The e-portfolio in a Kindergarten Classroom: Adopting Alternative Assessment Methods through Action Research

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Abstract The purpose of this work is to develop, implement and evaluate e-portfolio as an alternative method of assessment in a kindergarten classroom. This research follows the methodology of qualitative research and specifically action research. Particularly, the e-portfolio was designed by the teacher-researcher as a website using state-of-the-art technology in order to present to the parents the best works of their children in the classroom. The participants of this survey were students of a small kindergarten classroom in a private school in Trikala, Greece, during the school year 2014-2015. Initially, a portfolio tool was implemented within the classroom in a paper format at the start of the school year and after three months, a fully functional implementation of an e-portfolio was used throughout the rest of the school year. The evaluation of the utility of the e-portfolio was conducted by the teacher-researcher in several layers, including participant observation on a daily basis (calendar), semi-structured individual interviews with children and open-ended questionnaire combined with semi-structured interviews with the parents. The data collected throughout this procedure, were processed and categorized using thematic content analysis. The thematic areas that emerged from this analysis concerned the application of the e-portfolio, the attitude of the children, the children's emotions, emotions of their family environment, the frequency the e-portfolio was used, peer relationships, child - family interaction and general feedback about the e-portfolio. The results reveal a positive attitude towards the promotion of self assessment and peer assessment through the use of the e-portfolio. Furthermore, the parents showed great interest for the e-portfolio tool and reacted positively in using it. As a result, the e-portfolio was proved to be successfully implemented in a kindergarten classroom, and its application revealed that the peer assessment among the classmates helped the children to develop the process of self assessment at a high level.

Keywords: action research, portfolio, e-portfolio, alternative forms of assessment, self assessment, peer assessment

1. Introduction

In recent years, teaching and learning methods have encountered a significant diversion from the teacher-centered model. Wickersham and Chambers [1] argued that a new teaching method has emerged which introduces new environments that focus on acquiring the knowledge of the use of technology. More specifically a new and very promising tool, which encourages this change in teaching and learning, is the so called e-portfolio. According to Yavelberg [2] the e-portfolio approach has been improved and expanded rapidly over the last years and thus enriched the educational technology in general. Particularly, the development and use of the e-portfolio is believed to help create an environment with frequent self assessment and feedback from the child itself on his/her work and projects.

Another aspect presents e-portfolio as a powerful tool, due to the fact that it is designed to support a variety of teaching principles and evaluation procedures [3].

The aim of this investigation is to present the design, process, development, implementation and evaluation of the e-portfolio as a qualitative and alternative evaluation method in a kindergarten classroom. This research is based on the methodology of action research, and additionally employs technology in order to design and develop a website for the needs of the e-portfolio. By using the e-portfolio, the educator intends to present the best projects of the children to their parents through a digital platform, and develop pedagogical alternative assessment practices [4]. The goal of the design, implementation and evaluation of the use of the e-portfolio, is to determine its utility in the educational process and in promoting children's self assessment. Another aspect of the implementation of the e-portfolio

tries to investigate whether peer assessment can be developed by the peers in classroom. Based on the above, several research questions arise; i.e., can e-portfolio be considered as a useful tool in a kindergarten classroom that helps the development of the reflective skills of the children? Does e-portfolio contribute to the development of self assessment? Can peer assessment be promoted in connection with the use of e-portfolio? Is self evaluation of the children enhanced by the peer assessment? In this work, we consider e-portfolio as a systematic action that organizes children's projects, helps self development through a regenerative process and gives the opportunity to each child to interact with his/her classmates, the teacher-researcher and his/her family [4,5]. This paper is organized as follows: In Section 2 we present a literature review that concerns the Bronfenbrenner's framework, self and peer assessment, and e-portfolio assessment. In Section 3 we give details about the methodology of the design and the implementation of the e-portfolio. Moreover in Sections 4 and 5 we present the qualitative results from the data analysis and a detailed discussion on the results respectively. Finally, we conclude our work in Section 6 by presenting some final findings and future directions.

2. Theoretical Framework

In this section we present a literature review that concerns the Bronfenbrenner's framework that describes how the child receives influences from his/her surroundings. Particularly, in this research we rely on the Bronfenbrenner's framework, taking into consideration that the student is influenced by his/her peers, the teacher, and his/her school and family environment, in order to evaluate his/her learning development. We also present the literature review on self and peer assessment and how this affects the child's development of learning. Finally, we talk about the development of e-portfolio assessment, the implementation and the utilization of the e-portfolio and its advantages in respect with the traditional portfolio.

