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I Congrés Internacional de
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A L'EDUCACIÓ INFANTIL

I CONGRESO INTERNACIONAL DE CIENCIA
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Introducció

Aquest llibre d'actes recull totes les contribucions presentades, avaluades per doble revisió i acceptades al I Congrés Internacional de Ciència a l'Educació Infantil (Manresa, 5, 6 i 7 de juliol de 2023) organitzat pels estudis de Mestre d'Educació Infantil de la Facultat de Ciències Socials de Manresa de la Universitat de Vic – Universitat Central de Catalunya.

El Congrés neix per donar resposta a dues preocupacions ben actuals.

Per una banda, es constata fàcilment que en qualsevol congrés de didàctica de les ciències, la presència de les aportacions d'educació infantil és poc més que residual, al mateix temps que en els congressos d'educació a les primeres edats, la presència de l'educació científica també és molt limitada. Amb l'organització del Congrés s'ha volgut evidenciar la identitat pròpia de la ciència a l'educació infantil i visibilitzar una àrea de coneixement tan propera als infants, que senten curiositat des que obren els ulls al món per interpretar els fenòmens i entendre com funciona la realitat que els envolta. Si es vol treballar per aconseguir una millor relació de la ciència amb la ciutadania, cal començar a oferir experiències gratificants d'acostament a la ciència des del mateix moment del naixement.

Per altra banda, preocupa també la freda relació existent entre el món de la recerca en educació i el món de la pràctica educativa a l'escola. Cal que aquests dos mons dialoguin amb molta més fluïdesa del que ho fan habitualment i per aconseguir-ho cal crear espais que facilitin el contacte i l'intercanvi entre la investigació i la docència. Un diàleg que s'ha de donar des de la igualtat, des de l'expertesa de cadascú, ja que tant pot aportar la investigació a la docència com el saber docent a la investigació. D'aquestes sinèrgies en sortiran beneficiades les escoles alhora que les universitats en tant que centres d'investigació i en tant que centres de formació de futures mestres.

El Congrés es centra en les següents línies temàtiques escollides per la seva rellevància en l'educació científica en els primers anys: competència científica fins als 8 anys, amb especial atenció a les primeres edats (0-3); educació científica inclusiva per a reflexionar sobre com aconseguir fer de la ciència un context afavoridor de la inclusió; formació inicial i permanent del professorat per l'impacte en les noves educadores; i els reptes del futur que encara la societat amb l'agenda 2030.

El llibre d'actes s'estructura per tipologia de contribució: presentacions orals i pòsters, taules rodones, tallers pràctics i experiències escolars. De cada contribució es presenten totes les dades bàsiques i el resum ampliat que es va rebre com a versió final, excepte en el cas de les contribucions que només presenten l'abstract, que són les que es proposen per a formar part del monogràfic *Ciència a les primeres edats* de la revista *Didàctica de las Ciencias Experimentales y Sociales* de la Universitat de València (publicació prevista: desembre 2023).

Confiem que les investigacions, reflexions i pràctiques presentades en el Congrés i recollides en aquest llibre d'actes puguin ser l'espurna que encengui l'interès d'agents educatius i polítics en millorar l'educació científica des de les primeres edats.

COMITÈ ORGANITZADOR

Introducción

Este libro de actas recoge todas las contribuciones presentadas, evaluadas por doble revisión y aceptadas en el I Congreso Internacional de Ciencia en la Educación Infantil (Manresa, 5, 6 y 7 de julio de 2023) organizado por los estudios de Maestro de Educación Infantil de la Facultad de Ciencias Sociales de Manresa de la Universidad de Vic - Universidad Central de Cataluña.

El Congreso nace para dar respuesta a dos preocupaciones muy actuales. Por un lado, se constata fácilmente que en cualquier congreso de didáctica de las ciencias, la presencia de las aportaciones de educación infantil es poco más que residual, al tiempo que en los congresos de educación en las primeras edades, la presencia de la educación científica también es muy limitada. Con la organización del Congreso se ha querido evidenciar la identidad propia de la ciencia en la educación infantil y visibilizar un área de conocimiento tan cercana a los niños, que sienten curiosidad desde que abren los ojos al mundo por interpretar los fenómenos y entender cómo funciona la realidad que les rodea. Si se quiere trabajar para conseguir una mejor relación de la ciencia con la ciudadanía, es necesario empezar a ofrecer experiencias gratificantes de acercamiento a la ciencia desde el mismo momento del nacimiento.

Por otro lado, preocupa también la fría relación existente entre el mundo de la investigación en educación y el mundo de la práctica educativa en la escuela. Es necesario que estos dos mundos dialoguen con mucha más fluidez de lo que lo hacen habitualmente y para conseguirlo es necesario crear espacios que faciliten el contacto y el intercambio entre la investigación y la docencia. Un diálogo que debe darse desde la igualdad, desde la experiencia de cada uno, ya que tanto puede aportar la investigación a la docencia como el saber docente a la investigación. De estas sinergias saldrán beneficiadas las escuelas a la vez que las universidades en tanto que centros de investigación y en tanto que centros de formación de futuras maestras.

El Congreso se centra en las siguientes líneas temáticas escogidas por su relevancia en la educación científica en los primeros años: competencia científica hasta los 8 años, con especial atención a las primeras edades (0-3); educación científica inclusiva para reflexionar sobre cómo conseguir hacer de la ciencia un contexto favorecedor de la inclusión; formación inicial y permanente del profesorado por el impacto en las nuevas educadoras; y los retos del futuro que encara la sociedad con la agenda 2030.

El libro de actas se estructura por tipología de contribución: presentaciones orales y pósters, mesas redondas, talleres prácticos y experiencias escolares. De cada contribución se presentan todos los datos básicos y el resumen ampliado que se recibió como versión final, excepto en el caso de las contribuciones que sólo presentan el abstract, que son las que se proponen para formar parte del monográfico *Ciencia a las primeras edades* de la revista *Didáctica de las Ciencias Experimentales y Sociales* de la Universidad de Valencia (publicación prevista: diciembre 2023). Confiamos en que las investigaciones, reflexiones y prácticas presentadas en el Congreso y recogidas en este libro de actas puedan ser la chispa que encienda el interés de agentes educativos y políticos en mejorar la educación científica desde las primeras edades.

COMITÉ ORGANIZADOR

Introduction

This book of proceedings collects all the contributions presented and evaluated through peer review and accepted at the 1st International Conference of Science in Early Childhood Education (Manresa, July 5th, 6th and 7th, 2023) organized by the BA in Early Childhood Education studies from the Manresa Faculty of Social Sciences of the University of Vic – Central University of Catalonia.

The Conference was devised to respond two current concerns.

On the one hand, it is easy to see that in any Science Didactics conference, the presence of contributions from Early Childhood Education professionals is very limited. At the same time in Early Childhood Education conferences, the presence of topics about Science Education is also very limited. Thus, the organization of this conference aims to demonstrate that science education in early childhood has an identity of its own. Also aims to make visible an area of knowledge close to children, who feel curious from the moment they open their eyes in order to interpret phenomena and understand how the reality that surrounds them works. In order to achieve a better relationship between science and the public, it is necessary to start offering rewarding experiences of approaching science from the moment of birth.

On the other hand, the limited relationships between the world of educational research and the world of educational practice in schools is also worrying. These two worlds need to dialogue much more fluidly than they usually do. To achieve this, it is necessary to create spaces that facilitate contact and exchange between research and teaching. A dialogue that must be generated from the point of view of equality and from the expertise of each side, since research can contribute to teaching and also teaching knowledge can contribute to research. Schools will benefit from these synergies' schools and universities as well, as research centers and as training centers for future teachers.

The Conference focuses on the following thematic lines chosen for their relevance in science education in the early years: scientific competences up to the age of 8, with special attention to the early years (0-3); inclusive science education to reflect on how to make science a context that favors inclusion; initial and permanent teacher training for the impact on new educators; and the challenges of the future that society faces with the 2030 agenda.

The book of proceedings is structured by type of contribution: oral presentations and posters, round tables, practical workshops and school experiences. For each contribution, all the basic data and the expanded summary submitted as final version are presented, except in the case of the contributions that only present the abstract, which are the ones that are proposed to be part of the monograph *Science in the Early Years* from the Journal on *Didactics of the Experimental and Social Sciences* (*Didáctica de las Ciencias Experimentales y Sociales*) from the University of Valencia (expected publication: December 2023).

We trust that the research, reflections and practices presented at the Conference and collected in this book of proceedings can be the spark that ignites the interest of educational agents and politicians in improving scientific education from an early age.

ORGANIZING COMMITTEE

PAPERS ACADÈMICS I PÒSTERS

PAPERS ACADÉMICOS Y PÓSTERS

ACADEMIC PAPERS AND POSTERS

Impact of teachers' emotions on the teaching planning of the scientific areas in childhood education

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ABSTRACT

Currently, research reveals that teachers' emotional experiences guide their curricular decisions and condition the changes they can manage regarding educational practices. For this reason, in this research, from a qualitative and in-depth perspective, we seek to analyze the emotions experienced by teachers in an Early Childhood Education Center when planning the scientific areas and pedagogical activities to teach their students between 3 and 5 years of age. The results reveal that teachers' emotions come from memories of their school biography when learning these areas and from their desires. The results show evidence that the emotions that have their genesis in the school biography encourage teachers to avoid teaching certain scientific areas (especially Physics and Chemistry), as they are more alien to them and generate insecurity. Likewise, the emotions triggered by their desires condition decision-making when planning since they only choose those contents and activities that they believe will manage to control discipline and/or arouse interest in learning. Consequently, identifying the affective teaching dimension in the planning processes can be considered relevant since they can affect or stimulate the quality of the educational practices that are designed.

KEYWORDS

Early Childhood Education, scientific areas, teaching emotions, pedagogical planning, case study

INTRODUCTION AND THEORETICAL FRAMEWORK

Teaching is considered an emotional practice (Casassus, 2007; Hargreaves, 2000; Ritchie et al., 2011) due toa that play a role fundamental in the taking of decisions, something that the teachers do constantly in their practices educational. In the case of the teachers of Early Childhood Education the research show that I know feel insecure with certain contents, and that means that Sciences are not very present in these classrooms (Sackes, 2014; Furman, 2016).

Previous studies have shown that the educational practices of teachers in scientific areas are partly influenced by their own school biography, which in many cases generates memories of positive emotions because of learning in Primary Education (Brígido et al., 2013). and produces memories of negative emotions originating in Secondary Education, especially when learning Physics and Chemistry (Costillo et al., 2013; Dávila, et al., 2016).

In line with this aspect, there is a broad consensus about the importance of the teaching task in the educational act in order to extend and review the previous ideas that children have about natural phenomena (Howitt et al., 2011), for On the one hand, to promote education in these areas and to enrich teaching and learning throughout early childhood (Cowie & Otrel-Cass, 2011) and, on the other hand, to better prepare students for the years following and promote future vocational guidance (Akerson et al., 2011). However, previous studies have detected that teachers do not usually take advantage of the full didactic potential of practical Science activities with inadequate planning and execution (Bravo et al., 2019; Bravo et al, 2022).

For these reasons, it is considered that in order to know what happens with Science in Early Childhood Education, it is necessary to listen to the teachers, who can inform us about what they do in their classes: what content they teach, what they think and what they feel about what they teach. do (Cantó-Doménech et al., 2016).

Within this framework, the objectives proposed for this research are: a) to examine the relationship Come in the emotions triggered in the current affairs and the school biography of the teachers; c) investigate what kind of emotions trigger the yearnings or teaching needs; d) describe how the emotions felt by the Center's teachers have an impact on teaching planning, taking into account the type of emotions (positive or negative) and their origin (school biography and teacher needs or desires).

METHOD

A qualitative research of descriptive and interpretive nature was carried out, through a case study (Álvarez and San Fabián, 2012), in an Early Childhood Education Center (Buenos Aires). form part of is research the full squad of educators (three teachers) who are in charge of 52 children aged 3, 4 and 5 years. The data collection techniques used are two questionnaires of self-management to each teacher, a semi- structured group interview, an individual interview to each teacher. For data processing, the thematic analysis methodology proposed by the comparison of content from various sources from an established set of categories theoretical (Ballestín and Fàbregues, 2018). The two categories that have emerged from the data analysis are:

Teachers' emotional experiences during teaching planning. Subcategory: a) type of emotions; b) origin of emotions.

Teaching decisions within the framework of teaching planning: a) scientific areas chosen to teach; b) type of content selected and type of activities chosen.

RESULTS

How the emotional memories of the school biography impact on the decisions when planning the teaching of scientific areas

The three teachers have manifest that remember feeling pleasure, sympathy, joy (self-management questionnaire) when studying the scientific areas in Primary education. In this regard, in the group interview they expressed:

"I liked Science in Elementary School, because I they liked animals" (Celina). "I liked learning science at school. Elementary School because they touched on topics that they were interested in, like nutrition"(Gina). Instead, Maite expresses: "I liked learn Sciences why they taught topics of me interest, even though I remember to feel disgust when we dissected an eye cow in the laboratory".

In Secondary Education the three remember to feel happiness to the learn biology. Not however, celina Y Gina, recall feeling *irritability and frustration* when learning Physics and Chemistry. Maite states that she felt *joy* when she studied the contents of these subjects (in the self-management questionnaire).

Celina and Gina currently believe that they would feel *negative emotions* if they had to teach Physics or Chemistry, but they feel positive emotions when teaching Biology. Maite would feel and feel *calm or joy* when teaching all the branches *(self-management questionnaire)*. In the planning, it was observed that Celina and Gina select only Biology contents and avoid Physics and Chemistry, connected to negative emotional experiences. Maite, prefers to include Physics content *in* their planning, without ruling out the possibility of teaching Chemistry or Biology: *"teaching any branch of Science amuses me a lot, I like it..."* (individual interview).

The selection of the areas in the planning coincides with the memories of positive emotional experiences that the teachers expressed having had, throughout their compulsory schooling.

How do emotions originating from teachers' needs or desires impact decisions when planning the teaching of scientific areas?

The planning annual of Celine and Gina it only has Biology content, such as "parts *of Body human and the senses"* (Celina) and the *"dinosaurs"* (Gina).

celina justify the decision saying: "with the issue of Body human HE that the children participate". He adds: "when the boys are interested in something, bother less and behave better" (individual interview). Motivation and discipline control are considered two I long teacher pedagogy.

Gina justifies her decision by saying: "it arouses interest in the children of four years" . Add: "with the issue of the dinosaurs i make sure the stake of all class… I like to see them entertained, motivated with activities in the that I know have fun…" (group interview).

In the planning Celina and Gina do not incorporate the teaching of skills scientific What the observation, description, formulation of questions researchable, design experimental. This has the consequence that the classes do not encourage the intuitive ideas of the little ones to advance towards more rigorous knowledge, since the children are not out of tune to enrich their scientific ideas.

For her part, Matt decide include in his planning Physics content such as: "*the light, the shades Y the materials*". The teacher includes the teaching of scientific skills such as observing and describing natural phenomena or developing hypotheses and predicting possible results of what is going to happen (for *example, describing how the size of shadows varies when the distance between object-source of light varies). light),* among other activities. Teacher regard a is choice He says: "*I like much to teach stuff that challenge me as the sequence of lights and shadows...is very complete...and different from what is teach the little ones* ... (interview individual). Add: *"I choose these topics why I like much … that the children of five years them will like and I know will interest for learn"* And he goes on to say that: *"When they are entertained, they participate, have fun and improve their behavior",* considered a pedagogical desire (see their students motivated and control discipline).

CONCLUSIONS AND DISCUSSION

In summary, the evidence shows that the emotions experienced by the teacher's guide their pedagogical-didactic decisions for planning in the teaching of the area since the negative ones limit the selection (Celina and Gina case) and the positive ones generate freedom (Maite case) to choose educational proposals (Science branches and contents and proposals for classes more focused on teaching scientific skills). When the latter happens, the plans are more enriching for the teaching of the area than in the first case because they design more varied activities and implement new conceptual contents or scientific skills (Maite's case). In short, teachers' emotions guide pedagogical decision-making, impacting teaching planning, that is, they affect curricular decisions (Zembylas, 2003).

Although we must continue delving into other studies that confirm the representativeness of the emotions experienced by Celina, Gina and Maite and their impact on their decisions when planning the teaching of the area, we are convinced that the study of these cases opens a valuable door in the study of the potential that the design and execution of pedagogical, metacognitive and emotional follow-up and support programs (as we propose) can have to achieve, in this way, the security and empowerment that teachers need to design and implement proposals for scientific literacy from early childhood, as a necessary strategy to train full citizens in the 21st century.

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Early Childhood Teachers facing the challenges of the 21st Century: The role of socio-environmental Issues

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ABSTRACT

Today's society is characterized by a series of problems, including social inequalities, armed conflicts, climate disasters, or the depletion of natural resources, among many others. All of them are challenges that education has to face, playing a fundamental role as a promoter of scientific and environmental literacy. Future teachers must, therefore, be trained to become aware of the situation and be given the tools to face these problems.

From this perspective, within the framework of the subjects "Knowledge of the Social Environment in Early Childhood Education" and "Teaching of the natural environment in the 0 to 6 years old stage", which are taught in a coordinated manner in the third year of the Degree in Early Childhood Education at the University of Seville, we propose to the students an activity of reflection, through a report, on the challenges of the 21st century, as stated in the Royal Decree 95/2022, the most recent Spanish Education law.

The analysis of the reports elaborated by the 53 students has been carried out following a qualitative methodology of content analysis. This has allowed us to know that the challenges of "protecting the environment", "planning healthy life habits" and "promoting gender equality" are the ones they consider to be the most important ones to develop with Early Childhood Education students. Therefore, we can conclude that future Early Childhood Education teachers give relevance to teaching science content from an early age since two of the most chosen challenges are directly linked to this discipline.

KEYWORDS

Early Childhood Education, Higher Education, Curricula, 21st Century Challenges, Environmental Literacy

INTRODUCTION AND THEORETICAL FRAMEWORK

Imbernon et al. (1999) said in their book Education in the 21st Century: The Challenges of the Immediate Future, that the beginning of the 21st century was seen both with hope for renewal and unbridled technological advances, and with suspicion and uncertainty. Today, however, the outlook has not changed much. There have been great advances in science and technology, but there are still social inequalities, armed conflicts, depletion of natural resources, etc. This scenario poses a series of challenges in which education has a fundamental role to play as a promoter of scientific and environmental literacy. Consequently, future teachers should receive training that allows them to become aware of the situation and provides them with tools to face these challenges (Fermín, 2007; Moreno-Crespo and Moreno-Fernández, 2015; Gómez-Trigueros et al., 2019).

From this general framework, in the present study we set out to find out which challenges are the ones that future teachers of the Early Childhood Education Degree consider most relevant and how they justify their choice.

RESEARCH METHOD AND DESIGN

The sample for this study consisted of 53 students who were enrolled in the subjects "Knowledge of the social environment in Early Childhood Education" and "Teaching the natural environment in the 0 to 6 years stage", which are taught in a coordinated manner in the third year of the Early Childhood Education Degree at the University of Seville. This was a purposive and convenience sample, which agreed to participate voluntarily in this study after being informed and having been guaranteed anonymity and ethical treatment of the results.

For the study, qualitative research was conducted within a descriptive and interpretative paradigm (Creswell, 2013).

The material for analysis were the individual reports requested from the students. These reports were composed of several questions, the first of which is the one analyzed in this study. This question required the students to make a justified choice of one of the challenges included in Royal Decree 95/2022, which establishes the organization and minimum teaching of Early Childhood Education. The analysis was carried out in two phases: the first in which the selected challenges were counted and the second in which a content analysis of the justifications accompanying the selection was carried out. For this last phase, an inductive category system was determined, composed of four categories that correspond to four levels of progression (Rodríguez-Marín et al., 2014) according to the greater or lesser complexity of the justification developed (Table 1).

TABLE 1. CATEGORY SYSTEM

Level	Category
Level 0	There is just a description, the reasons for choosing the challenge are not mentioned.
Level 1	There is a justification using arguments based on the student's own interest or experience.
Level 2	There is a justification using arguments based on the importance of responding to a socio-environmental need or educating children.
Level 3	There is justification using several of the arguments listed in the previous categories.

RESULTS

We show below the results obtained after data analysis. First, we identified the frequency of choice of one of the thirteen challenges of the 21st century contemplated in Royal Decree 95/2022. After this, we were able to determine that students seem to have a predilection for challenges related to science didactic contents, being "protecting the environment" with 18% of responses and "planning healthy life habits" with 17% of responses, 2 of the 3 most chosen challenges. In the third position, we found "promote gender equality" with 13% of the choices.

Regarding the justifications offered by the students for these choices, and following the category system presented above, 38% of the responses are at the level we would consider desirable (level 3), with answers such as: "from my point of view it is an issue that is becoming more important lately, since every day we see news of how the planet is being destroyed, either by causes beyond our control or by the influence of human beings. In addition, I believe it is essential to transmit to children the importance they have in life [...]. If we do not transmit this need to them from an early age and they do not adopt behaviors that make them responsible adults, it will be difficult for them to become adults who are aware of the importance of caring for the environment" (A15).

However, the level with the highest representation is level 2 with 43%, in which they usually indicate that it is important to address the challenge in early childhood education or value the socio-environmental relevance of the problem, with answers such as: "because it is important to educate our children to take care of both the environment around them and the animals that live in it. It allows them to learn measures that favor their care and to be aware of how important it is, since [...] they have to maintain it for future generations" (A12) or "I have chosen this challenge because I think that nutrition and our eating habits and lifestyle have serious consequences on health and quality of life" (A30).

On the other hand, in level 1, with 17% of representation, we find answers based on their personal interests. And finally, only 2% of the responses are at level 0, where they do not justify the reason for their choice.

CONCLUSION AND DISCUSSION

After this study, we can conclude that, although all the challenges posed by the legislative text are closely interrelated, the future Early Childhood Education teachers of the University of Seville consider relevant the challenges more related to scientific and environmental literacy, since the most selected challenges have been environmental protection and healthy habits, coinciding with the recommendations and strategies to follow in initial teacher training (Ángels, 2011; Aramburuzabala, et al. 2015; Cantó, 2016; Cañal, 2004; Albornoz-López, 2010). Furthermore, in their justifications they indicate the importance of addressing these issues at an early age and because of the socio-environmental relevance of the problems, establishing a clear transfer to their professional future.

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Analysis of Paper Records of School Science Activities for Early Childhood Education

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ABSTRACT

This research presents the analysis of paper records made by children in three activities that are part of a didactic sequence on native plants of the semi-desert ecosystem of Monte. Forty-five five-year-old children, who attended *Jardín de Infantes N°1* in the city of Cipolletti, Río Negro, Argentina participated in the sequence. The proposal was founded on Inquiry-Based Education, the cognitive model of science, Restoration-Based Education and the purpose of teaching speaking and writing in Natural Sciences. Paper records included image classification, a double-entry comparison chart with three variables, and drawings of native plant observations. The children successfully sorted the images, and about 90% completed the comparison chart correctly. The drawings faithfully express the plant they observed, representing the same plant structures with similar lines. It is concluded that children of this age can make a variety of paper records that favors the construction of knowledge in Natural Sciences. Going deeper into this type of research promotes scientific education of citizens from early childhood.

KEYWORDS

Scientific Education, Restoration-Based Education, Kindergarten, Speaking and Writing in Science, Paper Records.

INTRODUCTION AND THEORETICAL FRAMEWORK

In Argentina, the purposes of scientific literacy for early childhood education are focused on favoring environmental inquiry (Ministerio de Educación de la Nación, 2004). Within the framework of a doctoral research, a sequence of activities was implemented in four groups of five-year-old children. The teaching proposal was substantiated on the Inquiry-Based Education (Harlen, 2012), the cognitive conception of science (Giere, 1999), the perspective of Restoration-Based Education (McCann, 2011) and the purposes of teaching

Natural Science proposed by Pujol (2003). Regarding the purposes of teaching to speak and write in science, each activity carried out in the classroom included a paper record made by each child of the contents addressed. This selection was based on the theory of distributed cognition (Perkins, 2001) and on the postulates of the external representation system (Pérez-Echeverría, Martí y Pozo, 2010).

RESEARCH METHOD AND DESIGN

The research methodology included a sequence of activities that was implemented in four groups of five-year-old children attending Jardín de Infantes N°1[1], in Cipolletti, Río Negro, Argentina. It was developed between September and November 2022 and forty-five students participated. The teaching contents focused on native plants and their adaptations. In this paper, the analysis of children's paper records of three activities used to teach the following basic idea (Harlen, 2012), is presented:

The plants of the "barda"[2] are different from those of the city, because they have small and hard leaves, some are light-coloured, others form thorns or have green stems. These characteristics allow them to live in an environment with little water, heat in summer and a lot of wind.

TABLE 1. DESCRIBES EACH ACTIVITY WITH THE CORRESPONDING PAPER RECORD

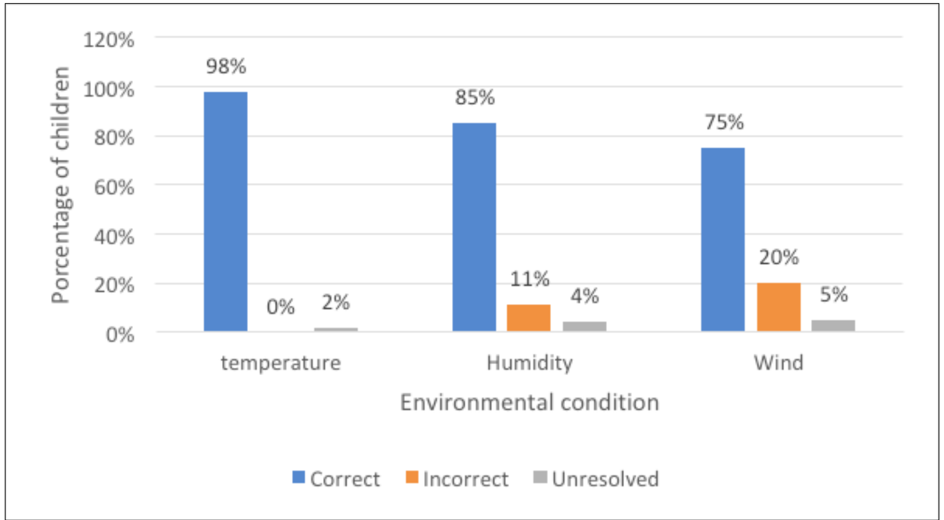
Activity	Role of teacher and children	Children´s paper record
N°1: Inquiry Initial Models	A serie of images of plants of the *barda* and the city were distributed. The teachers enabled the group discussion with trigger questions: How are these plants alike and how are they different? Where can they be found?	They placed the image on one of two posters. One for the plants of the city, represented with an image of the square and another for the plant of the barda, represented with an image of a natural site near the city.
N°2: Characteristics of the *barda* environment	A navigation was carried out with the google earth application. It began with the image of planet earth from which we "traveled" to a Patagonian Andean forest environment, to later contrast it with the semi-desert Monte environment.	They completed a double-entry table that compared the two environments visited (*barda* and forest) according to average annual temperature, humidity, and wind. To complete the table, they had to place a sticker that contained a different icon for each box.
N°3: Recognition of herbarium plants	With native plants collected from the Monte, the teaching team made a herbarium that was offered to the children, who in circles on the tables observed each plant. Observation was guided by trigger questions in order to identify the thorns, small, hard or light green leaves and photosynthetic stems.	They selected one of the herbarium plants and made a drawing of it. For the drawings they used black and colored pencils and markers.

RESULTS

The analysis of the paper records indicates that activity N°1, which asked to classify images of plants belonging to two different environments, was solved correctly by all the children, except for one student who placed the image where it did not correspond. The results of activity N°2 are presented in two graphs. In this activity, across a dialogue, the children traveled through the Google Earth program. They were able to compare the environmental conditions between barda and forest regarding the variable: average year temperature, precipitations and wind speed. After the traveling, the children had to place a sticker, with an icon representative of each variable, in a double-entry table to compare both environment, barda and forest.

[1] The name of the institution in Spanish is maintained. It refers to a kindergarten institution or an infant's school.
[2] The popularly so-called *Barda*, refers to the front of the plateau of Monte ecosystem, one of the forms of relief typical of the Patagonian region.

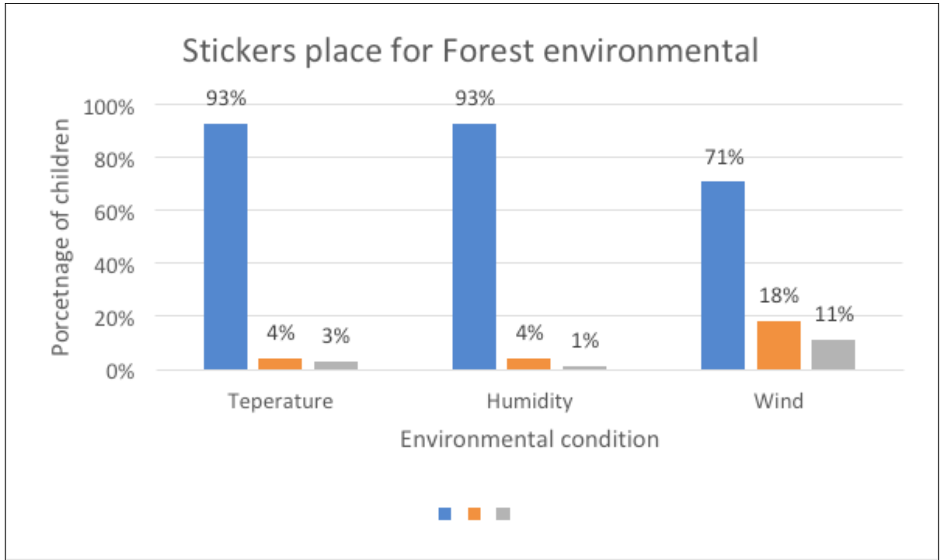
GRAPH 1. ANSWERS OBTAINED IN THE TABLE DOUBLE-ENTRY *BARDA* ENVIRONMENTAL



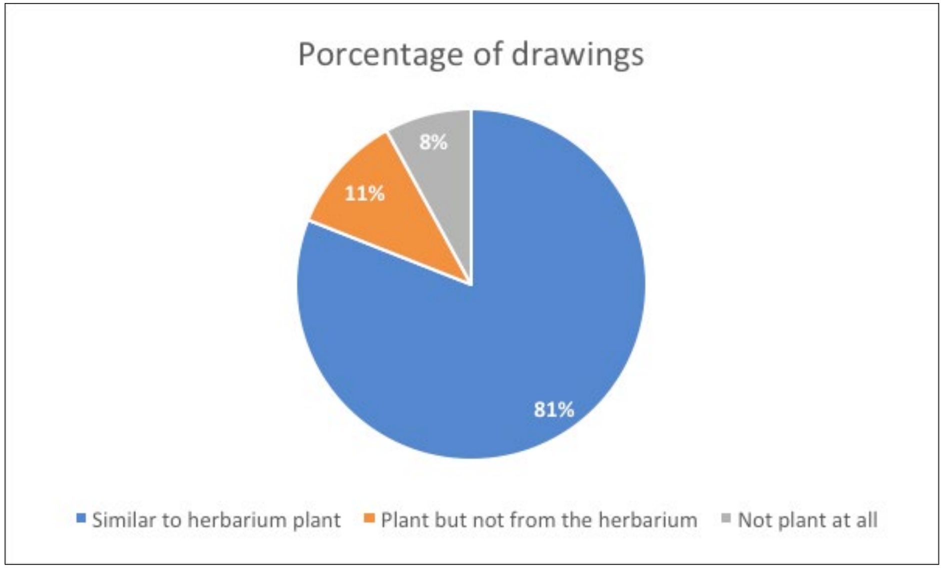
Graph N°1 shows responses obtained regarding the barda environment, and the N°2 those procured for the forest environment. We recorded the percentage of children who placed the icons correctly, incorrectly, or unanswered, for each variable. The evidence shows that the majority completed the three variables correctly for the two environments. In subsequent activities, we addressed the adaptations of the barda plants to these environmental conditions.

Regarding activity N°3, in which students had to draw a plant of their choice from the herbarium, it is observed in the graph three, that 81% of the children faithfully represented the selected plant, without resorting to stereotypes of plants presented in cartoons, tales or in their own houses. 11% drew plants with characteristics that did not correspond to the species in the herbarium. Finally, 8% of the children scribbled straight and curved lines. It is worth mentioning that, in the drawings of different children, the structures and characteristics of plants were expressed in a similar way.

GRAPH 2. ANSWERS OBTAINED IN THE TABLE DOUBLE-ENTRY FOREST INVERONMENTAL



GRAPH 3. RELATION BETWEEN THE DRAWINGS AND THE HERBARIUM PLANT



CONCLUSION AND DISCUSSION

Although it is recognized as a purpose of science education that students can speak and write in science, there is little research on the symbolic language that young children use to express the construction of their knowledge about school science (Farina, 2021). In this study we found that children can coherently use different types of paper records such as classifying images, completing comparative tables and drawing the observed object. The use of analogies and comparisons are valuable strategies for learning Natural Sciences (Justi, 2006). Drawing is the preferred type of creation in early childhood (Vigotsky, 1930/2015), and our research presents evidence that five-year-old children can make drawings similar to the plants they observe. In this regard, Pérez-Echeverría, Martí and Pozo (2010), argue that the meaning of the paper records "resides in what it represents, that is, in the information that it brings us about something that is not present" (p. 134).

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Child participation in science learning helps 3-4 year olds to encode relations between everyday entities

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ABSTRACT

The purpose of this study is to examine the potential of child participation as an approach to inclusive science education to promote relational thinking as an important competency related to science learning. Roma children at age 4 and a half and 5 years from a segregated kindergarten were tested at the end of a period their teachers supported and encouraged child participation in their regular science activities. The relational preferences of children in the Child participation group double both longitudinally and in comparison to a control group from the same community at the same age. The partial etas squared indicate large effects of the participatory science learning environment on RMTS task, which potentiate its importance for both science learning and cognitive development.

KEYWORDS

Child participation, development, inclusive science education, relational thinking, RMTS (relational matching-to-sample task)

INTRODUCTION AND THEORETICAL FRAMEWORK

Child participation can be defined as an approach that belongs to the large family of good practices in inclusive education (Esteban, 2022). It refers to learning environments that recognize children as important stakeholders in their development and typically influence the frequency and intensity of children's participation in their own education (Maxwell, Granlund, & Augustine, 2018). However, it has rarely been tested as an important factor for science learning (for an example, see Roth, & Lee, 2004), where cognitive factors such as relational thinking have been the focus instead (Dumas, 2017). This study aims to fill this gap and draw a line between inclusive education in general and child participation in particular as a way to promote science learning and in turn relational thinking, and at an early age. The research question is whether child participation in science activities can support science learning, particularly through relational thinking.

RESEARCH METHOD AND DESIGN

Kindergarten children were pre-tested and post-tested after 3 months of teacher training and supervision to implement child participation in their STEM activities. Teachers were supported to explore how to increase children's participation in routine science learning situations. Observation protocols and their self-reported activities showed that they encouraged active use of the senses in exploring learning materials, turn taking, and comparing (e.g., which is heavier, which is the largest continent, which are the best conditions for growing seeds, etc.). As a result, children's relational thinking before and after the introduction of child participation in science learning situations appeared to be positively affected. It was measured using a relational matching-to-sample-task (RMTS), which includes familiar objects such as food (i.e. apples, tomatoes, eggs, and juice) and artifacts (i.e. glasses, balloons, and books). Color photographs of these objects taken from Brady, Konkle, Alvarez, and Oliva (2008; 2013) were combined in different relations so that one response alternative illustrated the same target relation with different objects and the other illustrated a different target relation with the same objects as in the standard pair. For example, children were asked which was more similar to the standard pair consisting of two glasses filled with red juice, a pair of the same two glasses filled with orange juice, or a pair of one empty glass and one glass filled with red juice. The second contains the same object as the standard (i.e., a glass full of red juice), and the first contains different objects in the same relation (i.e., full glasses). Therefore, children are given a choice between a relationally similar but superficially dissimilar pair of objects and a relationally dissimilar but superficially similar pair of objects. Both responses were correct, but for different reasons, and the question was whether the participatory learning environment during science learning situations would be sufficient to change children's preference for this unrelated task. Moving towards more relational choices would mean a willingness to go beyond perceived objects and look for possible relations between them, which in turn are key to science learning where functions, interactions and relationships are between objects/parts/elements.

To test this, the RMTS choices of 13 children (9 girls) aged 59.5 months at posttest were compared with (1) their own preferences on the same task a year earlier (i.e., at age 47.5 months at the pretest), and (2) a control group from the same Roma community and kindergarten matched for age (i.e., 59.4 months) and sex (9 girls and 4 boys) to the target at the posttest. The study was approved by the Research Ethics Committee of the Department of Cognitive Science and Psychology at New Bulgarian University.

RESULTS

The mean relational choice scores of children in the Child participation group increased significantly from pretest (M=0.271) to posttest (M=0.500): F (1, 13) = 13.419, p=0.003, $\eta 2$=0.508. The results do not change if their cognitive development as measured by DAYC (Voress, & Maddox, 1998; Koltcheva, 2005; Koltcheva, 2008) is considered as a covariate. At the same time, the relational choices of children in the Child participation group (M=0.500) differ significantly from those of their peers matched in age and sex (M=0.238): t (25) = -5.733, p>0.000. Finally, partial eta squares show large effects of the participatory science learning environment on the RMTS task. The relational choices of the children in the Child Participation group were almost double those of the two control groups.

CONCLUSION AND DISCUSSION

This research fills an important gap between child participation as an approach to inclusive education and the cognitive benefits it brings. Children at the Child participation group but not children at the control group preferred rational in front of perceptual similarity between pairs of familiar objects, hence relational shift (Rattermann, & Gentner, 1998) that usually takes place at that age cannot explain alone that result. Based on previous research on

Child participation, this cognitive gain can be attributed to children's increased curiosity about the world around them and increased responsibility for their own actions and thoughts. Moreover, it was speculated that spontaneous curiosity may enhance relational discovery at age two (Gentner, Shao, Simms and Hespos, 2021). However, the goal of this study was not to identify specific drivers of change, but rather to explore the potential added value of engaging children through a child participation approach as the core of inclusive science education (Love, & Horn, 2021). Last but not least, both the children in the control group and the Child participation group learned the same concrete science facts (e.g. body parts, life cycle, etc.) but developed different transferable competencies and skills, as the way we measured their potential to learn science was through an abstract and unrelated to the concrete science content they were learning, relational reasoning task.

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Young children's creative products in a STEAM project

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ABSTRACT

Creativity is closely related to the development of STEM competencies: the creative process relates to scientific inquiry, as, in order to take decisions, it is needed to identify problems, design and test prototypes and solutions, and take decisions based on data. Creativity can be examined from a collective perspective as a product of interaction with cultural tools. This case study involves a group of children of diverse learning capabilities and their teacher, engaged in a range of STEAM projects over a school year. We examine children's creative products, such as their 2D designs of houses and 3D final constructions, using comparative content analysis. We aim to contribute to expanding current knowledge about inclusive content-specific instruction. The STEAM projects carried out allowed all children to develop their creativity. Results show that children created a diversity of products, original and fit for purpose, achieving their interests despite their different abilities.

KEYWORDS

STEAM, creativity, structures, diverse learning abilities, inclusive instruction

INTRODUCTION AND THEORETICAL FRAMEWORK

The development of STE(A)M competencies is closely related to creativity. The creative process promotes scientific inquiry as, in order create products and solutions, children need to take part in science practices: they identify problems, design and test prototypes and solutions, and take decisions based on data. Welch and McPherson (2012) state that creativity allows to transform the environment to provide original solutions to problems that are complex. Thus, children's solutions, such as their productions, designed and created during STEAM projects' are products of their creativity. Creativity is a core XXIst century skill (Donovan et al., 2014) that can be fostered by education (Shaheen, 2010). It can be defined both individually and collectively (Kupers et al., 2019).

Our perspective of science learning in early ages is rooted in socio-cultural views (e.g. Fleer & Pramling, 2015), thus, our interest relies in the collective, focusing in creativity as a product of interaction mediated by cultural artifacts.

