and transmission of knowledge and facilitates the retention of information.

When you're studying for an assessment, you'll spend more or less time on a course with a design thinking than a traditional course:

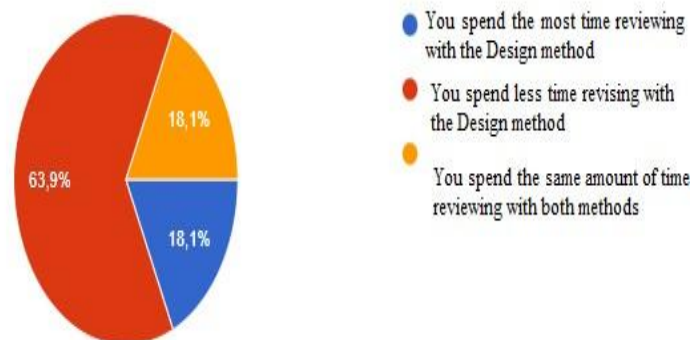


Fig. 11. Revision in mode Design

If we compare the traditional, academic teaching to Design Thinking, we find that 14.5% of students see that the new approach allows knowledge transmission at a high

rate against 67.5% at an average rate and only 18% at a low rate.

Do you think that compared to traditional teaching, teaching through the Design thinking method will be able to transmit knowledge at a rate:

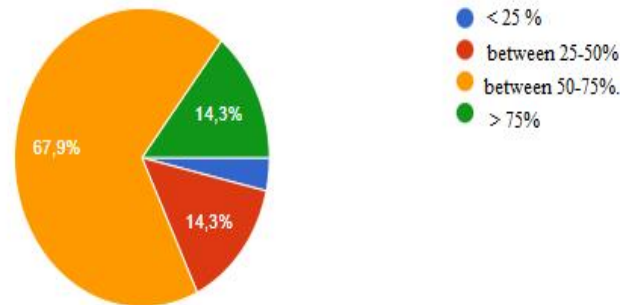


Fig. 12. The Degree of Knowledge Transmission

3.2.2.4 The challenges of Design Thinking

We realized that the adoption of design thinking allowed the students to build a deep representation of the problem at hand and to propose coherent, accepted and creative solutions with this representation.

Referring to the survey data, we realize that the majority of the surveyed students, after their experience of using Design Thinking,

find that this method allowed them to:
Develop their skills (86.9%),
Strengthen their creativities (84.5%),
Innovate (92.9%),
Learn knowledge (65.5%),
Interact in groups and promote the collaborative spirit (71.4%).

Design thinking is for:

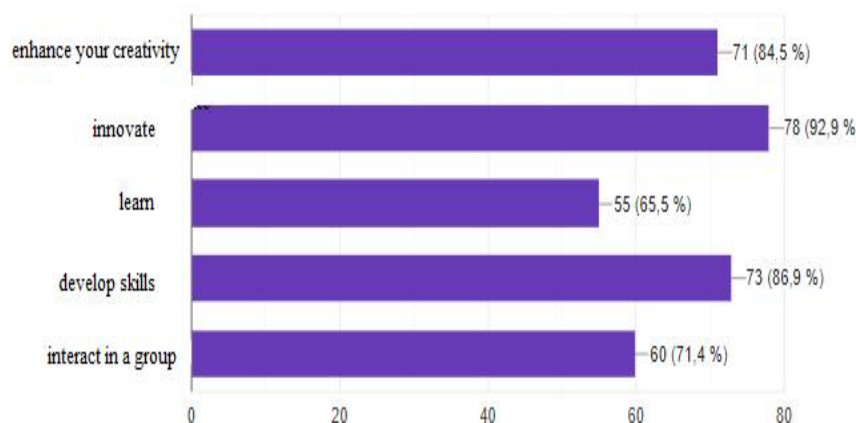


Fig. 13: The vocation/mission of Design Thinking

3.2.2.5 The advantages of using DT in the learning process

Referring to the survey, we find that the course in Design Thinking mode has several advantages in relation to the evolution of knowledge, the improvement of the quality of teaching and the improvement of the student's well-being in the learning environment, as it's shown in the results of the survey in relation to the advantages perceived by the student following the lived experience.

Through this experience and while using the stages of Design Thinking, the students feel that this method has served them to:

- Working to make the world more open (Being open to others while adapting to the demands of the environment) (73.5%);

- Encourage the sharing of resources (88%);
- Encourage and promote collaborative work (85.5%) (Learn to stimulate and federate group work, optimize their collaboration to achieve the expected result);
- Learn how to manage time and space efficiently (75.9%);
- Promote interpersonal communication (inter and intra-group) (80.7%);
- Provide a source of motivation and enjoyment for students (73.5%);
- Enrich and consolidate ideas (86.7%) (Be creative and generate ideas in groups);
- Promote the exchange of experiences. (72.3%);
- Mobilize and develop the collective intelligence of the group so that all collaborators are involved in the missions to be realized. (75.9%).