2.1. Bronfenbrenner's Framework: The Ecology Theory of Human's Development

According to [6] the world surrounds the child with systems that are interconnected. These systems include the closest environment of the child and also several levels from his/her surrounding environment. Moreover, the author of [7] categorizes these systems into the microsystem, the mesosystem, the exosystem, the macrosystem and the chronosystem. The microsystem is the living area of the child and provides the most direct interaction between his/her parents, teachers and classmates. The mesosystem refers to the relationship of the different functions of the microsystem with functions to the benefit of the child. The exosystem depends on the other related situations that interact indirectly with the child's environment. The macrosystem includes all previous systems and deals with different value systems and cultural values of a society that have an effect on the child's life. Finally, the chronosystem includes environmental events and transitions over the life of the child. What is more, the term behavior used by [8] in the theory of social

psychology appears to play an important role in Bronfenbrenner's theory. According to the theory of [8], behavior is formed by the interaction between the individual and his/her environment. Bronfenbrenner, however, in his work [9], replaced the word behavior with that of development. Development was considered as a series of procedures that take place when the individual influences and is influenced by his/her environment and by constant changes generated in the individual's personality throughout his/her life. Bronfenbrenner and Morris [10] argued that human evolution is more progressive when the same person is more actively involved in interaction with the immediate external environment such as for example, other people, objects and symbols. The ecosystem theory of human development [6] focuses on how the personality of a child develops, as it receives various influences from the environment. It is claimed especially that a stimulus received by a child from his/her environment, has a severe impact on the learning process and development [7]. However, besides his/her environment, the child interacts with objects or various symbols as well, that help his/her development of learning. Apart from himself/herself, the child is motivated and develops positive interpersonal relationships among other people [9]. These interpersonal relations are important during the child's development period, and concern reciprocal actions, balance and stability. Furthermore, the rate at which the child chooses to change something in his/her environment is associated with his/her participation in activities related to personal development. The ecosystem theory [9] considers the child as a separate and active personality that receives influences from the ambient content that surrounds it.

2.2. Self and Peer Assessment

Considering the theory of human's development [7], the stimulus received by the child from the family and the school should not be considered as simple variables, but rather as the interaction with the life of the child. Thus, through the school environment the stimuli received by the child affect immediately the effectiveness of learning. The overall development of the children depends on how well designed the assessment is, and how it relates to the objectives and the learning content [11]. According to many researchers, evaluation is an internal procedure of the learning process which is used as a way to lead and direct the learning development. Therefore, assessment encourages the individual to analyze the process of the steps of learning, and not only its content [11]. It is emphasized that the assessment is a proactive and targeted procedure for learning that takes into account all the goals each child has set [12]. According to the Greek Curriculum, from a teacher's perspective, evaluation is the procedure where the teacher receives feedback from the educational practices he/she uses in order to improve his/her educational process [13]. However, children should not be seen as the target of evaluation but rather as the ones that benefit from this procedure [14]. The assessment either self or peer, involves actively the person in his/her development process [15].

The critical reflection of the individual on his/her accomplishments can help promote the development and

improvement of self assessment, ascertaining his/her strengths and weaknesses [11]. Jarrott and Gambrel [16] argued that the reflection process can be further improved when the individual has the ability of assessing his/her own development and evaluating his/her learning targets through specific assessment tools, called portfolios. According to [17], portfolio is defined as a process in which the students actively select materials related to their achievements with respect to some specific criteria, and which also enables the promotion of self-assessment among the students. It is worth noting that the development of children's self evaluation and feedback is largely determined by the comments they receive from their classmates and their teacher [18,19]. These comments play a greater role in what the child perceives as the advancement of knowledge, and help him/her to focus more on self assessment. John Dewey [20] dealt with the value of self reflection, and stated that the importance of reflection lies upon the ability of reflecting on past actions considering their significance, and understanding of how they can meet future experiences. Thus, through self assessment children acquire a more active way in the educational process, evaluate their achievements with more responsibility and use this information gained for their future targets in their learning process [21]. Portfolio gives the opportunity to the students to spend some time on deciding which works to include in it, and at the same time enables the development of future learning goals with the teacher [18]. In essence, when children evaluate themselves, they try to distance themselves from their experiences and focus on their beliefs and how these beliefs affect the way they act and think [22]. The evaluation of peers increases the behavior of the student, since the comments of peers help him/her to improve his/her representations [23,24]. The active involvement of students in the learning process encourages the integration of the student's self assessment and peer assessment [25]. Empirical research has shown that there exists a positive relationship among portfolio and peer assessment, supporting that students' comments play an important role to the development process of the portfolio [26,27]. The peer assessment feedback helps the student to develop more easily a skill, and through this process he/she understands if something is right or wrong [28]. Therefore, the importance of student's self assessment and peer assessment is great as it contributes to the development of the reflection of the learning process [25].