Research and policy have acknowledged the relevance of providing children with learning opportunities for developing creativity and STE(A)M competencies. STEAM pedagogies have shown positive results in science education, yet studies in Early Childhood are scarce (Ata-Akturt & Demircan, 2017). The introduction of the A of Arts in the STEM acronym may provide an easier way for young children's teachers to design instruction, as they usually feel more efficient in subjects such as the arts and the languages than science (Appleton, 2003). Learning can be hindered by socioeconomic issues as well as by both lower and higher cognitive abilities than average (Rodríguez-Naveiras et al., 2019). Classrooms are diverse and instruction design should be inclusive and address all children. STEAM pedagogies have shown to provide opportunities for including diverse interests and more research on STE(A)M educational contexts that pay attention to diversity, whatever its cause, are needed (e.g. Blanco et al., 2022).

This study involves learners with differing abilities and interests. We aim *to examine children's creative products in the context of a STEAM project*. Results of the study may help in guiding design of inclusive tasks and learning goals.

RESEARCH METHOD AND DESIGN

The research takes place in a non-formal education STEAM academy. The methodology is qualitative (Merriam, 2009). A group of four girls and four boys (6 to 8 years-old) and their teacher (second author) were accompanied by the university researcher (first author) along a school year, during weekly sessions of 1,5h. All children are of ethnical and social origins alike, four children have high abilities and one cognitive difficulties. The projects involved the design and construction of 2D and 3D structures, circuits and video-games. Informed consent from the children's families was gathered to accompany and register (audio, video and pictures) selected sessions. Children are identified with pseudonyms and data that led to their identification was avoided.

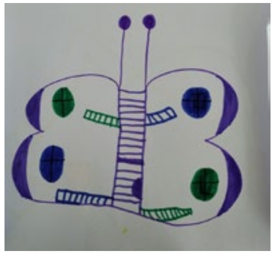
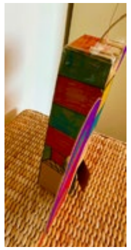
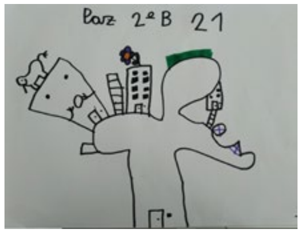
We report results from one of the projects. We are guided by Murcia et al.'s (2020) framework A to E Children's Creativity Framework, who use the dimensions *person, product, process*, and *press* to examine young children's creativity. Within the dimension *person* we focus on children; and within the dimension *product* (Table 1), we focus on their individual designs and final products. These are examined through *comparative content analysis* (Bell, 2001). The analysis *variables* are: *resources*, *appearance* and solutions to *stability*.

RESULTS

Children were asked to design and build a house. The project chosen is a real problem, as, in order to build their designed houses, they analyzed and solved the difficulties encountered, related to the possibilities of the materials' initially chosen or the stability of the houses they built, whilst aiming to meet their aesthetic concerns.

The products of three children illustrate the results (Table 1). Regarding *resources*, all children employed an A3 white sheet and either colored (children 1 and 2) or only black marker pens (Child 3) for their 2D design. For the final product, they chose materials and tools available in the classroom. Figure 2 shows the choice of paper bag, paperboard and a blue marker (Child 1). Regarding *appearance*, different floors, with the doors on the basement, stairs and spaces for sport-playing are depicted in this house. When producing the initial design, Child 1's explained the idea of creating a "bag-house", using a blue plastic bag decorated with permanent markers. Regarding *stability*, when building the prototypes, Child 1 found that the plastic bag was not stable, and began to use a paper bag instead. Nevertheless, the house shape wanted by Child 1 could not stand on its own and paperboard was added to the top to achieve the final result. Child 2's final product, created using paperboard and colored markers, resembles physically the initial shape of a colorful butterfly house. As shown by the side view, the stability was achieved by using paperboard rectangles as basic structures and pasting the butterfly shape on the front, with a little door. Child 3 also chose to use the same basic paperboard structure and decorated it with colored pens and tinkering supplies. The initial idea showed a smiley house with many details in it. When coming to stability, its shape was difficult to achieve and the difficulty was overcome by Child 3's choice of using pipe cleaners to resemble the initial design.

TABLE 1. INITIAL 2D DESIGN AND 3D FINAL PRODUCTS OF THREE CHILDREN

	2D Initial Design	3D Final Product
Child 1		
Child 2		 
Child 3		

CONCLUSION AND DISCUSSION

This STEAM project allowed all children to develop their creativity, achieving their interests despite their different abilities. The diversity of products met the two core features of creative products, being original and appropriate for purpose (Runco & Jaeger, 2012).

Limitations due to extension restrictions are that, aside from examining the products of children's creativity, detecting patterns in the pedagogical practices that support children's learning is equally important for providing teachers with tools that can be used to develop their work. This objective could be pursued by expanding the analysis of person to analyze the teacher's practices as well examining children-teacher-resources interactions and organizational patterns, related to dimensions *process* and *press*.

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How do prospective teachers approach an interview to find out the ideas of children's learners?

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ABSTRACT

The aim of the study was to see how students in the third year of the Degree in Early Childhood Education, in the course of their first subject in Didactics of Experimental Sciences in the degree, design and implement an interview to identify the previous ideas that children in Early Childhood Education have about health-related aspects. The proposals, with specific guidelines, were to be addressed to Infant Education children in the context of the coronavirus. It is therefore a documentary analysis with an eminently quantitative treatment. The results revealed some interesting achievements but also some shortcomings that should be much better addressed at the initial training stage.

KEYWORDS

Initial teacher education, didactic knowledge, early childhood education, preconceptions, Health

INTRODUCTION AND THEORETICAL FRAMEWORK

Although in recent years there has been a growing number of contributions on the initial training of Early Childhood Education (ECE) teachers (Pro et al., 2022), we believe that it is still necessary to clarify and discuss what should be the didactic and professional content, in the field of science teaching, that should be prioritised in ECE undergraduate studies (Cantó et al., 2016).

Among the skills that any science teacher must develop, which must be addressed from their initial training stage, are: making decisions about what to teach, making decisions about how to teach, making decisions about what and how to evaluate, developing educational action and evaluating teaching, and promoting their own professional development (García-Barros, 2016). However, we agree with Perales et al. (2014) that the central axis of knowledge in competences should be "know-how" implemented in real learning contexts.

Thus, among the professional competences that Bachelor's Degree in IE students should acquire are "designing and regulating learning spaces that meet the unique educational needs of students" and "knowing how to systematically observe learning and coexistence contexts and knowing how to reflect on them" (BOE, 2007), as educational intervention must take into account the diversity of students so that educational practice can adapt to the personal characteristics, needs, interests and cognitive style of students (BOE, 2022).

Therefore, it seems appropriate to address, in the initial training of EI teachers, an important didactic aspect such as the detection of students' prior ideas through questions, which is not an easy task to implement in the classroom but which, if used properly, can help them to enhance reasoning skills or stimulate language (Cruz-Guzmán et al., 2017).

This work is part of a larger study focused on checking the degree of acquisition of the didactic knowledge and professional competences required by future EI teachers to teach science. Here, we only focus on assessing how a group of students conducts an interview to collect and analyse the prior ideas that EI children have about aspects related to health education.

RESEARCH METHOD AND DESIGN

The study was carried out in the context of the subject "Teaching and Learning of Natural Sciences I" (6 ECTS credits), the first subject of Didactics of Experimental Sciences, located in the third year of the Degree in IE at the University of Murcia. This subject promoted the development of didactic contents integrated with the scientific topic of the human body and health. The participants in the task "Let's find out the children's ideas" were a total of 51 students, mostly women (88%), who were distributed in 15 working groups of 3 to 5 people. This group practice consisted in the elaboration of an interview with six questions (the last one a drawing) with which they had to find out the previous ideas -about COVID- of four or five second cycle EI schoolchildren.

In this way, we carried out a documentary analysis of the students' written reports, which had the following requirements to be considered: [E1] characterisation of the interviewed participants (anonymous identification, characteristics and presentation of the information), [E2] details of the interview (place where it was conducted and use of guiding or rephrasing questions), [E3] design of the instrument (adjusted to the number of questions, explicitness of intentionality, typology of questions and materials used), [E4] prediction of answers, [E5] analysis and interpretation of results and [E6] conclusions obtained.

RESULTS

Following the analysis carried out, we give a descriptive breakdown of the results obtained in terms of the six considerations above.

With regard to E1, 75% generally chose to interview 5-year-olds, except for four groups that opted for 4-year-olds, a priori simpler ages. In addition, all of them maintained the anonymity of the pupils, 73% identified them with acronyms and 33% presented their characteristics in tables.

As for E2, all groups detailed, to a greater or lesser extent, the context in which the interview was conducted, and 66% also detailed the use of pre-established rephrasing questions to facilitate the collection of information, an aspect recommended by the age of the children.

Regarding E3, all of them covered all six required questions except for one group that did not include the drawing and only 60% clearly explained the intention of each question in their instrument. The questions were mostly open-ended (67%), as opposed to semi-closed (24%) or closed (9%). Moreover, 64% of the questions were subdivided into several questions, 56% used resources or materials (pictograms, images, food, everyday objects, etc.) and 33% of the drawings additionally required a description of what was represented, which in all cases facilitated understanding.

Concerning E4, all groups indicated predictions (8.2 on average per group) of the participants, individually per question (53%) or as a whole for the whole test (47%).

Regarding E5, all presented the results of the answers in tables and 80% also included frequency and percentage values in the tables. In contrast, only 53%

interpreted the results, the rest merely repeated the data in the table (27%) or did not interpret (20%).

As for E6, all related the results obtained to their predictions, but slightly more than half (54%) did so incompletely, generally omitting some prediction.

CONCLUSION AND DISCUSSION

Although the degree of involvement of our students in the proposed activity was high, possibly motivated by the fact of working with children outside the school practice period, we have been able to verify once again that not all of them assimilate the didactic aspects of the subject in the same way (Pro et al., 2020).

Thus, in the approach of the interviews to find out the prior ideas of the EI children, we found that the results obtained show that there are many difficulties in transposing the results of the research into the professional competences of the future teachers. This should make us rethink different aspects of what we do in initial teacher education.

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Professional development research in childhood for the inclusiveness of school contexts

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ABSTRACT

Within the framework of the H2020 C4S ("Communities for Sciences - Towards promoting an inclusive approach in Science Education") project, the GiocheriaLaboratori educational service of the Municipality of Sesto San Giovanni, in collaboration with the University of Milano-Bicocca (Italian Hub), organised a professional development research pathway for educators and teachers involved in the project, including those practitioners who would be involved in the later pilot phase. The pathway was held on-line (because of the restrictions due to the COVID-19) from February to June 2020, for a total of 10 meetings, attended by 18 teachers, 5 educators and 2 teacher trainees from 3 Infant Schools of Sesto San Giovanni, i.e. Fante d'Italia, Monte San Michele and Primavera. The meetings, lasting two hours each, followed a recursive pattern of training and research-action and therefore involved teachers and educators, between the meetings, conducting classroom scientific laboratories with children (140 in total), also collecting the pedagogical documentation to reflect on with the pathway leads during the training. All meetings were videorecorded and fully transcribed; through a thematic analysis of the words of leads, teachers and educators, the research team tried to answer the following questions: What conditions, according to teachers and educators, promote children's active participation and inclusion in scientific activities? What are their representations of inclusive science education and their own professional development? Therefore, the analysis identified some categories through which to examine the perspectives that a teacher professional development research pathway in the Infant School opens up in terms of inclusive science.

KEYWORDS

teacher professional development research, inclusive science education, childhood education, thematic analysis, participation

INTRODUCTION AND THEORETICAL FRAMEWORK

National and international pedagogical debate highlights the importance of lifelong learning in order to build a system of quality educational services, necessary for the support and good growth of children (Lazzari, 2016). Regarding educational services 0-6, the reference is to the quality principles expressed in the *Proposal for Key Principles of a Quality Framework for Early Childhood Education and Care* (ECEC), that states the need for qualified staff and professional development based on observation, reflection, planning, and collaboration with parents. The document also affirms the need for early childhood education services to strengthen social inclusion, encourage participation, and accommodate diversity. The educational professional is required to have the skills of being able to design, observe, document, verify, and evaluate (Bondioli & Savio, 2018; Peleman et al., 2018), with a view to providing children with high-quality services that promote their skills/talents and support their well-being. According to the *Toolkit for Inclusive ECEC*, for inclusiveness of school contexts we need to ask ourselves: What are the best strategies to make systems more accessible and inclusive for all children? Are there specific strategies best suited to the needs of children with special needs, children from low socioeconomic backgrounds, and children from migrant backgrounds? And how to measure the inclusiveness of educational systems?

So, guided by these general research questions, considering the importance of quality science education to have the proper tools to participate in everyday social life (McGunagle & Zizka, 2018), we designed a professional development research within the framework of Inclusive Science Education (ISE), which combines two perspectives, namely that of inclusive pedagogy and that of science education (Stinken-Rösner et al., 2020).

RESEARCH METHOD AND DESIGN

Within the H2020 C4S project, the GiocheriaLaboratori educational service of the Municipality of Sesto San Giovanni, in collaboration with the University of Milano-Bicocca, designed a professional development research pathway for educators and teachers involved in the project, including those who would be involved in the pilot phase. This pathway was created with the aim of acting on the competences and professionalism of the teaching staff, making them protagonists of a research. In this perspective, we asked ourselves (Asquini, 2018): How can research be contaminated "from within"? Besides, how to act "through research" on teaching professionality?

The methodology of teacher professional development action-research provides a recursive model of design and experimentation – which becomes a training device – with three main purposes: research to contribute to pedagogical development, action to cause change, training to generate transformation in participants (Zecca, 2018). Action-research represents the most advanced form of participatory research, where researchers are conceived as facilitators of heuristic processes and reflection on experience (Mortari & Ghirotto, 2019). So, action-research arose to meet the need to orient practitioners toward a more reflective professionalism and to promote transformative learning.

The pathway was held on-line (because of the restrictions due to the COVID-19 pandemic) from February to June 2020, for a total of 10 meetings, attended by 18 curricular and support teachers, 5 educators and 2 teacher trainees from 3 Infant Schools of Sesto San Giovanni, Fante d'Italia, Monte San Michele and Primavera. Practitioners were involved, between meetings, in conducting classroom scientific laboratories with their children (140 totally), during which they collected the pedagogical documentation to reflect on with the pathway leads. All meetings, lasting 2 hours each, were videorecorded and fully transcribed. Through a grounded approach (Charmaz, 2014) and a thematic analysis of the words of leads and practitioners, the research team tried to answer the following questions: What conditions, according to teachers and educators, promote children's active participation and inclusion in scientific activities? What are their representations of ISE and their own professional development?

RESULTS

The thematic analysis allowed some categories to emerge that characterize the interventions of both path leads and teachers and educators. For instance, the lead can intervene to promote teachers' sharing of documentation collected in the classroom or prompt participants to reflect more on observations made during the laboratories; to provide methodological guidance taken from the literature on the topic concerning the research; to take stock of the situation, guiding next steps through actions that include suggestions or open and closed questions. The teachers and educators, on the other side, can describe and argue the actions undertaken; many of their interventions are aimed at formulating hypotheses concerning the conditions that can promote children's experimentation and that make the experience enjoyable; other interventions reveal their theories and beliefs about issues concerning the quality of relationships among colleagues and children's preferences in the experience of play; others show, through the use of images, symbols, and actions, some of the thought processes involved in how children learn.

The hypothesis formulation is a very present category: from the leads' questions, teachers and educators share hypotheses, which particularly relate to the conditions conducive to children's experience (novelty of the educational proposal, which generates wonder; non-chaotic context and small group experience; experience proposal that succeeds in satisfying the child's need to feel competent; promotion of a gradual detachment from the adult of reference; peer support; proper setting preparation). Teachers and educators are also very willing to problematize their own work, questioning their own abilities to support the child's experiences and ask questions that encourage discovery and experimentation without anticipating the answers.

CONCLUSION AND DISCUSSION

Participants confirm the importance of lifelong learning anchored to the professional contexts, arguing that design is one of the skills to be promoted in training. Professional development research, especially when accompanied, has therefore the positive effect of questioning certain assumptions taken for granted, leading to the deconstruction of teachers' theories about their own role and idea of child. Participants demonstrate the ability to reflect on their own practices toward change, highlighting also some barriers to inclusion (such as the difficulty in establishing trusting relationships with parents and specialists). Science proves to be a social activity that equally involves children and adults, engaged in constructing new knowledge and learning new strategies and methodologies for making meaning of what happens in the classroom.

The results of this research were useful in redesigning the pathway in subsequent years.

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Inclusive science education in infant school: obstacles and barriers to overcome

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ABSTRACT

Science is recognized as a vital part of everyday life, it can help society tackle important topics, such as global warming, pollution, pandemics, and even social inequality. Given this centrality, it seems important to provide everyone with science education from an early age in order to become active agents in modern society. Providing science to everyone means transforming science education in inclusive science education (ISE).

To see how to implement an ISE in pre-school an empirical research, which follows a naturalistic ecological paradigm, has been undertaken. It is a multiple case study methodology which involves an in-depth data collection, placed within a qualitative method. 44 pupils from 2 different infant schools participated in a 3-month pilot research period. During the Infant school Bambini Bicocca's pilot 18 pupils took part in a biology laboratory, whereas in Infant School Monte San Michele 26 kids participated in activities involving physics.

Laboratories were observed and recorded by researchers, recordings were subsequentially coded through an observational grid tailored for the research. Coding brought out 4 factors that facilitate or hinder inclusion: the activity design, that motivates the learning process; the quality of the classroom environment, which predicts learning achievements; peer and adults' attitudes. These variables suggest that in order to have and ISE environment practitioners should adopt specific pedagogical styles and a laboratorial approach.

KEYWORDS

Science education, inclusion, early childhood education, biology, physics

INTRODUCTION AND THEORETICAL FRAMEWORK

Recognized as a vital part of everyday life science can help society tackle important topics, such as global warming, pollution, pandemics, and even social inequality (ScienceEurope, 2021). Given that in today's society the main tool for accessing employability opportunities and making informed decisions is possessing a scientific understanding of the world (McGunagle and Zizka, 2018), quality science education appears to be of enormous importance. Today's society asks for an education of quality which, as stated by the Agenda2030 (2015), must be fair and inclusive and has to offer learning opportunities for all. Even young children, as current and future citizens, must be able to enjoy the right to receive an inclusive science education (ISE) that gives them the proper tools to participate in everyday social life.

To make science available for everyone and to create an inclusive science educational approach the perspectives of inclusive pedagogy and science education must merge. However, as stated by Stinken-Rösner et al. (2020), dialogue between those domains is still rare, making ISE quite scarce. To close the gap between inclusive pedagogy and science education the authors founded the Inclusive Science Education Network (NinU - Netzwerk inklusiver naturwissenschaftlicher Unterricht). This network involves experts in inclusive pedagogy and science education, who see science education as a tool to inclusion of students, which recognizes their diversity and learning prerequisites and ensures individualized teaching-learning processes (Walkowiak et al., 2018). How can ISE be taught to pupils, valuing their diversity and their respective learning prerequisites? How can one teach ISE in preschool?

RESEARCH METHOD AND DESIGN

In order to see how to implement an ISE in preschool an empirical research, which follows a naturalistic ecological paradigm, has been undertaken. It is a multiple case study methodology which involves an in-depth data collection, placed within a qualitative method (Creswell, 2014). The multiple case study methodology wants to shed light on the potentials of science as a medium of inclusion, in the meantime identifying phenomena and recurring patterns among the two distinct case studies (Stake, 2006).

The first case study was conducted at the infant school Bambini Bicocca; a private infant school located in a former industrial area in Milan. 18 pupils took part of the study, it is a heterogeneous age group (age 3-5) and, except one, all the children are Italian. In the group there were 2 children with special educational needs (SEN).

The second case study took place in Monte San Michele, a public infant school of the Municipality of Sesto San Giovanni. The project involved 4- and 5-year-olds from two sections of the school, with a total of 26 children, majority of which had a migrant background. There were 4 SEN kids. Children were divided into groups heterogeneous in gender, age, and skills.

Both pilots took place during the school year 2021/2022 and lasted three months. During the pilot Bicocca's children were involved in biology education whereas Sesto's kids in activities involving physics. Laboratories were conducted by teachers, who had a previous training in the subject, and were observed by researchers. 9 sessions from Bambini Bicocca and 12 from Monte San Michele were recorded, transcribed, and coded through a specific Observational Grid. The Grid was created to extrapolate and codify behaviours and actions that can make science education inclusive. Positive interactions between peers, such as include someone, collaborate, negotiate etc. and positive communication in adults, such as promoting decision making and motivating, are considered practices that make science education inclusive.

The study follows a Responsible Research and Innovation approach, so families and practitioners have been informed and the informed consent has been collected.

RESULTS

Through the coding of observations and the search for dialogic partners, it was possible to observe what behaviours enacted by teachers can make the learning environment inclusive. The three teachers participating (AAU, AP, AI) shared a similar incentive (code = INC) pedagogical style, characterized by a high amount of questioning (code = QUES) and listening (code = LIS) interventions. Furthermore, all three teachers shared a laboratorial approach, designing the activities and curating the learning space in a way that children can explore and learn in their own time and manner working alone or collaborating with peers.

However, even though teachers had the same pedagogical style, they intervened differently: on one hand teacher AAU invited children to collaborate (code = COL) supporting teamwork and AP stimulated participation through the implementation of positive attitudes (code = PA) and the practical management of the activities (code = PMA); on the hand other AI was more concerned on conveying information, questioning, and explaining, missing out good PMA.

CONCLUSION AND DISCUSSION

From the analysis of the results emerged four macro-categories, which strongly impact the course of science laboratories, enabling, or at the opposite end hindering, participation and thus inclusion:

- Activity design.
- Quality of the classroom environment.
- Peer attitude.
- Adult attitude.

In both case studies it was observed that a laboratorial approach is effective in the development of scientific thinking and inclusion. Compatible with Ashgar et al. (2017) we've observed that children's active participation prompted high hypotheses and question formulation, rasing motivation and learning in science.

The overall quality of the classroom, prompted by the activity design, may, or may not, help to include children and to motivate their learning as well. In line with Boyd et al. (2014) observations highlighted that a positive classroom climate, where attentive socio-affective relationships between peers, teachers, and pupils and teachers thrive, affect the overall inclusion in the classroom.

This leads us to think that peer and adult attitude is important for the achievement of an ISE environment. As Lorca, Richaud and Malonda's research (2017) states that parental styles impact on peer positive attitudes our study suggest that practitioner's pedagogical style may have an impact on the inclusion during the activities. Thus, during ISE teachers should work on the establishment of good relationship and, like communication assistants, must become a mediator with respect to the proposed teachings (Mignosi, 2012) and must create "*challenging and relevant themes, contexts, problems, and scientific questions*" (Stinken-Rösner et al., 2020, p.35).

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The use of STEM in early childhood: what do future teachers think about it?

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ABSTRACT

STEM practices are increasingly widespread in education, even in Early Childhood Education. However, there is still a lot of confusion about what it represents in this educational stage, since it is often confused with the simple use of technology. Therefore, it is not only about knowing how to bring STEM practices to the classroom, but also critically reflecting on their use, orientation and limitations. In this work we want to present a work that goes in this direction. To do this, 41 students from the last year of the Early Childhood Education Teacher degree worked individually on an open questionnaire about their beliefs about different aspects of STEM work. Then it was used to a collective debate that analyzed its potentialities and dangers in scientific education of the first ages. The conclusions go in the direction that although there are many useful STEM elements that can be incorporated into children's play and help develop processes of scientific thought, present serious difficulties in applying STEM to teaching practice

KEYWORDS

Pre-service, STEM, digital technology, educational implications

INTRODUCTION AND THEORETICAL FRAMEWORK

The importance of introducing STEM (science, technology, engineering and mathematics) work or STEAM (including art) at an early age, is based on the idea that the earlier scientific skills begin to be promoted, the more important and permanent they are its effects (Watts et al., 2014). Therefore, it is not surprising that different studies have appeared focused on the methodologies that are applied or should be applied to the teaching and learning of these scientific areas in the early ages (Campbell et al., 2018), on the benefits that has for children of these ages (Brenneman et al., 2018), in the difficulties faced by teachers who do not feel well prepared to carry them out or have little practical experience (Çavaş et al., 2013; Early et al., 2010; Paro et al., 2009); in the need for it to be a topic to be dealt with from initial training (Preston, 2021).

In the case of Early Childhood Education, there is often a biased image in which any technological activity is included as a STEM activity without any interrelationship with the other areas. Therefore, it is important that future teachers are able to critically reflect on STEM work. Following this last idea, in this work we want to approach the ideas that pre-service teachers have about the use, advantages and disadvantages of STEM work for their professional future.

RESEARCH METHOD AND DESIGN

The participants were 41 students (38 girls) in the last year of the Early Childhood Education Teacher degree at the University of Valencia (Spain) in the context of a regular classroom activity of Science Didactics subject, during the 2021-22 academic year, in which the students gave their consent so that the data and conclusions could be used in research. The duration of the intervention was two classroom sessions of two and a half hours each. Before the first, they had to answer individually an open questionnaire in which they were asked about different aspects of STEM teaching in Early Childhood Education. The questionnaire consisted of the following five questions: 1) Draw a diagram that shows the relationships between the different areas of the STEM approach; 2) Give an example of a STEM activity; 3) Indicate the advantages and disadvantages of STEM work.; 4) Do you think that STEM work is convenient in the entire stage of early childhood education (0-6 years) or should it be concentrated in certain courses? 5) What training needs would you need to be able to develop STEM work in the early childhood education classroom?

Subsequently, in the first of the sessions, they were randomly divided into groups of 4 or 5 people, where they had to present the ideas, they had written in the questionnaire and reach a summary of the main conclusions in this regard. In the second session, each group shared their conclusions and, together, they had to reach the shared ideas. At that time, a debate began on the use of STEM work in the Early Childhood Education stage.

RESULTS AND DISCUSSION

As regards the answers to the questionnaire: 1) only 5 students (12.2%) were able to show in the diagram all the interrelationships between the different areas of STEM; 2) Only 3 activity proposals can be considered as STEM, indicating the difficulties they have in putting STEM work into practice; 3) The main advantage was the need to jointly show the knowledge involved in STEM and, as for the main disadvantage, the difficulty of finding suitable activities for all ages in this stage; 4) The vast majority (78%) believe that STEM work is more suitable for children aged 4 and over and no one in the group mentioned its usefulness for children under 2 years of age; 5) The three main training needs expressed by the students were: examples of contextualized proposals (82%); lack of adequate materials (64%); the absence of specific training in this field (53%).

Regarding the discussion, there were three axes around which all the interventions revolved. The first was to define types of activities that consider all STEM interventions globally and not just those that used only some isolated element. The second was the confusion between STEM work and the use of certain technological tools (for example, carrying out an activity using robots or building with legos, by itself is not a STEM activity). And, finally, a debate was opened about the most appropriate age to develop this type of work. The majority opinion was that this type of work is best done in the final part of Early Childhood Education (4 – 5 years old), while in the initial stages (0 – 3 years old) it was considered that it was much better to carry out experiential work in contact with natural materials.

CONCLUSION

In this work we have tried to approach the initial ideas that future Early Childhood Education teachers have about STEM work in this educational stage. We have found that the knowledge they possess is insufficient to develop a work of a STEM nature that takes into account its main characteristics: globalized activities that enhance all aspects (science, technology, engineering, mathematics and art), involve children in tasks such as make designs, enhance their creativity, identify problems, find solutions, share ideas, synthesize ideas... through play.

For this reason, it is necessary to reflect on the need to present STEM work models in initial training in accordance with the characteristics of the students throughout the entire stage and reflecting on what the role of the adult should be when presenting and develop these work proposals. The results show that it is necessary to deepen its use from a critical way that allows its correct use in their professional future.

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The school pond: the experience in the faculty of education and in several schools in the Basque Country

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ABSTRACT

There is an increase of early childhood schools that are intentionally using natural resources such as the orchard, naturalized playgrounds or other green spaces to develop scientific competence with children, but not many have used the pond as an educational resource. At early childhood education the pond is suitable to work on the living-being model or to develop simple observation activities of representative species such as odonates or amphibians, the latter being very significant at these early ages. In recent years in the basque region (Spain), the Aranzadi Science Society has promoted the creation of ponds in educational centers, which are being used at all stages from infants to teachers in training. In the Faculty of Education we used the pond for the scientific practice of modeling, through drawings and the use of crosscutting concepts (CCC). On the other hand, we have identified good examples of the use of ponds in early childhood centers of the region such as Bizilore (Azkoitia), Errekabarri (Vitoria-Gasteiz) or Lardizabal (Zaldibia), among others, where children have carried out small investigations in relation to meteorology or nearby biodiversity.

KEYWORDS

School pond, ecosystem, Crosscutting concepts, model, drawings.

INTRODUCTION AND THEORETICAL FRAMEWORK

Outdoor spaces can be an appropriate environment for scientific learning, since as in nature, in these places we can also find a high degree of variability (in sounds, shapes, textures,...) and stability (in patterns, systems...). Perhaps the pond, whether natural or created expressly in the school, is a resource that has not been used much, more scarcely in early childhood (Coffey and Sterling 2003). The pond is representative of the ecosystem model and at lower educational levels offers good opportunities to sample, explore, observe and inquire about the living beings. Other topics such as meteorology or the water cycle can also be worked on through small investigations or observations. It is therefore interesting to compile activities that are based on the pond and make them visible to the educational community. In this work, the two research questions are the following:

- How is the pond model worked in the Faculty of Education?
- How is the pond worked in the early childhood schools of the Basque Country?

RESEARCH METHOD AND DESIGN

In the Faculty of Education of Donostia-San Sebastián we have worked with our students on the modeling of the pond, among other aspects, through the use of drawings and the use of crosscutting concepts. Students were introduced to drawing in a workshop led by scientific illustrators from a basic point of view. The degree of understanding of the ecosystem model was analyzed through the drawings that each group (14 groups, 4-5 students) had to make of the pond. Taking as a reference the three levels of components of an ecosystem (Del Carmen 1999), the elements present in each drawing (accompanied by a written explanation) were categorized. In addition, students were asked to design activities to work on the pond with children, based on scientific processes such as observation, classification or experimentation, and expressly working on at least one of the seven crosscutting concepts (Nordine and Lee, 2021). Students' productions (pond drawings and proposed activities) were used as the base of analysis. In relation to the second research question, we contacted the early childhood schools that work in the School Pond Network of the region (https://www.urmaelaeskolan.eus/), to determine what kind of activities where developed with children.

RESULTS

Most of the activities proposed by preservice teachers were observations (83%), and to a lesser extent predictions (10%) and experiments (7%), related to the classification of insects and amphibians, pond flora, the water cycle or seasonal changes. Three groups of crosscutting concepts were quantified by the degree of use (Figure 1). The most frequent was Causes and effects (8), followed by Patterns (5), Scale, proportion, and quantity (4), Structure and Function (4), Systems and models (3), and a last group that had hardly any presence: Energy and matter (2) and Stability and Change (1). It is interesting to note that in many cases the students mistakenly determined that they were working on one concept when they were really working on another. Taking as an example, the statement 'The leaves on the ground are usually brown, yellow or red, and those on the trees are usually green' is correct when students related it to the CCC of Patterns. On the contrary they stated that 'In each season there will be physical changes in the pond, for example, leaves will fall, the water level will change (there will be less in summer), and other types of living beings will be seen', determining it as Changes, when the correct categorization is Patterns (Nordine and Lee, 2021).

From the analysis of the drawings of each group (Figure 2), it was assessed a high understanding of the pond ecosystem, as almost all groups took into consideration aspects related to the three levels that define the model: the boundaries and dimensions of the ecosystem and its (living and non-living) elements (level 1), the relationships between these and the changes in the ecosystem (level 2), the relationships of the ecosystem with the outside including humans (level 3). It is interesting to note that they identify trophic chains very well ('the insects and amphibians in the pond, and the birds that visit the pond, are related by the trophic cycle') and matter-energy relationships ('the sun is necessary for life in the pond'), or the need to connect the pond with the environment ('the grass around the pond should not be cut and thus the pond would be more connected to the surrounding forest).

FIGURE 1. NUMBER OF CROSSCUTTING CONCEPTS IDENTIFIED IN THE ACTIVITIES PROPOSED BY PRESERVICE TEACHERS AND EXAMPLES OF ACTIVITIES (INSERTED PICTURES ABOVE THE GRAPH)

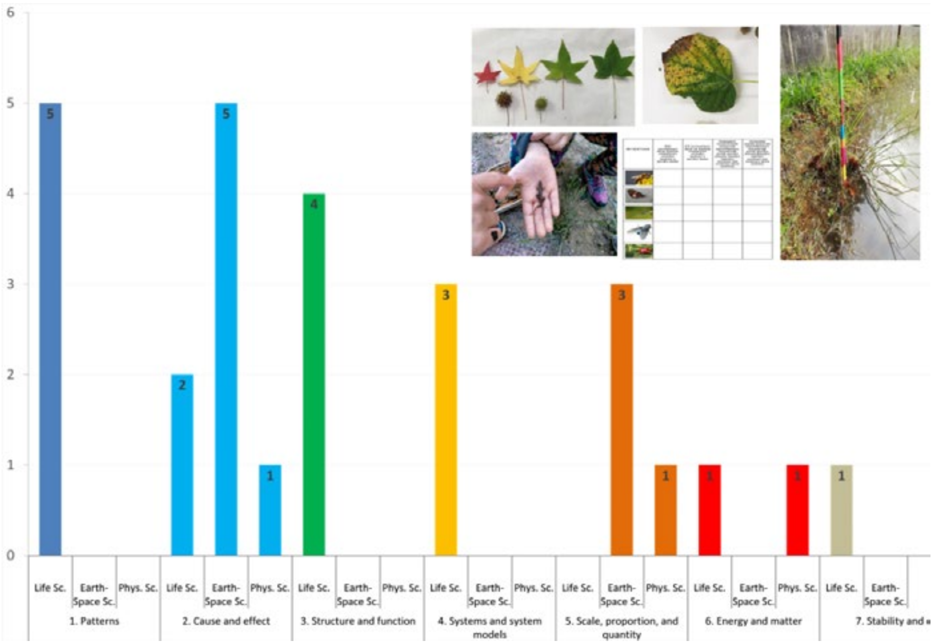

FIGURE 2. EXAMPLES OF POND REPRESENTATIONS BY PRESERVICE TEACHERS

In relation to research question 2, i.e. the use of the pond in the preschool context, some interesting experiences have been compiled. For example, children from the third year of preschool in the Errekabarri school (Vitoria-Gasteiz) systematically collect atmospheric data and make observations of species (Figure 3L). In other schools such as Lardizabal Eskola or Bizilore, both in Gipuzkoa, special importance is also given to recording and documenting experiences in the pond. In the latter, for example, a small cabin called Azterretxea was constructed next to the pond where children document and study in more detail the insects and plants they collected, and the changes that occur in the pond ecosystem (Figure 3R).

FIGURE 3. EXAMPLES OF ACTIVITIES IN ERREKABARRI SCHOOL (L) AND BIZILORE ESKOLA (R)

CONCLUSION AND DISCUSSION

Working on aspects such as graphical representations or crosscutting concepts can help future teachers to better understand the ecosystem model through the pond. Drawing is also a future teaching tool, since on many occasions teachers must guide children to draw and communicate what they have observed or learned. On the other hand, we have observed that actually the pond is a feasible educational tool in the schools of the region, with significant examples of children exploring, observing, making records and generating data. We can therefore highlight the great educational potential of this natural resource, both in teacher training and in the reality of the school context.

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Reflections on emerging science in children between years 2 and 4

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ABSTRACT

Education in science for children 0 to 6 years is a crucial aspect of early childhood development. The early years are a time when children are most receptive to learning and have the greatest potential for cognitive, social and emotional growth.

Current research indicates that young children have the capacity for constructing sophisticated conceptual learning and the ability to use the practices of reasoning and inquiry (NRC 2007, 2012)

Much empirical research has been done in recent years for children aged 3-6. Research in science for infancy–childhood, in the birth to three period, is much more critical and less widespread. (O'Connor et al., 2021)

Starting from a vast research experience about a longitudinal approach to science teaching and learning, carried out since the 80's in the Italian group headed by Paolo Guidoni (Arcà et al., 1982), in the last two decades our attention was devoted to children and educators in early childhood centers, with methods based on 'looking and listening-in' (Sumsion & Goodfellow, 2012).

Here we propose some reflections and examples on:

- what can be understood by sophisticated scientific knowledge between 2 and 4 years
- what can be meant by conceptual understanding and how can the emergence (Russell & McGuigan, 2016) of this learning be recognized in this age group.

Carefully observing children while they explore physical facts about: light and matter, it is possible to recognize unexpected and deep ways to give meaning to the world around them.

KEYWORDS

Preschoolers, emergent science, conceptual understanding, matter, energy

INTRODUCTION AND THEORETICAL FRAMEWORK

According to recent results from research in different fields (neurosciences, cognitive and developmental psychology, science education, learning and teaching sciences) children have been recognized as competent learners in science since very early age (NRC, 2007) and in the last years early childhood science education has been receiving increasing attention by the scientific community (Science, 2011).

The first five years of human life are particularly important for unmatched developments on the linguistic, cognitive, social, emotional plane: "Right from birth a healthy child is an active participant in that growth, exploring the environment, learning to communicate, and, in relatively short order, beginning to construct ideas and theories about how things work in the surrounding world. The pace of learning, however, will depend on whether and to what extent the child's inclinations to learn encounter and engage supporting environments." (Bowman et al., 2001).

The idea of child as a concrete and simplistic thinker has been replaced by the idea of kids as thinkers unexpectedly sophisticated on issues that relate to natural world.

He/she has important basic competences that appear very early and seem to have general characteristics not related to society and culture to which they belong.

Through research conducted in experimental controlled situations or in more natural ones, it is highlighted that "Even the youngest children are sensitive to highly abstract patterns and causal relations...they generalize, make inferences and make sense of the world. There is increasing recognition of the richness and variability of children's understanding that involve implicit and explicit, non-symbolic and symbolic, associative and explanatory components" (NRC, 2007).

In Italy since the '80s (Arcà et al., 1982) we had a long tradition of research on early physics education, headed by prof. P. Guidoni , getting results in excellent agreement with these more recent ones. (Gagliardi & Giordano, 2014)

In the last years our research extended to preschoolers working with colleagues from different background and preparation. (Rossi et al., 2015)

RESEARCH METHOD AND DESIGN

Trying to find evidences of their scientific competencies we adopted an "observational approach" (Sumsion & Goodfellow, 2012) looking and listening to children in activities of experimenting and interpreting the world.

The reflections proposed here are transversal, do not refer to a specific experimentation among those carried out over the years with various nursery schools and kindergartens, in teacher preparation activities and in informal contexts. (Giordano & Rossi, 2014; Tuay-Sigua et al. 2017)

They refer to cross aspects that can be found in particular working children 2 to 4 years old.

Since we are dealing with preschoolers, as researchers we have rarely worked directly with children. Main interaction was with educators and with future-teachers students, who carried out their internship work and thesis for the University degree in "Formazione Primaria".

The role of our scientific supervision and that of colleagues in the pedagogical area was helping field actors on planning environments and materials, suggesting observations and (very limited) interventions both before the activities with the children and in the subsequent analysis.

The implementation with children was carefully monitored through photos, video recordings and field notes, analyzed separately and then jointly by the mixed research group.

The two main themes we are referring to:

- water (GiocheriaLaboratori, 2013)
- light, darkness, shadows, light colors (Rossi et al., 2015) to look at the emerging (Russell & McGuigan, 2016) ideas about matter and energy as they are experienced in many simple, everyday situations.

RESULTS

Our main research goal was to understand whether involving children in free experimental activities, without specific questions to answer, it is possible to understand how they relate to these two fundamental aspects of reality and if some basic concepts of physics can be recognized emerging in their games and in their first formalization.

From the cross analysis of collected data, children appear to spontaneously use some cognitive strategies and procedures, close to the "scientific" ones: they look carefully at what happens, both at the expected facts and at the unexpected ones; are open to diverse possible interpretations; compare their expectations with the experience; are searching permanence through changes; are using different languages (words, gestures, sounds, ….) to represent what they are noting.

Moreover, we recognized the emerging of some important scientific ideas.

Just one example. In the case of light, a recurring spontaneous game in almost all children is pointing the lighted torch at a surface, moving it closer and further away, noticing how the size and intensity of the luminous spot change, describing it dynamically by words (smaller and smaller, larger and larger) and by the voice tone. The space between the torch and the wall seems empty, but when they try to grasp it by hands, a dark figure immediately appears on the wall (a black hand, there they exclaim a bit scared).

