THE EFFECTIVENESS OF DESIGN THINKING AND COLLABORATION ON EDUCATORS' INTERNSHIP

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ABSTRACT
In the present study investigated whether the adopting strategy "design thinking" has benefited the effectiveness of prospective teachers by developing cross-curricular work plans and educational action plans during their internships. The sample is comprised of 20 pre-service teachers of the 4th year students in the Faculty of Early Childhood Education Science, in Greece during the academic year 2017-2018. The methodology that was followed was the qualitative analysis of the discourse in the submitted minutes of the students' activities and assessments that coded the concept of "design thinking" and "creative collaboration". The conclusions indicate that the pre-service teachers believe that they have developed the design thinking, the creative collaboration during the implementation of the work plans through discussion, teamwork, collective planning, implementation and collective reflection feedback on work plans.
Keywords : design thinking, pre-service teacher education, internship, collaboration.

DESIGN THINKING
Design Thinking is a strategy that can use the educators in order to find a solution in teamwork. Koh, Chai, Wong & Hong (2015) define that " *Design Thinking characterizes the mental processes that practitioners use as they frame, explore and reframe ill-structured problems to derive design solutions".* As they have mentioned in their research Gul, Cassuma, Ahmada, Khana & Saeeda (2010) "*Design Thinking can serve as the missing link between theoretical findings in pedagogy science and the actual practical realization in schools. It meets the crucial criteria for effective 21st century learning by facilitating interdisciplinary projects, approaching complex phenomena in a holistic constructivist manner. It thereby leads to a transition from the transfer of knowledge to the development of individual potentials. It enhances the implementation of learning by giving teachers more confidence in creating and exercising collaborative project work.* It is estimated that this strategy enhances the teamwork and their connections. The relationship among students and mentors is positive and fruitful.

There are researches that prove the effectiveness of Design Thinking in education (Wooff, 2017). Furthermore, these researches indicate that the internship of educators prepare teachers who are equipped with critical thinking. Afterwards these educators who can plan and deliver the programs exhibit higher level thinking in their teaching practices (Gul et al., 2010).

In other research by Noweski (2012) indicates the fostering of students social and metacognitive competences through Design Thinking. It offers teachers the needed support towards in a new way of teaching. Through a formalized process it may serve as a bridge between demand and reality.

For Meinel & Leife (2012) the procedure of Design Thinking is a cycle where synthesis and divergent thinking, analysis and the nature of the problem all come together and finally achieve a resolution. In Design Thinking processes there is no solitary action or procedure that actually defines the process. There are as many different design processes as there are design thinkers (Meinel & Leifer, 2012· Wrigley & Straker, 2017)

CREATIVE COLLABORATION
More recent perceptions of creativity hold that it is not only characteristic of individuals but also of groups (Kampylis & Berki , 2014· Kim et al., 2019). Cropley (1999) defines creativity as a social phenomenon. The concept of collective / collaborative and group creativity describes the joint effort of two or more individuals to achieve an innovative result that cannot be achieved by one person alone (Kampylis & Berki , 2014).

According to Pirola-Mero & Mann (2004), collaborative creativity arises in two ways, either through the total efforts of creative individuals, who work independently first and then collect their individual elements, or through the interactions of team members, where creative performance depends on the contribution of the whole team from beginning to end.

INTERNSHIP MODELS IN EARLY CHILDHOOD EDUCATION STUDIES
In recent years, the Department of Early Childhood Education Science, Democritus University of Thrace in Greece, in an effort to meet the new educational challenges of enhancing the creative collaboration of

prospective teachers, has been applying learning processes and methodologies that provide future educational tools to become more creative. Two of these processes is the professional development model Lesson Study (LS) (Fernandez, 2002· Lewis, 2002) and "design thinking" (Chapman et al., 2016), which encourage developing thought-provoking teachers (Karadimitriou et al., 2014) who can design, implement and evaluate the educational process creatively by actively participating in learning communities. Furthermore, through these models is developed the collective as well as individual creativity, critical thinking and collaboration skills share-design, participatory learning and educational reflection. Both methodologies are integrated into active learning and creative problem solving processes by placing the prospective teacher at the center of the process. In addition, it is possible to freely develop ideas without criticizing either the supervisor or the team members for the purpose of releasing their creativity. Finally, enhancing empathy, where prospective teachers strive to understand students' needs and interests.