2.3. E-portfolio

With the advancement of technology and the trend for active and reflective learning [29], a need for the design and development of the portfolio in a digital environment has emerged, a fact that eventually led into the creation of the e-portfolio [30]. In the literature review there are several definitions of e-portfolio and most of them present a child-centered approach [4]. In this process, children themselves choose how to organize and shape their environment, by choosing the projects they consider most important. Although the e-portfolio is considered a digital collection of video and audio content including text, images and sound [31], the authors of [32] argued that e-portfolio is a lifelong learning tool that aims at self

evaluation and helps children understand the value of knowledge. Furthermore, in [33] it is stated that the e-portfolio is an organized and structured collection of information that a person selects with a particular purpose to show his/her improvement and achievements in a suitable digital environment.

Additionally, in [34] it is argued that the e-portfolio offers a direct communication between the educational process and children, indicating that teachers can get to know better their students through the observation of their behavior and their comments. Wall, Higgins, Miller and Packard [35] argued that the e-portfolio is comprised of a) data which are selected in a well structured way, b) children's projects based on specific purposes that present their development and c) all the information that is stored digitally and organized with the appropriate software. The e-portfolio enables the user to navigate at any time and any place, using an easily accessible digital tool [36]. Teachers upload, store and process the children's works in the e-portfolio and promote the procedure of assessment, encouraging them to comment on the process of learning or on their achievements [35]. The e-portfolio is an important tool for teachers but also for students which creates multiple links to projects that are presented in the school environment [37]. Particularly, researchers have argued various types of e-portfolio [31,38]. Abrami and Barrett [31] reported that e-portfolio may be categorized into 3 types: a) process portfolio that focuses on the way the learning procedure is conducted through the student's projects, b) showcase portfolio which presents the best works and c) assessment portfolio, that is created for evaluation. The process portfolio predominates the others because it helps the child to construct his/her knowledge, familiarize him/her with the learning process, and reflect self assessment and peer assessment [36]. According to [39] through the use of e-portfolio, students engage themselves into the self assessment process for their work and thus support a more substantial learning way that promotes important educational skills. The e-portfolio and the portfolio have proved to increase the motivation of children to evaluate their peer's work by developing comments, whether these are inside or outside the classroom [33,40]. The whole process of the use of e-portfolio creates independent students who realize their significant experiences, procedures and situations in order to improve the level of their knowledge [41].

Furthermore, several studies suggest that the evaluation of children in school is achieved by the authentic assessment tool of portfolio [42], [43]. In general, the portfolio focuses on self and peer assessment, by creating an environment with new goals that helps the child to get feedback and promote self reflection. At the same time, portfolio and e-portfolio promote active learning because they enable to create discussion and reflection on their friend's work [44]. Hence, this active peer's conversation motivates children to be involved in the process of self and peer assessment [45]. Therefore, e-portfolio can be considered as a tool that develops critical thinking and evaluation reasoning in learning [4]. As a result, through e-portfolio children get involved into the process of reflection upon their experiences and identification of how they understand the knowledge they have acquired. To evaluate their work, children seek for specific aims and try

to compare their projects based on existing knowledge [46]. More specifically, both portfolio and e-portfolio promote an authentic evaluation of the progress and improvement of the educational process [4,47]. Children throughout the process of learning, need to be responsible and collect and produce material for a specific purpose.

Studying various surveys, someone could highlight several advantages of the use of e-portfolio [44]. To begin with, one can argue that e-portfolio develops more effectively the various multimedia technology skills of the student [31,40]. Moreover, e-portfolio reinforces the formative evaluation, since it makes it easier to exchange ideas and develop and process feedback from students [48]. Furthermore, another advantage concerns the reflection that occurs through the use of the e-portfolio. Children engage themselves in the learning process and acquire experiences by linking different pieces of information [48]. Through this procedure, children's experiences seems to be rewarded on a psychological level, leading to their personal satisfaction [49]. Moreover, e-portfolio involves students in their evaluation process, through which they monitor their own personal development, understand their strengths and weaknesses and review different components in order to improve their learning development [40]. Unlike portfolio which constitutes a collection of the best works in a paper format, e-portfolio can incorporate multimedia such as graphics, photos, audio, video and recordings, a fact that makes it superior to other approaches [31]. Moreover, data from e-portfolio can be transferred very easily and quickly in a CD, or other portable formats [31]. Finally, student's material is accessible at any time and place by the user [40]. This means that apart from the child itself, access to the e-portfolio can be granted to teachers, parents, peers, etc. [50]. The above assertion reports on the benefits of e-portfolio and facilitates its implementation and utilization in relation to portfolio.