For us physicists they are noticing, discovering and describing the characteristics of an energy flow coming out from a nearby source.

More examples and suggestions will be illustrated in the presentation.

CONCLUSION AND DISCUSSION

The first conclusions are about the cognitive abilities of children and their possible appropriation of some basic concepts and procedures, positive beyond what was initially imagined.

Looking with open eyes and minds at how children actually used the proposed materials, it was possible to see emerging in an implicit and often non-verbal way: 1) more deep specific and general concepts and ideas than we expected; 2) the interplay between concrete and multi-representational dimensions, confirming the idea of children as thinkers unexpectedly sophisticated.

Looking ahead, we hope that groups carrying out research, action-research, teacher's preparation on science education in the 0-6 age, will overcome the traditional dichotomy between disciplinary experts and experts in pedagogical and teaching methodologies.

The suggested approach 'looking and listening-in' to children in action on tasks that are not too predefined and delimited allows:

- disciplinary experts to re-appreciate basic contents and epistemology of their discipline
- pedagogical experts and teachers to appreciate children's deepest capacities to make sense of the world around them, in continuity between scientific and every-day-life knowledge.

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Early childhood teachers in training communities

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ABSTRACT

The continuous training of early childhood teachers from science education deserves a special condition because it allows knowing the pedagogical experiences based on their scientific competences that guide the teaching exercise with children. However, it is found that, in most cases, teachers studied early childhood education because they had no interest in science, this is how it is necessary to structure the strategy called training communities. It is made up of teachers trained in science and early childhood teachers. These groups are articulated through commitments of a practical, cognitive, evaluative, epistemological nature and possible scenarios that make it possible to give meaning to the teaching identity to generate learning environments suitable for science education. Through an experience, worked in a focus group of teachers, the topic addressed was the identification of patterns in nature, which shows the relevance of training communities a continuous training strategy.

KEYWORDS

Early childhood, teacher training, training communities, training strategy.

INTRODUCTION AND THEORETICAL FRAMEWORK

Bringing science closer to childhood from birth, allows establishing conditions of how scientific thought contributes not only to the development of cognitive processes but also to the social demand for a scientific culture. The bases for an investigative attitude, of search and reflection, are supported by investigations, where it is shown that children from the first years can

1. Know, use and interpret scientific explanations of the natural world,
2. Generate and evaluate scientific evidence and explanations,
3. Understand the nature and development of scientific knowledge and

4. Participate productively in scientific practices and discourses (AA.VV., 2007, p. 215)

It is thus, that for a construction of a scientific education from the first years according to Pedreira and Márquez (2016), one must start from the experiences with reality to get to know the ideas of the children and with the activities of the "Puck touch" achieve the development of scientific and sociolinguistic skills that allow, through the formulation of questions, an approach to the powerful ideas of science. These experiences must be accompanied by the teacher, as an interlocutor, to reach networks of connections and levels of explanation when identifying objects or phenomena of study, that is, expressing through language the codification of these objects or phenomena to differentiate them through elements, relationships and structures.

This makes it possible to change the perspective of what children learn in science (concepts, development of scientific skills and the process of science) and requires a pedagogical practice that considers an epistemological vision, that is, the conceptions of what science is. and its historical evolution, the purpose of scientific learning and the distinctive features of school science for the first years.

This task must be assumed by the early childhood teacher who needs to be trained not only in scientific theories and practices but also in an epistemological and affective component from a sociocultural perspective. This communication wants to make known the benefits of the strategy, called training communities as a collective condition of continuous training focused on research (Tuay, 2021), where it is assumed that teachers are subject to knowing where all their teaching actions are. They are structured and motivated by commitments which are based on agreements (rules and norms), practices (performances) and actions (arguments).

The training communities correspond to the continuous training opportunities for teachers based on their needs and interests. Here teachers configure normative states, such as those commitments that teachers assume within the practice of giving and asking for reasons. In this dynamic, teachers are acquiring practical, cognitive, evaluative, epistemological commitments and possible scenarios, which commit members and in turn allow continuous training processes. (Valencia and Tuay, 2018, p.2)

A reference for educational action from science education is to provide opportunities for young children to experience nature in their early years based on the identification of patterns, that is, to identify the type of characteristics or most significant features to describe the objects or phenomena. This indicates that early childhood teachers must be trained to make sense of scientific work and provide opportunities for children beyond the school environment (Tuay, Giordano and Testa, 2017).

RESEARCH METHOD AND DESIGN

The methodology is of a qualitative nature with an interpretive approach, with the configuration of a training community made up of 10 science teachers (biology, physics and chemistry) and 2 early childhood teachers belonging to public institutions in Bogotá-Colombia. The work was developed in a focus group with three stages: recognition, explanation and extension. The study considered the ethical issues corresponding to this type of research

RESULTS

In the recognition stage, early childhood teachers, with the support of discipline-trained teachers, were able to identify some patterns in the growth of some plants, such as the climber known by the scientific name of Passiflora, which shows a spiral structure and can be represented Through diagrams, this allows how to contribute to the cognitive and epistemological commitments of teachers, (Valencia and Tuay, 2018).

The explanation phase requires more precise collaborative work from the other colleagues in the training community to relate the structure to a relationship between surface-volume, essential in the relationships between shapes, this contributes to the research as a result of the work. Collectively, it trains early childhood teachers in explaining how school science is built.

The extension phase is facilitated because teachers can relate the structure to the horns of a mountain ram, a snail to galaxies. However, reaching these generalizations requires hours of discussion to go from a graphic representation to a scientific understanding, that is, to recognize the epistemic character of the diagrams. This makes it possible to strengthen value commitments and future scenarios, because these experiences allow early childhood teachers to improve children's ability to participate in learning science.

CONCLUSION AND DISCUSSION

The joint work between teachers of science training and early childhood teachers in the training community makes it possible to reinforce, modify or adapt the explanations of teachers in the face of a particular phenomenon. It is important for teachers to identify and select data from the experience according to some common guideline (pattern) that allows stimulating the search and explanation of regular features in nature from the confrontation of their explanations in the training communities.

Guiding science education in early childhood requires teachers' previous experiences to find the essential connections to interpret facts and phenomena from interactions with science colleagues. I can only accompany learning processes when the teacher has felt the need to explain to reach an understanding of the fact or phenomenon.

Contribute from research to the training of early childhood teachers to strengthen capacities in the construction of scientific concepts, generate better conditions for teaching as well as the collective work that is required to consolidate the training communities.

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Analysis of an inquiry-based sequence with Early Childhood teacher trainees

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ABSTRACT

This research focuses on the analysis of the results of a pilot experience of introduction to enquiry as a scientific practice for the teaching and learning of science. This study is motivated by the need to prepare future teachers in scientific practices, such as enquiry, present in the current curriculum decrees for the Infant Education stage. To this end, an enquiry experience on the germination process of a plant has been designed and implemented, and their classroom diaries have been used as instruments for data collection. The results show that, although this is a new didactic-scientific experience for them, they consider that having experienced this type of practice in their initial training has implications for their future educational practice.

KEYWORDS

Science Education, Teacher Training, Inquiry Cycle, Germination, Early Childhood education

INTRODUCTION AND THEORETICAL FRAMEWORK

Science education in the 21st century requires teachers capable of introducing resources, materials and teaching strategies that favour the implementation of experiences based on scientific practices in their classes and overcome the fears that teachers have regarding science from, even, the initial training (Yilman &Malone, 2020). From this perspective, recent research with trainee teachers shows that it is necessary to pay greater attention to processes such as enquiry, modelling and argumentation from the early stages of education (Mosquera et al., 2018; Jiménez-Aleixandre & Crujeiras, 2017). Science education must go beyond transmitting knowledge and carrying out decontextualised experiments; it must move towards a science that enables the formulation of questions that make it possible to seek evidence to build knowledge (Jiménez-Liso et al., 2019). Thus, in an increasingly urban and digitalised world, in which societies are experiencing a distancing from nature (Torres-Porras et al., 2017), teachers must learn to find new ways to bring students, from an early age, to discover and explore their immediate environment (Galician Decree on Early Childhood Education, 2022). Within this framework, we must contribute to training teachers who can carry out didactic-scientific experiences that promote an approach to nearby natural spaces, in which, in addition to playing, they can explore, experiment, discover, observe, and experience the particularities that nature has to offer (Mazas et al., 2017). For this reason, this study has carried out an experience of enquiry in science with teachers in initial training in Early Childhood Education, with the aim of introducing enquiry, as a scientific practice, for the teaching and learning of science. In this way, the aim is to provide trainee teachers with the necessary methodological guidelines to be able to bring science education in line with the new curriculum decrees to their future classrooms.

RESEARCH METHOD AND DESIGN. CONTEXT OF THE STUDY

The experience was carried out during the 2021-2022 academic year with students of the subject Learning the sciences of nature, of the Degree in Early Childhood Education at the University of Vigo (Galicia- Spain). It lasted 9 sessions of 1 hour and a total of 79 students took part in it.

METHODOLOGICAL APPROACH

From the didactic point of view, the experience was designed following a globalising approach, characteristic of the Early Childhood Education stage, and is linked to the socio-constructivist paradigm. In this way, it starts from the initial ideas of teachers in initial training, and works through enquiry, collection, analysis, and interpretation of evidence (Couso et al. 2011; Garzón & Martínez 2017; Harlen 2015; Jiménez-Liso, 2020). In this line, the sequence of activities was structured following the 5E model (Engage, Explore, Explain, Elaborate and Evaluate) (Bybee et al., 2006; Bybee, 2015).

A summary table (Table 1) of the tasks that make up the learning experience is shown below.

TABLE 1. SUMMARY TABLE OF EXPERIENCE

5E Model	Teaching strategy involved	Didactic purpose
Engage	Routine of thought Drawing Initial Kahoot Concept map	Creating the focus of interest Identifying preconceptions
Explore	Strategy: "Rotating paper". Padlet Strategy: "Projecting thinking" Strategy: "Thinking as a whole" Information puzzle	Active observation. Formulation of research questions. Formulation of hypotheses and data collection. Testing hypotheses through experimentation. Analysis and explanation of the results obtained. Search for information on seeds, germination, and plants, which will allow initial doubts to be resolved.
Explain	Strategy: "Numbered heads".	Drawing conclusions on the observations made. Explanation of the enquiry process.
Elaborate	Strategy: "4-Way Mind Map".	Development of a mind map Presentation of results
Evaluate	Kahoot	Final evaluation of learning and experience.

DATA COLLECTION AND ANALYSIS

The instruments used for data collection were graphic representations (drawings), documentary analysis (classroom notebooks) and the Kahoot results obtained as a pre- and post-test.

RESULTS

The initial and final graphical representations (drawings) show an advance in the scientific knowledge gained from the experience. Thus, we can see the evolution of learning from Figure 1, which shows a greater and better knowledge of the topic covered during the enquiry practice.

This improvement in scientific knowledge of the study process is also seen in the results of the Kahoot (Figure 2). Moreover, as the participants pointed out, this second time they were much more aware of what was being asked in each question. It should also be noted that the Kahoot questionnaire was very useful to know those aspects in which there were still doubts and that it would therefore be of interest to return to them, or to reinforce them with other tasks and activities.

FIGURE 1. EXAMPLE OF INITIAL AND FINAL DRAWING EVOLUTION

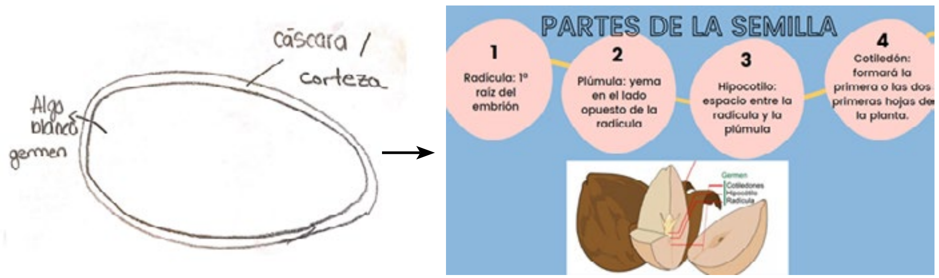
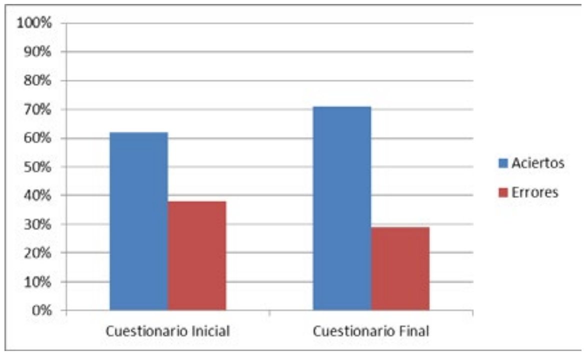


FIGURE 2. PERCENTAGES OF HITS AND MISSES IN THE QUESTIONNAIRE ON GERMINATION AND PLANTS PRE- AND POST-EXPERIMENT



Similarly, it is in the reflections in these notebooks that the trainee teachers point out that this experience has allowed them to "immerse themselves more and more each day in experimentation, research and knowledge, since, without realising it, we have been acquiring different learning experiences".

CONCLUSION AND DISCUSSION

The development of the experience following the 5E enquiry model has allowed trainee teachers to work actively and from a motivated position. This shows the didactic potential of scientific practices and their potential to promote more meaningful learning (Garzón & Martínez 2017). Various studies such as those by Rodríguez Melero et al. (2021) point to the importance of showing teachers enquiry experiences that can be carried out in the Early Childhood Education classroom, so that students can be progressively introduced to the procedures of the scientific method and thus lay the foundations for scientific thinking. This pilot experience aims to reduce, as Cantó et al. (2016) point out, the distance between research and teaching, providing trainee teachers with reference articles and authorship for their future scientific educational practice.

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Es demasiado difícil: derribando prejuicios en torno al pensamiento computacional en educación infantil

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ABSTRACT

La robótica educativa y el pensamiento computacional están llegando a las aulas, incluyendo las de Educación Infantil (EI), donde generalmente se une al uso de robots de suelo. El desarrollo del pensamiento computacional se relaciona con capacidades básicas como la resolución de problemas o el pensamiento crítico, aunque su introducción en infantil no está exento de controversia, dada la limitada capacidad de abstracción y sistematización que se asume a los niños y niñas. Se presenta un estudio de caso en el aula de 3º EI, basado en la resolución de retos computacionales utilizando operadores mecánicos. Las estrategias de facilitación más útiles implicaron la lectura comprensiva de los factores clave en el enunciado y la corporeización de la estrategia y los posibles errores en el *programa*. Usando estos apoyos, la participante resolvió 16 retos, incluyendo operaciones lógicas simples y complejas. El primer reto no resuelto implicaba el uso de condicionales (el comportamiento del circuito dependía de la configuración del tablero inicial), y fue además necesaria la ayuda adulta para planificar una estrategia heurística sistemática y detectar la necesidad de depurar errores. Los resultados demuestran que, dados los apoyos físicos necesarios, niños y niñas de infantil son capaces de resolver tareas sencillas y complejas y abren la puerta a intervenciones en el aula de infantil que superen la robótica de suelo.

KEYWORDS

Pensamiento computacional; resolución de problemas; estrategia; material manipulativo; programación

INTRODUCTION AND THEORETICAL FRAMEWORK

La robótica educativa y la programación, unidas con el desarrollo del pensamiento computacional, se están incorporando a las aulas desde las edades más tempranas. De hecho, muchos consideran que el pensamiento computacional, que abarca las habilidades de formular problemas, automatizar soluciones, organizar lógicamente, analizar datos, implementar soluciones eficientes y transferir el proceso de resolución a otras situaciones y que se relaciona estrechamente con la resolución de problemas y el pensamiento crítico, es algo que toda persona debería desarrollar. Esto no está exento de controversia: mientras que algunos expertos defienden que es en la etapa infantil cuando hay que sentar las bases, iniciando al alumnado en su utilización y planteamiento (García-Valcárcel y Caballero, 2019; Öztürk y Calingasan, 2019), otros muchos argumentan que estas edades son demasiado tempranas para trabajar con estos conceptos (Benitti, 2012).

Es importante notar que estas propuestas no tienen por qué depender de artefactos tecnológicos: aunque la robótica educativa se suele usar como intermediario material, no es el único modo de desarrollar el pensamiento computacional (y, de hecho, no siempre contribuye a ello) (Álvarez, 2020). Eso no excluye que los objetos tangibles sirvan para desarrollar los objetivos de la etapa, que el INTEF (2018) establece en crear y seguir conjuntos de instrucciones paso a paso para completar tareas, desarrollar programas sencillos con secuencias de instrucciones para resolver tareas simples, conocer cómo los programas presentan la interacción, comprender y verbalizar los resultados esperados de un programa sencillo e identificar y corregir errores en algoritmos o programas formados por secuencias simples.

Asumiendo la conveniencia de introducir al alumnado de infantil al pensamiento computacional, como modo de iniciarles en el desarrollo de ciertas destrezas y habilidades (Pila et al., 2019), se hacen necesarias propuestas de intervención que faciliten al profesorado su incorporación (González-González, 2019). De lo contrario, si se hace sin una planificación adecuada, o si el docente no se siente cómodo guiando la actividad, el uso de robots como elemento meramente lúdico puede ser incluso contraproducente (Benitti, 2012).

En esta comunicación se presenta un estudio de caso de introducción al pensamiento computacional en un aula de 5 años mediante un juego analógico, con el objetivo de describir:

- El nivel máximo de abstracción o complejidad alcanzado
- Las principales barreras o limitaciones
- Los apoyos por parte del docente que resultan más útiles para superarlos

RESEARCH METHOD AND DESIGN

Se presenta un estudio de caso en un aula de 3º de Educación Infantil, en concreto una niña de 5 años y 8 meses en el momento de la intervención.

El escenario es un juego comercial de computación mecánica, consistente en un tablero con diversos operadores mecánicos, que permiten y dirigen el flujo de canicas. El juego propone la realización de diferentes retos que, en progresión creciente de dificultad, ilustran los fundamentos de la programación.

La investigadora leyó los enunciados de los problemas al inicio de cada reto. Se registraron las conversaciones entra la investigadora y la participante, y se anotaron los gestos y acciones de ambas. La intervención se extendió durante varios días, hasta alcanzar el primer reto que la niña no fue capaz de conceptualizar y resolver (nº. 17).

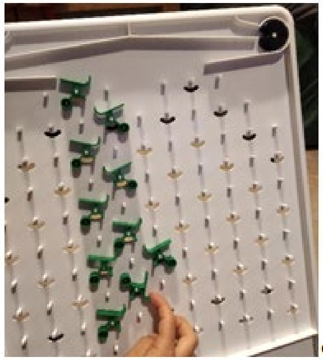
RESULTS

Se superaron 16 de los 60 retos propuestos, incluyendo las siguientes operaciones: hacer llegar canicas a un destino, crear patrones (p.ej., RAAAAA(…) o ARAR(…), donde R=rojo y A=azul) activando alternativamente diferentes puertas, resolver el circuito en un número limitado de movimientos, crear caminos alternativos, aplicando un operador lógico (bit) o repetir el circuito un número limitado y determinado de veces. El primer reto no resuelto implicaba el uso de condicionales (el comportamiento del circuito dependía de la configuración del tablero inicial).

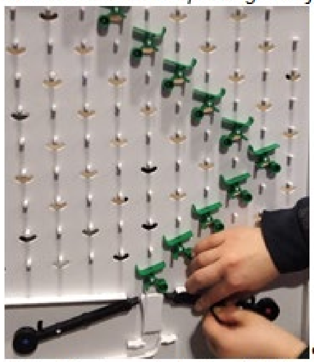
Las estrategias más útiles utilizadas por la investigadora resultaron tener en común dos elementos: primero, la simplificación a los elementos relevantes (lectura significativa del enunciado, incidiendo en los parámetros clave) (Fig 1.a) y la *corporeización*, o concreción mediante gestos de los pasos en la secuencia (Figura 1.d). Fue de ayuda que la investigadora trazase las trayectorias predichas sobre el tablero de las sucesivas (Fig 1.b) o demostrarse el funcionamiento de las piezas (Fig 1.b). Con este apoyo, la niña fue capaz de traducir a gestos los retos planteados y anticipar las trayectorias previstas (Fig. 1d). Solo fue capaz de detectar los fallos tras su ejecución, no antes, pero fue capaz de depurarlos de modo autónomo tras varios ciclos de ensayo – error (Fig 1.b,c).

FIGURA 1. ESTRATEGIAS ÚTILES EN LA RESOLUCIÓN DE RETOS. (I) INVESTIGADORA; (N) NIÑA

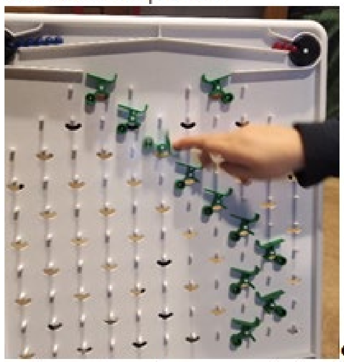
Lectura significativa del enunciado: (I) *TODAS las canicas ROJAS tienen que llegar al final.*



Depuración de la estrategia. (I) ¡Socorro, me caigo! N coloca otra pieza.



Depuración de la estrategia. (I) ¡Pero va a caer en las azules!



N reproduce el camino con su dedo: "Tiene que llegar aquí"

La mayor limitación se encontró en el tratamiento sistemático del problema (analizar por orden los distintos escenarios), así como la detección de errores y necesidad de depuración, que requirieron de la ejecución y la modelización adulta.

CONCLUSION AND DISCUSSION

Los resultados de la intervención sugieren que los niños y niñas de infantil son más capaces de resolver retos computacionales de lo que generalmente se concibe. A esta edad es posible resolver retos que van más allá de llevar un objeto a un destino (habitual en los ejercicios de robótica de suelo) (Álvarez, 2020), y que incluyen elementos lógicos más avanzados (en determinadas situaciones, producir resultados alternativos o detener el programa), confirmando y concretando los objetivos de etapa marcados por INTEF (2018).

El éxito de la tarea descansa en el uso de intermediarios físicos, tanto en el material (operadores mecánicos) como en la resolución de la tarea (gestos), y no requirió más intervención adulta que la lectura comprensiva del enunciado y la ayuda a sistematizar y detectar la necesidad de depurar. Con todo, esto apunta a la necesidad de que el propio docente tenga la capacidad de descomponer las tareas en pasos, desarrollar una visión sistémica que relacione la configuración de cada pieza con la salida lógica global, e identificar los pasos y piezas clave en la resolución. En esencia, una alta capacidad de abstracción y abordaje sistemático de los itinerarios.

Una limitación de este estudio es que presenta los resultados preliminares del estudio de caso con una única participante (se presentarán datos más completos en la conferencia).

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My first green museum: a taxonomical proposal of nonfiction picturebooks on botany

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ABSTRACT

This paper aims to analyse a corpus of nonfiction picturebooks using a selection of books from the Library of the Botanical Garden of the University of Valencia. Drawing on a previous research by Campagnaro (2021) on the field of Architecture, we propose a taxonomy and a content analysis model for classifying the new artistic generation of nonfiction picturebooks (Grilli,2020) on Botany published over the last decade. In this regard, our research focuses on the multiliteracies pedagogical potential of these books using the nonfiction-hybrid divide by Campagnaro (2021) as a basic category of analysis.Going further,we propose a set of new exploratory dimensions based on compositional and thematic issues, as well as on the scientific sources and authorship of these impressive heterogeneous books. Considering the ecocriticism perspective, the findings show that the artistic nonfiction picturebook is not only an innovative revolutionary editorial field (Campagnaro, 2021; Grilli, 2020; Goga, Iversen & Teigland, 2021; Tabernero, 2022) but it can also act as a sort of “first green museum” (Nodelman, 2018) in Science learning spaces so as to foster botanical knowledge in the early years through an impressive threefold formula of: (1) Beauty, (2) Wisdom and (3) Wonder (BE-WW). In line with the SDGs of the 2030 NATO agenda, its scientific and cultural value for children’s education is undeniable due to its poetical capacity to inspirit them a sincere biophilic (Wilson, 2021) fascination and love for the vegetal world.

KEYWORDS

Early Childhood Science Education, Artistic Nonfiction Picturebooks, Botany, Ecocriticism, Multiliteracies.

INTRODUCTION AND THEORETICAL FRAMEWORK

Over the last thirty years, many scholars have claimed that picturebooks are a valuable multi-faceted artistic and educational resource able to foster emotional and aesthetic experiences, as well as promote slow looking and critical thinking in childhood. Coined by Nodelman (2018) as a first museum for children as well as defined as an innovative revolutionary editorial field (Grilli, 2020a; Goga, Iversen & Teigland, 2021; Tabernero, 2022), the new nonfiction picturebooks can be considered as a sociocultural trend that has triggered the publication of increasingly hybridated pedagogical artifacts that boldly invite children to enter the pages of a fascinating narrative of the natural world. Mending the rift between science an art (Grilli, 2020b), these innovative nonfiction picturebooks offer the very young children an emotional and playful reading-viewing experience that equals the effect of being in front of any famous artwork in a gallery. Considering the sense of wonder (Carson, 2012) as an innate and essential disposition in early childhood education contexts the visit to the pages of a contemporary nonfiction picturebook by any child can inspirit not only good quality scientific contents, but also the opportunity of growing intuition, curiosity and arouse ecocritical dispositions towards the creation of a biophilic (Wilson, 2021) bond to the Planet and the vegetal world. Keeping this idea in mind, our investigation aims to classify and explore the multimodal features of these innovative artworks, as well to confirm its pedagogical potential to foster new ways of science education teaching in the early years.

RESEARCH METHOD AND DESIGN

Drawing on previous research by Campagnaro (2021) on the field of Architecture, our research explores a selection of nonfiction books on the topic of Botany. In order to establish a coherent framework, the corpus was made using a sample of artistic nonfictional picturebooks from the Library of the Botanical Garden of the Universitat de València. Our selection of picturebooks at the library of the Botanical Garden was determined by four variables: (1) picturebooks on the field of Botany, (2) published in the last ten years (i.e. between 2012 and 2022, (3) suitable for early education children, and (4) showing and telling a high visual, aesthetic and sensorial potential. Methodologically, the research used a double qualitative exploration procedure. To begin with, we designed a proposal of systematic taxonomy for books using as a first starting classification criterium (a) Campagnaro's nonfiction-hybrid division (2021) adapted with the notion of "artistic" (Grilli, 2020). Going further Campagnaro's proposal, we established a set of three new classification criteria based on: (b) the composition and stylistic communicative dimension of the multimodal information displayed (c) the authorship model regarding three perspectives (unique, dual and choral), and (d) the reliability of the scientific sources explicitly mentioned in picturebooks, or either non-explicit (Table 1).

TABLE 1. A TAXONOMICAL PROPOSAL FOR ARTISTIC NONFICTION PICTUREBOOKS ON BOTANY

Classification criteria	Categories	Features
Typology	Nonfiction Hybrid	Factual elements Factual and fictional elements
Composition & Style	Pictorial Structured Innovative	Holistic. Art Museum Inventory. Science Museum Challenging. Sensorial Museum
Authorship model	Unique author Dual author Choral	One writer-illustrator Different writer and illustrator Three authors or more participating
Scientific information source	Explicit Non-explicit	Reliable scientific source None

In relation to the second research procedure, we elaborated a qualitative content analysis focused on the key botanical thematic areas conveyed by the books and on their multiliteracies pedagogical possibilities to be able to act as a "first green museum" to promote meaning making in Early Childhood Education teaching.

RESULTS

As for the findings, our analysis suggests:

As for the criterium of the communicative display model, we found that in many of these artistic nonfiction picturebooks space composition is often divided in different sections (i.e. different plant species or plant structures) confirming that verbal text and images occupy well-differentiated places when reading-viewing the double spread pages. We also remarked that this was used in the majority of the books since it is something specific of presenting knowledge in Botany books or Science museums. However, we also discovered that some picturebooks studied included new ways of pictorial multimodal communication with a structured global display behind. It was surprising the fact that most recent picturebooks analyzed offered bold 3D resources, formats and materials that make them more manipulative and appealing for the hands of a little child: flaps that hide the seeds of the fruit, the pistils and stamens of the flower...

Regarding the criterium of authorship, we discovered that there is a wide diversity of models used, highlighting that a lot of books can be conceived and designed only by one illustrator-writer.

When exploring the presence and reliability of the scientific sources of information, we confirmed that in many occasions this was explicitly mentioned (scientific experts, institutions, or simply, a list of bibliography)

Regarding the content analysis, our research found (a) in relation to the botanical themes, the richness of the vegetal biodiversity and the interdependencies among the plants and other natural living beings of the Planet.(b)Taking into account the interdisciplinary pedagogical potential of these new information books, the study highlighted that the threefold "BE-WW Formula" (Beauty, Wisdom and Wonder)can promote in early childhood education fascinating creative and dynamic science multimodal learning practices to connect the infants to the green natural world.

CONCLUSION AND DISCUSSION

The results of our investigation confirm our first research design question (RD1), i.e. that beyond the "encyclopedic" tone of a traditional informational picturebook (Tabernero, 2022), the new generation of artistic nonfictional picturebooks on Botany can nowadays become a sort of "green museum" in an early science classroom. Since this genre of books is quickly evolving towards a myriad of multimodal pictorial synthetic styles, new authorship models and challenging material solutions that navigate in the dual waters of reason and emotion(Grilli,2021), the whimsical affordances offered by these books can invite children to develop emotional, creative and critical multi-dimensional responses so as avoid passively the reception of "true" answers from teachers. Thus, the "BE-WW Formula" of these new botanical information books is ideal to guide the little ones towards building a respectful care and love bond to the vegetal world.

ACKNOWLEDGEMENTS

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First steps of engineering design in kindergarten: a case study approach

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ABSTRACT

The engineering design process begins with the analysis of a detected problem and the creation of something to solve it. This paper analyzes the achievements and limitations of a group of Kindergarteners in each of the steps of this process. The context is a didactic proposal focused on the movement of water, and which combines inquiry-based learning with engineering design approaches. The students' level of achievement in both skills and knowledge is analyzed through observation cards and voice recordings. At the same time, the importance of the teacher's intervention is discussed; for that purpose, the group was split into two, and each of the subgroups received a different guidance. It has been seen that the understanding of the problem and the visualization of the previous steps to a possible solution are very important. In addition, in the exercises that required a high degree of abstraction, the students encountered more problems and interest also decreased.

KEYWORDS

Kindergarten, Engineering practices, Water movement, Inquiry, Problem-solving skills

INTRODUCTION AND THEORETICAL FRAMEWORK

Engineering is about applying scientific principles to design, build and invent new products or processes. Unfortunately, we think engineering is something very serious that is only for college students when, in reality, engineering is something perfectly compatible with young children. In STEM education, engineering is transposed as "tinkering", which means playing, manipulating, disassembling, mixing and trying to fix (Furman, 2016). If young children's creative inclinations for play are stimulated in engineering contexts, their understanding of the increasingly elusive concepts of science would be develop in meaningful natural situations.

Although the potential of working on engineering ideas and practices in Kindergarten is increasingly valued, there are still few studies that offer indications of how to take them to the classroom (Anggoro et al., 2021; problem-solving skills are part of science and engineering practices for K–12 students in the United States. Evaluating these skills for the youngest learners is difficult due to the lack of established measures. This paper reports on our process of developing an observation instrument to measure preschool children's learning and their application of problem-solving skills, namely, the steps of the engineering design process (EDPSimarro & Couso, 2022). The main aim of this work is to investigate the achievements and limitations when children are immersed in engineering practices.

RESEARCH METHOD AND DESIGN

The research was carried out in a public school in Navarra, northern Spain. 19 children from the third year of early childhood education participated. The group was split into two, and each subgroup followed the session once.

The engineering design process was new to the children, so the 1st challenge aimed to get them familiar with the engineering process. Representative icons were used to help them recognize the goal of each stage (Table 1). Then, they were requested to design and create a device with limited material to remove a lock from a bottle, without turning it upside down (Figure 1).

TABLE 1. SUMMARY OF ACTIVITIES AND ENGINEERING PROCESS STEPS ICONS

Challenge	 ASK IMAGINE PLAN CREATE IMPROVE
1	A device to take a lock out of a bottle
Project: how does the water come to school	
2	A pipe circuit
3	The best place for a water deposit

FIGURE 1. MATERIALS AND THE BOTTLE WITH THE LOCK INSIDE

Then, students were immersed in problem-solving activities within a common goal: to analyze the movement of water to determine how water reaches the school. First, they analyzed a map of where the children lived, and were briefed on how water reaches the school through pipes (Figure 2a). Then, they imagined a pipe circuit and drew it, and finally, they created a prototype pipe in small groups and tested whether it worked (Figure 2b). The last activity was to select the best place to locate the water tank close to the school.

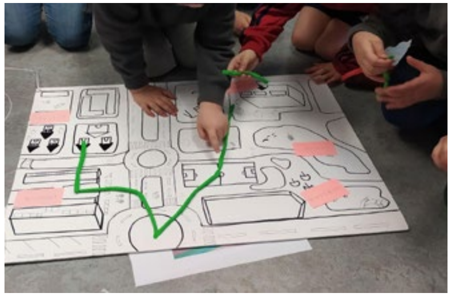

Figure 2a. The map and the simulated playdough pipes

Figure 2b. Two kids checking if the pipe they have made works

To conduct the research, observation sheets (adapted from EIE (2018)) and voice recordings were used to analyze the level of achievement of students, regarding both skills and knowledge. Consent for data collection from all parents was obtained through the responsible teacher.

RESULTS

The activities were very engaging for the students, especially the 1st challenge, which kept the students immersed for 45 minutes. The students proposed different possible solutions, such as breaking the bottle or creating "*something with a hook*" (Figure 3). Without testing the tool, one student realized that the wire would not support the weight of the padlock and proposed the following fix: "*We thought it would be better to use a paper clip to make the hook*".

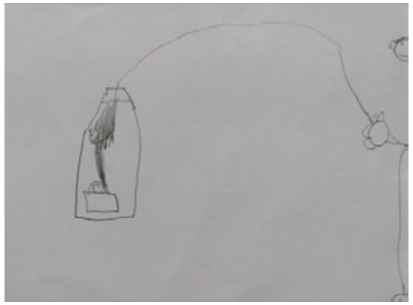

Figure 3. One group of students drew a fishing rod

75% of the students proposed some improvements in relation to their own device and that of their classmates. Moreover, they mentioned several key factors, such as the length of the rope or the need for a rigid hook. Only 15% did not understand the reason why it did not work.

In the second challenge, the students stated that they knew that pies existed, but the idea of channeling water and its function seemed abstract to them at first. To improve this, in the second group (B) a map was used and the students represented the pipe circuit with plasticine (Figure 2a), before drawing it. At that moment they realized that it was necessary to redirect and "divide" the water so that it would reach all the town buildings. This fact was key to understand the next challenge: to build a pipe circuit with predetermined pieces of pipe.

One group of students found that in some parts of the pipe the water wasn't moving because it had to rise from a lower level to a higher level (Figure 4a). Another group observed that the best pipe configuration involves arranging the pipe so that the water goes from a higher to a lower point (figure 4b).

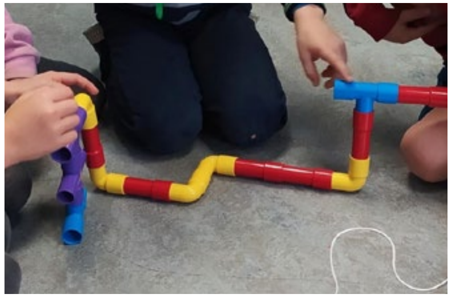

Figure 4a. A pipeline created by a group of students B

Figure 4b. The pipeline created after the arrangements proposed

The most challenging phase of the engineering design cycle was to explain or represent in a drawing their ideas in the second challenge (36% of the students had difficulties), with a considerable improvement observed in group B. Also, the "planning" phase was better in this group, i.e., how to organize the process of materializing the design that was imagined or drawn.

In relation to water movement, they understood that water can be channeled, and closed pipe circuits are necessary (88%); that the natural movement of water is from top to down, and that is why the water reservoir is located at a high point in the city.

CONCLUSION AND DISCUSSION

The engineering challenges posed suggest that when the proposal is concrete and understandable, both the discourse and the students' comprehension are improved, confirming that is important for students to code the problem accurately (Anggoro et al., 2021). Moreover, the introduction of visual prompts is key at this age to foster understanding of the challenge and to facilitate the verbal expression and representation of the prototype design.

For future proposals, it is tempting to systematize and explicitly expose to students the phases of the methodology itself, with its characteristics, to evaluate if improve their problem-solving skills, with the final aim of being able to develop proposals that improve the training of teachers in engaging children in engineering thinking (Lippard et al., 2019).

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Inclusive science education in the early years

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INTRODUCTION AND THEORETICAL FRAMEWORK

Inclusive education is a process whereby all children, regardless of ability, race or any other difference, are given the opportunity to learn from and with their peers. Science education is an essential tool for the social and cultural inclusion of children. Like any other discipline, science should be accessible to all.

Research supports the crucial role of quality early childhood education and care in a child's life and future (OECD, 2017). Early childhood education and care therefore spans a critical window for development which sets the foundation for later success in school, career and life (UNICEF, 2019).

Investing in early childhood education and care and ensuring universal access to quality services is one of the most effective ways to reduce inequalities (UNESCO, 2017; OECD, 2020; Mathwasa & Sibanda, 2021).

Aim of the "Communities for Sciences – Towards promoting an inclusive approach in science education" (C4S) Project is to promote inclusive science activities to children and youth in 6 different European locations in Austria, Spain, Italy, Bulgaria, Hungary and Belgium to allow them to promote science learning through the creation of Community Living Labs (CLL) with the co-participation of families and surrounding communities.

In Hungary the target group of the C4S project is the 0-6 age group, with a special focus on children aged 0-3. The project focuses on Roma children and their families in the implementation of inclusive science education. To this end, in 2022, we set up an EduLAB 0-6 CLL in a nursery in the 8th district of Budapest organized by Galileo Progetti Nonprofit Kft. One of the hallmarks of a CLL is that it is a scientifically demanding and practically relevant way of creating knowledge in a concrete place, addressing concrete problems and concrete solutions (Higgins & Klein, 2011). The members of the HUB are early childhood educators, head of institution, parents, researchers and representative of the district municipality.

The aim of the project is to identify the barriers to inclusive science education, to find and develop real problem-solving solutions together with stakeholders, from which both early childhood educators and equal opportunities policy experts can draw new knowledge and ideas to improve the social inclusion of those at risk.

RESEARCH METHOD AND DESIGN

The main question of the research is how to make early childhood education more inclusive and effective for those in vulnerable situations. Both quantitative and qualitative methods were used to explore the research question. The sample of children, early childhood educators and parents who participated in the EduLAB 0-6 CLL programmes was the same throughout the pilot.

All the research activities were undertaken in agreement and collaboration of educators of the EduLAB 0-6. A questionnaire was used to collect input and output data from early childhood educators participating in the CLL.

For families, the participation was involve focus groups. For children the participation was involve gathering observational data. The observations included taking photographs and videos. Collected data were anonymised so that no data will be used to identify participants.

6 institutional educators and 2 researchers participated in the SWOT analysis. This paper focuses on the results of the SWOT analysis (Byington et al., 2020). The research was carried out in accordance with the ethical rules set out in the project. The research project had been approved by the Research Ethics Committee at Universitat de Vic-Universitat Central de Catalunya (187/2021).

RESULTS

The purpose of this study is to document the design and implementation of a CLL to promote science education in the early years and to discuss aspects for the future.

Inclusive science education and cooperation are based on trust between parents and educators. This is especially true with communities in vulnerable situations. For families' lived experiences during the pilot period were the positive self-perception and the active participation competences, learning process, quality time together with their children in the living lab.

For the strengths, we identified elements that could be transferred to similar interventions, such as children's experiences during the pilot in academic, social and other relevant competences, such as the development of cognitive-linguistic, motor, socio-emotional competences. The early childhood educators observed children's enthusiasm and positive engagement when working with different tools, materials and natural environments.

One of the most valuable outcomes of the pilot programme mentioned by the participants was the development of academic, didactic and multicultural inclusive competences among early childhood educators.

The weaknesses identified in this pilot version of the program refer to two different issues: indoor space with a small capacity and educator knowledge and interest of science education.