The "Design Thinking" model consists of five stages: (a) empathy, in which designers of an educational process understand their subjects (e.g. students), their needs and interests within relevant contexts (e.g. class), b) the designation that designers clearly define one or more "needs" of the subjects, based on what they understood from the interaction with the subjects in the previous step; involved in a storm ideas to design actions or give solutions or new ideas by combining imagination and creativity; d) producing an original project or idea created by the designers to test and give the necessary feedback; e) the application, where the subjects test the original project or idea and give feedback to the designers to improve it (Chapman, et al., 2016).

Specifically, the Lesson Study model consists of a series of circular phases, which are as follows: Collaborative design of the course, Implementation and observation-recording, Reflection - evaluation - detailed feedback, and redesign (Fernandez, 2002; Bruce & Ladky, 2011).

During the Internship of the 4th-year prospective teachers, groups of five, who collaboratively design, implement, and explore in early childhood education class the cross-curricular work plan or educational action plan or even a combination of two learning goals. The structure of the Internship combines the phases of both the LS 'lesson study' and the Design Thinking model and consists of a series of circular phases which are as follows:

1) Prospective teachers as project planners firstly they visit the classroom, discuss with the kindergarten teacher, and observe students in order to gather first-hand information about the target group. They then work together with the responsible teacher supervisor to design and implement daily activities that will be implemented during the week of kindergarten engagement in order to understand and respond to students' needs and interests in emerging potential issues. The Work Plans: Daily, two of the prospective teachers are animated and actively involved in discussions with students during both free play and organized activities, and the other three observers observe the children's educational process and behaviors.
2) After the engagement week is completed, prospective teachers collectively evaluate it by handing in a detailed report (evaluation sheet) to their supervisor analyzing and clarifying the reasons for developing specific work plans that are of interest to children as well as their specialties.
3) Candidate teachers have two weeks to collaborate and produce ideas using the brainstorming technique and plan out their work plan, goals and observation axes. The tutor then sets up small feedback groups of five prospective teachers who present each other with the plans under study to identify weaknesses and incorporate improvement suggestions.
4) In the next phase, the teams implement the work plans with the students for two weeks. On a daily basis, two of them, with the primary role of inspiration and the other as auxiliary, carry out the planning and the others observe the educational process by taking notes on the course of instruction and the achievement of goals by students.
5) In the fifth phase, all team members participate in an evaluation and feedback session on the outcomes of the 'lesson / work study' daily, student learning and prospective teachers, and errors, weaknesses are identified, good and bad practices while developing and incorporating the improvement suggestions that came up during the feedback session. At this stage, prospective teachers develop flexibility by changing and customizing where the work plan is needed, taking advantage of students' needs, interests, and suggestions.

It is worth noting that feedback meetings are conducted in all the above phases with the responsible tutor supervising.

RESEARCH PURPOSE

On the basis of the foregoing research, in this study investigated whether the adopting strategy "design thinking" and creative collaboration has benefited the effectiveness of prospective teachers by developing cross-curricular work plans and educational action plans during their internships.

Research sample

The research sample consists of texts from 20 prospective 4th year teachers in the Faculty of Early Childhood Education Science during the academic year 2017-2018.

Research questions

Based on the above, the research questions that arise are the following:

Q1 : In what ways do pre-service teachers think they have developed Design Thinking when implementing work plans?

Q2: Does the "Design Thinking" process benefit from enhancing the collaboration among prospective teachers?

Q3. Is there a difference between groups and between team members in "design thinking" processes and creative collaboration?

RESEARCH PROCESS METHODOLOGY

The methodology followed was the qualitative analysis in the submitted minutes of the students' activities and assessments. The objective in qualitative content analysis is to systematically transform a large amount of text into a highly organized and concise summary of key results (Erlingsson & Brysiewicz, 2017). In analyzing and comparing texts and presenting them, we focused on the concept of "design thinking" and "creative collaboration" and the elements that enhance them.

RESEARCH RESULTS-ANALYSIS

The analysis of the texts revealed that prospective educators believed that through the collective design, implementation and feedback of work plans they tried to develop the Design Thinking and creative collaboration and, thus, to exploit a range of appropriate conditions on their own, methods and techniques. There is interaction and collaboration among future educators, who are being members of a learning community. They followed the design thinking process that has created the appropriate supportive framework to develop our creative collaboration.