However, the interactive use of technology in schools is not evident in most countries [51], and therefore some teachers do not seem to be motivated in using it during the learning process. Moreover, it has been observed that when there exists a positive interaction between the students and the teacher, the first develop a more positive attitude towards the school environment [52]. In this context and due to the limited Greek educational research reports, the current research focuses on the utility of the application of the e-portfolio in a kindergarten classroom of a private school. As a result, little research has been conducted in order to examine how peer assessment is promoted when using e-portfolio in primary education, since its use is mainly focused on secondary [53] and higher education [54].

3. Methodology

In this section, we describe the methods that were used in this work, in order to investigate the use of the e-portfolio as a qualitative and alternative assessment method, and answer the research questions introduced in Section 1. Particularly, we give details about the participants, the instruments used, the technical details about the development of the e-portfolio and the general procedure followed for this research approach. Finally, we report the analysis of the data collected and the role of the teacher in this investigation.

3.1. Participants

In the present study, the participants were students of a small kindergarten [1] classroom of a private school in Trikala, Greece, during the school year 2014-2015.

3.2. Instruments

In order to identify the usefulness, necessity and functionality of the e-portfolio, semi-structured interviews were held with parents and their children during the first pilot implementation of the e-portfolio. Moreover, after the pilot phase, additional semi-structured interviews with parents and children took place respectively. The latter, concerned the opinion of the children regarding the collection, selection and evaluation of their e-portfolio, while the first concerned parent's opinion about the operation of the e-portfolio. The questions asked to the parents during the interviews were open-ended and were similar to the questions asked to the children, so as to have triangulation in data. Furthermore, additional semi-structured interviews were held on a monthly basis within the school year, regarding the progress and development of their child with comments on their educational process and presenting their overall work. As a result, the expected outcome through these specific interviews was the parents to evaluate the progress of the e-portfolio, by expressing their experiences and opinions about the use of the tool at home.

Within three months of the use of the e-portfolio, a set of open-ended questionnaires were given to the parents. Through these questionnaires we expected to identify any questions or concerns regarding the use of the tool and suggestions or ideas in order to improve it. More specifically, the questionnaires were consisted of open-ended questions concerning the operation of the e-portfolio, how frequently the child and its parents use it, questions and difficulties in posting comments below each work of their child and finally general discussion about the e-portfolio. After the completion of the use of e-portfolio, open-ended questionnaires were given to the parents of the children. In the second questionnaire, half of the questions were the same as in the first set, while the rest regarded the contribution, operation and use of the e-portfolio. Taking into consideration the above instruments, we used triangulation of data in order to verify the validity of our work. According to the triangulation theory, the researcher tries to combine different sources of data and information as a method to check validity and consistency of the research findings [55].

3.3. Development of the e-portfolio

In order to develop and implement the e-portfolio online platform, we used web development techniques and

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[1] Kindergarten in Greece is the first level of the compulsory primary education and the ages of the students are between 5 to 6 years old.

more specifically content management systems (CMS). Content management systems constitute advanced web development tools that allow the user to design and manage a webpage in an easy and fast way. Moreover, using content management systems allow the user to create a webpage through an easy graphical environment without the need of producing HTML, MySQL and PHP code [56].

Particularly, the CMS tool we used for the development of the e-portfolio was Drupal [57]. Several specific packages (modules) were installed in order to allow the use of different features in an easy way, such as uploading posts that contain text and multimedia or designing user profiles. Finally, significant emphasis was given to the security of the e-portfolio website, where specific modules were employed in order to secure any form of sensitive data uploaded on the platform. The initial design and testing of the e-portfolio was held on a local server (standalone computer) using the tool Wampserver [58], and the final form was uploaded on a real webserver and was accessible by all the users at the address http://www.topaidikooneiro.net.