Research has shown that enhancing children's natural curiosity, and providing positive childhood experiences with enjoyable science, and encouraging family educational involvement plays an important role in learning outcomes (Monkevinciene, 2020).

Weaknesses can be prevented in the future, for example by including integrated science education for early childhood educators in university education.

The opportunities for program improvement that most frequently mentioned were the followings, organizing more outdoor activities for the families, cooperation with other institutions, and enrich the program with children's educational experiences with atypical development or special education needs.

CONCLUSION AND DISCUSSION

Education in the early years is an excellent space for promoting inclusive, integrated learning. One possible way to implement inclusive science education is to create CLL for young children and their families.

Based on the results of the project, we can draw conclusions that can help to identify the less visible characteristics of the barriers to inclusion. In addition, they help to highlight the importance of factors that can be applied to improve the effectiveness of science education both inside and outside the institution.

The results from the pilot's short-term, six-month, sample are not generalisable, but they help to provide insights into the possibilities for implementing inclusive science education.

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Creation of digital stories with Early Childhood Preservice Teachers in order to explore the natural environment

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ABSTRACT

This study sought to understand which perceived learning and general impressions produces on early childhood preservice teachers (N=39) the elaboration of a digital story focusing on the exploration of the natural environment. In order to assess this, a questionnaire was passed before and after the intervention. The activity consisted on three sessions where students had to create a digital story using the platform StoryJumper while using pictures that they had taken in an urban park. The findings show that the activity was perceived by students as enjoyable, easy and useful for improving their curiosity and knowledge towards the natural environment. However, as extracted from their opinions, some improvements need to be implemented in future editions, such as: the digital platform used and the inclusion of guided sessions in order to deepen some difficult contents.

KEYWORDS

Storytelling, Biodiversity, Curiosity, Environment, Science education

INTRODUCTION AND THEORETICAL FRAMEWORK

Stories are considered a suitable learning instrument (García and Ortega, 1999), since they allow the acquisition of learning in an actual, attractive and accessible way (Huertas, 2006) and are frequently used in the early childhood stage (Vílchez López and Escobar Benavides, 2014). Despite these characteristics, a story that deals with natural themes should not completely replace contact with nature, since the lack of this contact, in the long run, might promote the development of negative attitudes such as biophobia (Soga et al., 2020). As Caduto and Bruchac (1997) propose, the ideal would be to combine storytelling with outings to the natural environment to create complete experiences. The problem with outings is that teachers are known to sometimes feel uncomfortable when planning and implementing activities in the natural environment and this is often attributed to, among other things, their lack of training and confidence (Scott et al., 2015). It is therefore necessary to facilitate learning models for the degrees of education that preservice teachers can reproduce in their professional life. To this end, an activity consisting of making a digital audio book was included in a science subject in the Teacher Early Childhood Education degree. The book was focused on the exploration of the natural environment and aimed at small children. The questions that were asked were: Which are the different types of knowledge perceived by students after doing this type of activity? Which are their general impressions?

RESEARCH METHOD AND DESIGN

This study was carried out with students attending to the subject «Knowledge and Exploration of the Natural Environment» included in the second year of The Teacher Early Childhood Education Degree of the University of Barcelona. The intervention consisted of an introductory session about science storytelling followed by two-hour sessions were they had to create a story (in groups of 4-5 students) using the digital platform *StoryJumper*. The story had the following mandatory characteristics:

- 6 photographs representing natural elements taken by the students in a park in Barcelona.
- Asking questions that encourage curiosity.
- Interactivity, including an activity that children can carry out in the park.
- Defined structure: beginning, conflict and solution.
- Extension of 10 pages.

The sample (N=39) consisted of 95% women and 5% men. Before starting, the students were informed about the study and the anonymity of the collected data. The study is descriptive with quantitative and qualitative approaches as well. Students were asked to complete a questionnaire (using Microsoft Forms application) before (initial questionnaire) and after the intervention (final questionnaire). In the initial questionnaire, they were asked about their previous experiences in writing stories, their knowledge of digital tools, and their feelings about writing a story about nature. In the final questionnaire they were asked for the level of learning they considered they had reached for different items, their predisposition to use the same digital platform in the future as well as for the positive aspects and potential improvements related to the activity.

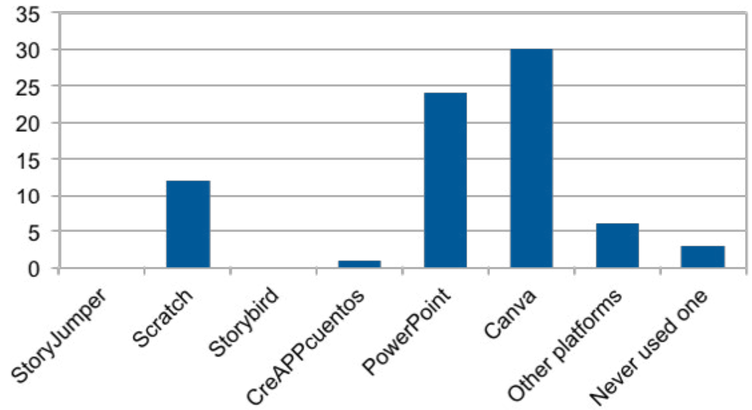
RESULTS

Initial questionnaire

37 students answered the initial questionnaire. The majority of students declared to have created stories previously using a mixture of manual and digital techniques (59,4%). The use of a single technique (digital: 19%, manual: 8,1%) was less frequent. When asked for the type of stories created, the majority were about education values (51,4%) and fantasy (17,1%). Only 14,3% of them were about nature. Most of the students did not know the StoryJumper application (94,6%). The most used digital platforms to create stories were Canva, Power Point and Scratch (Figure 1), while StoryJumper has been used by none of them before.

At this point, when asked for which could be the benefits, in their opinion, of telling stories to small children, the majority said it was a good way to work on concepts (54,1%), values (8,1%) or values and concepts (16,2%). Only 5,4% mentioned the relationship with science. When asked if they knew the characteristics of a science story, 5,4% said they thought to know them well, 59,5% say to know them «more or less», and 32,4% didn't know.

FIGURE 1. NUMBER OF STUDENTS THAT HAVE USED EACH OF THE DIGITAL PLATFORMS BEFORE



Final questionnaire

25 students answered the second questionnaire. As it can be seen in table 1, the majority of students enjoyed the activity, found it easy and considered it useful to improve their knowledge about digital tools, science didactics as well as to awake their curiosity. On the other hand, the perceptions on the learning about plants and animals remained low.

TABLE 1. PERCENTAGE OF STUDENTS CLASSIFIED ACCORDING TO THEIR PERCEPTIONS FOR DIFFERENT ITEMS

Item	Valued as high and good	Valued as low	Valued as nul	Don't know
Enjoyment	68	24	8	
Easiness	76	12	12	
Learning about plants	28	44	24	4
Learning about animals	36	20	36	8
Learning about digital tools	56	36	8	
Learning about science didactics	72	20	8	
Awakening of curiosity towards nature	56	36	4	4

After the activity, all students said to clearly (56%) or, at least, «more or less» (44%) distinguish the characteristics of science stories. Concerning the activity, they specially appreciate the possibility of recording their voices to make an audio-book (32%), the fact of learning topics about science (12%), the inclusion of real pictures (8%) and the exploration of natural spaces (4%). They considered *StoryJumper* adequate because it was very easy to use and could be a good option to create stories together with the children in a more interactive way. However, they exposed, as the main negative aspect, that the platform was limited (in terms of creative possibilities) and that they preferred other platforms such as Canva to create stories.

CONCLUSION AND DISCUSSION

The present study extends the existing body of research on the motivational and learning potential of using science stories with preservice teachers (Anilan, 2018). In particular, the innovativeness of these findings are to show how this kind of activity is considered by students to be enjoyable, easy and useful for improving their curiosity and knowledge towards the natural environment through the connection between new technologies and storytelling. This perspective is necessary to show to students, who generally consider stories just as a tool to talk about values and routines, that they are a powerful resource for learning and teaching science as well. Furthermore, results bring valuable insights into the best practices to be implemented as well as on the importance of the platform selected and the relevance of gathering information all through the process.

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Plant awareness: drawing to learn about plant anatomy, development, and diversity

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ABSTRACT

In the framework of the subject "Natural Sciences", at the 3rd year of the Degree in Early Childhood Education, we implemented a didactic proposal focused on the study of plants in the context of the educational garden. Previous research has evidenced that young people show limited knowledge about the world of plants, as well as numerous alternative conceptions, and thus it is necessary to address this scientific topic from new teaching and learning approaches, aimed at promoting its meaningful learning. In this work, we used botanical illustration as the main teaching and learning strategy. Drawing involves systematically and rigorously observing structures, as well as perceiving the beauty of natural elements, thus resulting in an increase of their appreciation by students. To collect information about students' learning, we used instruments such as *mind maps*, *sketches from nature*, botanical illustrations whose elaboration was supervised by an art specialist (in both the scientific and artistic scopes), open questions, and problem-situations. The preliminary results of the analyses of a subset of initial and final mind maps, and botanical illustrations, are presented here. Mind maps were assessed both from the science and artistic perspectives. Botanical illustrations were analyzed based on a rubric specifically developed to this purpose, which included a range of dimensions related both to structural and aesthetical aspects. Progression in significative understanding of plant anatomy, development, and diversity is observed, as well as an increase in aesthetical appreciation of plants' beauty.

KEYWORDS

Art education, Biodiversity, Initial teacher training, Plant awareness, University gardens.

INTRODUCTION AND THEORETICAL FRAMEWORK

Gardens are valuable outdoor teaching and learning resources that facilitate addressing a wide range of scientific and socio-environmental topics at different levels of complexity, thus being useful across all educational stages (Eugenio-Gozalbo et al., 2020). Moreover, gardens are particularly suitable for initial teacher training, since they will be used as didactic resources by pre-service teachers themselves in the future (Eugenio-Gozalbo et al., 2019). In previous works, we have used sustainably managed gardens to address biodiversity issues: insects' biodiversity (Eugenio-Gozalbo y Ortega-Cubero, 2022), and pollinators' biodiversity (Eugenio-Gozalbo et al., 2022), through a visual strategy based on observation and drawing (both scientific and naturalistic drawing).

Knowledge of the plant world is generally limited (Wood-Robinson, 1991), including understanding plant communities only as the background in which animal life develops, difficulty for identifying plants, misunderstanding of plant biology even at an elementary level, and inability to recognize the functions and importance of plants in ecosystems and for humans. This has been coined *Plant Awareness Disparity* (Parsley, 2020), formerly *Plant Blindness* (Wandersee and Schussler, 1999).

Drawing is considered a valuable learning strategy that allows students to mentally reorganizing and integrating knowledge, as well as applying what they have learned to new situations (Fiorella and Mayer, 2016). Learning by drawing is effective depending on drawing guidance, understood as scaffolding provided by a specialist, i.e., it needs of specialized support to occur (Fiorella and Zhang, 2018). In this work, we use drawing, and in particular botanical illustration, as a fundamental teaching-learning strategy in the search for a significative learning on a range of questions related to plant anatomy, development, and diversity, together with the appreciation of the beauty of natural world (Birch, 2020).

The success of previous experiences teaching on biodiversity at the university garden in Faculty of Education of Soria (University of Valladolid, Spain) leads us to consider that the systematic and rigorous observation of plants will promote the evolution of students' ideas towards scientific ones. Our main research objective is continue testing the combined use of art education and science education to achieve significant progresses in students' knowledge, in this case in relation to plants.

RESEARCH METHOD AND DESIGN

The study was conducted with 52 students of a mean age of 21 years, who were taking the subject "Natural sciences", at the 3rd course of the Degree in Early Childhood Education. In that subject, an organic learning garden (OLG) located at the Soria University Campus (University of Valladolid, Spain), is used as a nuclear resource, in such a way that, every academic year, a particular didactic proposal is developed to teach and learn on a range of scientific and socio-environmental topics. Participating students were informed and gave their explicit permission to use their productions as research data.

In an initial phase, and to elicit initial ideas, two activities were conducted: one consisted in the elaboration of a *mind map* about plants, where each student represented his/her main ideas about plants' world mainly through drawings and (few) words, and the other was a hands-on classification activity in which students, working by groups, needed to find 13 plants at the garden, and classify them following 6 different criteria. In the intervention phase, different activities were conducted, including plant observation and handling of instruments for observation in the class-lab (magnifiers, microscope, art books on plants, etc.); a short theoretical introduction by the art teacher followed by drawing *sketches from nature* in the garden on a freely selected plant individual; lectures on plant evolution and classification; and finally, a short theoretical introduction by the art teacher followed by a botanical illustration hands-on workshop in the art class. In the final phase, students elaborated again a mind map about plants, and answered to some open questions and problem-situations. Open questions and problem-situations were qualitatively analyzed by the science teacher, whereas drawings were analyzed by the art teacher based on a rubric specifically developed to this purpose, which included a range of dimensions related both to structural and aesthetical aspects. Preliminary analyses of mind maps and botanical illustrations are presented.

RESULTS

Preliminary analyses of initial mind maps reveal that students have a poor knowledge of plants' world: in relation to plant anatomy, they tend to use graphic stereotypes or try to copy (mainly from the Internet) when they are asked to draw spontaneously; in relation to plants' physiology, misunderstandings are frequent. Taxonomy, for its part, is a subdiscipline of Plant Biology largely unknown by students. Related to drawing, two main problems arise: firstly, stereotypes are oversimplified representations in which details and relevant characteristics are not present, because their function is that of symbols: they constitute a conventional representation of reality. Secondly, when the choose to copy, either there is a lack of visual literacy that results in the election of inadequate models or, when suitable models are selected, a lack of deep knowledge on structures results in graphic misconceptions (Figure 1).

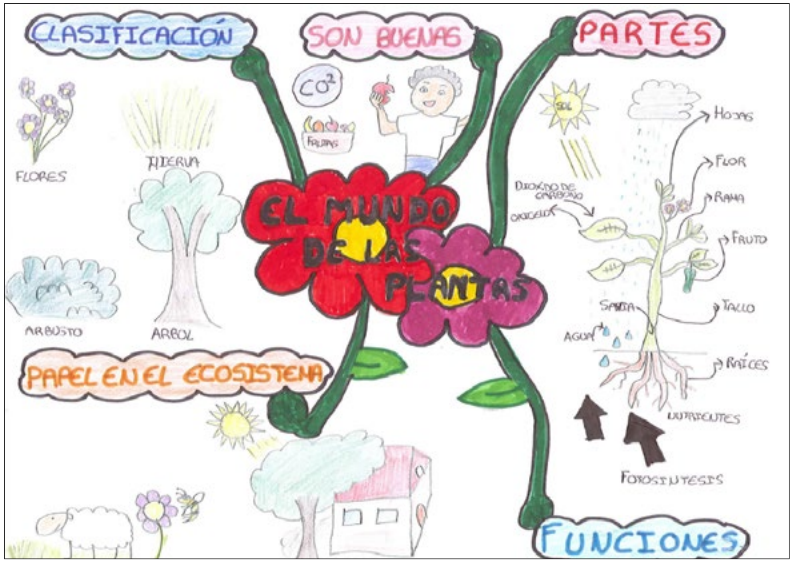

Figure 1. *Initial mind map on plants made by a 21 years-old student. Flowers, bushes, and trees are graphic stereotypes; misunderstandings on plant physiology are represented, and plants are wrongly classified in trees, shrubs, grasses, and flowers.*

Preliminary analyses of botanical illustrations and final mind maps reveal a significant progress regarding the anatomical traits of plants (Figure 2), which has a positive impact on students' knowledge and appreciation of plant diversity.

Figure 2. *Unfinished botanical illustration of a pansy plant (not finished) made by a student.*

CONCLUSION AND DISCUSSION

Drawing appears as a valuable teaching and learning strategy to profoundly understand plant structures, and thus to recognize the characteristics that are used in plant taxonomy, and finally, to appreciate plant diversity. In addition, drawing sensitizes students about the beauty of the natural world, in some sense seducing them to better appreciate its value. Tiny details, previously unknown and unexpected, are revealed to the eyes, generating wonder. Overall, both cognitive learning and aesthetical learning occur simultaneously and generates synergies that push emotions to flow. Again, the role of organic learning gardens outstands as a rich context to promote both science and art education.

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Science Week a formative proposal for future early childhood teachers

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ABSTRACT

The present work is focused on the formative proposal "La Semana de la Ciencia" (Science Week) based on Project Based Learning (PBL) and the assessment of this experience.

Thirty-one undergraduate students have taken part carry on nine workshops about different themes of sciences for 240 young children within 3 and 5 years old and his nine forms teachers.

We wanted to check it is indeed possible to work with active methods on uncommon nature science topics in Early Childhood Education and this really leads to the children's learning. Also, to check if this kind of proposal allows Degree students to achieve certain professional competences and, finally if the connection between the University and educational centres is possible and successful.

The analysis has allowed us based in the assessment conducted for the undergraduate students for every activity, that active methods really lead to the learning about non-usual topics and that scientific work is possible in Early Childhood. Furthermore, we think that this proposal, is an effective way to improve the development of professional competence of university students because themselves comments they have developed some of them as the understanding of the Early Childhood Education curriculum, some principles and procedures used in Early Childhood Education practice and a few main teaching-learning techniques. Lastly, about the connection between the University and schools we have proved that is necessary, also is possible and many teachers expressed that are useful.

KEYWORDS

Early Childhood Education, project-based learning, sciences learning-teaching, competences, University-schools collaboration.

INTRODUCTION AND THEORETICAL FRAMEWORK

In Early Childhood Education, natural sciences receive less attention than other subjects (Mantzicopoulos, Patrick and Samarapungavan, 2008). On some occasions is perhaps avoided because many teachers do not feel prepared to deal with science content (Vílchez y Bravo, 2015), which leads to young children to work on them to a lesser extent (Metz, 2011). Thus, children are ultimately unfamiliar with certain topics in the natural sciences and as well as scientific work. Although, as a variety of authors claim, they can think scientifically (Metz, 2011) or that it is appropriate to introduce science in early childhood because of its benefits (Eshach, 2006).

In addition, the connection and cooperation between Faculties of Education and Early Childhood Education establishments, which is so necessary for growing in both areas, is often limited to the Practicum. But by working together from the University with teachers in the early childhood classroom, we can benefit from each other (Mazas, Cascarosa y Mateo, 2021).

To try to cover all these problems, it was decided to conduct the formative proposal "La Semana de la Ciencia" (Science Week) based on Project Based Learning (PBL) and to assess that experience.

The analysis of the experience put its finger on checking whether it is indeed possible to work on certain nature science topics in Early Childhood Education; whether working through an active method really leads to the children's learning; if the Degree students achieve certain professional competences through this proposal and, finally though the connection between the University and educational centres is possible and fruitful.

RESEARCH METHOD AND DESIGN

The methodological approach is qualitative, and the scope is interpretive and descriptive.

The activity analysed was an event included in the subject: "Experimental activities for the discovery of the environment" carried out this school year 2022/23. This optional subject has 6 ECTS credits and is taken in the fourth year of the Early Childhood Education Degree, before the second Practicum period.

Thirty-one undergraduate students in groups of three or four were given two months to design and prepare a one-hour workshop about a free election science topic to implement with young children. Both class time and homework were used to develop the workshop. Furthermore, one or two hours per week were used for lectures supervision and feedback during the course.

The event was held for four hours in some different spaces of the Faculty of Education building on November 17th. Whereby 240 young children within 3 and 5 years old belong to five public schools of our city and their nine form teachers.

The Science Week included all the workshops designed by every group of students, a total of nine workshops were held about: cell, electricity, Earth lays, circulatory system, chemical reactions, Living beings, matter states, mixtures, and sustainable development. The workshop structure was initial activities to present the subject worked, manipulative activity carried out for the pre-schoolers along or by groups and final activity to go over the worked themes and to evaluate the learning process.

The research tools were two online questionnaires designed *ad hoc*. One for in-service pre-school teachers (9 open questions) and the other for undergraduate students (17 questions: 6 open questions and 9 valuative Liker –4 levels-).

Both surveys were voluntary, but participation was encouraged. The links for the questionnaires were distributed by e-mail to the participants after the event. The answers were analysed and categorised manually, without software help.

RESULTS

We finally received answers from fourteen (45,1%) undergraduate students and seven (77,8%) form teachers.

About the teachers' assessment of the workshops and the cooperation between the Faculty of Education and Pre-school establishments, the teachers were agreeing that this collaboration allows them to learn and to find support for new methods, to find new ways to teach science, to contribute to the undergraduate's formation or to include new trends in the class. For this particular experience, most express a positive opinion as "there is a good source of learning" or "undergraduate students were very involved". Just one of them expressed a negative opinion: "activity was not suitable for the age". But all of them answered yes to the question "Will you participate again in a similar experience?"

About to work on uncommon issues or scientific method, five of the fourteen students revealed after the activity that "any subject can be taught-learned in early childhood if you consider age, and you work playfully and manipulatively".

Regarding whether working through the methods used in the workshops really leads to the children's learning, undergraduate students had planned some strategies to check out. They used children's drawing, target of evaluation filled by themselves, final meeting and observation of the process (what they did, asked, answered or spoken).

Finally, about if the Degree students achieve certain professional competences with these activities, they expressed that they have learned to program realistically. Also, to plan activities they have first to master the curricular contents, to know teaching methodologies age-appropriate and to know psycho-developmental characteristics of the young children. These learns were achieved through practice, and for this reason this activity was evaluated as the best of the subject for some students.

CONCLUSION AND DISCUSSION

PBL proposal has allowed us to demonstrate the connection between the University and schools is possible and useful. Many form teachers were agreeing that this collaboration is a formative experience for them ("long-live learning"). Also, teachers think this collaboration does not either take time or hinder their routines. Although there are some negative opinions, it means that we need to keep this track of working.

We can conclude that active methods really lead to the children's learning about non-usual topics and scientific work is possible in Early childhood based on assessment carried out for most undergraduates' groups.

We stand out that performing this formative activity in the classrooms of the Faculty of Education, with the presence of the children's teachers and with their subsequent opinion on the activity, is an effective way to improve the development of professional competence of university students.

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Connecting school to university through the assessment of degree students

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ABSTRACT

In this work, the inclusion of a professional vision of an early childhood education teacher in the assessment of a formative experience of Project Oriented Learning in University Teaching is analyzed. After some initial considerations on the features, possibilities, and limitations of out-door science learning, we discuss the experience development, which has been carried out over two months in a group of students in the fourth year of an Early Childhood Education Teacher Degree. The experience is valued by students and teachers based on assessment tools like the teacher's diary, rubrics, co-assessment and self-assessment reports and students' learning diary. The students highlight the usefulness of the formative proposal to develop professional competences and especially the feedback offered by the early childhood teacher.

KEYWORDS

Higher Education, Feedback, Project-Based Learning, Early Childhood Teacher Education, Formative Assessment

INTRODUCTION AND THEORETICAL FRAMEWORK

Teacher training should be directed towards the development of reflective capacity and autonomy, as well as providing criteria for decision-making. In this sense, it is essential to get closer to the real context, to reduce the distance between theory and practice in a critical and reflexive way (Martínez-Mínguez y Flores, 2014), and between the university and the children's school (Medina and del Carmen, 2013).

It has been proved that Project Oriented Learning (POL) methodology has positive aspects in terms of reality adaptation and work mentoring (Barba et al., 2012; Nieva et al., 2023). As well, it has stood out the power of formative assessment in higher education (Panadero et al., 2019; Nieva et al., 2023). As has been pointed out by several authors, for example Panadero and Lipnevich

(2022), it is important that the information offered in the feedback is of high quality, adapted to the characteristics of the learner and that it can be used during the learning process.

According to the mandatory curriculum, the teacher must plan and propose activities both in everyday life and didactic proposals in specific spaces and times for early childhood. Without losing sight of the socio-affective orientation of early childhood education, we consider that scientific content in general, and above all knowledge of the environment, are centers of interest around which learning of all kinds, not only instrumental but also axiological, is more easily constructed (Carver and Shrager, 2012; Eshach, 2011). Nonetheless, the reality in schools shows that early childhood teachers do not feel sufficiently prepared to teach these contents in practice. Teachers' perception of insufficient training is one of the reasons why outdoor science activities are not carried out properly in some schools. Therefore, initial teacher education should focus more on addressing the constraints that teachers report.

In the Education context is happening a global ICT inclusion, specifically in university and more intensity after Coronavirus pandemic intromission. The use of digital platforms for the development of scientific knowledge as well as for the training of future professional workers are the clearest mainstreaming. The digital innovation at universities points out the possibility of transforming the training model (De Pablos et al., 2019).

Based on research and taking advantage of the availability of digital platforms, it was decided to implement the formative experience that is presented and analyzed here. The main question that guided this qualitative study was: it deemed in-place to include an early childhood education teacher in the assessment of the learning process about the use of the natural environment in teacher education?

RESEARCH METHOD AND DESIGN

The formative experience analyzed was included in the subject: "Experimental activities for the discovery of the environment" carried out the school year 2021/22. This optional subject has 6 ECTS credits and is taken in the fourth year of the Early Childhood Education Degree, before the second Practicum period. Two university lecturers oversaw the subject.

Sixteen undergraduate students in groups of three or four were challenged to design a formative proposal around gardens for early childhood education. The project lasted two months, both class time and homework were used to develop the proposal. The first phase of the project sequence was the introduction to the challenge and modelling. The first model experience was a dramatized route in the green belt of the city which includes the municipal leisure gardens. The second one was an escape-land in a socio-ecological vegetable garden. The project continued with the analysis of both experiences based on bibliography provided by the lecturers. After that, each students working group wrote the first draft of the proposal and handed it to the lecturers. The lecturers give feedback to the draft and the students keep working on the proposal. The second delivery of the draft was a co-assessment task at university class with a rubric as support tool. This task was developed by a couple of students, then each working group received two co-assessment reports of their draft. The next milestone in the process was the public oral presentation to the classmates, the lectures and the early childhood teacher who acted as external evaluator. This class session was possible thanks to the ICT because the teacher connected by videoconference from her school.

The research tools were the lectures' diary, the observation template of the presentation session, the rubrics, the learning diaries of each student, as well as the messages sent by the early childhood teacher. The answers were analyzed and categorized manually, without software help.

RESULTS

The students highlight the feedback offered by the early childhood teacher. They perceive the quality of the information she offered them, perfectly adapted to their characteristics and useful in a close future: "In my opinion, it is very enriching that a teacher of Early Childhood Education offers us different perspectives on how to improve our work so that we can then put it into practice with our future pupils"; "[she] has given us various feedback, which I think is important for us, or at least for me"; "we had the opportunity to experience a different kind of feedback to what has happened in the classroom so far"; "Sometimes the corrections and evaluations of the teachers of the university, remain in theoretical aspects that make you feel that a more practical approach is missing, on this occasion this did not happen, because both a theoretical aspect and a vision of productivity in the classroom were given".

CONCLUSION AND DISCUSSION

We stand out that this use of digital platforms contributes effectively to connect the academy and the schools. The experience of being assessed by a professional improves the development of professional competence of university students.

In addition, the POL experience about gardens helps to increase knowledge of degree students about the environment and scientific education of early children.

This formative experience and the conclusion from its analysis encourage us to repeat and extend the experience in other subjects of the Early Childhood Education degree during this academic year 2022-23.

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10 years of science workshops: a university-school experience

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ABSTRACT

Since the 2013-2014 academic year, the students of the fourth year of the Early Childhood Education Degree of the Faculty of Education in Donostia-San Sebastian (Spain) have been organizing science workshops with school children. With an average of between 16 and 24 science workshops per year, up to 300 children and their tutors participate in these events. Beyond the practical science experience with children the pedagogical objective of this initiative is that our students generate a critical reflection on their practice. To this end, aspects such as self- and co-evaluation are encouraged. In addition, this initiative aims to become an action-research activity, and thus, the questionnaires and evaluations that we conduct each year to our students point to an increase in autonomy, self-efficacy and a high degree of critical reflection of their work. Finally, year after year we are consolidating and improving the relationship with the participating schools, especially through the increasingly active involvement of the tutors.

KEYWORDS

teacher training, science workshops, university-school initiative, pedagogical relationship, self-efficacy.

INTRODUCTION AND THEORETICAL FRAMEWORK

Our students come to the Faculty with many beliefs about how and what children learn or how they should to teach, especially sciences. These beliefs hardly vary across training programs (Zeichner, 2010). Authors such as Chang-Kredl and Kingsley (2014) advocate for experiences based on reflection on real practice as part of the teaching training, so students can confront these beliefs. In addition, sometimes we must, as Siry (2014) indicates, "deconstruct" science in children, basing it on aspects such as "processes, content, stories or emotions".

On this basis, and within the implementation of the new Degrees in 2013/2014, we proposed in the subject Science Workshops for Early Childhood a new form of teaching, based on science workshops that our students would hold with schools of the region. Not only we expected to develop an initiative of real practice with children, but our aim was to encourage a practice for reflective and critical thinking in our students.

So, the final objective of these workshops was for future teachers to analyze their beliefs towards teaching and learning, which are usually strongly rooted and resistant to change, but which tend to emerge with their first responsibilities as teachers (Pajares, 1992), such as in this case the workshops, where our students are the ones who decide from the school they are going to bring to hold the workshops -they commonly 'invite' them to come to the center where they have been on their internship- to the topic they are going to work on. After 10 editions of these science workshops, we can draw some general conclusions from this initiative.

RESEARCH METHOD AND DESIGN

Each group of 4-5 students (a total of 12-14 groups) organizes two science workshops (free theme: sound, cooking, light, the senses...) that will be held in our Faculty, in addition to pre- and post-sessions in the invited schools. We give special attention to self-evaluation and co-evaluation between groups. For co-evaluation the groups that are not performing the workshops should evaluate aspects that are contrasted among all the students in an open and collaborative way in a later class. For self-evaluation the performing group must analyze the video recordings of each workshop, giving rise to a report of the whole process.

We also conducted a questionnaire (Table 1 and 2) before and after the workshops to determine the degree of learning, epistemological beliefs, self-efficacy or the evaluation of the pedagogical relationship established.

Through these workshops you can achieve several objectives, rank them from 1 (most important) to 5 (the least important).

TABLE 1. QUESTION INCLUDED IN THE PRE- AND POST-TEST

		Pre-test	Post-test
Level 1	To build a close relationship with the children who visit us and make it a rich and rewarding experience.		
Level 2	Learn how to conduct science workshops.		
Level 3	See what the reality of the school really is.		
Level 4	Combining theory and practice.		
Level 5	Develop the workshops and analyze what we have done and what has happened, and as (future) teachers improve through reflection.		

TABLE 2. FACTORS THAT MOST INFLUENCED LEARNING (POST-TEST QUESTION)

Reflection after the workshops.	
Have the workshops well prepared in advance, both conceptually (theory) and in terms of activities.	
Developing the workshops in class and having the opportunity to repeat them	
The evaluation among the groups and being able to share our opinions.	
To have the help and motivation of the rest of the groups.	
Others	

RESULTS

We have been organizing science workshops with children at the Faculty of Education for 10 years now. Even during the COVID-19 pandemic these workshops continued, in this case being held in the schools instead of at the Faculty. Each year we observe that beyond the practical experience with children our students reflect on aspects of their practice as future teachers.

FIGURE 1. DIFFERENT MOMENTS OF THE SCIENCE WORKSHOPS: WELCOME TO THE FACULTY, FLOTATION WORKSHOP, LIGHT WORKSHOP, CONCLUSION OF THE COOKING WORKSHOP

From the results of the last years, it can be stated that if at the beginning they considered the contribution of the workshops as one more experience with children or to learn procedures and methodologies, at the end the perception of the contribution of the workshops as a reflective practice increased, as almost most groups vary their answers to the ones related to reflection (level 4 and 5). After performing the workshops the factors that students more often admit to most determine their learning are those directly related to the critical evaluation of their practice: "The reflection after the workshops" and "The evaluation among the groups and being able to share our opinions" (Table 2).

They also consider important to feel confident about the workshops they are going to develop, not only in terms of logistics and group management (remember that in each workshop there are 3-4 students with 25 children) but also the conceptual aspects of the workshops: "*To have previously prepared the workshops well, both conceptually (theory) and activities*" (student quote). In the methodological aspect, they value the fact of organizing different workshops, with different themes and with different schools. This is an enactive practice, one of the four components that, as Bandura (1997) indicates, reinforce our students' sense of self-efficacy.

CONCLUSION AND DISCUSSION

We can say that after 10 years of workshops, that this is an initiative with strong roots in our Faculty and also has a wide echo in the schools of the region. On the other hand, we have been able to observe how our students generally overcome their fear of the more theoretical aspects of science, and have improved their attitude and their conception of science in children. How to learn it and how to teach changes substantially year after year: '*Without realizing it, and together with the children, we learned a good number of contents, both about science, its didactics and how to carry out science experiences*' (student's quote). Therefore, one of the great benefits of the workshops is that they have identified, contrasted and reflected on their own pedagogical ideas, since these strongly condition their future practice.

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The "Flying Nest": natural sciences for early childhood, from the Museum to nursery school

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ABSTRACT

The Flying Nest is a project of the Natural Sciences Museum of Barcelona (Museu de Ciències Naturals de Barcelona, MCNB) to promote science from early childhood by bringing the heritage and didactic proposal of the museum closer to nursery school children. The aim is for teachers to put their own version of the Nest into practice at school, to gradually incorporate with the youngest children a scientific perspective in their understanding of the world, their environment and natural materials, thus promoting the learning natural sciences.

Based on the Science Nest, the Museum's unique and exclusive space for children from 0 to 6 years old, the Flying Nest consists of a mobile suitcase with didactic proposals and biological and geological materials. The importance of objects in learning science and their evocative and bond-generating role is indisputable, but it is also essential to follow a didactic approach that helps to create the links between the materials and the children's ideas. That's the reason why we count on training the teaching teams of nursery schools and advising and providing constant support so that they can make the Nest's didactic methodology their own and apply it to their centres.

As the Flying Nest leaves its mark, there are several preschools that have incorporated this scientific look at natural materials and the environment into their own day-to-day life.

KEYWORDS

Museum, heritage, natural science, early childhood, teachers training

INTRODUCTION AND THEORETICAL FRAMEWORK

The Natural Sciences Museum of Barcelona (Museu de Ciències Naturals de Barcelona, MCNB) aims to generate and share knowledge to help create a more informed, connected and environmentally responsible society. This goal is achieved through the scientific research, the preservation of biological and geological collections and an own educational model proposing a way of learning science beyond the simple transmission of information, but encouraging exploration and active learning among the wider public. The activities created with this methodology work on the basis of questions, stimulating curiosity and ability to research, reason and discover.

As an accessible and inclusive museum, the MCNB works from the premise that science is for everyone, helping to understand the world and is therefore part of people from the earliest ages. To naturally involve people in scientific decisions and make them able to assess their consequences, we must offer them a close contact experience with the scientific processes from an early age.

The Science Nest is the place in the MCNB to encourage young children's natural curiosity, helping them to make sense of the natural phenomena, stimulating reasoned intervention about the materials, inviting them to interact, ask questions and develop hypotheses. The Science Nest experience is a set of several factors:

A close environment: suggestive biological and geological materials from our immediate environment ready to be manipulated. Diversity of rocks and minerals with different sensory qualities, sands from different beaches, shells, snails and other marine animals, insects, remains of vertebrates such as skulls, horns, skins or bones, trunks, leaves and fruits or seeds.

Free choice: freedom to inspect the materials that interest them most without any imposition from adults.

Interest: distribution of materials designed to arouse interest and desire to investigate, to stimulate observation, questions, hypotheses, contrast of ideas by comparing close materials and searching in books.

Respectful accompaniment: the educator accompanies children in their research without offering unique answers but stimulating them to think and express their own ideas. Posing questions, leading conversations, valuing their own ideas and reflections, and helping them to look for evidence among the materials and books.

By offering space, materials and educational support following the didactic model of The Science Nest, the museum becomes the rich and stimulating context for children to learn about nature. In short, it is the context to become a truly transformative museum.

RESEARCH METHOD AND DESIGN

The Science Nest offers school activities for children from 2 to 6 years old. However, the nursery school community has not been very present: although teachers value our offer very positively, the difficulties of school logistics make it complex for them to come to the Museum.

Faced with this fact, the museum decided to create the Flying Nest, a mobile suitcase with didactic proposals and biological and geological materials, to approach the museum, its philosophy and its heritage to the nursery schools, being aware of the importance of real and available natural materials and their indisputable didactic role. The Flying Nest, however, is not a simple resource for borrowing natural material: it goes much further and includes training and counselling sessions so that teachers can make these materials their own by applying the Science Nest's own teaching methodology in their classrooms. The Flying Nest remains in each nursery school for 5 weeks, during which the museum educators support the teachers in various ways: visiting them at the school to show them how to do the sessions, offering additional information, and holding meetings periodically to share doubts and strategies about the methodology and practice of the sessions.

The Flying Nest proposes six themed nests with natural materials and related didactic proposals: Geological materials, vegetables, sea materials, vertebrate forest animals, invertebrate forest animals and reference scientific books. I also has its "Script for the teaching staff," a comprehensive document detailing all the necessary aspects to choose the most suitable space for the "nest" at each school, to distribute the materials, to structure their sessions didactically and to carry them out satisfactorily. It also provides information on the different natural materials, and on how to stimulate children through questions, research itineraries and diverse and rich conversations specifically related to those natural materials.

The Flying Nest took off in the 2019-2020 school year. Unfortunately, after visiting four schools its schedule was disrupted due to the closure of all schools on 13 March 2020 as a preventive measure to deal with the health emergency caused by the Covid-19 pandemic. After that, the Flying Nest was opened to visit new schools again.

RESULTS

Since the Flying Nest started visiting nursery schools, it has reached around 25 different centres. Each time, the museum educators have been accompanying the teaching teams to help them feel comfortable with the methodology and enjoy the activities with their children.

The result of this process is empowered teachers, including a new scientific way of looking at the natural materials into their daily work at school, sharing ideas, discussing about good scientific questions, and combining materials in different ways according to each session.

According to their comments and the observation of children's attitude during the activities, the vast majority of teachers have enjoyed the activities with their children, who have expressed many ideas in different ways (words, gestures, photographs in the books). They have also noticed that the children have changed their attitude around natural materials outside the Nest, when they went out to the garden, the yard,... showing more respect and asking more questions about them.

Two of those schools have already created their own "science nest", as a result of the training process carried out by the entire team with the educators of the Museum during their participation of the Flying Nest project. All the children go every week to their science nest and both teaching teams continue sharing experiences and reflexions with each other and with the museum.

Other schools have been expanding their way of working with natural materials to incorporate the scientific perspective, questions and research, and are gradually creating their own small science spaces with available materials.

Once a year the museum holds a meeting with the teachers participating in the Flying Nest project toy share experiences and strategies on how they are incorporating their small science spaces into day-to-day life at the nursery school. For the museum, it is a great pleasure to see how the flying nest is gradually leaving its small mark.

CONCLUSION AND DISCUSSION

The Flying Nest provides a different didactic methodology that helps nursery schools to include natural sciences in their day-to-day life. It is also committed to the continuous training of teachers and maintaining a fluid dialogue between schools and the Museum, working together on this scientific approach to young children.

The Flying Nest is a success story that still has a long way to go and, therefore, to keep flying. https://nattv.museuciencies.cat/programes/el-niu-volant/

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Science education in Early Childhood Teacher Education: initial student's social representations

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ABSTRACT

Due to the challenges posed by the current ecosocial crisis, the need to integrate Science Education (EC) and Education for Sustainability (ES) in Education degrees supposes an urgent demand. As is revealed in several studies, this connection is beneficial since it favours the interest and learning of science and enhances citizen positive actions towards the environment. The present research aimed to analyze the social representations that future early childhood teachers present about socio-environmental problems related to: the loss of Biodiversity (DB), climate change (CC) and well-being and health (BS). The study followed a case study design and recruited 60 students from the Early Childhood Education Teacher Degree of the University of Barcelona who participated in the subject "Knowledge and Exploration of the Natural Environment". In order to analyze quantitative and qualitative data, a questionnaire that included multiple-choice, Likert-scale and open-answer questions was designed and validated. Results show that participants presented a poor understanding about many of the causes behind the ecosocial problems, their origin and their effects when these are not possible to be observed directly. At the end it is discussed how the understanding of the social representations of students is relevant in order to effectively introduce sustainability into teaching programs.

