Digital Creativity through Design Thinking in teacher training

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Abstract

The rapid technological and cultural changes in today's society have inevitably affected the field of education. Thus, future teachers must be prepared to face the challenges of this changing society. A powerful tool for adapting to change and resolving conflicts is creativity. This paper shows how Design Thinking can contribute to foster creativity in students of degrees related to the educational world. Specifically, it presents an experience of teaching innovation in which the Design Thinking process was used for the development of digital educational projects in three degrees of education at the University of Jaén. In order to explore the effects of the methodology on the students, a quantitative study was carried out to collect the students' perceptions through a questionnaire. A total of 163 students from the education degrees participated in the study: 65 from the Degree in Primary Education, 61 from the Degree in Early Childhood Education and 37 from the Degree in Social Education. The results show an increase in creativity, along with other dimensions analyzed, in the development of creative digital projects after the Design Thinking process. Therefore, it is concluded that it is interesting to introduce this creative process in teacher training as a preparation for the future educational challenges they will have to face.

Keywords 1

Design Thinking, creativity, teacher training, ICT, higher education

1. Introduction

Social changes are reflected in different spheres: economic, cultural, spiritual, educational, etc. Currently, the rapidity of these social changes as a result of continuous technological and cultural advances has challenged society as a whole [1]. Thus, an educational response is indispensable. However, as Lor [2] asks, how can a teacher prepare a student for an unknown and changing future.

In this sense, in the face of uncertainty, it is interesting to provide students with a tool that helps them to face the future challenges they will encounter, regardless of what they may be. A powerful tool for facing such challenges and resolving conflicts in general is creativity [3]. Creativity facilitates divergent thinking and experimentation being useful in dealing with complex, novel or unexpected situations [4].

Other benefits of creativity are: improving cognitive processes for processing and organizing information, expanding imaginative capacity, and increasing brain plasticity [5]. Also, according to Gajda, Karwowski, & Beghetto [6] creativity has maintained a positive correlation with academic performance for decades, becoming even stronger in recent decades.

Thus, it is an important skill to be developed by all people, especially teachers. The development of creative skills in teachers is important for two fundamental reasons: the first is for their role as trainers of future generations in the face of this uncertain future, for which they must first train themselves; and the second is to respond to the complexity of their classrooms. Globalization and interconnection have given rise to a series of educational challenges that are evident when we enter the classroom. Thus,

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teachers must be creative in their teaching-learning designs, allowing them to be personalized in order to achieve more inclusive teaching [7].

In line with the above, Design Thinking is an interesting tool for teacher training as it is a methodology that enhances creative skills through a systematized method.

2. Design Thinking

Design Thinking is an innovative process based on the knowledge of reality to generate challenges to which to respond in a creative and collaborative way. Although initially, part of the world of business product design, it has recently had a great reception in the educational world for the possibilities it offers.

In addition to increasing creativity in students, Design Thinking has several benefits at the educational level, among which are: problem solving, increased collaboration and the promotion of innovation [8]. According to Scheer, Noweski, & Meinel [9], when this creative process is used during the teaching-learning process, it generates a series of benefits for both students and teachers.

According to the above, Design Thinking is related to experiential learning and educational innovation, causing an increase in student motivation by exploring new scenarios [10]. A systematic review of the literature states that there are nine reasons why teachers should use Design Thinking in their classrooms [11]: productive failure, reduced cognitive bias, tacit experiences, creative confidence, flow, collaboration, playful learning, surprising solutions, and increased empathy.

Design Thinking contemplates a systematized process that is summarized in a series of phases, which can be seen in Figure 1.

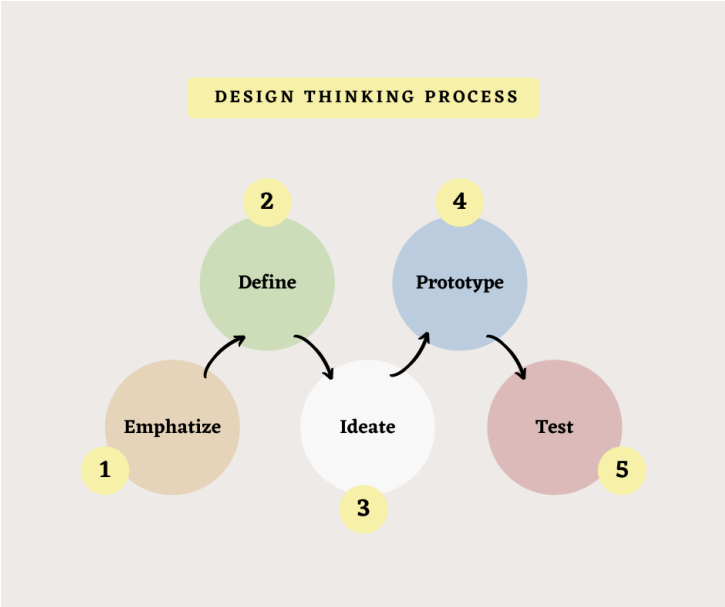

Figure 1: The 5 stages of the design thinking process

The five phases of the Design Thinking process can be defined as follows [12],:

1. Empathize. This is the initial phase of the process and is one of the keys of this methodology, since it is a user-centered design process. The objective of this phase is to empathize with the problem to be solved. The intention is that the creator leaves aside his beliefs and opinions to immerse himself in those of the users for whom the final product is intended.
2. Define. This second phase focuses on analyzing all the information gathered in the previous phase, in order to define the main problems identified in the users' needs.
3. Ideation. If the role of creativity is relevant throughout the process, it is even more so in this phase. In the third phase, ideas are generated around the problems identified in the second phase. The more ideas generated, the greater the chances of finding the best solution.

4. Prototyping. This is the experimental phase of the process. During this phase, the best solution to the problems must be selected. To do this, the ideas generated in the third phase are prototyped to be tested one by one, putting themselves in the place of the user with whom they empathized in the first phase. After prototyping, the product that is considered to provide an answer to the problem defined in the second phase must be chosen.
5. Testing. This is the last phase. In it, the product selected in the prototyping phase will be evaluated, checking if it really responds to the problem and the needs of the users.

These phases can be easily extrapolated to the educational field, solving challenges and problems related to education. Thus, it is a methodology easily adaptable to teacher training.

3. Method

This paper presents a teaching innovation experience in which a series of digital educational projects were carried out through the Design Thinking methodology, using the stages described above. The experience was conducted at the University of Jaen, in three degrees related to the educational field: Degree in Early Childhood Education, Degree in Primary Education and Degree in Social Education.

The objective of this methodological change was to awaken creativity in the digital projects developed by the students. In this sense, this paper explores how Design Thinking can enhance creativity in learning processes in students of education-related degrees. Also, other variables related to the teaching-learning process are considered to evaluate the impact of the methodological change in a global way.

In the three degrees we worked with students in subjects related to educational technology, using Design Thinking for the development of digital educational projects. Thus, the students were organized in small groups (4 to 6 students) for the development of the projects. Once the process was completed, the experience was evaluated from the students' perspective. Thus, a quantitative methodological design was carried out, in which a descriptive method and a survey-type design were used to obtain information about the learning process. The instrument used was a Lickert-type questionnaire developed ad hoc. The questionnaire collected information on a series of identification data such as sex, grade level or age, together with the eight dimensions of the study analyzed on the basis of 25 items. In addition to creativity, six other dimensions were measured: Motivation, Involvement, Communication, Monitoring, Dissemination and Success.

The questionnaire was created based on a table of specifications. Its validity was confirmed through expert judgment and factor analysis, in which one factor explained 53.27% of the variance. Likewise, its reliability was tested, obtaining a high reliability with a Cronbach's Alpha value of 0.964. Thus, through these reliability and validity analyses, the quality of the data collection instrument was evidenced.

A total of 163 students from the education degrees participated in the study: 65 from the Degree in Primary Education, 61 from the Degree in Early Childhood Education and 37 from the Degree in Social Education. As is common in education-related degrees, the majority of the students were women (79.8%) compared to a lower percentage of men (20.2%). The age of the participants ranged from 18 to 35 years, the mean age being 20.87 (SD 2.353).

4. Results

The results are presented in two fundamental blocks. First, the results of the dimension related to creativity are presented, detailing the answers given to the items associated with this dimension. Secondly, the general results of all the dimensions analyzed are presented, analyzing the differences between them.

Of the 25 items that made up the questionnaire, 5 were designed with the aim of evaluating the creativity that had resulted from the inclusion of the Design Thinking process in the development of

digital educational projects. Figure 2 shows the results of these four items according to the 5 measurement values of the Likert scale: completely agree, mostly agree, slightly agree, slightly disagree, mostly disagree and completely disagree.