3.4. Procedure

Portfolio. In order to optimally implement the portfolio approach inside the classroom, initial discussions were carried out with the children, in order to find a specific area to store their portfolio folders. Furthermore, it was mutually agreed, that the children would select at the end of every week their best works. The use of the portfolio was organized and classified in 3 specific categories. The first category was that of the free activities, in which a child could choose a work from the current week, such as free painting or various free crafts. The second category included the thematic planned activities (topic) in which a child could choose the most important activity according to his/her opinion. The third category included the children's work that had a specific goal in the learning areas of the current curriculum.

Based on the above categories of portfolio, the child had the opportunity at the end of every week to choose only one work from each category. To this direction, the child had to choose a work for his/her portfolio and at the same time to explain, in the form of comments, the reason for his/her selection. Initially, the teacher had a more advisory role to the children helping them with their comments, while after a few months she was more encouraging to them to give more details and information about their selection. Thus, the choice for the material in the portfolio could range from a child's favorite work to a difficult one.

After four months of successful use of the portfolio, the method of the selection process of the child's work was upgraded to include peer assessment. In particular, the children were forming groups of 3 to 4 that could monitor the phase of the selection and reflection of their friend for the portfolio. At the same time, they encouraged their friend's choice for an activity or expressing a comment on it, strengthening in that way the peer assessment process.

E-portfolio. After two months of use of the portfolio, we designed a digital platform on which we implemented the e-portfolio during the school year. The teacher-researcher received the positive consent from all the parents to use

data from the work of their children, such as comments on images from everyday life at school for the general operation of the e-portfolio. Moreover, we generated an individual password for every child so that each corresponding parent had access to his/her works and was able to share thoughts and comments that were only visible to the family.

In order to maintain the same structure of the portfolio, the e-portfolio had the same three main categories regarding children's projects including one additional category. This last category was named as "other activities", and the teacher could select and display material (photos, recordings, videos) of each child, during the individual or group play time. Furthermore, the teacher could post a comment related to the personal achievements of the children or encourage the parents to post comments or questions about their children's works. Similar to the portfolio, the presented comments in the e-portfolio were arising from the child's self assessment during his/her work selection and from the comments derived from peer assessment.

3.5. Teacher's Role

The teacher in this investigation had a dual role, that of the researcher and that of the teacher, and more specifically that of a participant observatory role. Participant observation is an exploratory method that focuses on a small number of the investigated groups [59]. The observation took place in the classroom, in the school yard during the break time and during the children's dinner time.

Through the participant observation and action research, the teacher assimilated into the research environment, trying to observe and record comments during the day and the lessons, about the learning process and development of the children. As a result, the action research gave the teacher the opportunity to be aware of any issues in the classroom [60], in order to improve the applied practices, a fact that verifies that action research combines theory and practice [61]. According to [62], action research is a systematic approach contacted by the teacher, in order to gather information about the children's learning progress, their teaching practices and generally issues that occur in the school. Moreover, action research is considered flexible due to the fact that the teacher can evaluate and re-design new practices and methods in order to improve the learning process in the classroom [63]. Generally, action research is suggested to all teachers who want to be successful in their work and to promote their teaching methods in the most effective way [61].

Another instrument used in this work was a calendar operated by the teacher-researcher in order to systematically record, design and reflect the roles and procedures of the educational process during the action research [64]. The teacher-researcher observed and reflected the achievements of the children for various projects, individual and group efforts, on a daily basis. Additionally, it was proved useful to collect material, such as images, audio recordings and videos from the educational process of the children. Recording a calendar throughout the school year contributed positively in the contemplation of different concerns in the educational process and in resolving them. Hence, the calendar assisted the teacher-researcher to refer

to any feelings, problems, interactions, reflections etc. that took place in the educational process. Furthermore, the daily use of the calendar helped the teacher to evaluate the educational practice that was followed and to get to know better the children and their educational needs.