KEYWORDS

Teacher training, Ecosocial crisis, Biodiversity education, Climate change education, Sustainability education

INTRODUCTION AND THEORETICAL FRAMEWORK

The ecosocial crisis that humanity currently faces depends on multiple dimensions in which several causal factors converge. Increasingly, evidence proving this multifactorial approach can be found at the environmental (climate change, loss of biodiversity, ocean acidification, resource depletion), social (increase in world population, forced migrations) and economic spheres (increase in inequalities). Often these phenomena are clearly connected to each other and have a direct (pandemics) or indirect (lack of water) effect on people's health and well-being.

The latest curricula for both compulsory pre-university and university educational stages are clearly directed towards the 2030 Agenda and the SDGs' specific targets, aiming to train future generations in the spirit of ecosocial transition. This trend is notorious in educative laws, for instance the LOMLOE (Organic Law 3/2020) states that one of the principles on which the Spanish education system is inspired is "education for the ecological transition with social justice criteria as a contribution to environmental, social and economic sustainability" (Ministerio de Educación, 2020). On the other hand, the LOSU, currently a bill in the legislative process, includes in its articles the promotion of activities aimed at the culture of peace, human rights, compliance with the SDGs, social transformation, equity and environmental sustainability in the university fields of teaching, research and knowledge transfer.

Although the connection between Science Education (EC) and Education for Sustainability (ES) has an extensive background, today, due to the challenges posed, the need to integrate them supposes an urgent demand. Several authors (Garcia, 2004; Sauvé, 2010) state that the crossing between EC and ES is beneficial for the learning processes related to both fields, since their connection favours the interest and learning of science and enhances citizen positive actions towards the environment.

The incorporation of sustainable issues into educational programs cannot be limited to just a brushstroke of the contents, preferably it would require a complete integration into the entire teaching and learning process (contents, methodologies, classroom management, evaluation, interaction between students and teachers, etc.). This inclusion has been called for years *curricular environmentalization* or *sustainability of the curriculum* (Barron, Navarrete, Ferrer-Balas, 2010).

Given this context, this research sought to analyse the social representations that future early childhood teachers present about socio-environmental problems. The study is based on the assumption that it is necessary to know what the social representations of students are in order to introduce effectively sustainability into teaching programs. This analysis focused on three of the most relevant problems: the loss of Biodiversity (DB), climate change (CC) and well-being and health (BS), which are related to: SDG-15, Life on land; SDG-13, Climate Action and SDG-3, Good health and well-being, respectively.

RESEARCH METHOD AND DESIGN

The research follows a case study design. The sample consisted of 60 students from the Early Childhood Education Teacher Degree of the University of Barcelona who participated in the subject "Knowledge and Exploration of the Natural Environment". In order to analyse quantitative and qualitative data, a questionnaire that included multiple-choice, Likert-scale and open-answer questions, and that contained the three thematic blocks presented above (CC, BD and BS) was designed and validated. The quantitative analysis was performed with the statistical software *Jamovi 2.3.18* and consisted of a descriptive analysis followed by comparisons through correspondence tables and Xi-square tests. Besides, for qualitative analysis *Iramuteq software* was used to develop correspondence analysis and hierarchical classifications.

RESULTS

An initial analysis of the answers showed that students, despite knowing about the problems of climate change, biodiversity loss and environmental issues related to well-being and health, express a poor understanding about many of the causes behind the problems, their origin and their effects when these are not possible to be observed directly. For example, in the case of biodiversity, it was evident that most students did not prioritize biodiversity loss as a relevant socio-environmental problem. In addition, when they proposed solutions to this problem, they addressed issues that were not related to it such as the restriction of hunting or the decrease in the consumption of animal products.

Furthermore, they failed to provide deep arguments, so very general solutions such as environmental awareness or the conservation of protected areas were given.

When it comes to analyse situations where ecosocial problems are the result of the interconnection between different factors, most students showed understanding limitations and, therefore, offer partial and reductionist solutions to problems that require a more complex, multidimensional and transdisciplinary view.

CONCLUSION AND DISCUSSION

These preliminary results provide a window into the need for a much more interdisciplinary vision of sustainability in university degrees, especially in those that train future educational agents. Only by understanding and facing this lack of scientific literacy it seems plausible to achieve a society that understands this multidimensionality and acts accordingly. These findings suggest the importance of investigating new ways of approaching socio-environmental problems from a systemic, global and critical approach (Calafell & Junyent, 2017). Here it is important to highlight the need to incorporate a complex approach to the socio-environmental crisis, in order to educate citizens in the understanding that the current unsustainable situation responds to problems that are transnational and multidimensional (Morin, 2007). Consequently, this leads to encouraging them to acquire more empowered, critical and participatory positions of knowledge and eco-citizenship (Sauvé & Asselin, 2017) that allow dogmatic positions to be questioned, as well as pseudoscientists or deniers of the socio-environmental crisis. In particular, studies like the present one contribute to the capacitation of future early childhood teachers to face the ecosocial transition with an adequate knowledge of what it means to teach and learn science in stage 0-6.

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What do Early Childhood trainee teachers think of a science subject? A preliminary study

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ABSTRACT

In this work, we analyze the perception of a sample of students of the Degree in Early Childhood Education from the University of Valencia (Spain) about a scientific content subject. Furthermore, the assessment of an activity performed with a plasma ball in class while studying the topic of states of matter is also presented. The results show a positive opinion about the necessity and usefulness of this subject and its contents. The plasma ball activity is also positively assessed by the students about aspects such as curiosity, utility, or fun. As teacher trainers, it is interesting to know the opinion of trainee teachers about science subjects because their perception could help us to design and program them also considering the interests of these students.

KEYWORDS

Early childhood education, science education, initial teacher training, pre-service teachers, science content

INTRODUCTION AND THEORETICAL FRAMEWORK

University study programmes for the Degree in Early Childhood Education must provide students with the necessary knowledge and tools for their future teaching work. Within scientific training, it is common to find subjects with disciplinary content, as a complement to previous scientific education before accessing the Degree, as well as the Didactics of the Sciences subjects. However, students sometimes do not value in the same way the different scientific topics addressed in the subjects. In the study conducted by Cantó & Solbes (2014), Early Childhood Education students considered the contents related to physics and chemistry to be less relevant than those of biology.

Although the pre-service teacher scientific training should be general, an activity was performed with a plasma ball to broaden the topic of states of matter, and it was also assessed for this research. Activities with science toys

(Güémez et al., 2009), or recreational science, could motivate or improve students' emotions towards science, something that is completely necessary for their future work as teachers (Bravo et al., 2022).

The two main objectives of this work are:

- To analyze the perception of trainee teachers of the Degree in Early Childhood Education about a subject of disciplinary science content and the different scientific topics that are revised during the first semester, mainly focused on physics and chemistry content,
- To study their assessment of an activity with a plasma ball.

RESEARCH METHOD AND DESIGN

In order to achieve these objectives, a preliminary descriptive study was carried out with a sample of 39 students of the Degree in Early Childhood Education of the University of Valencia at the end of the first semester of the subject "Natural Sciences for Teachers", a compulsory annual subject of 9 credits ECTS. This subject aims to complete their basic training in this scientific discipline while improving their training as teachers.

For data collection, a self-administered questionnaire with a 4-point Likert scale (1 – strongly disagree and 4 – strongly agree) was used to rate three statements about their perception of the subject "Natural Sciences for Teachers":

- Q1: A subject with disciplinary science content is necessary for the Degree in Early Childhood Education.
- Q2: The content addressed in this subject is useful for your future work as Early Childhood Education teacher.
- Q3: The content addressed in this subject is useful for your training.

Three open questions were also included to analyze the reasons for their answers. Furthermore, a checklist table was included to allow students to choose, according to their opinion, which topics addressed in class during the semester are necessary.

In order to assess the students' perception of the plasma ball activity, five 4-point Likert scale questions were included in the questionnaire. The aim was to obtain their opinion on how useful the plasma ball activity was for their future career or training, as well as to assess whether they found it fun, curious, and interesting. This experience consisted of, besides touching the plasma ball toy, understanding its physical basis. The activity took about half an hour, and it was performed within the states of matter unit.

RESULTS

The preliminary results of this work, which is part of a wider project, are here presented. Students consider the science subject necessary for the degree of Early Childhood Education (3.26± 0.68; mean±SD) and that the contents are useful for their future teaching work as well as for their training (3.00± 0.65; 3.21±0.58, respectively).

Regarding the scientific topics trainee teachers considered useful for their future teaching work, the distribution of responses is very heterogeneous. The three contents (and their relative frequencies) most repeated are seasons (100%), day and night and Solar system (97,44% in both cases). Otherwise, topics such as unit conversion or atomic structure are the least repeated contents (2,56% in both cases).

Finally, the activity with the plasma ball also yields positive results. Students positively value the usefulness of the activity for their future work and their training, as well as considering it fun, curious, and interesting (mean values above 3 in all cases).

DISCUSSIONS AND CONCLUSIONS

Despite the small sample, this preliminary work analyses the opinion and perception of students of the Degree in Early Childhood Education after completing the first semester of the subject "Natural Sciences for teachers", mainly about topics related to physics and chemistry. Students have a positive perception of the need for a subject like this not only for their future work as teachers but also for their training.

When they have been specifically asked about the contents which they consider useful for their future teaching work, general science contents such as day and night or seasons appeared in most answers. These topics are usually addressed in Early Childhood Education. However, some responses seem to show contradictions. Some students choose an advanced topic but they do not choose the basic related content. The issue is whether the question “Which of the following addressed topics do you think are necessary for your future teacher work?” was misunderstood or students really consider these topics essential for their future work. Further personal interviews could complete these preliminary results.

The results obtained in relation to the activity with the plasma globe show that, although it is not a topic that is addressed in their future classrooms, it does foster and strengthen positive emotions towards science, which they could later permeate to their future pupils.

From our point of view as teacher trainers, Early Childhood trainee teachers must have a complete basic science education. However, we consider very useful to analyze their opinion about subjects like this, as well as the experiences and topics addressed in it, because knowing their perception could help us to design and program science subjects taking into account also their interests so we can improve trainee teachers’ interest and motivation towards science, which is necessary for their future work.

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TecnoLAB. Technology on wheels

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ABSTRACT

Several studies demonstrate how girls and boys are capable and active, in terms of experimentation, inquiry, sensory and motor exploration, etc., in their physical environment. This fact reinforces the use of free-choice spaces for learning about science and technology. For this reason, in this contribution we will present in detail the composition of the TecnoLAB mobile space (consisting of six modules) and we will analyze whether the use of these materials in schools can be useful to foster a satisfactory relationship between children and the use of technology, in addition to improve both content and procedures specific to the field.

KEYWORDS

Technology, engineering, early childhood, laboratory, free choice.

INTRODUCTION

Multiple studies show how girls and boys have a spontaneous interest in their environment (Dewey, 1985) and in having a better understanding of those everyday phenomena that surround them (Gopnik and Meltzoff, 1999). In fact, both from the neuroscientific (Bueno, 2017; Carballo-Márquez, 2016; Mora, 2013), and pedagogical fields (Csikszentmihályi, 1995; Pozo, 2008; Santos Guerra, 2019) and more specifically from the field of didactics of sciences (Poddiakov, 2011; Osborne, 2014; Pedreira and Márquez, 2017) several authors show how capable and active, in terms of experimentation, inquiry, sensory and motor exploration, etc., are girls and boys in their physical environment.

This ability to carry out science at an early age has supported the creation of science spaces (Labs) conceived and proposed as a third educator (Malaguzzi, 2001; 2005). An example of this is the LAB 0_6 on the Manresa campus of the University of Vic-Central University of Catalonia. Spaces that are structured through a free-choice criteria, which means that the children can choose what proposals or materials to work on, can decide what actions are they going to carry out with the materials and with whom and for how long they are going to investigate (Pedreira, et al., 2019). Being able to choose actions in a stimulating environment turns the visit into a play, and therefore a very beneficial environment for learning (Bodrova, 2008; Weissmann, 2014; Wood, 2014). Adults and/or educators should be concerned that such playing has learning value. For this reason, the proposals are always structured, since they clearly point to a specific phenomenon (magnetism, weight, trajectory...) but at the same time they are open, since great value is placed on maintaining the initiative to solve challenges in children (Pedreira and Márquez, 2016; Pedreira, et al., 2019).

It is for all these reasons that the FECYT project "Ciencia sobre ruedas -FCT-16-11603-" was born. This project had the objective of expanding the experience of LAB 0_6 to groups with difficulty accessing spaces of free choice. Conducting this project in various educational centers in Catalonia generated a high degree of satisfaction in the teachers who requested it. In addition, the teachers proposed changes in their didactic practice and promoted the creation of their own science spaces.

Departing from such experiences and expertise the TecnoLAB project has been created. The main objective of this project is to bring technology closer to early childhood. The starting hypothesis, based on data from the project "Ciencia sobre ruedas -FCT-16-11603-", is that visiting the space or using this type of space at school can be very useful to foster a satisfactory relationship of children with the use of technology, in addition to allow them learning both contents and procedures specific to the field.

DESIGN

The mobile laboratory of technology (TecnoLAB) is based on the pedagogical potential of organizing free-choice spaces. That is to say: 1) they respond to the different children's needs, 2) they offer diverse proposals open to different problem-solving levels, 3) they do not make public the mistakes made by the children, 4) the non-existence of a unique answer and 5) the organization of a space that favors the interaction between small groups of equals (Pedreira, et al., 2019).

Specifically, the TecnoLAB is made up of six modules. A first module is about the transmission of movement using gears and their application in everyday life. A second module provides an experience about the transformation of mechanical energy, by converting the driving force of children, into electricity. The third module focuses on change and continuity using mobiles and telephones of different generations that will be arranged in a timeline. The module is completed with the proposal to control sound transmission using various materials. A fourth module proposes the construction of an electrical circuit with different elements (source, conductors, components) that the children will be able to organize based on their initiative. A fifth module focuses on posing the challenge of moving a car by using various forces (the force of the wind, the tension of the elastic bands, magnets...). A sixth module proposes the construction of circuits with ramps to control the trajectory and movement of a marble.

PARTICIPANTS

During the course 2022-23, the TecnoLAB will visit a total of 30 schools with the participation of children from the second cycle of Early Childhood Education, with a total of 120 school groups(approximately 2,400 children).

DATA SOURCES AND PRELIMINARY RESULTS

In order to test the starting hypothesis, a brief questionnaire will be carried out to the teachers who have conducted the workshop with their class. In addition, participant observations will be made by the TecnoLAB trainers. These instruments will make us consider if the final results of the project "science on wheels -FCT-16-11603-" can also be extrapolated to the field of technology. Therefore, the results of this project may confirm that the visit of boys and girls in mobile science or technology spaces at school are very useful to foster a satisfactory relationship between children and technology. Likewise, a high level of satisfaction is expected on the part of teachers and a change in their didactic practice.

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Adult intervention determines the development of science skills development

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ABSTRACT

Contrary to the commonly held belief that preschool children are not prepared for understanding certain scientific phenomena, studies have shown at least incipient command of scientific skills (SPS), whenever children are provided with various opportunities and contexts for learning. Specifically, the degree of adult intervention may strongly determine learning outcomes, especially if this role consists of guiding exploration with productive questions that help the children focus their attention on the phenomena of interest. This research was aimed at assessing the impact of different styles of adult intervention on the learning and on the engagement with science tasks, in the context of a proposal intended to develop SPS among young children. 42 children aged 4 to 6 were subdivided in three groups and participated in various science proposals under different styles of adult intervention: children-led, adult-led or scaffolded exploration. While the adult-led group attained the most detailed learning of concepts, the scaffolded exploration group improved more their basic SPS. Children-led intervention had the poorest results. The type of questions proved crucial, with productive questions that prompt the children to focus their attention or find a solution leading to much more accurate and complete answers.

KEYWORDS

Adult intervention, productive questions, science process skills

Perspectives in science education: Educators' perceptions and professional development experiences

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ABSTRACT

Prior research has found some connections between professional development (PD), early childhood educators' self-efficacy, perceived benefit of science education, and challenges. However, there is limited understanding of how these variables differ across international early childhood contexts. This study explored differences between early childhood educators from Spain and the U.S. regarding science perceptions, experiences, and engagement in PD. A total of 396 educators completed the P-TABS Questionnaire (Maier et al., 2013). T-test and Pearson's correlations found U.S. educators were more comfortable teaching science and Spain educators engaged in more PD. Across all participants, educators with more experience were more comfortable teaching science and had fewer challenges. Participants that engaged in more PD had higher levels of comfort and child benefits, and fewer challenges.

KEYWORDS

early childhood educator; professional development; educator perception; science education; cross-cultural perspective

Development of scientific thinking at 0-3 years of age: a systematic review

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ABSTRACT

Several studies show the importance of scientific education in childhood, but there is little research on science learning in early childhood, especially in the first cycle of childhood education (0-3 years). This study analyses the researches published to date on the development of scientific thinking in early childhood, carrying out a systematic review of the publications on the subject between 2012 and 2022, at ages corresponding to the 0-6 years stage of early childhood education. It is a study with a sample of 165 potential articles of which 65 have been selected that have evidenced research carried out in the field of study of the development of scientific thinking in the infant stage.

The conclusions reached, show the importance of keeping investigating in this field of study, given that the published literature shows the importance of scientific literacy at an early age. The result of the systematic revision also shows the shortage of research on the subject in the 0-3 age group.

KEYWORDS

Scientific learning, sensorial exploration, science education, early childhood.

The Riverside Community Living Lab as an experience of inclusion through science

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ABSTRACT

The project "Communities for Sciences (C4S) – Towards an Inclusive Approach in Science Education" aims to transform the pedagogical approaches in science education, with an inclusive approach so to detect and eliminate barriers to inclusion in science didactics. Different authors experts in science education, inclusive, intersectional and decolonial approaches have been considered (Pedreira & Marquez, 2017; Harlen, 2010; Kuhn, 2010; Djonko-Moor et al. 2008; Boiselle, 2016; Maina Okori, Koushik & Wilson, 2018; Oliveros & Lemkow, 2022). The research involved a multiple Inclusive Science Education (ISE) case study with children in 6 European Hubs by means of the creation of Community Living Labs (CLL's). In Manresa city, the pilot developed a CLL with children aged 3-6 y/o in the riverside near Valldaura School. This school has families from low economic income background and a highly diverse sociodemographic context. A qualitative methodology was chosen, using a case study with participant observation. Data was gathered through observation charts, pre-post questionnaires, teachers' diaries and semi-structured interviews with educators and local policy-makers during 4 months. The preliminary results show that the children progressively showed interest in the activities, actively engaging in processes of scientific enquiry and in new peer-to-peer relationships, boosting communication among them and also proactive enquiry attitudes and engaging their families in the use of this natural space. Teachers valued very positively the inclusive science activities and also discovered new pedagogical approaches to promote the children's interest. The conclusions of the pilot will be used to transfer ISE initiatives to other EU realities.

KEYWORDS

Inclusive Science Education, science didactics, Living Labs, vulnerable communities, nature

TAULA RODONA

MESA REDONDA

ROUNDTABLE

Before, during, and after: Field trips as meaningful connections to science learning

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ABSTRACT

Field trips have long existed as staples in early childhood programs to provide students with experiences outside the classroom. Often, field trips are centered around community activities, themes, or special events. For many students, exploring their community through field trips provides opportunities to experience new and different venues and activities.

The current study will address the relationship between planning and conducting science-related field trips with young children on preservice and inservice teacher attitudes and beliefs about teaching science. Perceptions of the effectiveness of using field trips as an instructional method will also be studied with both preservice and inservice teachers, along with benefits and barriers to using field trips as instructional experiences. Participants of this study are preservice teachers from a regional university in the Southeastern U.S. who are Birth-Kindergarten majors. Some of the preservice teachers are students seeking licensure but are also working in the field as Inservice early childhood practitioners.

Data will be collected in Spring 2023 and will consist of quantitative and qualitative measures. Quantitative data collected and subsequent analyses seek to evaluate the science-based field trip planning and execution processes and their impacts on teacher perceptions of the importance of field trips as modes of introducing academic content. Additional quantitative analyses will also provide information about how planning and conducting field trips impacts teacher beliefs and attitudes toward teaching science. Qualitative data and analysis will provide insight into the perceived benefits, barriers, and curriculum connections related to field trips.

INTRODUCTION AND THEORETICAL FRAMEWORK

Field trips are often hallmarks of the elementary school experience and provide students with exposure to new ideas, places, and activities present in the community. However, even pre-pandemic, the incidence of educational field trips was declining across the United States, with a shift toward "reward" field trips where students get to go on a field trip when they have met a goal or achieved an award (Greene et. al, 2014). Educational field trips are excellent ways to deliver academic content and are particularly impactful for students from rural, high-poverty, and minoritized populations (Greene et al., 2014). The positive impacts of field trips are optimized when teachers are able to integrate the content of the field trips with required academic standards (Coughlin, 2008; DeWitt & Storksdieck, 2008). Science-based field trips have been found to have multiple benefits for students, including providing experiential and hands-on knowledge, increasing awareness of environmental and social responsibility, and providing exposure to nature, which is of particular importance in early childhood education (Bravo, et al., 2021; Oktay, 2022).

The current study will address the relationship between planning and conducting science-related field trips with young children on preservice and inservice teacher attitudes and beliefs about teaching science. Perceptions of the effectiveness of using field trips as an instructional method will also be studied with both preservice and inservice teachers, along with benefits and barriers to using field trips as instructional experiences.

Research on field trips recognizes that the role of the teacher is imperative to maximizing the effectiveness of field trips as learning experiences (DeWitt & Storksdieck, 2008). However, barriers including curricular, financial, logistical, etc. may impact a teacher's ability to plan and enact field trips in ways that best optimize learning for students (Anderson & Zhang, 2013; Coughlin, 2010). Best practices for teachers when planning field trips include: planning pre-field trip activities aligned with learning standards; ensuring students have time for exploration during the trip; and planning follow-up activities related to standards and the field trip (DeWitt & Storksdieck, 2008).

Learning to apply the best practices of field trip planning is also necessary for preservice teachers to build confidence and increase pedagogical skills. Providing opportunities for preservice teachers to plan and conduct field trips results in meaningful learning experiences, opportunities for pedagogical growth, and increased likelihood of planning high-quality field trips as inservice teachers (Bravo, et al., 2021; Oktay, 2022; Fielle, 2021). Consequently, Behrendt and Franklin (2014) recommend that all preservice teachers receive experience planning and implementing field trips so they may better understand their role before, during, and after the experience.

RESEARCH INNOVATION

The research innovation proposed for this study focuses on the reflection of inservice and preservice teachers related to science instruction and science-focused field trips.

This study will survey preservice and inservice teacher groups as a data collection instrument. The survey combines an adapted version of Teacher Perceptions of Field Trip Planning and Implementation, developed by Anderson and Zhang (2013) with the Preschool Teachers' Attitudes and Beliefs Toward Science Teaching (P-TABS) Questionnaire (Maier et al., 2013).

EMPIRICAL UNDERPINNINGS

Participants of this study will preservice teachers from a regional university in the Southeastern U.S. who are Birth-Kindergarten majors. Some of the preservice teachers are students seeking licensure, but are also working in the field as in-service early childhood practitioners.

All participants will complete the survey instrument. Data will be analyzed to determine differences between groups (pre-service and in-service teachers, teachers who participate in field trips and those who do not) and then to make comparisons between groups.

Quantitative data collected and subsequent analyses seek to evaluate the science-based field trip planning and execution processes and their impacts on teacher perceptions of the importance of field trips as modes of introducing academic content. Additional quantitative analyses will also provide information about how planning and conducting field trips impacts teacher beliefs and attitudes toward teaching science. Qualitative data and analysis will provide insight into the perceived benefits, barriers, and curriculum connections related to field trips.

CONCLUSION AND DISCUSSION

This study seeks to understand more about how the process of planning and conducting field trips impacts preservice and inservice teachers' perceptions about field trips as well as how that process impacts attitudes and beliefs about teaching science. The study has the potential to shed light on how planning and conducting field trips serves as a factor in increasing pedagogical knowledge for teachers as well as its potential to impact more affective factors related to teaching such as attitudes and beliefs. This information could be particularly impactful in the context of practices that promote teacher retention and well-being.

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Science education from 0 to three years old: challenges and questions from the alliance between educational agents

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ABSTRACT

The new political and legislative changes and the need for the current ecosocial transition invite all educational agents to promote and enhance scientific competence and the teaching and learning of science in early childhood.

Although these challenges are often focused on the stage of primary and secondary education, innovation and research are also necessary in the stage of early childhood education, and especially from two to three years old, where children have a tireless pioneering need to understand the environment that surrounds them and investigate the phenomena they find there

This round table aims to share and debate some questions that we are formulating from the initial training of teachers and from educational centers (schools and support to formal education), and at the same time, we want to show some research evidence about practice in the context of scientific education in young children from 0 to three years old.

KEYWORDS

Scientific education, scientific competence, early childhood, 0 to 3 years old, learning situations.

INTRODUCTION AND THEORETICAL FRAMEWORK

Enrollment in the first cycle of Early Childhood Education (0 to 3 years old) has grown exponentially in recent years (Herrán Izaguirre et al., 2014), raising the need for continuous research into its educational quality.

At the same time, there is a comparative grievance between the two cycles, since in the first cycle there is almost nothing published, although there is some research published in the third year of the second cycle ((EI-5) (Sánchez Rodríguez et al., 2020). However, the dissemination of good practices in classrooms has been well developed, being a reference for many professionals (Amorós et al., 2013; Daly et al., 2016; Laguía et al., 2009; Pedreira, 2019).

The new LOMLOE education law (Organic Law 3/2020) frames early childhood education (ECE) as a unique educational stage, of a voluntary nature, and with its own identity, which aims to contribute to physical, emotional, social development , cognitive and artistic of students, as well as education in civic values for coexistence. Both the LOMLOE (Organic Law 3/2020) and the future study plans for compulsory and university education are also clearly committed to an education towards the ecosocial transition. A new framework for science education based on competence, shared between the different educational institutions (schools, university training centers and formal education support institutions).

Also, this stage is the starting point for children's competences, according to the recommendations of the Council of the European Union regarding the key competences for lifelong learning (EU, 2018), specified in the Royal Decree on the organization and minimum education in Early Childhood Education (RD, 95/2022, of February 1).

Based on this normative framework, scientific competence at these ages (first cycle, 0 to 3 years old) is achieved through the development of several specific competences, which we can represent in two areas: intrapersonal to the child (from the child's relationship with himself and the environment), and interpersonal (relationship with adults and others). These children take the first important steps towards scientific thinking through play, manipulation and observation, experimentation and discovery, in a very early and simple way.

Currently, there is a need to consider the training of teachers with a view to developing a professional profile that is reflective and critical of their actions, open to transformations (Alsina, 2013). According to De Pro Bueno et al., 2022, current teacher training in science teaching involves five key questions: 1) the scientific updating of the students who will be the teachers of the future, 2) their didactic training, 3) their professional experience and practices throughout the teacher's degree 4) beliefs, conceptions and prejudices and 5) personal qualities. This research aims to improve those five key questions from a scientific education approach under the umbrella of environmental education in stage 0 to three years old.

At the same time, the teaching of science also has the challenge of aligning the behavior and positive attitude towards science, since active teachers of early childhood education do not always match classroom practice with this positive vision (Erden and Sönmez, 2011, cited in Bravo et al., 2019). A fact that can be considered negatively if we take into account the fact that "knowledge of the environment" is the area that, slightly, scares future teachers more than other areas (Bravo et al., 2019).

INNOVATION IN RESEARCH

In this round table, we want to develop a double route of knowledge transfer: from the university to the school and from the school to the university (Pascual-Arias et al., 2019), being aware that any educational innovation that does not accompanied by adequate innovation in assessment (such as formative and shared assessment), it will fail (Barberá, 2003; Zabalza, 2001).

METHODS

A qualitative analysis is carried out using the focus group methodology, from a systemic and ecological approach, to identify the thoughts and feelings of the participating professionals. The study collects the perspective of the diversity of educational institutions and agents that work on science education at the Early Childhood Education stage: from the university in the initial training of teachers, through nursery schools, to museum institutions that incorporate science educational proposals at this stage.

INSTRUMENTS

The focus group methodology (Krueger and Casey, 2009; Patton, 1990) was chosen because we are interested in the perspectives and reflections of the professionals from the interaction and dialogue of the participants. Questions of an exploratory nature are raised, focusing on the child-centered perspective, promoting the child's competence view and overcoming the demands of precocity, authoritarianism, or a certain laissez faire (Falk, 2003), specific to these stages.

EMPIRICAL BASES

This qualitative research seeks to find evidence based on scientific competence in children aged 0-3 years, and at the same time, to identify the training gaps raised by the participating professionals.

In this Round Table, the collected data will be presented, analyzed and discussed. These are:

1. Theoretical framework and selected bibliography from the fields of research and educational outreach [Documentation provided at the Congress].
2. Diagnosis of the current characteristics of "good learning situations" to promote scientific competence in 0 to three years old [Results contributed to the Congress of the previous work, in the different Focus Groups].

DISCUSSION AND CONCLUSIONS

It is very important and key to develop scientific competence in these early stages of schooling, when children's attitudes towards science are more positive (Gómez-Montilla and Ruiz-Gallardo, 2016). While the fundamental role of the teacher in the development of science in preschool classrooms is recognized, some studies (COSCE, 2011; Gómez et al, 2021; Cantó, 2017) pointed to different factors that condition the development of a good scientific practice in kindergarten classrooms, and they agree that one of the factors is the initial training of teachers.

This round table aims to contribute to overcoming this challenge and therefore aims to:

- Create a rich and deep debate around the emerging questions of the study [Work plan during the Congress].
- Create a network of alliances of researchers and university teachers and active teachers, from a collaborative work point of view.
- Share criteria and proposals to advance the experimental practices of science education in the period of two to three years, from the research and reflection of the school practice, identifying the training gaps in the professionals, to encourage proposals for the future, that reverse and improve the situation.

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Learning and Discovery in Contexts of Diversity: Opportunities, Barriers and Teachers’ Competences

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ABSTRACT

Children have a natural interest in their surrounding phenomena and in discovering new learning possibilities. The role of the educators, when engaging children in processes of discovery and boosting their learning, not only involves an awareness of positive pedagogical strategies. It also involves an awareness of those barriers or limitations that hinder learning processes so to dismantle them and promote more positive pedagogical outcomes. Currently our European societies are more plural and diverse, with children from very different backgrounds, competences and daily realities. Given these contexts, children, especially those in a vulnerability risk situation, may find additional barriers that should be detected in advance, to avoid generating processes of exclusion or limiting their learning and socialising opportunities. Thus, in this Round table we will discuss about the learning opportunities, barriers and teachers competences necessary to promote children’s engagement with learning and discovery processes regardless of their specific vulnerability backgrounds.

KEYWORDS

Teaching-Learning strategies, barriers, teachers competences, intercultural education, diversity, disability

TALLERS

TALLERES

WORKSHOPS

¿Dónde estáis matemáticas? El desarrollo de las matemáticas intuitivas e informales de los 0 a los 3 años

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RESUMEN

En la actualidad, la literatura avala la importancia de favorecer el desarrollo del pensamiento matemático en las primeras edades, de los 0 a 3 años. En este sentido, se consideran el eslabón imprescindible y necesario para futuros aprendizajes. La Escuela Infantil, puede ser un contexto perfecto donde se pueden fomentar a través de la misma vida cotidiana y de las propuestas de juego, manipulación y exploración. Por ello, se requiere contar con profesionales conscientes de la importancia y necesidad de estas primeras matemáticas intuitivas e informales, formados para poder diseñar las propuestas educativas diversificadas, de alta calidad y con sentido matemático. Con esta finalidad, se presentan distintos diseños de espacios y materiales, junto a diferentes momentos del día en la Escuela Infantil, se describen las acciones matemáticas que aparecen y se reflexiona en torno al papel y la intervención del adulto que observa y acompaña las acciones de los infantes.

PALABRAS CLAVE

Matemáticas Intuitivas e Informales, Espacios y Materiales, Vida Cotidiana, Escuela Infantil, 0 a 3 años.

INTRODUCCIÓN

Los tres primeros años de vida son de gran importancia para el desarrollo de los niños y las niñas porque son los años en los que se fundamentan las bases de los posteriores aprendizajes, siendo una gran oportunidad única y decisiva para el desarrollo humano. La neurociencia subraya que en ningún otro período el crecimiento cognitivo es tan notable como lo es en los tres primeros años de vida (Bueno, 2017).

De hecho, diferentes autores exponen que, desde el día en que nacen (Geist, 2014) y a lo largo de los primeros meses de vida (Fernández et al., 2004), los niños y las niñas, ya muestran una curiosidad innata comenzando a construir una comprensión matemática. Por ejemplo, Clements y Sarama (2015) hablan de que, desde su nacimiento, los infantes tienen ciertas competencias asociadas a las matemáticas en cuanto a los números, el sentido espacial y los patrones.

En este sentido, Alsina (2015) caracteriza las matemáticas que desarrollan los niños y niñas menores de 3 años como unas matemáticas intuitivas (Fischbein, 1987) e informales (Baroody, 1987) y describe los cuatro bloques de contenido que las integran: cualidades sensoriales (álgebra temprana), cantidades continuas y discretas, posiciones, figuras y formas y los atributos mensurables. Poco a poco, gracias a la interacción con el entorno cotidiano y al juego, de una manera natural y sin una instrucción formal, estas primeras matemáticas se van construyendo como un conocimiento cada vez más elaborado.

Organismos internacionales como NCTM (2003) enfatizan la necesidad de que los adultos que acompañan a los niños y las niñas en estas primeras edades sean conscientes de la importancia de estas primeras matemáticas y las favorezcan mediante contextos diversificados y de alta calidad.

Por ello, es necesario preguntarnos bajo qué criterio el profesional de la Escuela Infantil acompaña las acciones de la vida cotidiana y diseña los escenarios educativos, espacios y materiales, para favorecer estas primeras matemáticas, tan imprescindibles y necesarias.

PROCEDIMIENTO

El taller que se presenta a continuación está destinado a profesionales de la Educación Infantil, aunque puede despertar interés a otros profesionales vinculados a las ciencias matemáticas. Pretende despertar la mirada matemática en las primeras edades, así como fundamentar y vincular estas primeras matemáticas intuitivas e informales con las propias de estadios superiores (segundo ciclo de educación infantil y primaria).

El objetivo principal es introducir algunos conceptos fundamentales en torno al desarrollo de las matemáticas intuitivas e informales propias de las primeras edades y que se pueden desarrollar en las Escuelas Infantiles.

Para ello, se plantea un taller teórico – práctico, estructurado en tres partes. En la primera parte, a modo de introducción, se visualizará un vídeo donde se podrá observar durante unos minutos a diferentes niños y niñas en la Escuela Infantil desarrollando algunas acciones y se les pedirá a los participantes que anoten, individualmente y en un papel, qué matemáticas observan. Seguidamente se les pedirá que se reúnan en grupos pequeños para compartir las acciones matemáticas que han detectado.

Seguidamente, en la segunda parte del taller, se describirán y caracterizarán las primeras matemáticas y se ofrecerán ejemplos concretos a partir de las experiencias de las Escuelas Infantiles Municipales de Vic (Barcelona). A continuación, se reflexionará en torno el papel del adulto como agente que diseña las propuestas, prepara los escenarios y acompaña a los niños y las niñas observando, documentando e interviniendo en el momento adecuado, ofreciendo andamios al aprendizaje.

En la tercera parte, se presentan diferentes materiales y documentaciones donde los participantes jugarán a descubrir e identificar las principales acciones matemáticas que aparecerán. Para ello se les ofrecerá unas plantillas con los contenidos y capacidades matemáticas que aparecen en estas edades para que las señalen.

Finalmente, se invitará a los profesionales a reflexionar sobre los contenidos y capacidades matemáticas detectadas y los andamios que pueden ofrecer para favorecerlas. Para ello se formarán grupos de trabajo que reflexionarán en torno a diferentes preguntas referentes al papel del adulto como agente que diseña, planifica, observa, acompaña y documenta el desarrollo de las diferentes propuestas educativas y momentos cotidianos. Para cerrar la sesión, se volverá a reproducir el vídeo introductorio con la finalidad de, una vez desarrollado el taller y con los contenidos introducidos, los participantes puedan volver a responder la pregunta que da comienzo al taller: ¿dónde estáis matemáticas?

CONCLUSIÓN

En el taller que se presenta veremos que el conocimiento matemático y didáctico-matemático es necesario e imprescindible para que los profesionales puedan transformar y (re)pensar las propuestas educativas que ofrecen, ya sea mediante los espacios y materiales o en los momentos cotidianos del día a día, incorporando así una mirada matemática. En este sentido, los profesionales necesitamos conocer profunda y ampliamente por qué son importantes estas primeras matemáticas, a qué refieren y cómo podemos ayudar a favorecerlas mediante nuestras propuestas y acompañamiento. En este sentido, si los profesionales desconocemos el valor de las primeras matemáticas y su contenido, difícilmente podremos favorecerlas. Si desconocemos cómo se despiertan en los niños y niñas y cómo podemos ayudar a desarrollarlas desde un punto de vista didáctico, difícilmente prepararemos las propuestas adecuadas para que puedan emerger. La clave va a ser descubrir y reflexionar en torno a qué criterios y qué conocimientos son necesarios para preparar las propuestas de juego, manipulación y experimentación y para planificar y acompañar los momentos cotidianos.

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Integrating computational thinking into young children's daily educational experiences: Insights from a U.S. robotics program

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INTRODUCTION

Computational thinking is widely considered a critical skill for 21st century citizenship (Wing, 2008) and is becoming a topic of discussion in early childhood education. In recent years, research interest in preschool computational thinking and computer science (e.g., Sullivan & Bers, 2016), the availability of robotics tools and toys (e.g., Yu & Roque, 2018), and the demand for connected STEM learning and experiences (e.g., Lavigne et al., 2020) have all increased greatly. As a result, early childhood educators need to acquire knowledge of the powerful ideas of computational thinking (Bers, 2008) and related pedagogical knowledge so they can provide educational experiences that build computational thinking in developmentally and contextually appropriate ways. Constructionism and sociocultural views of early childhood education contend that children learn best when designing, constructing, and programming through social interactions, projects, and collaborative activities (Bers, 2008). As such, it is critical for educators to facilitate rich learning opportunities that embrace ongoing, open-ended, and exploratory play and construction using a range of familiar materials as well as new tools and technologies. The aim of this workshop is to introduce attendees to the powerful ideas in computational thinking from computer science (Bers, 2021), explore hands-on activities that leverage and extend typical educational experiences with preschoolers, and brainstorm ways to adapt these activities to fit local early childhood educational contexts.

PROCEDURE

This workshop will be centered on deconstructing key components of the powerful ideas of computational thinking from computer science (Bers, 2021) and identifying how to support children's development of these ideas through early educational experiences. These seven core concepts/skills include algorithms, modularity, control structures, representation, hardware/software, the design process, and debugging. To foster thinking and planning during the workshop, these powerful ideas will be explored through hands-on activities and group discussions aimed at providing educators and other attendees with a flexible framework for embedding computer science into daily experiences with children. In particular, this session will highlight practical ways to leverage existing instructional contexts and accessible, open-ended, affordable materials to support children's computational thinking development and increase overall opportunities for early STEM learning. The focal activities will include experiences that can be conducted as a part of whole group, small group, and play-based contexts. Importantly, the activities that will be shared largely focus on tech-free approaches to robotics and computer science that can support children's computational thinking without considerable investments in new equipment and materials. Through discussions, attendees will develop a plan for integrating the powerful ideas of computer science into their current instructional contexts across the school day. These plans will allow attendees to provide opportunities for coding and robotics in ways that are developmentally appropriate and additionally contextually appropriate for the children they teach. The session will also support attendees in embedding language supports - that is, questions and conversations that build capacities for computational thinking and interest in computer science in young children from different cultural, ethnic, linguistic, and socioeconomic backgrounds.

EXPECTED RESULTS

Attendees will understand four of the 'powerful ideas' in early childhood computer science. These include: (1) Algorithms: using ordered sequences of steps to achieve particular goals; (2) Representation: the understanding that concepts and actions can be represented using symbols; (3) Debugging: using intentional problem solving to address issues; (4) The design process: solving problems and answering questions using an iterative process.

Attendees will learn strategies for making important connections between the 'powerful ideas' of computer science and daily educational experiences in and out of the classroom.

Attendees will participate in engaging, hands-on activities, connected to the 'powerful ideas' of computer science that can be recreated in preschool classrooms to support CT, integrate computer science into the curriculum, and build children's interest and sense of belonging in STEM.