What are the advantages of teaching with the design thinking method?

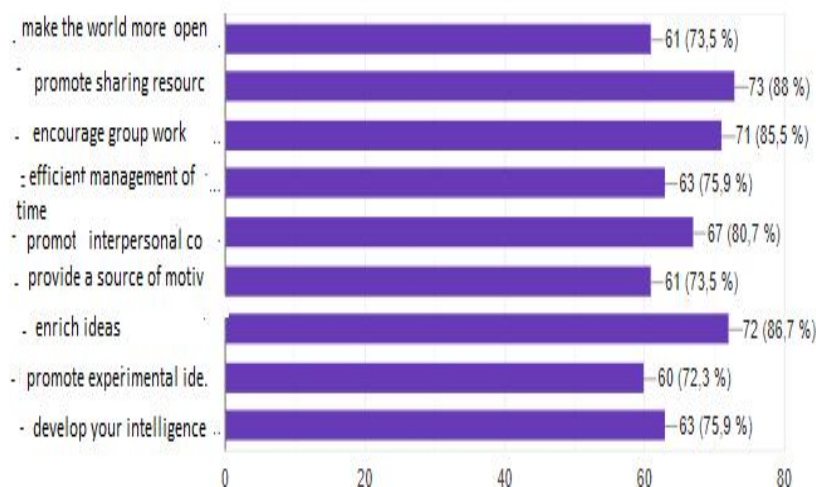


Fig. 14: The advantages of Design Thinking

3.2.2.6 Reality and perspectives

More than 84.5.7% of the students, declare having previously attended a Design Thinking course or having used Design Thinking in their academic careers. This

confirms the idea that design thinking is not new and that it is rather integrated in our thinking process. However, we still need to know how to apply it properly.

Have you ever attended a design thinking course or used the design thinking method in your academic career?

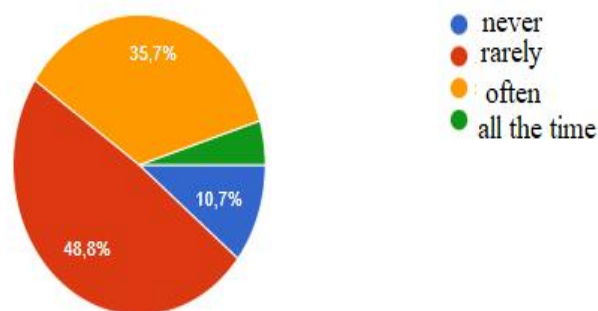


Fig. 15: Experience spent in Design mode

The survey revealed that 96.4% of the students were satisfied with their experience which had widely met their needs to the point that they wish to repeat it

in other modules in the future and to accompany the students who had difficulties in applying this mode of thinking in future experiences.

Do you think it would be interesting to attend some modules in design thinking mode for other specialties in the future

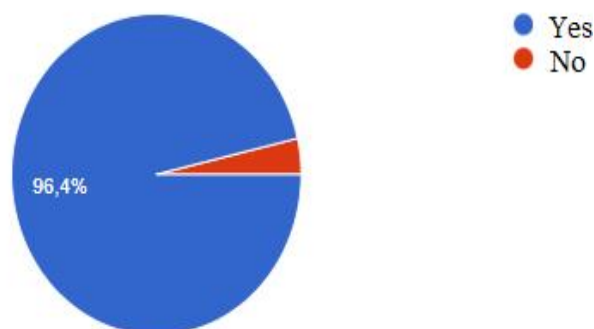


Fig. 16: Use of design in the Future

4. CONCLUSION

In conclusion, we suggest that the university should integrate the precepts of design thinking into its pedagogical process in order to respond appropriately to the needs of its partners, particularly the enterprises, and this in order to improve the professional integration of students in the job market, which is undergoing a strong transition on the national and the international level.

Design Thinking is not simply a disciplinary field or a creative domain; it is also a cognitive style, a way of thinking and a way of being. Such an approach has become essential insofar as it allows us to adapt to the demands of a dynamic environment that requires increased flexibility, especially when it comes to addressing the specific needs and desires of students from generations Y and Z.

On the one hand, it has become essential for teachers to design attractive courses that meet the expectations of students in terms of content and teaching methods in the age of abundant information. On the other hand, it is important to make the student an actor of his learning and of the transformation of the pedagogical contents and the university spaces by design thinking.

The experience that we have conducted focused on Design Thinking and its application in the field of teaching by teachers and students. The obtained

results showed that this innovative approach allowed reaching the objectives of the course in a more motivational manner, improving the quality of learning and the degree of assimilation and retention of information, and developing the students' skills.

This experience has been applied to certain subjects and has resulted in the satisfaction of teachers and students. Can it be applied to all types of teaching modules or should we resort to other innovative pedagogical methods? Whatever the adopted pedagogical innovation, the key is to ensure the pedagogical effectiveness and to optimize the student experience.

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