3.6. Data Analysis

In this work a qualitative analysis of the data was used through action research and by the teacher-researcher of the class. Moreover, the approach of content analysis was employed where the analyzed data were comprised of data collected from the questionnaires, the researcher's observation and data from the semi-structured interviews transcribed from the recordings [65]. Through this process, data were classified in themes and then categorized and analyzed according to the thematic content analysis [65]. The first thematic area was related to the application of the e-portfolio and was characterized as a) usefulness, b) fun and c) communicational. The second thematic area had to do with the child's attitude, which was divided into a) effusive and b) explanatory. The third thematic area concerned the child's emotions regarding mainly a) satisfaction, b) pride and c) joy. Similarly, the fourth thematic area was related to the emotions of the family environment, which was characterized in a) pride and b) joy. Regarding the frequency of the use of the e-portfolio which was the fifth thematic area was separated in three categories a) on a weekly basis, b) every 10 days and c) once per month. Also, the sixth area concerning the peer relationships comprised of a) cooperation, b) setting rules and c) interaction. Regarding the interaction between the child and his/her family the seventh thematic area emerged, that was divided into a) moral support and b) reflection. Finally, the eighth thematic area regarded the feedback received by the children for the use of e-portfolio and was categorized into a) individual b) group. Table 1 shows a summary of the aforementioned categorization.

4. Results

In this section, we present the results derived from the data analysis that were collected from semi-structured interviews with the parents and the children separately, before and after the implementation of the e-portfolio. Moreover, another useful material that contributed significantly in the results presented in this section, were open-ended questionnaires. Parents answered two sets of open-ended questionnaires that took place during and after the use of the e-portfolio respectively. Finally, two important tools that were operated by the teacher-researcher were the teacher's daily calendar and the participant observation in the context of action research.

4.1. Application of the e-portfolio

Regarding the application of the e-portfolio, the children were asked if they faced any difficulties when using the e-portfolio. The answer of all children was 'no' and only 3 of them reported some minor difficulties when collecting and selecting their works for e-portfolio. In another question the children were asked if they would like to continue using the e-portfolio and all of them answered positively ('yes'). Apart from the children, their parents expressed their excitement for this electronic platform as well.

In general, the implementation and application of the e-portfolio was characterized as a *useful* action according to 17 recorded reviews from the tools' analysis. 'I like the fact that the e-portfolio is more personalized and presents the personal and learning development of my child', said one of the parents. Furthermore, in respect to 11 statements recorded from the materials' analysis, the application of the e-portfolio was considered as an opportunity for *fun* at home. 'The moment we were logging on the e-portfolio was very special to us … it was very fun watching with our child her works together', said the parents of student 1. Another characterization about the application of the e-portfolio was that of *communicational*. Particularly, according to 8 reports of tools' analysis, e-portfolio was regarded to promote communication between the children and the whole family. According to the teacher's calendar, student 4 reported: 'Miss, yesterday I was looking with my mom at the picture I made for the moon … I explained her how difficult it was to finish the ladder to the moon when the head of my paintbrush broke down'.

Table 1. Thematic content and corresponding categories, as derived from the data analysis

Thematic content	Categories		
Application of the e-portfolio	Usefulness	Fun	Communicational
Child's attitude	Effusive		Explanatory
Child's emotions	Satisfaction	Pride	Joy
Parent's emotions	Pride		Joy
E-portfolio frequency of use	On a weekly basis	Every 10 days	Once per month
Peer relationships	Cooperation	Following rules	Interaction
Child and family interaction	Moral support		Reflection
Feedback about the e-portfolio	Individual		Team

4.2. Child's Attitude

In the area regarding each child's attitude, according to 15 reports, it was observed that during the use of the e-portfolio at home, each child maintained an *effusive* attitude. 'She looks with great interest at her works and many times she asks us to read the comments made by her classmates', said the parent of student 4. Additionally, a set of 12 reports reveals an *explanatory* attitude for the children when being at home. The Parent of the student 3 reported: 'He was explaining to us how he struggled to finish his work and then compared it with other works of his classmates … he was talking about his friends' works and what they selected for the e-portfolio'.

4.3. Child's Emotions

As the child's emotions are regarded, parents and children were asked to talk about the emotions caused during the use of the e-portfolio. Parents spoke of a positive emotion expressed by their child as it was a new experience for him/her and for them as well. According to the data collected from the tools' analysis, 8 reports stated that the emotions of the children, while they were looking at their works at home in the e-portfolio, was expressed as *satisfaction*. 'Sometimes she was talking about the pictures she made, which we were going to see in a few days in e-portfolio … when we were logging on a few days later, the child felt satisfaction about the fact that we were watching it all together now', said the parent of student 7. In addition to the previous categorization, another 10 statements from the materials' analysis reported that children felt *pride* at home while observing their posted works. 'I was looking at my works at home and I was also showing them to my grandma … she told me they were brilliant', said student 8. Finally, 9 recorded comments from materials' analysis stated that children were also experiencing *joy* in the house while observing their posted works. 'Our child was feeling joyful and excited while he was explaining to us his works', said the parents of student 9.