CONCLUSION

Take-home messages for this session include how consistent, early educational experiences are necessary for children to develop computational thinking and a strong foundation for later STEM learning, ultimately contributing to long-term interest and sense of belonging in STEM.

When early childhood educators are able to integrate the 'powerful ideas' within daily classroom experiences, children are provided early and often experiences to form both concrete and conceptual understandings. Further, these integrated learning activities and interactions in the early grades help children build essential connections that improve their learning within future educational experiences. Attendees will be able to use the knowledge gained in this session to justify how play-based and open-ended learning experiences should be prioritized in order for children to develop CT. Empowering teachers to continue to advocate for play-based learning has become even more critical as increased accountability and regulations in pre-K and kindergarten have led to extensive use of developmentally inappropriate practices. In efforts to encourage ongoing connections between attendees and other interested teachers, the presenters will introduce their current culturally relevant robotics program website as a springboard for future collaboration and networking.

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Discovering insects' beauty through drawing

ABSTRACT

We propose a practical insect drawing workshop, structured in four different parts. It is known that emotions constitute the first obstacle that we encounter in relation to the teaching and learning of insect biodiversity. That is why the first part will consist in a conversation with the attendees about the emotions that this group of animals generates in them, including fear, rejection (disgust), and sympathy; we will share past personal experiences and social beliefs. A second obstacle is the anatomy of these animals: they often have structures that we associate with pain, such as stingers or strong jaws, as well as other characteristics that we find unpleasant, such as strong hairs. Consequently, in this practical workshop we will work on anatomy through drawing, which involves the need of systematically and rigorously observing how these animals are like. Thus, the second part will consist of a scientific drawing activity supported by a basic theoretical foundation (in terms of the scientific and artistic part); only the initial stages of the graphic activity will be approached, since reaching a level of professional image would require too much time. Since there is a need to incorporate direct experiences with nature and living beings involving cognitive, affective, and evaluative modes of learning to create new experiences and understanding about insects, the third part will be an outdoor activity to look for insects, to identifying them taxonomically, and to draw them in a naturalistic style. Didactic guidelines will also be provided to assistants, in other for them to address these activities in the context of childhood education. Finally, there will be a pooling to share impressions.

KEYWORDS

Art education, biodiversity, drawing, insects, science education.

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INTRODUCTION

Insect morphology is one of the main reasons for negative attitudes (Gómez Prado et al., 2020; Wagler & Wagler, 2012) towards insects, for which a suitable strategy is promoting rigorous observation through drawing. Scientific and naturalistic drawing are two approaches closely linked to scientific activity that differ in important characteristics. Whereas scientific drawing involves slow work and an additional documentation process, naturalistic drawing is more freely and quickly developed, and is frequently used to complement handwritten notes, that need to be taken fast.

Drawing is known to contribute to a deeper understanding of scientific topics, since it stimulates intense observation processes and allows for effective data recording and subsequent study (Katz, 2017). Several theoretical frameworks, including the theory of generative learning, which considers that drawing promotes the connection of previous knowledge and new content, contributing to the construction of mental models and encouraging higher levels of understanding and recall (Fiorella & Mayer, 2016).

However, drawing involves several associated difficulties: it is a complicated task for many people, requiring spatial abilities that are hard to develop, and is time-consuming and cognitively demanding (Fiorella and Zhang, 2018). In this respect, the role of the teacher is known to be of key importance; when students draw without close guidance, they can easily feel discouraged and may not invest the required effort (Schmidgall et al., 2019). Drawing insects is challenging for additional reasons, such as the variety of shapes, complexity of structures, and small size (Rouaux, 2014).

Including insects both in early years education (pre-school and primary school stages) and at initial teacher training, has been repeatedly recommended by literature on biological education (Hummel et al., 2012; Wagler & Wagler, 2011). Practical work on insects at school may increase knowledge and reduce rejection and fear of insects (Hummel & Randler, 2012; Hummel et al., 2012), since specific fears or phobias are known to develop during childhood (Marks & Gelder, 1966). It has been suggested that insects exhibit a range of unexpected anatomical traits that can be fascinating for children (Shipley & Bixler, 2017).

Our aim with this practical workshop is introducing teachers to the world of insects, giving them basic notions on insect morphology and diversity through drawing by providing them an enjoyable experience.

METHODOLOGY

Target participants: 15 pre-school or primary teachers / pre-service teacher

Part 1 – Talking about emotions towards insects.
In the initial part, we will propose an open dialogue about insects, including: anatomic a taxonomic knowledge, personal experiences with this group of animals, and sympathy, disgust, or fear towards them.

Part 2 – Initiation to scientific drawing of insects
The art teacher will explain the main clues to draw an insect, from a scientific perspective. Later, participants will draw their own specimen from a collection.

Part 3 – Initiation to naturalistic drawing of insects
Participants, together with both the science and the art teachers, will go outside to look for, observe, and draw insects in nature.

Part 4 – Closure: sharing impressions.
Back to the classroom, we will talk and reflect together about the experience.

REQUIRED MATERIALS

- a classroom with (15) tables and chairs, and projector
- 5 packs of sheet: DinA4 size, 130 g/m2 thickness (for example, “Canson. Dibujo Basik. Guarro”)
- 3 pens per person (2B, HB, 2H) = 45 pens, 15 of each type (hardness)
- 15 soft erasers (Milan type)
- 15 rules 30 cm-long

- 7 boxes of color pencils (Alpino type: "Los colores de tu vida", 12 colors)
- rigid folder that serves as a support to support the drawing sheet
- 15 magnifying glasses

WE WILL CARRY WITH US:
- Our insect collection
- Our insect field guides.
- Our "helping hands with magnifier"

EXPECTED RESULTS

We aim to provide assisting teachers with an enjoyable experience that may open new approaches (naturalistic drawing) and fields (outdoor education, insect biodiversity) for them to take to their schools.

CONCLUSION

This workshop connects with which constituted a classical descriptive work line in Natural Sciences (scientific and naturalistic drawing) and can inspire hands-on work at pre-school and initial primary education. It also constitutes an initiation to visual literacy in the field of science.

In previous works with early childhood pre-service teachers, we have observed that the inclusion of drawing in our didactic proposals showed positive results in relation to improving anatomical and taxonomical knowledge. Moreover, drawing also promoted positive attitudes and higher appreciation of insect diversity (Eugenio-Gozalbo & Ortega-Cubero 2022). Since it is known that pre-service teachers' knowledge and attitudes will condition the likelihood of insects being included in science education from early ages (Wagler & Wagler 2011), drawing must be considered a valuable strategy to be incorporated in scientific education at initial teacher training. An additional reason is that early childhood pre-service teachers are women, who tend to report greater aversion to insects (Schlegel, Breuer, & Rupf 2015).

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Temps de canvi: Conversant amb la pluja

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RESUM

Ens situem en un context de canvis en les dinàmiques ecosistèmiques a nivell planetari i, en concret, en aquest taller ens volem centrar en un dels components essencials d'aquestes dinàmiques, la pluja. Sense caure en alarmismes i des del rigor de la ciència, aquesta proposta pretén contribuir a donar valor a la pluja com a recurs, no només essencial per a la vida, sinó també com una oportunitat d'aprenentatge científic a l'Educació Infantil.

El taller s'estructura en tres parts diferenciades: l'exploració sensorial de la pluja, els espais d'experimentació amb la pluja i una proposta sobre la pluja com a agent de transformació dels paisatges. A través de processos com l'observació, la descripció, la conversa, la formulació de preguntes i d'hipòtesis, l'experimentació, i la manipulació, les propostes que es plantegen ens permetran conversar amb la pluja, per tal de poder-hi connectar de forma més positiva i creativa, estimar-la i construir futurs cuidadors del planeta.

PARAULES CLAU

pluja, canvi climàtic, educació infantil, educació científica, experimentació

INTRODUCCIÓ

L'actual situació d'emergència climàtica i els canvis en la dinàmica pluviomètrica a nivell global ens porten a una alteració de les reserves d'aigua que té unes repercussions directes en les persones i el planeta. Sense caure en alarmismes, des del rigor de la ciència i amb la voluntat de mirar cap al futur amb esperança, volem abordar la necessitat de parlar de la pluja en el context escolar com un recurs necessari per la vida al planeta però també com un recurs pedagògic que tenim al nostre abast. Conversar sobre la pluja ens permet connectar-hi de forma més positiva, donar-li valor, estimar-la, tot construint futurs cuidadors del planeta.

Des d'aquest punt de partida es presenta una experiència pràctica en format de taller que té per finalitat treballar amb la pluja a l'escola, quan plou, sense la necessitat de sortir a l'exterior o si no tenim els recursos per a fer-ho, aprofitant les oportunitats d'aprenentatge que la pluja ens ofereix com a recurs didàctic. Per a dur-ho a terme es proposa, a nivell conceptual, interaccionar amb la pluja com a agent de canvi i transformació de l'entorn i del paisatge. Per altra banda, a nivell dels processos didàctics que podrem abordar amb aquesta propostes hi trobem l' observació, la descripció, la conversa, la formulació de preguntes i d'hipòtesis, l'experimentació, i la manipulació.

PROCEDIMENT

- Durada: 90 minuts.
- Nº participants òptim: 15 participants
- A qui va dirigit: mestres del 1r i 2n cicle d'Educació Infantil, formadors/es de mestres d'Educació Infantil
- Espai: Una aula amb un mínim de 6 taules que puguin moure's

Es dona la benvinguda al grup i es convida a seure als i les participants en rotllana. Amb els ulls tancats, s'escolta un àudio enregistrat amb el so de la pluja. A partir d'aquí iniciem una conversa al voltant de la pluja: Què fem a l'escola, quan plou? Què hi ha de diferent aquells dies a l'aula? Aprofitem els dies que plou per fer alguna cosa diferent? Els dies de pluja amb quines emocions connecten els infants? Són més aviat agradables o desagradables? I, vosaltres, què sentiu, en el context d'escola, els dies que plou?

A continuació expliquem a les persones participants quin és l'objectiu d'aquest taller: explorar les diferents possibilitats de treball amb la pluja com a recurs didàctic, tant a dins com fora de l'aula. En aquest sentit volem posar èmfasi en el fet que no totes les escoles tenen la possibilitat ni els recursos de sortir a fora quan plou i que, per tant, amb aquest taller, volem donar eines a les mestres per poder aprofitar el recurs pluja des de dins de l'escola.

Arriba el moment d'experimentar amb la pluja i per a fer-ho presentem tres propostes:

Exploració sensorial
A partir de l'àudio prèviament escoltat, es convida a tothom a reproduir el so de la pluja utilitzant diferents materials: llapis, paper, cel·lofana, plàstic, plàstic de bombolles, bols metàl.lics, etc. Representar el so de la pluja a partir de materials quotidians ens permet acostar-nos a aquest fenomen de forma atenta, connectada, vivencial i positiva.

Espais d'experimentació
En aquests espais posem l'èmfasi en el procés d'observació, la formulació de preguntes, l'experimentació i la manipulació, a través de presentar una sèrie de materials que ens permeten interaccionar amb l'aigua i relacionar-nos-hi des de diferents mirades:

Taula 1: Allà on cau una gota d'aigua
Utilitzarem estris com comptagotes, culleretes, mesuradors… que permeten deixar anar gotes d'aigua amb molt poca quantitat i de forma controlada. Al deixar anar l'aigua sobre els elements, observarem com es comporten les gotes, aquests elements i també què passa en aquesta interacció.

Per guiar l'observació, podem intervenir amb preguntes del tipus: Com es mou l'aigua de la pluja quan cau sobre diferents superfícies? Quina forma adopta? Es desplaça, rellisca, deixa rastre, s'amaga, es transforma, es filtra…?

També proposem noves accions i reptes: Podem fer moure una gota d'aigua? La podem fer caure? La podem recuperar? La podem passar d'un lloc a l'altre? Com podem fer: una gota gran feta de gotes petites sense que es desfaci, un camí de gotes, un bassal fet de moltes gotes, aguantar una gota sobre una pedra, o una branqueta? Quantes gotes hi caben sobre una fulla?…

Taula 2: L'aigua a través de la terra
Posarem a l'abast sòls i terres de diferents característiques i propietats. També estris i recipients de vàries formes i mides per tal de poder realitzar diferents accions, observant i comprovant què passa al fer interaccionar de diferents formes l'aigua amb els tipus de sòls i terres.

Algunes de les possibilitats i propostes: Omplir provetes i recipients amb diferents substrats per deixar anar aigua de forma controlada observant i comparant què passa. Controlar i regular la rapidesa amb què es desplaça l'aigua, la filtració, l'absorció, etc., escollint diferents tipus de terra o sòls.

Algunes preguntes i reptes que podem proposar: Com es "mou" o es desplaça l'aigua a través de cada terra? Què passa en cada interacció o mescla? Podem fer una barreja de terres que no deixi filtrar l'aigua o que sí la deixi filtrar? Quina terra absorbeix millor l'aigua? Podem fer que l'aigua es filtri cap amunt?...

Transformació de paisatges

En aquesta última part del taller ens asseurem al voltant d'unes imatges que representen la pluja i convidarem a les persones participants a escollir-ne una. *Quina imatge reflecteix el que, com a mestres, representa la pluja? Quants tipus de pluja hi ha? Totes ens fan sentir igual? Sempre plou de la mateixa manera? Com és el cel abans de la pluja? I després? Si observem els animals, podem saber si plourà?* Aquestes i d'altres preguntes ens conviden a fixar-nos amb la diversitat de tipus de pluja i en quin és el seu paper en la transformació del paisatge més quotidià com pot ser el cel que veiem des de la finestra de l'aula o el jardí de l'escola bressol. A partir d'aquí proposem construir un paisatge amb elements naturals (troncs, roques, terra, sorra, rastres, fulles seques…) i després fer-hi ploure. Per a fer-ho possible ens haurem de preguntar quin paisatge volem construir o quin tipus de pluja volem representar. A continuació, el paisatge transformat pel pas de la pluja ens permetrà seguir observant i conversant al voltant dels canvis ocasionats.

I per acabar, un conte. Tornem a la rotllana, llegim un conte i donem espai per al tancament del taller preguntant-nos què ens emportem d'aquesta experiència.

CONCLUSIÓ

Amb aquesta proposta pretenem posar en valor la pluja com a element transformador des de diverses mirades: com a element transformador de paisatges, element transformador d'emocions, o fins i tot com a element transformador de les dinàmiques d'escola. Proposem diverses activitats per dur a terme tant a l'escola bressol com a l'escola d'educació infantil de forma concreta però també oberta, propostes que poden adaptar-se a les diferents opcions i necessitats de cada centre, però que totes tenen en comú un element: donar valor a la pluja com a agent de canvi.

Hacer y no hacer… en ciencia desde el nuevo currículum. Esa es la cuestión

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RESUMEN

¿Somos conscientes realmente de que la ciencia está presente en nuestras vidas desde el momento en que nacemos? ¿Tenemos esto en cuenta a la hora de trabajar con los niños y niñas de Educación Infantil? ¿Aquellas actividades que planteamos para trabajarlas recogen el espíritu de la nueva normativa? El Real Decreto 95/2022, de 1 de febrero es el nuevo marco normativo a partir del cual se establece la ordenación y las enseñanzas mínimas de la Educación Infantil en Spain. Por primera vez se publica un currículum para toda la etapa y también, por primera vez, se encomienda a las comunidades autónomas la definición de los contenidos educativos del currículo del primer ciclo. Por tanto, ambos ciclos tienen una intencionalidad educativa. El objetivo de este taller es crear un espacio de análisis y reflexión sobre cuestiones generales del currículum, pero sobre todo qué nos dice en referencia a la ciencia. Este es el punto de partida para ver qué hacemos, pero sobre todo qué deberíamos hacer y no estamos haciendo. Esta es una cuestión a tener en cuenta por los profesionales que trabajan directamente con los niños y niñas, pero sobre todo para aquellas personas que nos encargamos de la formación tanto inicial como permanente. A lo largo del taller intentaremos dar respuesta a las preguntas planteadas y a otras muchas y establecer un decálogo de aquellas cuestiones que sí o sí deberíamos tener en cuenta a la hora de hacer ciencia en Educación Infantil.

PALABRAS CLAVE

Currículum, ciencia, formación inicial y formación permanente

INTRODUCCIÓN

El Real Decreto 95/2022, de 1 de febrero es el marco normativo a partir del cual se establece la ordenación y las enseñanzas mínimas de la Educación Infantil en nuestro país. En él se establecen los elementos curriculares, los principios generales y pedagógicos a tener en cuenta, así como las áreas en las que se organiza el currículum. Aunque en esta etapa el trabajo con los niños y niñas se tiene que abordar desde una mirada o perspectiva globalizada, el currículum organiza los elementos curriculares en torno a tres áreas (Crecimiento en Armonía; Descubrimiento y Exploración del Entorno y Comunicación; y Representación de la Realidad). De estas tres, las que más conexión tienen con las ciencias es el área dos, pero como dice la norma “El área adquiere sentido desde la complementariedad con las otras dos”.

En el desarrollo del taller se persiguen distintos objetivos:

- Mostrar qué nos dice el nuevo currículum respecto a las ciencias en Educación Infantil (Un nuevo currículum para una etapa única, consideración de la infancia como protagonista de sus propios aprendizajes, cultura de la infancia, el juego, la observación, la manipulación y la experimentación como procesos básicos en el acercamiento a la ciencia, la evaluación poliédrica como clave en el proceso, etc.)
- Trabajar las conexiones de los saberes del área 2 con las dos áreas restantes de la que hemos hablado.
- Crear un espacio de análisis y reflexión de la realidad escolar.
- Proporcionar ejemplos prácticos de cómo trabajar las ciencias en este nuevo marco curricular.

Todo ello desde una perspectiva práctica y dinámica por parte de los participantes. Además, se desea obtener un producto final de lo trabajado en el taller: un documento construido entre todos los participantes con aspectos que se deberían tener en cuenta a la hora de hacer ciencia en Educación Infantil como, por ejemplo:

- Entender la ciencia desde lo cotidiano. Aspectos tales como la proximidad, la seguridad, la fácil manipulación o la curiosidad han de estar presentes en nuestras decisiones.
- Vincular la ciencia a la curiosidad, a la atención sostenida, a la motivación y especialmente orientada a la comprensión del mundo que les rodea.
- Pensar en el recorrido: yo, nosotros y cuanto se encuentra a nuestro alrededor.
- Hacer que las ciencias experimentales no parezcan inaccesibles.
- Dar valor a los aspectos manipulativos y experimentales. Importancia la selección de espacios, tiempo y materiales. Partir de lo sencillo para llegar progresivamente a aspectos más complejos, hacia la simbolización.
- Utilizar procedimientos científicos para las experiencias, en las que se contemplará la formulación de hipótesis y la comprobación de resultados sobre las conjeturas planteadas.
- Favorecer el trabajo individual y/o en equipo que permita mayores recorridos en las sencillas investigaciones planteadas (siempre hemos de tener en cuenta a los destinatarios y destinatarias y su edad, que determinan en gran medida sus habilidades, destrezas, posibilidades y competencias, entre otras)
- Planificar de forma inclusiva y consciente.
- Entender las ciencias experimentales en el marco de la globalidad de los lenguajes.
- Hacer una evaluación que parta de las ideas previas y sea formativa, permitiendo hacer de la misma un punto de partida y no tanto de llegada. Contemplando el propio proceso de planificación y ejecución.

PROCEDIMIENTO

Los destinatarios de este taller son todos aquellos profesionales que, de alguna u otra forma, acompañan el proceso de aprendizaje de los niños y niñas de esta etapa o forman a los profesionales que estarán en contacto con ellos de una manera más directa.

Como requisito para formar parte de él solo se pide interés por conocer realmente qué dice la norma en general y respecto a las ciencias de manera particular y cómo podemos aplicarla posteriormente en nuestra tarea como profesionales.

El taller constará de tres partes diferenciadas: Una primera parte expositiva que servirá de marco teórico/punto de partida para el trabajo posterior.

Una segunda, de análisis y reflexión a partir de lo planteado en la primera parte. Para propiciar el análisis y la reflexión se realizará una dinámica con las personas participantes. Se formarán pequeños grupos de trabajo en los que, mediante una discusión interna, deberán explicitar las principales novedades que, en su opinión presenta la nueva normativa respecto de las ciencias.

Una tercera parte en la que se pretende, a partir de las conclusiones, elaborar un pequeño documento (decálogo) con las ideas fuerza/clave para trabajar las ciencias desde los 0 a los 6 años.

Se trabajará a partir de ideas y conceptos como:

- ¿Qué entiende por ciencia en Educación Infantil el nuevo currículo?
- ¿Qué ha cambiado respecto al anterior currículum?
- Significado de currículum competencial a través de situaciones cotidianas
- Conocimientos de los nuevos elementos curriculares y cómo articularlos
- La evaluación: La observación y la documentación pedagógica como claves en el proceso.

El taller no exige de ningún requisito previo, aunque sí se aconseja asistir con apertura de mente y ganas de aprender.

RESULTADOS ESPERADOS

Como resultado del taller se espera que entre todas las personas participantes se elabore un documento base, con aquellas cuestiones imprescindibles que se planteen durante su desarrollo y que no se pueden obviar a la hora de hacer ciencia en Educación Infantil.

CONCLUSIÓN

La propuesta pretende trabajar de manera práctica las novedades que el nuevo marco legislativo ofrece para trabajar las ciencias en Educación Infantil. Mediante una metodología participativa se pretende destacar aquellos aspectos imprescindibles como profesionales de la educación, para ofrecer dar respuesta a una serie de cuestiones imprescindibles en este ámbito. Creemos que el contexto que nos ofrece este congreso es el ideal para avanzar en la comprensión y puesta en valor que nos ofrece el nuevo currículo.

Els materials de la natura: font inesgotable de propostes de ciència inclusiva

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RESUM

L'exploració dels materials de la natura ofereixen una infinitat de propostes de ciència inclusiva. Des del Museu de Ciències Naturals de Barcelona sabem que apropar-nos als objectes patrimonials, als materials naturals reals, crea un context molt valuós per afavorir la comprensió del món i la natura, i per tant l'aprenentatge de les ciències. Però aconseguir que els materials naturals estimulin aprenentatges científics passa invariablement per aquelles estratègies didàctiques que permetin arribar a tots els infants independentment de les seves característiques, estratègies didàctiques que provoquin bones preguntes, interès per comparar i trobar explicacions, que enriqueixin les interaccions entre les persones i els materials i també la col·laboració entre infants per elaborar i contrastar hipòtesis...

En aquest taller pràctic partirem de la nostra pròpia exploració dels diversos materials naturals disponibles, fòssils, roques i minerals, cranis i cobertes animals, materials vegetals, restes d'éssers vius marins, i al seu voltant ens plantejarem inquietuds i preguntes, deixarem fluir les nostres hipòtesis i idees sobre allò que desperti el nostre interés... Per després analitzar juntes quins aspectes afavoreixen que els infants duguin a terme processos de recerca científica i reflexionar sobre què hi ha de ciència i què hi ha d'inclusió darrere d'aquesta proposta didàctica.

PARAULES CLAUS

museu, patrimoni, ciències naturals, ciència inclusiva

INTRODUCCIÓ

El Museu de Ciències Naturals de Barcelona (MCNB), és una institució amb més de 140 anys d'història amb un ric patrimoni en els àmbits de la mineralogia, la petrologia, la paleontologia, la zoologia i la botànica. Té com a objectiu generar i compartir coneixement amb el propòsit de crear una societat més in-formada, connectada i responsable amb la natura. Aquest objectiu s'assoleix mitjançant la recerca i preservació de les col·leccions, i el model educatiu propi que estimula l'exploració, l'aprenentatge, l'estimació i la participació entre el públic més ampli, independentment de l'edat, procedència, condició i nivell formatiu. Aquest model educatiu propi planteja una forma d'ensenyament de la ciència a partir de preguntes, incitant l'interès i capacitat d'investigar, raonar i descobrir de cada participant independent de les seves capacitat.

El Museu, amb voluntat de ser accessible i inclusiu, parteix de la base que la ciència és per a tothom, és una eina per comprendre el món. Per això cal treballar-la des de les edats més primerenques estimulant la curiositat natural dels infants, ajudant-los a donar sentit als fenòmens del món, incentivant el seu raonament sobre allò que experimenten, convidant-los a plantejar-se preguntes. Per això partim d'una idea d'infant potent i capaç, que viu la ciència amb interès i s'esforça intel·ligentment en entendre i donar significat a tot allò que veu, sent i viu.

DESCRIPCIÓ DEL TALLER PRÀCTIC

El taller "Els materials de la natura: font inesgotable de propostes de ciència inclusiva", és una activitat pràctica que tindrà lloc dins de l'apartat Tallers pràctics del I Congrés Internacional de Ciència en l'educació infantil.

Pretén transmetre a les participants la manera de treballar del MCNB apropant les ciències naturals a la primera infància. Aquesta es basa en l'observació i reflexió dels infants al voltant dels materials i fenòmens naturals amb l'acompanyament de l'educadora i resulta vàlida no només al context de l'activitat infantil del Museu sinó també aplicable a l'aula.

També es tracta d'un taller per adonar-nos, participant de manera pràctica, de com podem incloure a tota la diversitat d'infants treballant d'aquesta manera, i analitzar quines estratègies concretes es mobilitzen per aconseguir-ho.

El taller està conduït per dues educadores del MCNB expertes en apropar la ciència a tots els públics i en especial als infants. També duen a terme formacions amb docents per incloure aquesta mirada científica en les interaccions dels infants amb els materials naturals.

El taller s'estructura en dues parts principals, una primera més pràctica d'exploració de materials naturals i una segona de reflexió didàctica.

Durant la primera part del taller, disposem de diversitat de materials biològics i geològics, així com materials de suport (com llibres), col·locats a l'abast de tothom per afavorir-ne l'exploració. Cada persona pot anar a conèixer i investigar els materials que desitgi, compartir idees amb altres persones, contrastar-les amb els materials o documents de suport… Tindrem la mirada de docents per comentar després què passa durant l'activitat. Mentrestant, les educadores interaccionen amb les participants estimulant la reflexió, plantejant preguntes, intervenint en les converses sobre els materials partint de l'interès concret que es dóna en aquell moment.

Durant la segona part, es reflexiona conjuntament sobre la metodologia didàctica del taller, comentant algun procés de recerca que hagi tingut lloc i analitzar els aspectes que defineixen la proposta. També s'analitzen conjuntament els aspectes d'inclusivitat que aporta aquesta proposta didàctica:

- Per la idea de ciència que es dóna, com a manera de comprendre el món a l'abast de tothom, sense por a l'error ni estereotips.
- Pel paper que pren l'educadora: posició respecte el grup incloent a tothom, afavorir una atenció propera en petits grups, escolta activa i estímul de la participació de totes les persones del grup, fent ús de llenguatge inclusiu.
- Pel paper que prenen els infants: actiu des de diverses capacitats, partint d'interès propi i personal, accés a la proposta des de qualsevol entorn socioeconòmic.
- Pel paper dels materials i l'espai: a l'abast i manipulable, amb diversitat d'estímuls sensorials per incloure diferents capacitats, coherència en la tria i col·locació de materials per provocar preguntes, llibres rigorosos i comprensibles, llenguatge no verbal, interacció amb els materials.
- Per la metodologia de l'activitat: processos de recerca diversos que parteixen d'interessos i idees pròpies de cada infant, acompanyament centrat en la persona posant el valor en cadascuna d'aquestes persones, aprenentatge col·lectiu...

RESULTATS

Algunes valoracions de docents participants en aquest taller:

- Inspiradora, me'n vaig encuriosida i plena de preguntes. Activitat molt respectuosa inclusiva i des d'una ciència amorosa.
- Interessant, interdisciplinari, curiós. La pregunta m'ha semblat molt interessant, una nova manera d'afrontar la ciència. M'he qüestionat la manera en que dono atenció a la diversitat quan treballo la ciència.
- Inclusió, entusiasme per seguir aprenent Ciència des de la petita infància. Gràcies.
- Curiositat, motivació, sensació de tranquil·litat (estètica, material, ambient). No cal tenir resposta a tot. Fer-se preguntes?
- Descobrir, sentir, pensar, reflexionar. Apropar-nos a la natura i a l'entorn a través de la ciència. Fer arribar la ciència a l'escola i als infants.
- Inclusió. Molta cura amb l'exposició dels materials. Bon ambient de treball. Tots aprenen al seu ritme.
- Importància, llibres diversos, objectes de qualitat reals. Pràctica enriquidora (molt) de 'gestió aula' manipuladora, activa, aprenentatge. Un molt bon modelatge.
- Pensament obert, escolta activa, acompanyament, descobrir el món. Formació molt molt inclusiva. Molt interessant vist des de l'escola bressol.
- Taller on es crea el conflicte cognitiu necessari per assolir aprenentatges significatius. Em sembla una metodologia molt apropiada per a Educació Infantil.
- Sensorial, experimental, viva. Persona vàlida i única en que amb més coneixement o menys ens sentim incloses en l'activitat.

CONCLUSIÓ

El taller "Els materials de la natura: font inesgotable de propostes de ciència inclusiva", ofereix formació per a què les docents de les primeres edats incorporin aquesta metodologia didàctica.

Des del Museu de Ciències Naturals de Barcelona defensem una manera de treballar la ciència amb els infants i aquest taller planteja la mateixa metodologia a nivell pràctic per poder-la experimentar com a adultes. Metodologia que afavoreix l'aprenentatge científic incloent totes les persones i capacitats, innegablement una metodologia inclusiva que sorgeix del model didàctic del Museu i aplicable al context escolar.

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RE EDUCA: un laboratorio de ideas

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RESUMEN

Re Educa es un proyecto educativo a partir del reciclaje de materiales en desuso. Tiene la finalidad de ofrecer recursos para la escuela con la intención de dar posibilidades de aprendizaje a los niños con materiales procedentes de la industria y el comercio de proximidad. Defiende el valor de reutilizarlos para darles una segunda vida ya que pueden ser portadores potenciales de estética y capaces de estimular el pensamiento y ofrecer recursos a la educación. Es un material que fomenta el juego no estructurado porque no tiene una funcionalidad culturalmente atribuida. A partir de los materiales de Reduca ponemos en diálogo la creatividad y la sostenibilidad: podemos sorprender y fascinar a la vez que tomamos conciencia sobre la sostenibilidad.

La creatividad y el pensamiento crítico son elementos indispensables en la educación de hoy. Queremos ofrecer un taller donde se pueda mirar, tocar y manipular diferentes objetos reciclados y encontrar el potencial de aprendizaje que pueden ofrecer. El objetivo es descontextualizar los objetos para potenciar el pensamiento divergente.

Un espacio donde inspirarse para descubrir nuevos pensamientos, nuevos materiales, nuevas formas de comunicación y relación y poder ofrecer a los niños y niñas contextos de aprendizaje creativos para que se puedan expresar libremente y mediante diferentes lenguajes.

PALABRAS CLAVE

Sostenibilidad, creatividad, pensamiento crítico, aprendizaje y educación infantil

INTRODUCCIÓN

Re Educa es un proyecto educativo a partir del reciclaje de materiales en desuso. Tiene la finalidad de ofrecer recursos para la escuela con la intención de dar posibilidades de aprendizaje a los niños con materiales procedentes de la industria y el comercio de proximidad. Defiende el valor de reutilizarlos para darles una segunda vida ya que pueden ser portadores potenciales de estética y capaces de estimular el pensamiento y ofrecer recursos a la educación. Es un material que fomenta el juego no estructurado porque no tiene una funcionalidad culturalmente atribuida. A partir de los materiales de Reduca ponemos en diálogo la creatividad y la sostenibilidad: podemos sorprender y fascinar a la vez que tomamos conciencia sobre la sostenibilidad.

Formarse a partir de vivencias que contemplan contextos creativos es una herramienta útil para el docente y también para los niños y niñas pues, como indica Pérez (2005), la práctica educativa es un "proceso de acción y reflexión cooperativa, de indagación y experimentación, donde el profesor aprende al enseñar, y enseña, porque aprende" (p. 18).

Los docentes necesitamos tomar conciencia del valor de la creatividad y de la imaginación para estar capacitados en este proceso de tutela, saber qué rol desarrollaremos y qué experiencias queremos ofrecer atendiendo a los intereses de los niños.

Según Galvis (2007) en la sociedad actual se iguala la creatividad con la sociabilidad, la cooperación y la actitud participativa, otorgándole la misma importancia que los procesos psicológicos superiores. Se asume que debe estar presente en el currículo en todos los niveles educativos y muy especialmente debe estar presente en la formación de los docentes. Considera que deben entender la creatividad como un valor socioeducativo, porque formarán a sus estudiantes para enfrentarse a los retos del futuro mañana y adaptarse a las nuevas exigencias. Duffy (2006) asegura que la creatividad es una capacidad humana cuyo desarrollo requiere de otros factores como la actitud, la curiosidad por el entorno, la interacción social.

PROCEDIMIENTO

Pondremos a disposición de los asistentes objetos diversos (de diferentes materiales, texturas, tamaños y formas) para que puedan, conjuntamente, realizar una creación libre. Queremos que en el taller se experimente, se hagan probaturas y se pueda crear aquello inimaginable.

El objetivo del taller es descontextualizar los objetos para potenciar el pensamiento divergente, ya que como indica Craft (2002) es importante fomentar el proceso creativo desde una mirada diferente del objeto con la intención de relacionarlos entre sí y dar lugar a la posibilidad de diferentes pensamientos.

Los y las asistentes pueden ser de cualquier ámbito de la educación pues lo importante es que tengan ganas de descubrir y experimentar.

RESULTADOS ESPERADOS

Esperamos que se descubra que los objetos pueden ser lo que queramos que sean. Cuando los contextualizamos en un espacio de la escuela es cuando, estos objetos, adquieren un determinado significado y las experiencias que obtienen los niños y niñas se transforman en aprendizajes significativos.

CONCLUSIÓN

El taller ha de permitir desarrollar un pensamiento crítico del docente, que se inicie en la adquisición de capacidades para actuar en momentos de incerteza y competencias para establecer una buena comunicación con los niños y niñas. Así los docentes pueden ofrecer más espacios y oportunidades en los contextos educativos para favorecer la creatividad teniendo en cuenta las personas y el entorno.

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Plantas, mis queridas amigas: Talleres para indagar en educación infantil

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RESUMEN

El taller pretende acercar las plantas a la vida de los niños, de forma que entiendan su valor y las estimen, dada la importancia clave de las plantas en la vida de la Tierra y en nuestra propia vida. El taller introduce a los niños en la observación de su entorno próximo, la germinación de las semillas, la indagación sobre las necesidades de las plantas, y del alimento que nos proporcionan, el descubrimiento de las fases del ciclo de las pantas, y la importancia de reducir el gasto de agua en su cultivo, ofreciendo así una vía de implicación en el cumplimiento de los Objetivos del Milenio.

PALABRAS CLAVE

Agua, aire, azúcar, infantil, luz, pantas, semillas, sequía.

RESUMEN EXTENDIDO

La propuesta de talleres dedicados a las plantas para educación infantil se basa en la convicción mundialmente extendida de la necesidad de una urgente implicación de la ciudadanía en el cuidado del medio ambiente, dado el deterioro que se ha producido en las últimas décadas como consecuencia de una falta de conciencia medioambiental en las generaciones adultas.

La intención de los talleres para educación infantil es crear un sentimiento de aprecio hacia las plantas, como amigas merecedoras de respeto y apoyo, dado que se les debe el alimento y la energía que necesitamos para vivir.

Se contemplan actividades interdisciplinares STEAM; así como de indagación científica (IBSE) adaptadas a edades tempranas, de forma que las tareas manipulativas unidas a un pensamiento científico estén en la base del aprendizaje desde edades tempranas.

Se requiere la utilización del espacio exterior, de zonas con agua y con posibilidad de cultivo, así como herramientas que puedan usar los niños de infantil, tales como regaderas, palas.

Así mismo se necesitan materiales tales como algodón, tierra, medias, vasos, plantas reales, flores blancas, colorantes, ´papel, semillas variadas, frutas variadas, bolsas de congelado, bayetas, rotuladores, grapadora, gomitas, ojitos).

En concreto, las actividades propuestas en el taller se dividen en seis tareas:

- Observación de su entorno cercano
- Seguimiento de una semilla
- Análisis de necesidades de una planta
- Nuestro huerto. Alimentos y semillas
- Mi pequeño tulipán

Primera tarea: "Qué hay en mi patio". Descubrimiento de su medio natural próximo.

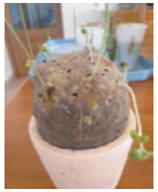
- Recoger 6 cosas que ven en el patio para clasificación en clase.

- Observar y buscar cuántos árboles distintos hay en su patio. Clasificación en seis categorías.
- Observar sus hojas y dibujar todas las hojas distintas que han visto.
- Colocar cada hoja en su árbol. Ordenar y clasificar
- ¿Cuántas flores distintas hay? ¿Cuántos frutos? ¿Vemos cómo están saliendo los frutos de las flores? ¿Hay algún insecto cerca de esas flores?

- Contamos el número de flores, frutos y semillas encontradas

Segunda tarea: ¿De una semilla saldrá una planta? Seguimiento de una semilla, creación de una planta

- Creación de "Mi Pedrito".



- Observamos la aparición de plantitas. Creamos muñeco con ayuda de semillas, introducidas en una media.
- ¿Qué semilla conseguirá crear una planta? Observamos la aparición de tres partes, raíz, tallo y hojas.

- Dibujamos la planta que ha aparecido.
- Contamos número de dedos que ha crecido cada semilla
- Creamos un modelo de planta uniendo partes dadas en papel.

Tercera tarea: ¿Qué necesita una planta para vivir?" Seguimiento de las necesidades de una planta.

- Indagación de su necesidad de agua, aire y luz para crear su alimento, el azúcar.
- Predicciones previas.
- Observamos una planta con agua, luz y aire; y otras, sin luz, sin agua y sin aire.



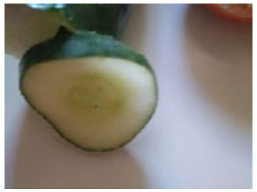

- ¿El agua llegará hasta las hojas? Explorar la llegada del agua a las hojas de una flor

Concluimos ¿Qué debemos a las plantas? Alimento, y aire limpio

Explicamos a los mayorcitos que con agua, luz y aire las plantas crean azúcar para vivir ellas y todos nosotros; y que además para crearlo cogen algo del aire y dejan el aire limpio.

Cuarta tarea: Plantamos semillas para crear nuestro propio huerto.

- ¿Qué parte comemos, las hojas, la raíces, el tallo? **Clasificamos** alimentos.
- ¿Sabrías decir qué semilla está en su interior? Unimos fotos de alimentos o alimentos reales con sus semillas.
- Buscamos semillas dentro de frutos




- Plantamos semillas. Tareas manipulativas en el huerto.
- ¿Cuánta agua necesitaremos? Explicamos la necesidad de no malgastarla. Riego por goteo.

Quinta tarea: "Mi pequeño tulipán"

- Lectura del cuento y dramatización en pequeños grupos.

- Escritura de palabras: trabadas y mixtas: árbol, planta, semilla, raíz, tallo, hoja, flor, fruto, e. Tulipán.

RESULTADOS ESPERADOS

- Crear un apego a las plantas desde edad temprana.
- Impulsar una conciencia crítica sobre problemas medio ambientales.
- Fomentar el hábito de reducción del gasto de agua y la preservación de semillas cercanas.

CONCLUSIÓN

El taller supone un intento de que los alumnos comprendan conceptos mediante habilidades científicas manipulativas; y, sobre todo, en edades infantiles mediante un gran impulso a las actitudes científicas positivas hacia el cuidado de su entorno próximo.

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EXPERIÈNCIES ESCOLARS

EXPERIENCIAS ESCOLARES

SCHOOL EXPERIENCES

Experiencias sobre la flotabilidad de objetos macizos

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RESUMEN

En este trabajo se analizan los resultados de la implementación de una propuesta sobre la flotabilidad de objetos macizos. La propuesta fue llevada a cabo con niños y niñas de cuatro y seis años. Se analizan los criterios que utilizan los niños en sus explicaciones para justificar la flotabilidad de los objetos y su evolución durante la implementación de la propuesta. Se utilizó la estrategia POE (Predecir-Observar-Explicar). La implementación de las actividades fue grabada y se analizaron las transcripciones. Los resultados indican que al inicio de la intervención los niños de cuatro años parten de explicaciones referidas a la fuerza del objeto, al tamaño o a la presencia de aire. Al referirse a la fuerza parecen hacer mención a una cualidad del objeto que le hace flotar. Las experiencias provocan, en algunos casos, la diversificación de criterios introduciendo la contradicción y adoptando explicaciones incompatibles. Al final de la secuencia mejoran a la hora de hacer predicciones y algunos niños empiezan a utilizar propiedades más relevantes como el peso e incluso el "peso del material". Los niños de seis años al inicio de la actividad utilizan diferentes criterios para justificar sus predicciones sobre la flotabilidad de los objetos. Sin embargo, al finalizar la actividad los niños utilizan un modelo precursor sobre la flotación basado en el material del que están hechos los objetos.