"Specifically, we felt comfortable to create, implement and reflect on new ideas by following social processes, such as the exchange of information within a collaborative coordination with defined motivations and goals." (X1)

"I self-assessed, recognized the strengths and weaknesses of my teaching, worked with my team to achieve a common goal, and cultivated critical thinking. As far as working with my team, I think we worked as a whole. There was mutual help and support. Each one had its strengths and weaknesses, which within the team utilized all the skills of each member for the best possible outcome. I find it useful that I was judged and evaluated, not only by the supervisor but also by my team members. In this way, there is greater feedback and active involvement of the process than all members, identifying possible mistakes and effective practices aimed at improving each member individually, as well as improving the team collectively. Therefore, there is a more holistic view of improving teaching, as more people are involved, an error that we have not identified in the course of our activity may be discovered by another member or vice versa" (X3)

"I learned through them how to work better, to listen to others first and to accept the good and the negative criticism, because through it I can evolve." (X4)

"Through collaboration and discussion we made changes to activities in case of disagreement. There is a reflection that has also helped us a lot because through discussion, feedback and criticism you can understand the pros and cons of your teaching, your character, what helps you and what doesn't, how you feel about something and how realize the rest. There were many benefits to seeing each other's bad points and then avoiding them you, you see what works and what doesn't, you understand what needs to change and what doesn't at any time teaching." (X5).

It helped to develop their ability to collaborate both at the level of collective planning of daily programs and daily collective feedback sessions with their team and supervisor. While working with their classmates on

project design of teaching, they exchanged ideas and opinions that they would not have thought alone. Each with its own knowledge and experiences added something to complete the planning of activities.

"Suggestions set were mentioned by each of them, discussed and either rejected on the grounds of the others or were strengthened. We came together as a result of a combination of ideas and thoughts and at the same time we worked on teamwork and collaboration. The feedback process with my classmates and supervisor was very important. Following my teaching, they identified errors that I had not identified. It's different to see the lesson as a third person and anyway be an active player in the learning process" (X6)
"It gave me the opportunity to reflect on the practices I applied and to critically engage my work during the learning process".

Efficient techniques have also been identified, which implies not only the negative criticism of their educational action, but also the positive, in order to maintain those strategies and to facilitate the process learning. During the observation of the training process they were able to identify both good and bad practices of their colleagues. This has allowed to critique their work and either avoid the bad practices in their own educational action, either to adopt or incorporate the good ones.

"We had feedback discussions every day, where we talked about the mistakes we made in order to improve the future activities. We also exchanged ideas to approach activities in a different and more creative way. Every day we were discussing our mistakes and the ways we could apply them in order to carry out the activities in the best possible way. This has led us to think of more creative and effective ways to conduct an activity the next time." (X8)

As a team they were planning activities. After completing the daily program, they were studying their activities with the aim of empowering the positive and improving the weak. At the level of collective planning of daily programs, they believe that collaboration with members of design team has been a positive contribution to their activities, as there was communication and positive interactions with oral level. The planning of their activities was done in a collective way level. On the other hand, at the level of daily collective feedback sessions, with both their team members and their supervisor they helped them more on developing their cooperation skills. After at the end of the daily program, they met with their team, posing to discuss evidence that they collected from the observations. Through daily discussions with the reviews and the feedback among the team members, they managed to go on one step below and change some practices that they found to be wrong. Also, daily collective feedback conversations helped them, as they have contributed to the development of criticism as well as creativity thinking and they managed to judge which items are right and which are not, either these were about the pedagogical materials that they had to bring to class, or course of an activity. Also, regarding the cooperation with in members in their group, they were exchanging ideas and thoughts, where everyone offered their knowledge in their own way and this has resulted in reaching out activities in a different and more creative way.