4.4. Parent's Emotions

In the thematic area of the emotions of the family environment, parents expressed pleasant emotions while watching their child's projects and progress through the e-portfolio. Observations of 15 data collected from parents, revealed that they felt *pride* when they were looking at their child's work. 'I was impatient to see the next work of my child and I felt very proud about his overall improvement', said the parent of student 2. Additionally, 12 reports showed that parents felt *joy* while looking at their child's work in the e-portfolio. 'Using the e-portfolio brought us even closer with our child in a creative way and all of us felt very joyful', said the parents of student 9.

4.5. E-portfolio Frequency of Use

In the thematic area that regards the frequency of the use of the e-portfolio, 11 reports were collected by parents that were using the online platform *on a weekly basis*. On the other side, 9 reports proved that parents visited the e-portfolio *every 10 days*, while from 7 reports it is derived that the parents visited the online platform *once per month*.

4.6. Peer Relationships

The thematic area of peer relationships presents results derived from the analysis of the teacher's participant observation and calendar. The daily observations of the teacher-researcher reveal various interesting outcomes for the developing *cooperation* among the children. Moreover, another important category designated by the teacher regarded the relationship among the peers and concerned *following the rules* in the classroom. The following example presents an instantiation of the previous category:

Student 8: 'Miss, student 5 won't give me the educational clock.'

Teacher: 'Have you asked her politely?'

Student 8: 'Student 5 will you please give me the clock when you finish playing with it?'

Student 5: 'Ok, I will play once more and then give it back to you.'

Finally, the last category of this thematic content concerned the *interaction* among the classmates. 'You need to think carefully which picture you did better and remember it more clearly', said student 9 to student 7 in order to encourage her to select material for the e-portfolio.

4.7. Child and Family Interaction

Regarding the interaction between the child with his/her family environment, 21 reports collected from parents and children revealed that this interaction during the use of the e-portfolio relied on *moral support*. 'He always wanted to hear our opinion … we were explaining to him what we enjoyed in his works and this was something that created stronger bonds among us', said the parent of student 2. Another 15 reports of parents and children for the interaction that occurred when observing the work in the e-portfolio, concerned the child's *reflection* on the material selection process. 'She always wanted us to read her the comments made by her classmates … she always remembered the comments and selections of her best friends', said the parents of student 7.

4.8. Feedback about the e-portfolio

Initially, as derived by 17 reports the feedback developed by the children was categorized as *individual* during the use of the e-portfolio. 'The e-portfolio helped our child promote self assessment … she knew that she should find a good reason to select her next works', said the parents of student 9. Other 10 reports present that during the collection and selection process of the material in the e-portfolio, *team* feedback was developed. 'Through the selection process of their works, the children promoted expressing their opinion to other classmates', said the parents of student 7.

5. Discussion

The objective of this work was to design, implement and evaluate the e-portfolio approach as an alternative

assessment method in a kindergarten classroom. In particular, we tried to investigate whether the application of the e-portfolio promoted self assessment in an individual level and peer assessment among the students in the classroom by providing comments on each other's work. The results obtained in Section 4 reveal interesting research directions in respect with the research questions of this study. Initially, according to the first research question of the survey the aim was to examine if the e-portfolio approach can be applied effectively in the kindergarten classroom. Results revealed that children showed a positive attitude towards the use of the e-portfolio throughout the school year and they developed positive feelings about it. According to [66], developing a learning platform certain essential principles need to be taken into consideration, such as the active involvement of the students in order to promote peer cooperation and communication. As a result it was observed that through the application of the e-portfolio and generally action research, the interaction, communication and cooperation among the peers was enhanced significantly. This particular observation was even stronger after the half school year than the beginning.

According to [34] e-portfolio offers an active interaction between the teacher and the children, since the first can get to know better the students through this educational material. Hence, the interaction between the children and the teacher in this context triggered the development of an authentic evaluation process which was based on the use of the e-portfolio. As mentioned in [67], self assessment is considered authentic when the students know that they are being evaluated, with which method that they are being evaluated and finally develop a trustful relationship with their teacher.