PALABRAS CLAVE

Flotación; Modelos precursores; Explicación, Educación temprana.

INTRODUCCIÓN

Hoy en día sabemos que desde edades tempranas los sujetos construyen sus propios modelos mentales acerca del mundo (Kuhn & Pease, 2006). El término de modelo mental hace referencia a una representación mental creada por los sujetos a partir de sus predisposiciones innatas y de sus experiencias con el fin de predecir, describir, o explicar hechos o fenómenos (Greca & Moreira, 2000). Por otro lado, el modelo precursor es un modelo que se genera en el contexto educativo, que se pueden construir desde edades tempranas y que constituyen las bases para posteriores construcciones (Ravanis, 2000; Weil-Barais, 2022). Analizar la construcción de modelos precursores es un enfoque fructífero para observar el progreso cognitivo de los niños.

Se presenta una propuesta donde se trabaja la flotación a través de tareas experimentales utilizando la estrategia Predicción-Observación-Explicación (White & Gunstone, 1992). La maestra interacciona con los niños planteando preguntas y fomentando que expresen sus ideas, sus predicciones y que las justifiquen y discutan para después contrastarlas con las observaciones que han de ser de nuevo explicadas y discutidas.

Este trabajo tiene por objetivo describir cómo construyen modelos precursores sobre la flotación durante la implementación de una secuencia de actividades niños de cuatro y seis años a través del análisis de los criterios que utilizan en sus explicaciones sobre el comportamiento de objetos en el agua.

EXPERIENCIAS ESCOLARES: ESTUDIO DE CASOS

La intervención constó de seis actividades, una primera actividad de exploración de ideas, cuatro actividades tipo POE y una actividad de recapitulación de lo aprendido. En la primera actividad se plantearon a los niños preguntas como: ¿Qué objetos conoces que se hundan? ¿Sabes qué quiere decir que algo flote? ¿De qué depende que las cosas floten? En las siguientes actividades se les proporcionaron objetos de diferentes materiales, tamaños y formas, y se les dio la oportunidad de que hiciesen predicciones y observaciones, que las justificasen y que las registrasen en una tabla. Se utilizaron objetos macizos para disminuir el número de variables con la intención de facilitar que puedan detectar regularidades y la construcción de generalizaciones inductivas.

Se adoptó un enfoque metodológico de tipo cualitativo, en concreto un estudio de casos. En el primer caso han participado cuatro niñas y tres niños de cuatro años de un centro escolar situado en un entorno rural, y en el segundo cuatro niños de seis años de un centro escolar situado en un entorno semiurbano. Para preservar el anonimato de los participantes sus nombres fueron sustituidos por seudónimos en los que únicamente se conservó el género. En cada caso la intervención fue grabada y los datos transcritos. Se analizó cómo fueron evolucionando las explicaciones atendiendo a los criterios que utiliza cada niño en cada actividad. La capacidad de generar explicaciones racionales se considera un indicador de que los niños están en condiciones de desarrollar un modelo precursor.

RESULTADOS

En la intervención con niños de cuatro años se observó que en las primeras actividades los niños dan explicaciones que hacen referencia a la fuerza del objeto, el tamaño, o la presencia de aire. Al referirse a la fuerza parecen hacer mención a una cualidad del objeto que hace que flote. Por ejemplo, dicen –si tiene fuerza flota–. Y en algunos casos hacen explícita la diferencia entre fuerza y peso. En una intervención Xoana dice –Si tiene fuerza flota–. Y más adelante –Si pesa se hunde–. Las experiencias provocan, en algunos casos, la diversificación de criterios y el incremento en el uso contradictorio de los criterios adoptando explicaciones incompatibles, cuestión que ya ha sido descrita en otros estudios (Inhelder & Piaget, 1972). Al final de la secuencia mejoran a la hora de hacer predicciones sobre la flotabilidad de los objetos y dos de los niños empiezan a utilizar propiedades más relevantes. Zara hace referencia al peso –Si es ligero flota…Si pesa se hunde– y Ramón hace referencia al "peso del material" –Si flota es porque el material es ligero… Si se hunde es porque el material es pesado–, intervención basada en conceptos que pueden entenderse como aproximaciones a un modelo precursor basado en el material.

En la intervención con niños de seis años se ha observado que mientras en las primeras actividades algunos niños no son capaces de justificar sus predicciones sobre la flotabilidad de algunos objetos, otros utilizan diferentes criterios como el tamaño, la dureza y el peso que ya han sido descritos en otras investigaciones (Butts et al., 1993; Paños et al., 2022; Piaget, 1934; Selley, 1993). Además, los niños utilizan diferentes criterios para cada uno de los objetos, cuestión a la que ya se ha hecho mención en otros estudios (Piaget, 1934; Shayer & Adey. 1984). Los niños utilizan los criterios de forma más racional que en el caso anterior y van abandonando criterios a medida que realizan más actividades. En la actividad final tres de los cuatro niños participantes utilizan ya un modelo precursor de la flotación que hace referencia al material del que están hecho los objetos.

CONCLUSIÓN

Los niños de cuatro años, al final de la secuencia, mejoran a la hora de hacer predicciones y dos empiezan a utilizar propiedades más relevantes como el peso, e incluso el "peso del material". En la intervención con niños de seis años, tres de los cuatro niños utilizan ya un modelo precursor de la flotación. Estos resultados apoyan los de otros autores (Canedo-Ibarra et al., 2010; Koliopoulos et al. 2004) que encontraron que los niños desde edades tempranas podían construir un modelo precursor de flotación basado en un concepto intuitivo de densidad considerando el tipo de material. También los estudios de Hsin & Wu (2011) y Kallery (2015) muestran cómo, a través de actividades bien diseñadas, los niños llegan a entender que el material es un factor determinante en la flotación. Debemos por tanto diseñar actividades de ciencias que generen situaciones a través de las cuales las niñas y los niños puedan avanzar en el desarrollo de habilidades intelectuales y en la construcción de nuevos conocimientos.

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Implementing the powerful ideas of computer science through culturally relevant pedagogy in the early classroom

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ABSTRACT

Computational thinking allows young children to engage, explore, and incorporate problem solving skills that relate to real world problems and build strategies related to twenty-first century skills needed to be successful as they grow. The work of Marina Bers, (2021), the powerful ideas of computer science, is a framework used to bridge the gap in early science and everyday experiences for young children. Focusing on computer science and complex problem solving through the use of algorithms, the design process, modularity, control structures, hardware/software, debugging, and representation. Each of these powerful ideas can be understood through the everyday experiences in a young child's life in the early classroom, at home, and in their community. The CRRAFT project, Culturally Relevant Robotics a Family and Teacher Partnership, is actively working to implement STEM and robotics in urban classrooms through intentionally built partnerships with families, educators, the local university, and surrounding communities. This presentation will follow the experiences of three early childhood educators in public pre-kindergarten classrooms in the Southeast United States. These teachers are actively implementing STEM robotics curriculum with preschoolers, connecting with families, and co-constructing the curricula through hands on community-engaged research (Blair and Haneda, 2021). The experiences shared by these teachers are direct examples of how culturally relevant early science can support in connecting the bridge between the home and school environments, the importance of learning science through play, and the observed discoveries of the young children in their classrooms as they develop their understanding that science and robots are everywhere.

KEYWORDS

Computational thinking, teacher professional development, teaching/learning strategies, research-practice-partnership, community engaged research

INTRODUCTION

Computational thinking (CT) through early science allows young children to incorporate problem-solving skills that relate to real world problems and build strategies related to twenty-first century skills needed to be successful as they grow. The work of Marina Bers, (2021), the powerful ideas of computer science (CS), is a framework used to bridge the gap in early science and everyday experiences for young children. Focusing on the implementation of CS concepts in the early classroom promotes complex problem-solving skills and critical thinking through the use of algorithms, the design process, modularity, control structures, hardware/software, debugging, and representation. Each of these powerful ideas can be understood through everyday experiences in a young child's life both in the early classroom and at home. The experiences shared by these teachers are direct examples of how culturally relevant early science can support in connecting the bridge between the home and school environments, the importance of learning science through play, and the observed discoveries of young children as they develop their understanding that both science and robots are everywhere. This presentation will follow the experiences of three early childhood (EC) educators and their journey of actively implementing STEM robotics curriculum with three- and four-year-old children, working alongside, and connecting with families, and co-constructing the curricula through the active process of community-engaged research (Blair and Haneda, 2021). Highlighting the power of collaborative partnerships with EC educators, the importance of leveraging diverse perspectives, and the deep connections that can be made between home and school when EC educators are empowered as leaders in early science implementation and in the classroom.

SCHOOL EXPERIENCES: STUDY CASE

The CRRAFT project, Culturally Relevant Robotics a Family and Teacher Partnership, is an ongoing NSF grant focused on building and implementing a culturally relevant robotics program in pre-kindergarten (pre-K) classrooms primarily serving Black and Latinx children in urban public schools. This research-practice-partnership (RPP) is composed of pre-K teachers, educational assistants, families, the local community, and university researchers whose research focuses on the EC workforce, STEM education, and early science. Though not directly associated with a specific school, the partnership works alongside EC educators in public pre-kindergarten, play-based classrooms across six schools and one associated school district.

Teacher 1: Working with the KIBO robot, T1 noticed that children are making connections when creating algorithms. To give the KIBO robot directions or build a sequence the children have to scan barcodes on connected cubes which have a beginning and end. A child noted that scanning the KIBO is similar to scanning the barcodes on groceries at the store. T1 expressed that the child is actively making connections between their home and school experiences and bringing CS and CT together in their daily life. During this activity another child shared that the KIBO robot flashes green and red, comparing the blinking red and green lights to the stop lights that the child sees along with noting the action associated (i.e., red, stop and green, go). These classroom activities are building the real-life skills of sequencing, problem solving, debugging, and observing the surrounding environment, while also making connections between home and school.

Teacher 2: T2 made connections between early literacy and science concepts. The CRRAFT project consists of four ongoing phases, each one breaking down the different components of Bers (2021) powerful ideas of CS. These phases are co-constructed and built to follow the pace and structure of the classroom and includes books that are culturally relevant, reflecting the children and communities served by the schools (i.e., *The Astronaut with a Song for the Stars: The story of Dr. Ellen Ochoa*). T2 made the connection that by integrating STEM concepts (i.e., algorithms, computers, who is a computer scientist) through literature and hands-on activities, such as coding the robot mouse, sequencing code-a-pillar, or learning how to debug the KIBO robot, young children are gaining pivotal twenty-first century skills needed for later learning. They are also being exposed to a whole new CS language, knowledge, and opportunities to think of themselves as computer scientists and creative problem solvers that are able to support the complex world around them.

Teacher 3: In phase one of the project the young children are asked, what is a robot? Where are robots? What can they do? And given the opportunity to explore the steps of the scientific method and experiment with how robots are built and understood through the use of recycled materials. During this activity T3 noted that the children shared how robots can help humans solve problems. One child mentioned how their robot is going to work towards solving the environmental crisis of ocean trash pollution and that the robot's purpose would be to collect trash in the ocean.

RESULTS

In year two of the project, the results, and opportunities to increase children's understanding of CT and CS are ongoing. The results reflect the responsive relationships built within the classroom environment, the confidence of the teachers, the importance of empowering EC educators as leaders, and the integration of lived experiences through the co-constructing knowledge.

T1 continues to make meaningful connections between home and school, working alongside families to expand the use of CT, problem solving, and the self-regulatory skills built through play and early science opportunities.

T2 works collaboratively alongside university researchers to co-construct curriculum and create literacy resources that are implemented across all eleven classrooms. The curriculum is intentionally grounded in culturally relevant pedagogy and representative of the children and families.

T3 weaves in real world, twenty-first century learning opportunities that encourage the use of problem-solving skills, planning for the future that focus on environmental and social justice.

CONCLUSION

To conclude, these school experiences are expanded growth opportunities for EC educators and are pivotal to both their classroom approach and participation within the RPP. There is a clear power in partnership that is actively working to bridge the information gap and build a sense of belonging through the connection of both home and school environments through CT skills and early science exploration.

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¿Y si sembramos nativas? Educación Basada en Restauración en un Jardín de Infantes de Argentina

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RESUMEN

Se presenta una experiencia realizada con cuarenta y cinco niños y niñas de cinco años de edad que asisten al Jardín N°1 de la ciudad de Cipolletti, Río Negro, Argentina. La experiencia consta de cuatro actividades incluidas en un proyecto de Educación Basada en Restauración. Durante el proyecto se dieron a conocer semillas de plantas nativas y su proceso de germinación. Luego los infantes sembraron semillas de una de las especies y colocaron plantines de dos especies en un predio cercano y en el patio de la institución. Durante la plantación participaron sus familiares quienes reconocieron la importancia de este tipo de propuestas y el interés que despertó en los niños y niñas. Las docentes expresaron el valor de enseñar sobre germinación a partir de especies nativas y se mostraron interesadas en continuar con este tipo de experiencias.

PALABRAS CLAVE

Educación Basada en Restauración, Plantas nativas, Germinación, Jardín de Infantes, Educación científica.

INTRODUCCIÓN

Se presenta una experiencia realizada con niños de cinco años de edad que asisten a un Jardín de Infantes del norte de la Patagonia Argentina. La propuesta de enseñanza es parte de una secuencia de 12 actividades enmarcadas en un proyecto de Educación Basada en Restauración (EBR). La EBR, es una corriente de Educación Ambiental que favorece proyectos de restauración ecológica con fines educativos, ofrece oportunidades para comprender conceptos y problemas científicamente complejos y afianza la protección del ambiente (McCann, 2011). Si bien la enseñanza de la germinación es un contenido ampliamente desarrollado en la educación infantil, generalmente se lleva a cabo con semillas de plantas exóticas, cultivadas y que no presentan dormancia (Rassetto, Farina y Pérez, 2021). El ambiente natural donde se asienta la institución, corresponde al ecosistema semidesértico de Monte en el que las semillas presentan diversos mecanismos de dormancia.

En este caso se seleccionan cuatro actividades fundamentadas en la enseñanza por indagación (Harlen, 2013). El propósito está centrado en que los niños conozcan las semillas y las técnicas de germinación de plantas del ecosistema semidesértico de Monte de la Patagonia y participen en experiencias de plantación de estas especies en espacios urbanos.

EXPERIENCIAS ESCOLARES: ESTUDIO DE CASO

La experiencia se llevó a cabo con cuarenta y cinco infantes de cinco años de edad que asisten al Jardín de Infantes N°1 de la ciudad de Cipolletti, Río Negro, Argentina. La secuencia de enseñanza fue construida de manera colaborativa entre la cátedra de Ciencias Naturales y su Didáctica del Profesorado en Nivel Inicial y las cuatro docentes responsables de los grupos de infantes.

La primera actividad (imagen 1), consistió en poner a disposición semillas de cuatro especies de plantas nativas, para que fueran observadas a simple vista, con lupa de mano y con lupa binocular. Paralelamente se presentaron a los niños ejemplares de herbario de las plantas de las que provenían las semillas y los frutos correspondientes. Los infantes observaron y luego realizaron dibujos comparados de la observación a simple vista y con lupa. En actividades previas realizadas por las docentes y sin intervención de la cátedra, ya se había abordado la germinación, pero en esa instancia de Phaseolus vulagaris (poroto). En ronda y mediante un ida y vuelta de preguntas y respuestas las niñeces relataron como se siembran las semillas y que condiciones necesitan para germinar. Posteriormente se les comentó que muchas especies de nuestro ambiente requieren de un proceso previo antes de ser sembradas y se abordó las formas de germinar de cada una de las semillas observadas.

Imagen 1. Observación en lupa de las semillas junto con la planta del herbario de referencia

La segunda actividad (imagen 2), se realizó a la siguiente semana y consistió en distribuir entre los niños semillas de Zampa (*Atriplex lampa*), una de las especies observada en la actividad anterior. A manera de dialogo grupal se recordó que estas semillas necesitaban ser lavadas antes de sembrarlas, como si les cayera lluvia durante varios días. A continuación, se repartieron las semillas y un colador de tela a cada niño para ser lavadas. Esta actividad se continuó durante tres días.

Imagen 2. Lavado de semillas de Zampa

Al cabo de tres días del lavado de las semillas, la siembra y los cuidados posteriores se acordaron junto con las niñeces, ya que estas son prácticas que habían realizado con sus familias y/o docentes previamente. Colocaron las semillas en una caja de siembra (imagen 3) y con un rociador regaron durante las dos semanas siguientes. A la semana comenzaron a surgir los cotiledones de las plántulas de zampa.

Imagen 3. Siembra de semillas de Zampa

La última actividad consistió en la plantación de plantines de Zampa y Melosa (Grindelia chiloensis) en el predio de la Facultad de Ciencias de la Educación (imagen 4) y en el patio de la institución (imagen 5). Se plantaron un total de cien plantines que fueron donados por el vivero del Laboratorio de Rehabilitación y Restauración de Ecosistemas Áridos y Semiáridos (LARREA) dependiente de la Universidad Nacional del Comahue. Se invitó a las familias de los infantes a participar de la plantación, quienes los acompañaron colocando los plantines en pozos hechos previamente, que luego regaron.

Imagen 4. Plantación de plantines en el predio

Imagen 5. Plantación de plantines en el patio de la Facultad de Ciencias de la Educación

RESULTADOS

A las dos semanas de realizadas las actividades, se entrevistó a trece niños quienes manifestaron que lo que más les gustó fue plantar. Todos los niños pudieron recordar que habían dibujado semillas vistas con la lupa, así como relacionar la planta con sus respectivas semillas y reconocer la especie que pusieron a germinar y luego plantaron.

También fueron entrevistadas las docentes quienes rescataron de la experiencia el haber germinado plantas nativas, y expresaron la gratitud de las familias, que se mostraron muy motivadas con que sus hijos e hijas hayan vivido esta experiencia.

CONCLUSIÓN

Según consta en documentos curriculares, la germinación ha sido abordada históricamente de manera descriptiva y como proceso generalizado de las plantas, sin considerar la diversidad de formas en que las especies germinan (Rassetto, Farina y Pérez, 2021). La declaración de la UN que determina la década 2021-2031 destinada a la restauración ecológica, es un marco relevante para fomentar propuestas educativas que involucren a las infancias y sus familias en experiencias para revertir la degradación socioambiental. Esta experiencia da cuenta del interés y motivación que despierta en los niños conocer sobre las plantas nativas, sus formas de germinación y adaptación al ambiente y las actividades prácticas al aire libre.

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La taula de llum com a projecte transversal d'escola

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RESUM

En aquesta iniciativa es planteja un projecte transversal i competencial de l'àmbit de les ciències, tant pel que fa a àmbits de coneixement, com per nivells educatius. Es parteix d'una necessitat sorgida en alumnat d'infantil (P3, P4 i P5) i de primer cicle de primària (1r i 2n). En aquests alumnes se'ls plantegen uns reptes en els quals es fa necessari disposar d'una eina que permeti l'experimentació. En el cas concret del projecte es tracta d'una taula de llum. El repte sorgit a infantil és el de construir un teatre d'ombres i en el cas de primer cicle de primària és el de dissenyar uns vitralls que permetin decorar la classe. A partir d'aquí es fa evident la necessitat d'experimentar per tal de conèixer les propietats dels materials i de la llum. En ambdós casos se li vol donar un enfocament STEAM on a partir de processos d'indagació permeti als infants experimentar amb els materials per tal de determinar-ne diverses propietats, com ara de transparència, textura, color, densitat i volum, per aconseguir trobar els més adients per la construcció dels projectes. És en la reflexió de la realització d'aquests projectes on sorgeix la necessitat de disposar d'una taula de llum que permeti als infants indagar i experimentar per tal de poder descobrir quins seran els millors materials per a la realització dels seus propòsits. Es considera que la millor solució per obtenir la taula de llum és demanar als alumnes de 3r de l'ESO, que participin en la seva construcció en l'assignatura de tecnologia.

PARAULES CLAU

Projectes transversals, infantil, primària, ciència escolar, taula de llum.

RESUM AMPLIAT

L'objectiu principal d'aquest projecte escolar és el d'implementar una proposta transversal i competencial on participa activament alumnat d'infantil, primària i secundària del mateix centre educatiu. Aquest projecte es vol emmarcar en l'àmbit de les ciències/medi i donar-li un enfocament STEAM. Es parteix d'un repte sorgit en infants d'infantil i primària i es reflexiona quines són les necessitats que sorgeixen per tal de poder-lo assolir. En aquesta reflexió a l'aula es fa evident que per tal d'aconseguir portar a terme el repte cal un recurs que possibiliti indagar i experimentar. El recurs en qüestió és una taula de llum. Donat que l'escola no disposa d'aquest recurs es demana als alumnes de 3r de l'ESO que, en el marc de l'assignatura de tecnologia, en fabriquin dues pels cursos d'educació infantil i primer cicle de primària. A través d'aquest projecte es vol promoure en infants d'educació infantil (P3, P4 i P5), alumnat de primer cicle de primària (1r i 2n) i de 3r de l'ESO l'interès per la ciència i la tecnologia a través de reptes autèntics. Es considera que les propostes ben contextualitzades involucren d'una forma molt potent i significativa en l'execució dels objectius que es proposa l'alumnat. Es parteix de la idea que disposar de recursos que permetin la indagació i fomentin l'experimentació ajudarà als infants a adquirir un coneixement dels sabers d'una forma molt més significativa i competencial. En aquesta proposta didàctica en pretén dissenyar activitats que ajudin als infants d'educació infantil i primer cicle de primària a adquirir experiència en l'àrea de ciències. Activitats que fomentin les accions exploratòries, l'experimentació i la generació de preguntes des d'un enfocament STEAM. Des de l'equip docent d'aquesta escola es pensa que les activitats basades en la indagació fomenten les destreses cognitiu-discursives d'una forma molt més eficient i que un aprenentatge competencial i globalitzat permet a l'alumnat assolir els sabers de manera autònoma i, alhora, adquirir valors i actituds per esdevenir ciutadans compromesos i preparats (Canals, 2008).

El projecte permet treballar diversos continguts tant conceptuals, procedimentals com actitudinals d'una forma competencial. En donar-li un enfocament STEAM es pretén tractar els sabers de les diferents disciplines. En l'àmbit concret de les actituds també es treballen temes com la comunicació, la solidaritat i la sostenibilitat. Pel que fa a infantil el producte final que es pretén configurar és un teatre d'ombres i a primària el propòsit és decorar la classe amb vitralls de colors. En els processos de configuració dels reptes es treballaran sabers de ciències respecte a les propietats dels materials i de la llum. L'alumnat de 3r de l'ESO serà l'encarregat de fabricar aquest recurs donant resposta així a la necessitat sorgida als més petits. El fet que els alumnes de 3r de l'ESO s'impliquin en la resolució d'una necessitat autèntica com aquesta permet fomentar i treballar amb ells actituds i valors com el compromís, la solidaritat, l'autonomia i la sostenibilitat alhora que es tracten les matèries STEAM d'una forma competencial realitzant un producte tecnològic.

INTRODUCCIÓ

L'Escola Andersen, avalada per més de 50 anys d'experiència, és un centre concertat per la Generalitat de Catalunya on s'imparteix l'ensenyament des de l'Educació Infantil (3 anys) fins a 4t d'Ensenyament Secundari Obligatori (16 anys). És una escola catalana i plurilingüe (català, castellà, anglès i francès), activa, participativa i laica. Escola familiar que, al costat de la comunitat educativa que la forma, dona un servei educatiu de qualitat al barri de Can Palet de Terrassa. Sempre en constant evolució i amb la voluntat de formar nens i nenes, nois i noies amb totes les competències necessàries per afrontar els estudis postobligatoris i un futur pròsper. Es promou activament la creativitat tant en l'àmbit científic, artístic i social i es potencia la llibertat, l'autonomia, la solidaritat i el respecte. Dona molta importància a una educació no sexista en el marc de la coeducació, l'equitat i a l'atenció a la diversitat. Escola oberta als canvis social i metodològics que la societat demana. S'introdueixen les noves tecnologies a partir d'Educació Infantil. En tots els nivells es fomenta el treball cooperatiu en la construcció de l'ensenyament-aprenentatge. La comunitat educativa està formada per l'Equip Directiu, l'Equip de Mestres, l'AMPA, el PAS i el Consell Escolar. En aquesta escola hi ha una sola línia des de P3 fins a 4rt de l'ESO. El nombre d'infants que participen en aquest projecte es distribueix de la següent forma: en l'etapa d'educació infantil participen 24 alumnes de P3, 23 alumnes de P4 i 24 alumnes de P5. Pel que fa a primària hi participa alumnat de primer cicle distribuït en 27 alumnes de 1r i 26 alumnes de 2n. També intervé en el projecte alumnat de l'etapa de secundària, concretament 31 alumnes de 3r de l'ESO.

La finalitat d'aquest projecte és dissenyar una proposta transversal, en la que es tractarien diferents disciplines i diversos nivells educatius. Entenem la transversalitat en l'àmbit educatiu com una estratègia docent per fer confluir tot el currículum educatiu en un sol tema (Velásquez, 2009). És a dir, desenvolupar diverses àrees, projectes i activitats de classe al voltant d'un eix central. Es tracta d'integrar gran part dels sabers en una motivació central que aglutina la majoria dels coneixements. Es partirà del fet d'idear una proposta que impliqui a diferents grups i nivells del centre. Les temàtiques dels projectes es pretenen tractar des d'un enfocament STEAM i pel que fa a la implicació dels diferents nivells educatius es pensa que és idoni per tractar temes de solidaritat, compromís i donar valor i sentit al fer de l'alumnat. Temàtiques de les àrees de llengües com la comunicació i l'expressió, de l'expressió artística i corporal i de la tecnologia i la ciència seran els eixos centrals del projecte. Es pretén que tot l'alumnat participant en el projecte esdevingui un agent actiu en el seu propi procés d'aprenentatge i sigui capaç de resoldre un repte i que ho facin de manera competent. Els propòsits que es marquen estan relacionats amb el fet que ho assoleixin amb valors i actituds d'autonomia, d'iniciativa personal i de creativitat, capacitat de planificació, prenent decisions i treballant en equip. Aquest enfocament els ha de permetre desenvolupar-se de forma eficient en la seva vida acadèmica i personal posterior (Generalitat de Catalunya, n.d.).

EXPERIÈNCIES ESCOLARS: ESTUDI DE CAS

En aquest projecte participa alumnat de P3, P4 i P5 de l'etapa d'infantil i 1r i 2n de primer cicle de primària. L'alumnat del nivell de 3r d'ESO contribueix activament en el projecte de ciències a través d'una relació directa amb els infants d'educació Infantil i del cicle inicial de primària. Les mestres que intervenen a les aules d'Educació Infantil són tres tutores, una tutora en substitució, una mestra de llengua anglesa, música i psicomotricitat i una vetlladora. Pel que fa a les aules de Cicle Inicial intervenen dues tutores, una mestra de llengua anglesa i un mestre de música. En total són sis mestres de l'aula de ciències entre Educació Infantil i Cicle Inicial de Primària. Pel que fa al professorat de l'ESO implicat en el projecte es tracta del tutor de 3r ESO, professor de ciències i de tecnologia de 3r d'ESO i coordinador TIC de l'escola i la directora de l'escola i professora de llengua catalana de 3r d'ESO.

L'objectiu general del projecte és el següent:

- Desenvolupar amb l'alumnat d'infantil, primer cicle de primària i de 3r de l'ESO una proposta educativa de l'àmbit de les ciències partint d'un enfocament STEAM i a través d'un projecte educatiu transversal de centre, partint d'un repte on s'impliqui tot l'alumnat esmentat.

Pel que fa als objectius específics són els següents:

- Promoure en els infants d'educació infantil (P3, P4 i P5), l'alumnat de primer cicle de primària (1r i 2n) i el de 3r de l'ESO l'interès per la ciència i la tecnologia a través de reptes autèntics.
- Involucrar en les resolucions dels reptes a tot l'alumnat participant.
- Evidenciar amb l'alumnat de les primeres etapes la necessitat de disposar d'un recurs que permeti la indagació (una taula de llum) per poder resoldre els seus reptes.
- Dissenyar activitats que ajudin als infants d'educació infantil en la resolució del repte proporcionant experiència en l'àrea de ciències. Activitats que fomentin les accions exploratòries, l'experimentació i la generació de preguntes des d'un enfocament STEAM per tal de descobrir canvis i propietats dels materials i de la llum.
- Crear activitats dirigides a l'alumnat de primer cicle de primària que permetin resoldre el repte i estiguin basades en la indagació i fomentin les destreses cognitiu-discursives a partir dels sabers de les disciplines STEAM per tal de descobrir canvis i propietats dels materials i de la llum.
- Implicar i motivar a l'alumnat de 3r de l'ESO en la resolució de la necessitat dels infants d'infantil i primària a través del treball indagatiu en la fabricació de la taula de llum amb un clar enfocament STEAM.
- Treballar en tots els nivells sabers científics i actituds com la comunicació, la solidaritat, l'autonomia, el compromís i la sostenibilitat.

Aquest projecte està englobat en la programació del pla de centre. Pel que fa a la programació de cicles es diferencia l'etapa d'educació infantil, la de primària i la de secundària amb la participació de l'alumnat de 3r de l'ESO. Cada etapa disposa de la seva unitat didàctica específica.

Pel que fa a les unitats didàctiques de les etapes d'educació infantil i primer cicle de primària i 3r de l'ESO es diferencien en tres fases. En una primera fase es durant a terme activitat que permetran conèixer les idees prèvies dels infants i activar el repte. En aquesta primera fase en treballaran aspecte d'indagació i comunicació. En una segona fase els alumnes de 3r de l'ESO dissenyaran i fabricaran la taula de llum. Aquest alumnat haurà d'investigar les necessitats reals tant de mestres com d'infants per tal de construir una taula de llum adaptada a les seves necessitats. Aptituds i sabers com la recerca d'informació, la generació d'idees, recerca i planificació es treballaran amb aquests alumnes. I en la tercera i última fase es dissenyaran activitats amb la finalitat de donar experiències riques i variades que permetin treballar a través de la indagació amb el propòsit d'adquirir sabers sobre la ciència, expressió artística i habilitats comunicatives.

En cas d'infantil el repte consisteix en la construcció d'un teatre d'ombres que permeti als infants fomentar la seva creativitat en la realització d'expressions i composicions artístiques i teatrals. Per tal de poder-ho aconseguir caldrà que prèviament descobreixin les propietats dels materials a l'hora de deixar passar la llum per tal de configurar els objectes del teatre, siguin els titelles o les pantalles de projecció. També els caldrà investigar en l'adequació en l'ús dels diferents focus de llum per generar ombres, ja sigui amb llum natural i llum artificial.

Pel que fa al repte de primària es tracta de realitzar una decoració de les finestres de l'aula inspirant-se en els vitralls modernistes. Durant el procés de configuració de les decoracions hauran de fer un treball d'indagació per conèixer les propietats de transparència de diferents materials (plàstics, teixits tèxtils, papers, etc.) per trobar els més adequats i descobrint les característiques de la llum i el color que els permetin fer combinacions i mescles amb unes finalitats concretes.

En ambdós nivells educatius es pretén realitzar un treball de descoberta de les propietats dels materials en la seva interacció amb la llum, la generació d'ombres i altres característiques com el color, les textures, volums, etc. a partir del coneixement previ i l'experimentació utilitzant la taula de llum com una eina d'investigació i creativitat. Treballar la comunicació i l'expressió oral, corporal i escrita a l'hora de manifestar les necessitats per part dels més partits i de rebre l'encàrrec pels més grans. El compromís i la solidaritat en tant que s'ajuda a companys de l'escola. I en el llenguatge i imaginació artística i creativa ja que es sap que les arts fomenten formes d'expressió que optimitzen la descoberta i la creació de noves maneres més enginyoses de resoldre problemes a través d'una consciència imaginativa (Hernández 2019).

Per tal de presentar el repte als infants es duen a terme una sèrie d'accions durant el mes de gener de 2023 on es fa evident la necessitat del recurs de la taula de llum per poder investigar amb els materials i descobrir les seves propietats.

A les aules d'educació infantil, en una primera sessió, es proposa un joc d'ombres per tal d'introduir el repte. A partir de les joguines que els han portat els Reis Mags es suggereix un joc inicial que consisteix a generar ombres a través d'un llençol. En aquesta sessió es van recollint les evidències de l'experiència per tal de conèixer els seus sabers previs, quines accions fan i l'explicitació de les seves idees a través de la classificació, la comparació o ordenació d'objectes. En finalitzar l'activitat se'ls proposa construir un teatre d'ombres. En el moment de decidir quins creuen que seran els materials més adients per crear els titelles i el teatre es fa evident la necessitat d'un recurs que permeti experimentar amb els materials i la llum. Se'ls parla de la taula de llum com una eina molt útil. Es realitza una recerca per saber com és una taula de llum. Un cop l'ha coneixen se'ls demana que la dibuixin tal com la voldrien per la seva classe. També se'ls demana dibuixar-la com se la imaginen per dins. En les següents sessions implementades en els mesos de març i abril es realitzaran activitats que proporcionin experiència a partir d'oferir als infants unes propostes i uns materials rics i diversos, que afavoreixen accions que impliquin la percepció sensorial, l'ús d'instruments i les accions exploratòries a partir de l'experimentació i la generació de preguntes. Ja que aquestes accions són la base indispensable sobre la qual es construeixen idees i teories.

A les aules de 1r i 2n del cicle inicial de primària, en la primera sessió es parla dels vitralls del modernisme. S'introdueix el tema a partir d'imatges de vitralls d'esglésies, de cases modernistes, i d'una visita d'una mestra a la Sagrada família durant les vacances de Nadal. En aquesta sessió inicial se'ls proposa decorar l'aula amb materials similars als vitralls. Es van recollint els seus coneixements previs a partir de preguntes de com pensen que han de ser i quins materials necessiten per a la construcció d'aquests vitralls per l'aula. També s'evidencia que per poder experimentar cal una eina que permeti treballar temes de transparències dels materials i de la llum. Es parla de la taula de llum com a recurs. Un cop conegut el recurs es demana a l'alumnat que en facin maquetes de com se la imaginen.

En ambdós casos s'evidenciarà amb l'alumnat que cal experimentar per poder resoldre el repte. Amb això es pretén promoure que, en el procés de construcció dels diferents reptes, l'alumnat indagui i experimenti per tal de descobrir certes propietats de la llum i dels materials. Això demostrarà que cal conèixer aquests sabers per arribar a la millor solució possible. Es deixa oberta la possibilitat de canvis, aportacions i noves necessitats que puguin anar sorgint per part de l'alumnat. Durant el projecte s'aniran coneixent i tenint en compte els interessos dels infants i en tot moment la proposta s'anirà adequant a ells. Es pretén que els infants siguin el màxim d'autònoms possible en la resolució del repte, tant en la idea inicial, com en el procés i en la consecució del producte final. Durant els mesos de març i abril es pretén dissenyar activitats d'indagació que permetin als infants plantejar-se preguntes investigables, treballar amb variables, realitzar experiments, comprovar hipòtesis, recomprovar, etc. La intenció és que l'alumnat adquireixi destreses d'indagació alhora que es treballaran sabers de ciències a partir de preguntes científiques. La finalitat és promoure en els infants la presa de decisions basades en els coneixements científics i les evidències alhora que es fomenten les destreses cognitiu-discursives.

RESULTATS

En l'activitat inicial del joc de les ombres realitzada amb infants d'educació infantil s'observa que es fan preguntes sobre la mida i el color dels objectes. S'adonen que depenent de la distància entre l'objecte i el focus les ombres seran més grans o més petites. També observen què alguns objectes de color projecta a la pantalla aquesta tonalitat. Els infants de P3 es fan preguntes i respostes tancades. La conversa de l'adult és en aquest punt més dirigida, ja que encara no coneixen el recurs i no saben raonar les explicacions. Tant a P4 com a P5 ja fan més preguntes i arriben a conclusions. Alguns coneixen les ombres xineses i les taules de llum.

En el cas de primer cicle de primària es constata que els infants quan se'ls proposa l'activitat inicial fan comprovacions diverses, ja sigui mirant a través dels materials que han portat, interposant-los a les finestres de l'aula.

Els resultats dels quals es disposa fins al moment es refereixen exclusivament a l'anàlisi de les activitats inicials. Durant el curs 22/23, concretament a partir de febrer, s'implementaran les resolucions dels reptes i es disposarà de les dades que permetran analitzar el projecte en tota la seva dimensió.

CONCLUSIÓ

Fins els moment no es disposa de conclusions. Durant els mesos de febrer, març i abril s'implementarà el projecte amb tot l'alumnat.

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Els petits també fem ciència

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RESUM

Vam partir del fet que els nostres infants semblen petits científics, tenen una necessitat i curiositat innata d'explorar i aprenent investigant el món que els envolta. Diferents investigadors/es afirmen que són els científics qui són com infants grans, que fan processos cognitius que podem observar en els nens i nenes des de ben petits (Gopnik; Meltzof i Kuhl,1999).

La formació organitzada per l'IMET, impartida per la Universitat de Manresa (Lab 0_6). Va motivar la Llim Sant Pere i Sant a crear una sala de ciència i a la Llim de la Taronja a millorar l'espai exterior amb propostes científiques, per tal d'afavorir i potenciar el procés d'aprenentatge aprofitant aquesta curiositat innata que tenen els infants de 0-3 anys. Espais on els nens i nenes puguin manipular, interaccionar i elaborar hipòtesis que pugin comprovar i així modificar els seus esquemes mentals.

Hem buscat espais que siguin pràctics, inclusius, amb propostes obertes i diverses que puguin donar resposta a los diferents interessos i necessitats dels nens i nenes.

PARAULES CLAUS

Ciència, hipòtesi, curiositat, experimentació, manipulació, observació, magnetisme, flotabilitat i pes

INTRODUCCIÓ

Llar d'infants de Sant Pere i Sant Pau i la Llar d'Infants de la Taronja acullen infants dels seus respectius barris però també infants que es desplacen des de Tarragona ciutat.

A les nostres aules també tenim el reflex de la societat multicultural que vivim i el perfil de famílies és un perfil de classe treballadora. Per això la importància del paper dels nostres avis i àvies, paper molt important, ajudant a la conciliació laboral i familiar. Una realitat que es fa visible cada dia a la llar d'infants, a l'hora de portar i recollir als nens i nenes i participar de les diferents activitats.

Entenem les llars com un entorn que ha de donar resposta a les necessitats de cada infant i afavorir el seu procés d'aprenentatge. El projecte ha estat molt ben acollit per les famílies de la llar.

El desenvolupament d'aquest projecte va començar a les dues llars durant el primer trimestre del curs 2021-2022 un cop finalitzat el procés d'adaptació dels infants a la llar d'infants i tenint en compte les diferents madureses o maneres de fer.

Inicialment el disseny d'aquests espais i activitats es van fer per infants de 2-3 anys amb intenció d'ampliar i adaptar aquest tipus de propostes i materials a la resta dels grups d'edats que tenim al centre durant els cursos posteriors.

A la LLIM de Sant Pere i Sant Pau al moment de treballar les propostes científiques a la sala de ciència, desdoblem el grup per tal de reduir la ràtio i així aprofitar millor l'espai i poder donar una atenció més personalitzada.

A la LLIM La Taronja les propostes de ciències es troben a l'espai exterior. I estan a l'abast de tots els infants, tant dels grans (2-3) com dels petits (1-2). A la Llim la Taronja ja fem un treball habitualment amb grups heterogenis, pensant i oferint propostes amb material obert i poc estructurat.

EXPERIÈNCIES ESCOLARS

La sala de ciències

Tots els infants coneixen el mètode científic que combinat amb la seva curiositat innata constitueix la base del seu procés d'aprenentatge, és per això que fem servir aquesta metodologia.