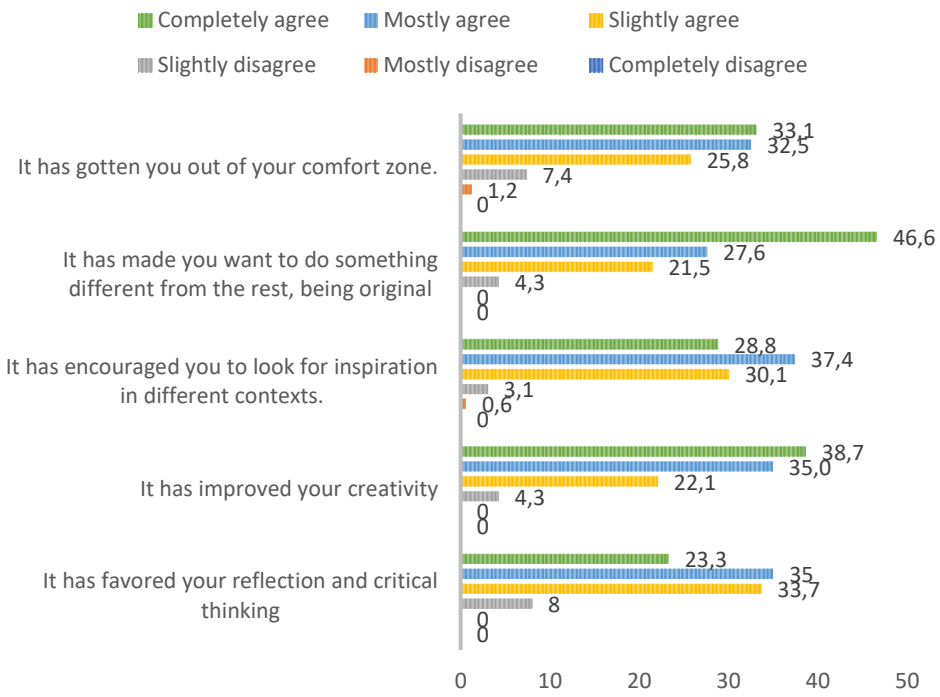

Figure 2: Items on the Creativity dimension.

As can be seen in Figure 2, the items related to creativity are positively valued by the students. In fact, there is no item with which the students completely disagree and only in two items they show to be Mostly disagree only a small percentage (1.2% and 0.6%). Most of the students completely agree or mostly agree that through this Design Thinking process they have wanted to do things different from the rest being more original (74.2%). They also completely agree or mostly agree that they have improved their creativity through this methodology (73.7%). In general, the students agree with the items related to the Creativity dimension, since in all of them at least slightly agree more than 80% of the students.

Moreover, if we analyze the means of each item, we observe the same trend, since the highest mean is found in the item "It has made you want to do something different from the rest, being original" with a value of 5.17 (SD 0.911), followed by the item "It has improved your creativity", with a mean of 5.08 (SD 0.882). In contrast, the lowest mean is found in the item related to reflection and critical thinking, with a mean of 4.74 (SD 0.908). In spite of being the item with the lowest evaluation, taking into account that the scale ranges between values 1 and 6, it is evident that it is still highly perceived by the students.

The means obtained generically in the dimensions of analysis are shown below, together with the standard deviation (SD) of each one of them (Table 1).

Table 1

Means and standard deviations of the study dimensions

Dimension	Mean	SD
Motivation	4,64	,888
Involvement	4,77	,729
Creativity	4,96	,741
Communication	4,77	,860
Monitoring	4,96	,840
Dissemination	4,91	,858

Success	5,10	,839

As shown in Table 1, the Creativity dimension has been highly considered by the students in the Design Thinking process. Along with it, the follow-up has also been highly valued, since the teacher made a very deep follow-up to each work group solving all the doubts that could arise and giving instructions in the process. These dimensions are only surpassed by success (motivation towards success; perception of usefulness of work...), this may be due to the intensity with which the students worked and the result of the effort they later obtained in their work.

Also, considering again the oscillation of the scale between values 1 and 6, the averages show that in all the dimensions high evaluations have been obtained by the students. In this sense, the Design Thinking process had a positive impact on other aspects such as motivation, involvement, communication and dissemination.

5. Conclusions

This paper focuses on exploring the relationship between the use of Design Thinking methodology and creativity in the development of digital educational projects in students. In this sense, as the results show, students have perceived an increase in their creativity. This methodology has helped them to be more original and get out of their comfort zone. It has also been shown that this creative process promotes other interesting dimensions in any training, such as motivation, involvement, communication and success, among others.

The introduction of Design Thinking in the training of future teachers becomes, therefore, an interesting tool given its role in the development of creative thinking. Both for their own profession and so that they can transfer it to their future students, creativity is a crucial element to face the complexity and speed of current social changes in the educational environment. Therefore, we agree with Scheer, Noweski & Meinel [9] and Henriksen, Richardson, & Mehta [13] that it is necessary to train teachers in this creative process to encourage its use as well as their creativity.

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