According to the second research question of this survey the aim was to investigate if the e-portfolio can be considered as a useful tool to contribute to the development of the reflective skills among the children and the promotion of self assessment in the classroom. Barrett & Wilkerson [32] stated in their work that e-portfolio helps children to improve their learning skills and encourages self assessment. Results showed that children were positively encouraged to develop their reflective skills during the collection and selection process of the e-portfolio. Moreover, children were proved to responsibly develop their own learning method through the process of reflection [68,69]. In a similar way, children appeared to promote self assessment during the use of the e-portfolio [47]. According to [14], children need to feel positively within the evaluation process, knowing that they will benefit from it. The process of self evaluation and reflection seemed to be difficult for the children at the beginning of the use of the e-portfolio as it was something new for them. For example, the initial feedback on the works of the children was mainly comprised of a few simple comments. As the use of the e-portfolio became more common and familiar to the children throughout the school year, self assessment became more targeted to the purpose of the e-portfolio. As a result, the comments of the feedback were significantly improved both quantitatively and qualitatively.

Furthermore, the aim of the e-portfolio approach in this study was also to focus on the promotion of peer assessment. Empirical studies [53,70] have shown a positive relationship between the use of portfolio and peer assessment. As mentioned above it was the development of self assessment of the children through the use of the e-portfolio that encouraged the development of peer assessment inside the school environment. For example, as soon as the self assessment process was comprehended by the children, they were encouraged to add more comments to the work of their peers. It is worth mentioning that it took some time for the children to understand and adopt the peer assessment process. Hence, all the children claimed to enjoy to be involved in the material selection process of their friends and most of them responded positively to the peer assessment process. As stated by [45], the active discussion among peers, strongly motivates them to involve in self and peer assessment procedures. The e-portfolio showed to increase the motivation of the children to promote peer assessment, developing comments, inside or outside the classroom [33,40].

Apart from the main goal of the application of the e-portfolio, namely the development of self and peer assessment, another question that had to be addressed was whether self assessment was promoted by peer assessment. Bronfenbrenner in his work [9] claimed that an individual is motivated and interacts positively with his/her surrounding environment which plays a key role on his/her life. Results showed that children who have significantly promoted self assessment, peer assessment contributed positively in further development of self assessment. As reported by [18] the development of self assessment and reflection in children, was mostly promoted at a high level by comments they receive from their peers and teacher. On the other hand, children who experienced difficulty in formulating and expressing comments to their friends, the feedback received from their peers helped them improve their own confidence and self assessment development.

Last but not least, the active response of the children's family environment to the use of the e-portfolio, was a key factor that played an important role in this research. Results revealed that more than half of the parents systematically used the online platform to log on the profile of their child and claimed a weekly frequency of use. Moreover, children reported in the interview process and through the observation of the researcher-teacher that they logged on the e-portfolio with someone from their family and in the majority of the cases with their mother. As verified by [71] the e-portfolio worked as a way for digitizing various projects of the children and it was open for access from their family. As a result, in this work it was demonstrated that children who were growing up in an environment that promoted communication and self assessment, were able to participate more actively in the learning process [4,72]. All parents responded positively to the use of the e-portfolio, and especially half of them showed a much stronger engagement.

6. Conclusions and Suggestions

In this work, we designed implemented and evaluated the e-portfolio approach in a kindergarten classroom. Results showed that children reacted positively to its use,

promoting in that way their self and peer assessment development. At this point, it is worth mentioning some limitations that were encountered during this investigation. Firstly, one limitation from the beginning of the school year was the fact that the number of the participants in this research was relatively small. Thus the small size of the sample cannot be considered as representative for generalization.

Furthermore, although parents were encouraged to leave comments either by themselves or along with their child, that was not always the case. Particularly, despite the fact that all parents had an introductory induction for the use of the e-portfolio and claimed to face no problems in using it, some of them participated less actively than others. For example, a parent who faced a difficulty during the log on process in the e-portfolio was prompted to contact the teacher-researcher through the help page in the e-portfolio. Finally, the action research process and the participant observation of the teacher-researcher could lead in safer qualitative results, if it was possible to include comments for more than one observer. In this context, it would have been more beneficial if another fellow teacher could have played the role of a 'critical friend' of the teacher in this survey [64].

Some future directions of the current work could include upgraded features in the use of the e-portfolio so that action research could be conducted in a more beneficial way. For example, it would be interesting to investigate what qualitative results would be if parents with their children could comment on other children's profiles and works. Furthermore, the e-portfolio could enable direct interaction between the children and the school. Particularly, as a case scenario, when the teacher would upload the material chosen in the profile of each child, parents and their children would be able not only to view, but also extend the current project and then upload it on the e-portfolio. In general, the digital format of the e-portfolio makes it easier to develop a number of new features that follow recent technology trends, which could result in a more beneficial educational process overall.

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