"It enabled me to reflect on the practices I applied and critically approach my work in the classroom learning process. On the other hand, identified and effective techniques, which involves not only the criticism on my educational activity, and positive, in order to maintain these strategies and facilitate the learning process." (X10)

"All we worked together, we exchanged views, we researched and we came up with specific activities. The process of planning activities and gave feedback was equal to all team members without there were injustices, disagreements and misunderstandings." (X11)

"It was the reason for me to change the way I think. Regarding his cooperative part, he helped me a lot in organizing it program because this is our first substantive experience and I needed the team spirit. There were many different ideas from all of them team members from the beginning to the end of the program that I held and I'll use them in my future action." (X12)

They develop the collaboration skills as there were frequent discussions about each stage. The conversations and communication between the team members contributed to developing the co-working abilities both during the collective designing daily schedules as well as daily sessions collective feedback.

"The collective design of daily programs as it helped us to focus more on the needs of the children and evaluate each of our activities based on the criteria discussed. The daily feedback sessions with the supervisor were just as helpful because they asked us questions and "forced" us to think on the part of the children to see if a

particular activity we were planning to achieve and why. So, we identified errors that we would not have thought otherwise." (X14)

"In terms of collaborating on the collective design of the daily programs, we all came up with ideas, exchanged views and made collective decisions. All members also took on roles in the division of tasks. Our team was well prepared during the planning meetings. "(X15).

It is essential to promote collaboration among team members and this help improve teachers to cultivate critical thinking and the process of self-evaluation, collaboration, feedback and evaluation. The collective planning of the daily programs helped a great deal because they were in the process with the team members to gather, discuss and plan the activities they would present each day. Teamwork was very important because the cooperative skills were developed, the creativity was nurtured and they had the opportunity to exchange views, thereby acquiring new ideas. The daily collective feedback with the supervisor was also very helpful because it helped to understand the points where they made a mistake and also gave valuable tips and ideas that may be useful in the future. Sharing opinions with other groups helped to understand that the team can function differently depending on how each group and each kindergarten teacher is taught.

"As far as the cooperation part is concerned, it was very good with all its members of my team and there were no problems. In the collective design of daily schedules, there were retreats where needed, the team listened and took seriously the opinion of each member and all the students we had roles that fit our personality and abilities, resulting in each of us being instrumental in creating and implementing of our program, as well as the shaping of the final work. Also, there were daily collective feedback sessions with all members. All of us were marked by reflection." (X18).

"The collective design of the daily programs helped tremendously because there was pluralism. Hypotheses have been put forward, contradictory until we reach something that is generally accepted. Subsequently, particular skills of cooperation and co-responsibility were developed in the daily collective feedback sessions with both my team members and my supervisor because there was an exchange of views, mutual evaluation and feedback, which ware used to our advantage. Also, through the process of observing the educational process there were really benefits to the 'next step', to my improvement and to the way children learn." (X19).

"We try to identify our right and wrong elements. The outcome of the feedback and cooperation has been positive. There were certainly benefits to promoting cooperation and active participation by all. It also contributed to the development of critical thinking, reflection, feedback and self-evaluation." (X20).

CONCLUSIONS
The results make it clear that, based on the research questions posed in the present study, pre-service teachers believe that they have developed the design thinking, the creative collaboration during the implementation of the work plans in a variety of ways and methods of teaching. In more detail, through discussion, teamwork, self-efficacy, collective planning, implementation and collective reflection feedback on work plans. There is a critical reflective process, which help the pre-service teachers to improve their self-efficacy.

The internship combined with design thinking processes benefits the enhancement of both the collective and individual creativity of prospective teachers (Tan et al., 2018).

Lastly, we did not find that there was a difference between the teams and the team members in the " design thinking " processes and creative collaboration.

All these results indicate that the critical frame is the only that can redefine their opinions of pre-service teachers. They can dispute and renegotiate the elements of the education process in their team that participated in. The more query whether, the more practice to critical education (Freire, 1970). If there is no critical thinking and critical reflection in a collaborative approach, then there is no effective outcome of the pedagogic method.

SUGGESTIONS
Based on the above conclusions, a holistic critical approach to fostering the Design Thinking and creative collaboration of pre-service teachers in their internship program is proposed. As Koh et al. (2015) says "*In the field of education, design thinking has not yet seen widespread permeation into the pedagogical vocabularies of students and teachers. There is a need to better understand the potential application of design thinking in educational settings"*. Further refinement and adaptation of this program is essential, as it is the goal of the program itself, an endless collective reflective process that puts the prospective teacher at the core with active

learning and creative problem-solving processes. This is achieved through the critical thinking, with the aim of unleashing the educators their creative collaboration.

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