A la Llar de Sant Pere i Sant Pau baixem a la sala de ciència un dia a la setmana i comencem la sessió a la catifa central. A partir d'una conversa inicial presentem als infants les diferents propostes fixes i la que varía quinzenalment.

Després del primer mes únicament presentem la proposta que es variable. A partir d'aquesta conversa deixem als infants que experimentin lliurement amb tot el material. Finalitzar la sessió amb un moment de retrobament i reflexionem sobre les qualitats dels materials(mides, textura, pes...) i sobre el resultat dels canvis i modificacions de diferents elements com a resultat de la seva acció.

Fer fomentar un ambient tranquil i una atenció més individualitzada desdoblar el grup en dos i així abaixem la ràtio a 10 infants

A partir d'una conversa inicial presentem als infants les diferents propostes.

La conversa inicial que es porta a terme a les dues llars té la finalitat d'ajudar als infants a ubicar-se dins l'espai i presentar els diferents materials.

La funció de l'adult durant les sessions és fer preguntes per generar el repte, acompanyar als nens/nenes, respectant els seus interessos i deixant en tot moment que sigui l'infant qui posi a prova les seves habilitats i pugui resoldre els reptes autònomament. Treballem conceptes científics com la velocitat, pes, equilibri, magnetisme, flotabilitat, capacitat, mesura, transvasaments.

Al tenir les propostes delimitades ajudem als infants a diferenciar les unes de les altres i l'espai està organitzat afavorir un moviment tranquil.

El material sempre està ben endreçat i a mà de l'infant.. La sala de ciència i les propostes estan pensades per donar resposta a la diversitat de l'alumnat. Conviden a tots els infants.

Espai de ciències al jardí

HORT: Hem dedicat un espai al pati de la Llar, per experimentar amb natura. Permet als infants observar i comprovar el procés de transformació i creixement de les llavors en plantes, com ara: faves, pastanagues, etc. Valorar la importància de l'aigua en aquest procés de creixement, ja que de vegades, observem si alguna planta ens demana aigua, quan té les fulles caigudes o comença a assecar-se. Observem com es van desenvolupant els fruits i finalment els collim.

L'espai de vegetació i hort del pati ens permet observar petits insectes: cucs, abelles, cargols, formigues,... Els agafem per observar amb el pot i la lupa i després els retornem.

Dediquem el temps a l'espai exterior de la Llar, a fer aquest tipus de propostes, d'una forma voluntària, en petit grup i amb els infants que mostren major interès.

Altres propostes

Disposem altres propostes en diferents indrets del pati: cau o no cau?, tots els saquets pesen igual?, rodola o no rodola, els colors, sorral, etc. Tota una sèrie de propostes a disposició dels infants. Es tracta d'oferir materials pensats de tal manera que generin curiositat en els infants, i els convidin a interaccionar amb ells. A més a més, tenim la sort de gaudir d'un pati força ampli, que ens permet ubicar els materials de ciències ben separats, per evitar interferències.

Objectius

- Establir relacions afectives positives, comprenent i apreciant progressivament el seu entorn immediat, iniciant-se en l'adquisició de comportaments socials que facilitin la integració en el grup.
- Comprendre el llenguatge adult i dels altres infants, comunicar-se i expressar-se a través dels moviments, el gest, el joc i la paraula, amb una progressiva millora del llenguatge oral.
- Dominar progressivament el cos i l'adquisició de noves habilitats motrius, augmentant la seva autonomia en els desplaçaments, en l'ús dels objectes i l'orientació en l'espai quotidià.
- Actuar sobre la realitat immediata, descobrir-ne l'organització a partir de les pròpies vivències i establir relacions entre objectes segons les seves característiques perceptives.
- Iniciar-se en la descoberta i l'ús del llenguatge corporal, verbal, matemàtic, musical i plàstic.

Resultats

Reflexionem sobre la resposta dels infants i la nostra pràctica durant l'activitat.

La finalitat d'aquestes valoracions i reflexions es poder plantejar solucions als problemes detectats i millorar la nostra pràctica docent.

- Indicadors sobre les diferents experiències
- Mostra interès per les activitats?
- Es mostra tranquil i relaxat durant la sessió?
- Gaudeix de les experimentacions proposades?
- Diferencia qualitats dels materials com a resultat de la seva exploració i manipulació?
- Es mostra actiu?
- Manifesta satisfacció amb el resultat de les seves experimentacions?
- Actua sobre els objectes, classifica i ordena segons característiques dels materials?
- Demostra habilitats motrius?
- Millora el control óculo-manual?
- Respecta i té cura dels materials?
- Estableix relació entre la pròpia actuació i les conseqüències que se'n deriven

CONCLUSIÓ

Valoració feta a les fitxes d'aprenentatge com a registre de les propostes presentades. Les quals utilitzem per avaluar els espais i a la vegada per fer propostes de millora.

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Dues activitats Educatives referents en la didàctica de la ciència i la tècnica per a infants de 0 a 6 anys en museus

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RESUM

Una de les missions del Sistema del Museu de la Ciència i de la Tècnica de Catalunya i els museus que en formen part és la de difondre i promocionar el coneixement de la cultura científica i tècnica. Els museus contribuïm al sistema educatiu oferint activitats que complementen el que l'alumnat aprèn a les escoles. Les col·leccions que preservem, sobretot les dedicades a l'àmbit de la ciència i la tecnologia poden ajudar a desenvolupar d'una forma mes vivencial aquestes competències, sobretot en les primeres edats. Els nostres museus tenen una vocació clarament educativa i fem una aposta per connectar amb el públic més jove. Actualment ens preocupa molt la manca de vocacions científiques entre els joves i, especialment entre les dones, introduir un espai específic adreçat a les primeres edats és una manera d'intentar revertir aquesta situació. Treballar per un acostament participatiu i engrescador a las ciències des de les primeres edats i al llarg de tota l'escolaritat, promou un interès genuí i durador per a l'infant al llarg de la seva vida.

PARAULES CLAUS

Museu, Didàctica de la Ciència i la Tècnica, experimentació, Gaudir amb la ciència i la tecnologia, Educació Infantil.

RESUM AMPLIAT

La societat demanda canvis en els models educatius i sobretot, que es facin esforços en crear experiències positives entorn la ciència i la tècnica. Els darrers anys hem estat molts els museus que hem desenvolupat una oferta educativa adreçada als centres escolars, habitualment oferint tallers, visites i activitats per a estudiants de 3 a 18 anys, però també per a públic familiar i de cap de setmana. Comptem amb un programa de Responsabilitat Social que ens fa plantejar-nos la necessitat de crear models didàctics que siguin capaços de crear experiències d'aprenentatge lliures i engrescadores al voltant dels conceptes

científics que estiguin a l'alçada de la ment curiosa dels infants per això, hem demanat l'assessorament de les professionals del grau d'educació infantil de la UManresa per desenvolupar els espais Explora 0-6 al Museu Nacional de la Ciència i la Tècnica de Catalunya a Terrassa i l'espai Tècnica 3-6 al Museu de l'Aigua i el Tèxtil de Manresa.

Ambdós espais busquen oferir una experiència enriquidora als infants, buscant un aprenentatge de la ciència enriquidor, que permetin a l'infant gaudir tenint experiències positives al voltant de fets i problemes de la vida quotidiana. La ment de l'infant és curiosa per natura i els més menuts tenen una mena científica, on a través d'assaig i error poden resoldre els reptes que se'ls ofereix. Permetre que cada infant pugui interactuar lliurement amb els diferents elements plantejats, i en un ambient agradable, no distorsionador, enriqueix molt l'experiència i el seus resultats, cada nen i nena és lliure de fer, descobrir, provar, allò que més li crida l'atenció, i al ritme que vulgui. En les nostres propostes tant hi ha lloc per a la interacció personal, com per a la col·lectiva, on els més menuts interaccionen coordinadament fent que l'experiència compartida sigui encara més enriquidora.

INTRODUCCIÓ

Els Museus del Sistema Territorial del MNACTEC som un conjunt de 27 museus de ciència i tècnica que expliquen la industrialització a Catalunya i la seva complexitat territorial. El Museu Nacional de la Ciència i de la Tècnica de Catalunya, la seu central, es troba a Terrassa, però el seu Sistema està estès per tot el país, A Manresa les col·leccions s'especialitzen en la distribució i usos de l'aigua i en la cinteria o teixit estret, mentre que al MNACTEC, hi ha diverses exposicions de temes relacionats amb la ciència i els avenços tecnològics, des de l'activitat llanera de la pròpia història de l'edifici, fins a explicar l'antiga estació espacial internacional.

EXPERIÈNCIES ESCOLARS: ESTUDI DE CAS

L'any 2018, conjuntament amb el grau d'educació infantil d'UManresa, es van crear una sèrie de materials per a la generació d'activitats per a infants de 3 a 6 anys encarades a l'aprenentatge a partir de l'experiència vivencial. El taller Tècnica 3-6, s'ofereix a escoles i públic familiar, amb l'acompanyament d'un monitoratge que fa les funcions d'ajudar als infants a descobrir diferents aspectes de la ciència i la tècnica.

L'any 2019 es va crear l'espai Explora 0-6 al MNACTEC, un espai de lliure experimentació, que consta de dos espais molt diferenciats, un està immers en un gran sorral i l'altre no. Ambdós presenten un seguit de propostes engrescadores que criden l'atenció dels més petits i en permeten la lliure manipulació i experimentació en total llibertat. Permetent que cada infant s'hi estigui l'estona que vulgui i es trobi amb problemes o situacions que ha de resoldre. Com a l'espai hi ha altres infants, hi ha també experiències pensades per poder interactuar i treballar cooperativament si es vol aconseguir algun repte determinat.

Les situacions de joc que es presenten, permeten que l'infant comprengui millor els conceptes científics, i com a situació de joc són activitats que permeten escollir el procés d'exploració, el descobriment de nova informació percebuda sense esforç i amb l'estimulació de diversos sentits.

L'any 2020 es va crear un espai específic per aquests materials on es poden utilitzar en tot moment i no requereix un muntatge previ de l'activitat.

RESULTATS

En el MNACTEC el resultat ha superat totes les expectatives prèvies, tant pel que fa al nombre d'usuaris, com a les diverses tipologies, tant les escoles bressol com els centres d'educació infantil i primària han trobat una oferta adaptada a les seves necessitats. Però també els usuaris familiars de cap de setmana i, cosa que ens ha sorprès molt, en aquelles persones que no fan us dels serveis de les escoles bressols, perquè els seus infants experimentin en llocs i situacions noves, així com que interactuïn amb d'altres infants.

A més també des del museu hem potenciat que aquest espai formi part de les experiències enriquidores en la formació de futurs mestres i educadors. Potser a vegades hi ha algun punt negatiu en el que esperen trobar alguns dels docents que venen, en el sentit que demanen que l'educador del museu, enlloc de servir d'acompanyant i espectador respectuós amb la dinàmica dels nens i nenes, esperen que "se'ls expliqui" alguna cosa. Per tant, doncs en aquest sentit encara hem de treballar una mica més en la formació i comprensió per part dels docents, de la potencialitat real de l'espai.

El resultat ha estat molt satisfactori tant a nombre d'usuaris com amb les opinions positives que s'han anat recollint durant el temps de funcionament de l'activitat.

CONCLUSIÓ

Els museus som agents d'innovació en la didàctica i la comunicació, i a més, ens toca enfocar-nos en tots els tipus de públics i de totes les edats. Però treballar en projectes que permetin aprendre ciència a les primeres edats, és fonamental per al desenvolupament posterior dels infants, i per tant, és el nostre deure social apostar en tenir més i millors recursos per a aquest públic.

En aquest sentit, la nostra experiència és pionera i creiem que pot ser molt útil per a altres museus i centres culturals. Destaquem la necessitat de més col·laboracions interdisciplinars amb centres de recerca, universitats, etc, així com molta interacció amb els centres escolars per acabar de crear espais realment interessants, engrescadors i innovadors.

Els museus habitualment disposem de poca oferta educativa per l'alumnat d'educació infantil. El fet de poder disposar d'aquests materials i haver desenvolupat.

Rediseño de la actividad de la caja negra realizado por futuros docentes de educación infantil

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RESUMEN

El principal objetivo de las asignaturas de ciencias experimentales en el grado de maestro en educación infantil, estriba en capacitar a los futuros docentes de la etapa en la elaboración de propuestas didácticas que promuevan la interacción con la ciencia y la indagación. Dos grupos de futuros docentes de infantil de dos universidades españolas fueron preparados en el conocimiento de los contenidos propios del método científico y tras experimentar por ellos mismos la implementación de estos mediante la realización de la práctica de la caja negra; se les pidió que la rediseñaran para su futuro alumnado de educación infantil. Los resultados obtenidos confirman que los futuros docentes encuentran el rediseño como una estrategia muy sugerente a la hora de formular propuestas didácticas y que puede garantizar muy buenos resultados con el alumnado de infantil. Sin embargo, también manifiestan que implica mayor complejidad que el diseño libre de propuestas. El rediseño es por tanto una solución que garantiza una implementación exitosa de la ciencia en las clases de educación infantil, pero en la que hay que instruir a los futuros docentes para que la consideren factible y atractiva frente a otras propuestas de diseño libre.

PALABRAS CLAVE

Educación infantil, método científico, rediseño, futuros docentes, secuencia didáctica

INTRODUCCIÓN

El principal reto a conseguir con el alumnado del grado de maestro en educación infantil dentro del área de la didáctica de las ciencias experimentales, pasa por capacitar al mismo en la enseñanza e implementación de las ciencias a los futuros alumnos de infantil. Para ello, este alumnado debe ir desarrollando en su formación, una competencia científica suficiente que le permita a su vez en un futuro, desarrollar la de su alumnado. Esta competencia científica junto con capacidad creativa y emprendedora de las competencias generales de cualquier docente, les van a permitir ser capaces de formular, diseñar y gestionar propuestas y actividades para que los niños y niñas de infantil puedan y quieran aprender ciencias (Cantó-Doménech et al., 2017). Con ello y haciendo uso de la innovación, darán respuestas a las necesidades detectadas entre su futuro alumnado, integrando nuevos conocimientos y actitudes, y promoviendo en todo momento la indagación y el deseo por el saber (Golías et al., 2021).

Existen muchas posibilidades a la hora de formular y diseñar propuestas, y una de ellas pasa por el rediseño o reformulación de propuestas conocidas, ya sea dirigidas a estudiantes de infantil o de otras etapas. Para ello es necesaria su adaptación al alumnado de educación infantil, así como ajustar su implementación al contexto y necesidades concretas del grupo clase. Este rediseño implica partir inicialmente de haber realizado y haberse familiarizado con el diseño de propuestas desde cero para alumnado de infantil.

De ahí que el objetivo de esta investigación pasa por el análisis de las propuestas rediseñadas y las percepciones obtenidas hacia este proceso por dos grupos de estudiantes del grado de maestro en educación infantil de dos universidades y cursos distintos. De esta forma se pretende comprobar la estimación que se hace del rediseño, así como las diferentes percepciones que se puedan dar entre alumnado de distintas universidades y niveles.

EXPERIENCIAS ESCOLARES: ESTUDIO DE CASO

La experiencia fue llevada a cabo en dos grupos de alumnado del grado de maestro en educación infantil de la Universidad de Alicante (21 alumnos) y la Universidad Rovira i Virgili de Tarragona (36 estudiantes). Aunque en ambos grupos, es la primera vez que se encuentran con una asignatura para la didáctica de las ciencias en educación infantil, hay que hacer notar que, en el grupo de Alicante, el alumnado es de 2º curso, mientras que en Tarragona pertenecen a 4º curso del grado. Ambos grupos, en una primera fase, trabajaron durante 5 sesiones (de 2 horas de duración cada una) los contenidos de la forma en que trabajan los científicos (el método científico) y la forma de implementar esto en las clases de educación infantil. Tras ello, en una segunda fase, en una sesión (2 horas), llevaron a la práctica la experiencia de la caja negra, viviendo en primera persona los objetivos que se perseguían en ella. Por último, en una tercera y última fase, inicialmente se les propuso que durante tres semanas disponían de tiempo para rediseñar la práctica realizada y adaptarla a alumnado de educación infantil. Para ello, desde el primer día se les facilitó una rúbrica con la que se les iba a evaluar el rediseño realizado, que una vez transcurridas esas tres semanas debían presentar al resto de estudiantes del grupo clase, y finalmente cumplimentar un breve cuestionario construido ad hoc en el que se recogían sus impresiones acerca de la realización de un rediseño frente a la realización de diseños libres.

RESULTADOS

Los resultados obtenidos en ambos grupos confirman que el alumnado considera una ventaja el disponer de una temática, un punto de partida y una referencia en el rediseño, frente a un diseño de propuesta en la que se tenga que partir de la nada. Sin embargo, reconocen que es más difícil elaborar una propuesta a partir de una estructura y un guion dado en el caso del rediseño, que partir de poder crear un hilo conductor y una estructura de forma libre. Con todo, presumen que obtendrían con alumnado de infantil, mejores resultados a partir de propuestas rediseñadas que a partir de propuestas diseñadas.

Entre los dos grupos sí se constatan una diferencia singular y esta estriba en el hecho de que el grupo de Tarragona presenta menor dificultad a la hora de realizar el rediseño de la actividad que el grupo de Alicante. Esto tiene una lógica explicación dado que, al ser alumnado de 4º curso, aunque sea la primera vez que trabajan la didáctica de las ciencias, sí están más puestos en la elaboración e incluso en el rediseño de propuestas pedagógicas, aunque sean de otras áreas o materias del conocimiento.

CONCLUSIÓN

El rediseño de propuestas pedagógicas para la enseñanza de las ciencias experimentales por parte de los futuros docentes de educación infantil, es considerado por estos como una práctica que puede ofrecer muchas más ventajas y mejores resultados a los que ofrece el diseño libre. Sin embargo, cabe formar y capacitar a estos futuros docentes en este tipo de prácticas pedagógicas y estrategias, para que permita en un futuro que las ciencias experimentales estén presentes en esta etapa y no caigan en el olvido o en propuestas banales y sencillas, ante la posible identificación del rediseño con una mayor dificultad y trabajo.

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Quan el problema és explicar la llum a educació infantil: Experiència d'investigació a l'escola Montserrat

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RESUM

A l'escola Montserrat de Sant Salvador de Guardiola es va realitzar un procés formatiu organitzat pel Departament d'Educació amb la finalitat de reflexionar sobre l'ensenyament i aprenentatge de les ciències i construir un espai de ciències a l'escola. Aquesta experiència escolar presenta el procés de disseny i implementació d'una seqüència d'activitats per promoure l'ensenyament de la llum a nenes i nens de cinc anys, per part de l'equip de mestres del segon cicle d'educació infantil. La proposta està alineada amb la idea que a les escoles cal fer ciència autèntica, que emuli les pràctiques científiques d'investigació, argumentació i modelització que fan els científics. Durant la implementació de les activitats s'han recollit dades a partir de les produccions elaborades pels nens i les nenes per avaluar com evolucionen les seves idees sobre el tema científic de la llum. Els resultats de l'experiència mostren algunes pràctiques docents rellevants per a la construcció d'un model de llum més sofisticat que podrien tenir implicacions didàctiques en altres escoles.

PARAULES CLAUS

Educació infantil, ensenyament de les ciències, llum, indagació basada en models

INTRODUCCIÓ

L'Escola Montserrat de Sant Salvador de Guardiola va fer la petició al Centre de Recursos Pedagògics del Bages d'una formació per tal de construir un nou espai de ciències a l'escola i innovar en l'ensenyament de les ciències. El novembre de 2022 va iniciar la formació que tenia per objectiu confrontar les orientacions dels mestres amb relació a com ensenyar ciències a l'escola, i com les nenes i els nens aprenen ciències. Les idees treballades en la formació i aplicades a la proposta didàctica són: a) la importància d'explorar les idees inicials dels nens i les nenes; b) la introducció dels fonaments que caracteritzen la construcció de coneixement; i c) la presentació d'un model didàctic basat en la investigació i modelització. En aquest sentit, l'experiència escolar que detallem a continuació, parteix de la voluntat de fer una proposta innovadora de ciència autèntica, que emulin les pràctiques científiques d'investigació, argumentació i modelització igual que fan els científics (Osborne, 2014).

EXPERIÈNCIES ESCOLARS: ESTUDI DE CAS

Una de les finalitats de la formació era dissenyar una proposta d'investigació breu sobre un dels temes científics treballats en el curs. Concretament, les sis mestres del segon cicle d'educació infantil, van escollir el tema científic de la llum.

La planificació de quatre activitats resultants té l'objectiu de treballar les idees de; a) la llum viatja en línia recta; b) la diferència entre focus de llum, raig de llum i pantalla i; c) l'ombra és l'absència de llum i la veiem en direcció oposada al focus de llum. Tal com mostra la taula 1, cada activitat té una funció didàctica, en primer lloc, explorar les idees inicials de les nenes i els nens (activitat 1), en segon lloc, investigar per obtenir evidències (activitat 2 i 3), a continuació modelitzar els raigs de llum (activitat 4) i finalment sintetitzar i avaluar l'evolució de les idees de les nenes i els nens (activitat 5).

TAULA 1. PLANIFICACIÓ SEQÜÈNCIA DIDÀCTICA

Act.	Objectiu	Idees científiques	Descripció
1	Explicar un fenomen per explorar les idees inicials dels nens i nenes	a) la llum viatja en línia recta; b) la diferència entre focus de llum, raig de llum i pantalla; c) l'ombra és l'absència de llum que és oposada al focus de llum	• Facilitem tres dibuixos d'una persona amb un sol a la part superior esquerra del dibuix. Un dibuix té l'ombra sota la persona, el segon té l'ombra en direcció contrària al focus de llum i el tercer en la mateixa direcció. Demanem a les nenes i els nens quina creuen que és correcte i per què. (document idees inicials)
2.	Investiguem la direcció de l'ombra per obtenir evidències i establir conclusions	a) L'ombra és l'absència de llum i és oposada al focus de llum; b) La llum viatja	• Investiguem on estaria l'ombra d'un objecte si col·loquem la llanterna en una posició o a la posició oposada. • Per parelles un alumne en un punt estàtic i l'altre amb una llanterna. Demanem on s'ubicaria la llanterna per obtenir l'ombra del nen/a en direcció a les finestres.
3	Investiguem com viatge la llum per obtenir evidències i establir conclusions	a) La llum viatja en línia recta	• Observem si la llum de la llanterna creua tubs rectes i corbats amb un experiment amb control de variables. • Observem com el raig del làser és recta dins un got amb aigua i llet.
4	Modelitzem el camí de la llum per imaginar allò invisible i construir explicacions.	a) La llum viatja en línia recta; b) L'absència de llum és l'ombra	• Representem la llum amb cordills. Cadascú agafa un fil que surt del focus de llum. Si en el recorregut topen amb la persona, el raig de llum acaba la trajectòria, l'absència de llum és l'ombra. Mostrem una imatge amb vàries ombres. Representem els raigs de llum per veure les ombres provenen de diferents focus de llum.
5	Avaluem les idees de les nenes i els nens	a) la llum viatja en línia recta; b) la diferència entre focus de llum, raig de llum i pantalla; c) que l'ombra és l'absència de llum que és oposada al focus de llum	Recuperem l'activitat inicial de les ombres perquè l'alumnat construeixi de nou una explicació, usant el nou coneixement. Facilitem un dull amb el dibuix central d'una persona amb tres ombres i tres lots en diferents posicions per avaluar la relació entre focus de llum i ombra. Facilitem una imatge d'un lot i una pilota i els fem dibuixar els camins de la llum. (document idees finals)

La implementació d'aquesta seqüència d'activitats es va realitzar amb 50 nenes i nens dividits en dos grups durant cinc sessions de 90 minuts cadascuna. Les activitats van ser dirigides per les dues tutores dels grups que van recollir documentalment l'experiència personal després de cada sessió. Al final de la proposta es va fer un grup de discussió entre les mestres i la formadora per valorar les produccions de les nenes i els nens de l'inici i el final de la proposta i identificar les bones pràctiques docents.

RESULTATS

Els resultats mostren la dificultat en concebre la idea de raig de llum a causa de la invisibilitat de la llum. Tal com mostra Del Val (1985), alguns alumnes creuen que la llum és el focus de llum com la bombeta o el sol, però no l'associen amb els objectes il·luminats. Així i tot, les activitats d'investigació han permès evidenciar com hi ha una excel·lent comprensió en relació a la direccionalitat en línia recta entre el focus de llum, objecte i l'ombra. L'activitat de modelitzar la llum amb fils ajuda a crear una representació de com són els raigs de llum, tot i que en alguns casos s'observa la complexitat en passar d'un pla concreta a la comprensió abstracta del model de llum. Per acabar, identifiquem la rellevància en documentar el procés d'investigació de forma conjunta entre alumnat i la mestra. En el nostre cas, l'ús dels pòsters com a estratègia per estructurar les noves idees introduïdes ha servit per guiar el procés d'investigació i l'evolució de les idees. En aquest sentit, els moments de revisió en cada activitat han estat clau per donar sentit a la investigació.

CONCLUSIÓ

Després d'aquesta experiència constatem que ensenyar ciències a partir d'investigacions breus que emulin les pràctiques científiques és un repte assumible amb nenes i nens de 5 anys. Els resultats mostren la importància d'emfatitzar i situar l'alumnat a l'inici i final de les sessions i revisar el procés per tal de seguir el fil de la investigació i poder donar sentit a l'aprenentatge. Així i tot constatem la importància de tenir un debat més profund sobre els processos de modelització i d'abstracció d'algunes idees de llum en aquesta etapa.

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Mirando al cielo en educación infantil

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RESUMEN

Este trabajo surge del proyecto *Ciencia con Consecuencia* en el que universidad y escuela trabajan de manera conjunta para intentar mejorar la cultura científica del alumnado de infantil y primaria y estimular las vocaciones científicas. En base a ello, se implementa una actividad sobre las nubes en un aula de educación infantil de 5 años, a la que asisten 20 alumnos y alumnas de un Colegio Rural Agrupado de Albacete. Esta actividad se introduce como rutina en la asamblea diaria, y a través de la guía del docente el alumnado es capaz de identificar y clasificar los géneros principales de nubes tras su observación diaria, así como de reconocer sus características principales. Se favorece, de este modo, la realización en las aulas de actividades de contenido científico próximo al entorno del alumnado.

PALABRAS CLAVE

Nubes, clasificación, observación, educación infantil.

INTRODUCCIÓN

Esta experiencia nace de una colaboración universidad-escuela en el marco del proyecto *Ciencia con Consecuencia (CcC): la escuela y los maestros como fuente de cultura y vocaciones científicas*, de las Facultades de Educación de Albacete y Segovia con la colaboración de la FECYT y el Ministerio de Ciencia e Innovación.

CcC propone crear una cultura de ciencia en los centros educativos desde los niveles iniciales, para lo que se llevan a cabo talleres formativos con docentes de infantil y primaria, dotándoles de actividades, recursos y estrategias que les permitan implementar en sus aulas una ciencia cercana al niño, vinculada a los contenidos del currículo oficial, conectada con su realidad y, en la medida de lo posible, aplicable a situaciones conocidas del alumnado. Desde su inicio (curso 2020-2021) se han abordado temáticas como: transmisión del movimiento, cantos de aves, minerales y rocas, energía eólica, aromas, entre otras.

EXPERIENCIA "MIRANDO AL CIELO": ESTUDIO DE CASO

Uno de los centros participantes es el CRA Nuestra Señora del Rosario, con secciones en los municipios de Valdeganga y La Felipa, de aproximadamente 1900 y 600 habitantes respectivamente, en la provincia de Albacete.

En el aula de 5 años, de 20 alumnos, se llevó a cabo una actividad de identificación y clasificación de 9 de los 10 géneros de nubes (estratato, cúmulo, estratocúmulo, nimboestratos, altoestratos, cirro, cirroestratos, cirrocúmulos, cumulonimbo), además de aprender sus características principales (altitud a la que se sitúa -baja, media, alta-, formado por gotas de agua o cristales de hielo, probabilidad de lluvia, etc.). También se asoció con la cultura popular, a través de refranes que hacen referencia a las nubes: "Cielo empedrado, suelo mojado", "Mañanita de niebla, tardecita de paseo", etc.

El empleo de rutinas en el ciclo de infantil es una de las características más relevantes del proceso educativo en estos años, favoreciendo que sean más autónomos y sistemáticos. Las rutinas han de ser predecibles, repetitivas y funcionales para conseguir beneficios en términos de aprendizaje (Woods et al., 2004). Así, es habitual que en las aulas de infantil se comente en la asamblea de inicio cuál es el tiempo atmosférico: si hace sol, hay nubes, llueve, etc. La actividad "mirando al cielo" (Figura 1) propone dar un paso más y que el alumnado sea capaz de:

- Identificar nubes según su género.
- Situar las nubes en función de su altitud.
- Relacionar el tipo de nube con la probabilidad de precipitación.
- Indicar de qué está compuesta cada nube identificada.

Figura 1. Alumnado observando las nubes

Tras la formación de la maestra por los miembros del equipo, la secuencia de aula fue:

1. Evaluación inicial para identificar los conocimientos previos.
2. Realización de preguntas para despertar el interés del alumnado. Algunos ejemplos: ¿Os habéis fijado en las nubes?, ¿Son todas iguales en su forma?, ¿Y en su color? … Visualización de imágenes de diferentes nubes y explicación de características, origen de su nombre, etc.
3. Observación diaria en el patio del tipo de nube e identificación de su género en la asamblea. Se dispone de dos pósteres A3 con los géneros básicos y de láminas plásticas transparentes que sirven como modelo de referencia. La nube seleccionada se coloca en una pizarra magnética blanca (Fig. 2a). Esta pizarra se utiliza como "diario de nubes". Conforme el alumnado se va familiarizando se va exponiendo también la altitud a la que se sitúan, colocándose de este modo en la pizarra, que lleva unas marcas con las tres altitudes características (Figura 2a).
4. Aprendizaje de nuevos tipos de nubes que surgen por combinación de las que el alumnado ya conoce. Se continúa con la identificación en el patio y en la asamblea.
5. Explicación de las características principales de cada género: altitud, composición, relación de cada una con la probabilidad de lluvia (nieve, granizo) y de su composición. También se les recitan refranes relacionados, explicando su significado.

6. Determinación del género y, un niño encargado, repite las características de ese género. Si se conocen refranes asociados, se repiten. También la maestra hace dictados con lo determinado en el día o el alumnado lo escribe de manera libre (Figura 2b).
7. Post-evaluación para comprobar los aprendizajes: la misma prueba inicial.

a *b*

Figura 2. (a) Alumna colocando la nube identificada en el "diario de nubes" (cirro). (b) Alumnos haciendo un dictado tras identificar las características de la nube diaria.

RESULTADOS

De los comentarios de los niños, escritos y verbales (Fig. 3a), recogidos de forma sistemática, se extrae que: indican que las nubes cambian a lo largo del día, el viento les hace que se muevan y modifiquen su forma e, incluso, su género; los niños, al finalizar el curso, son capaces de determinar, con un elevado grado de acierto, el género de las nubes. Argumentan sus decisiones: "No, tiene huecos, por eso es un estratocúmulo y no un estrato". En los cuestionarios post-intervención, la mayoría distingue de qué nube no llueve. Hay confusión entre las dos posibles de lluvia dado su parecido. Mayoritariamente, saben clasificar la nube por su altitud. Su capacidad de observación con criterio científico ha incrementado notablemente.

a *b*

Figura 3. (a) Texto libre de un niño de 5 años sobre las nubes del día y sus características. (b) Postest de una característica de las nubes: indica o no lluvia.

CONCLUSIÓN

La introducción de una rutina de identificación de nubes en infantil favorece el desarrollo de conocimientos y habilidades procedimentales como la observación y la clasificación, trabajando un contenido muy próximo al contexto del alumnado.

Estas actividades pueden estimular la curiosidad por conocer y comprender el entorno del alumnado de los primeros niveles educativos. Acercar esta ciencia a los docentes tiene en efecto muy positivo en sus aulas.

Finalmente, este proyecto ha permitido aumentar la relación universidad-escuela e involucrar a centros de ámbito rural, que normalmente tienen más dificultades para participar en actividades de ciencia y su divulgación.

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Constructing an Educational Curriculum on Inclusive Science Education

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ABSTRACT

The Erasmus Brussels University of Applied Sciences and Arts got involved in the Horizon 2020 project 'Communities for Sciences: Towards promoting an inclusive approach to Science Education'. One of the goals within the project is to develop a STEAM play-based learning environment that encourages children's creativity, inquisitive attitudes and that considers different "learning styles". (Kolb 1984; Gardner, 1993)

Crucial elements in the story are exploratory play with open ended materials, different ways of expression and communicating, but also creativity, critical thinking, collaboration and reflection. At the heart of it all is wonder and curiosity (Pauwels,2021). Therefore we include a diversity of art and aesthetic impressions as a medium to discover who you are and what you can do. These ideas were tested by a student-teacher in a school in Brussels for 7 weeks with 19 children 5/6 years old.

The study showed how powerful impressions and freedom to investigate stimulate children's creativity. How the personality of each child was expressed in this process of exploring, investigation and exchanging. How joyful they played together. This with the support of an open and understanding student teacher and mentoring teacher.

However further steps are necessary. More attention needs to be on the limitations of spaces. We will further investigate how we can use the creative process of children towards more focused research, keeping sight of our pedagogical principles. The quality of interventions and conversations must be improved. The collaboration with the mentor teacher and the school was enriching. Insights will be shared with other educational institutions.

KEYWORDS

aesthetic impressions, creativity, the exploring child, child adapted science, guidance style, interventions, the child community, the educator, pre-school education

INTRODUCTION

In order to fully participate and contribute to today's society, a scientific understanding of the world and the development of 21st century skills is crucial. The Erasmus Brussels University of Applied Sciences and Arts got involved in the Horizon 2020 project 'Communities for Sciences: Towards promoting an inclusive approach to Science Education'.

The developed materials and play proposals are focused on 'playful science education' or 'education in playful science', also referred to as the 'aesthetic steAm approach' (Science, Technology, Engineering, Arts and Mathematics). Looking at common practice in Brussels, the Bachelor of Education for pre-primary teachers at EBUASA, envisioned a more playful approach to science education for young children (2,5 to 6 years of age). They set out to develop a more inclusive approach to science education. Additionally they aim to multiply the novel approach into the workforce and educational practices.

SCHOOL EXPERIENCES: STUDY CASE

The study aims to develop an educational curriculum on Inclusive Science Education for the sector of Early Childhood Education on the one hand and for teacher training on the other.

For the study case, the EBUASA worked with a school in Brussels in a superdivers neighbourhood. The research included one class group of pre-primary children (N=19, 5/6 years old), a teacher, a student teacher and 2 supervisors. Focus was on a creative play-based learning environment, investigated during the internship of the student for 7 weeks. Observation was carried out on children's engagement and the way they investigated within the playful STEAM approach. The phenomenon "Connecting" and developmental goals determine the framework in which the investigative play takes shape. Consequently, open ended materials and well thought out aesthetic impressions are carefully selected. Children are used to playing in an independent manner.

A group of children and the student teacher were observed 6 times. Interviews with her were conducted before and after activities. Interventions and aesthetic impressions within the phenomenon of 'connection' were discussed. The student kept a diary for each activity. Observational results and photographic materials were collected. Following indicators were determined: the quality of exploration and interaction between the children. The teacher student guidance style: her guidance, interaction and conversations. Results were presented to two extenal experts in STEM education and in Arts.

RESULTS

The impressions and open ended materials had an impact on the experience and intuitive investigation of the phenomenon "Connection".

The creative processes children went through during investigation seemed very chaotic at first, but when impressions, materials and tools were well chosen, research became increasingly focused. It became obvious how important creating an environment that matches the personality, the prior knowledge and capabilities of children is. We discovered how each child gave his own interpretation to the impressions and designed very personal creations with the materials presented.

Furthermore, we noticed that certain children have a learning style that makes them more likely to need conversation to make their plan known. Most of the children however were very motivated and there was a warm and pleasant atmosphere in the classroom. The teacher was impressed with his children.

We wanted the creative process to continue in more directed research. We expected children to formulate new questions or problems through conversations and presentations. We were not able to observe this explicit phase.

In our opinion, the (un)availability of suitable spaces created a hitch. Play and research could sometimes continue in the classroom, sometimes not for practical reasons resulting in an unavailability of certain. This practical inconvenience hindered the creative process in some children.

Conflicts between the children were not noted. The student teacher is sensitive and included all children. All children felt accepted and appreciated.

Evolution in her conduct of conversations and interventions was clear.

At first she felt lost when a chaotic phase did not progress and children no longer knew what to do. Afterwards she admits, she herself had not explored sufficiently what insights and skills are needed to be creative with the material and tools.

Reflection conversations and the trust she received from the supervisors and teacher made her grow. Conversations stimulating reasoning and linking vocabulary is to the phenomenon could be improved. This might be a result of growing up in a multilingual context in Brussels.

CONCLUSION

When implementing this innovative approach, the role of the teacher is crucial to instigate and further the creative investigative process of children. The student teacher could not yet sufficiently conduct a variety of quality interventions and in consequence creative processes were not furthered. For the training program we conclude that increased focus should be on deploying a variety of interventions of quality with impact.

The EBUASA gained insight in the investigative process of children when it comes to exploration and intuitive research. We need to direct future effort into focused inquiry and investigative play, aimed at predetermined goals, thus zooming in on explicit and focused inquiry. The interdisciplinary collaboration was a great added value and must continue.

The aesthetic impressions with open-ended and recycled materials has impact on the investigation process of the children. A critical selection thereof in relation with the predetermined phenomenon is important. It is crucial to highlight artists whom children can identify with and can relate to; artists whose origins reflect the diversity of the classroom.

In future, we need to think even more about space used in the approach. Materials and technical aids must be accessible more conveniently.

To engage all children, creating sufficient presentation opportunities where children share constructive feedback is important. This way children can get acquainted with an open culture and practice of feedback and acquire the language to do so.

Additionally, discussions encourage children to analyse and articulate their actions and aims of inquiry. In deliberating, the children gain a deeper understanding of their actions. Intuitive inquiry thus evolves into more explicit or focused inquiry. Striving for full inclusion, we need to explore an even more responsive practice to different learning styles.

This case study strengthened our resolve to test our pedagogical approach further with younger children. It will increase insights into targeted investigative play in very young children. Therefore, we need partnerships with professionals.

Together we can make Creative Playful Inclusive Science Education a reality for all children.

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La ciencia y el agua en la vida cotidiana de la escuela de infantil de 0-3 años

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RESUMEN

En el día a día de una escuela de infantil de 0-3 años hay muchos momentos de la vida cotidiana en los que aparecen descubrimientos científicos. Los adultos que acompañan pueden presentar retos con conceptos científicos, pero la misma vida cotidiana nos presenta momentos que podemos aprovechar. La ciencia es una herramienta para comprender el mundo. Si aprovechamos la curiosidad innata de niños y niñas ofrecemos una oportunidad de aprendizaje y experimentación para despertar el interés y la motivación por el mundo científico. El agua está en nuestro día a día en muchos momentos: beber agua, lavar manos, regar, cocinar... El agua cambia la materia, también puede tener relación con la fuerza, con el peso, con la densidad... y todo esto ¿cómo lo descubrimos en el 0-3?

PALABRAS CLAVES

Ciencia - escuela infantil 0-3 años – cotidiano – exploración - agua

INTRODUCCIÓN

Actualmente varias investigaciones relacionadas con el desarrollo del aprendizaje científico en la pequeña infancia demuestran la importancia de favorecer este aprendizaje en los primeros años de vida (Fleer, 2009; Goulart et al., 2010).

Las criaturas son exploradores, curiosos e investigadores de forma innata (Johnston, 2009). Les encanta explorar el entorno y tienen un interés natural por descubrir el mundo que les rodea. La cotidianidad de la escuela está llena de experiencias que captan su atención y dan respuesta a su curiosidad, la naturaleza es una fuente de estas experiencias y una de ellas es el agua.

Una investigación realizada por Gopnik (2012) sobre el pensamiento científico en la primera infancia, en concreto a los 2 años, demostró inteligencia científica en momentos de cotidianidad.

En el día a día de la escuela infantil tanto las personas adultas como las criaturas hacen un uso continuado del agua. En un día tipo en la escuela se hacen cambios de pañal donde se utiliza esponja y agua para limpiar a las criaturas, después de las comidas se lavan las manos y cara, beben agua y los niños mayores consiguen servirse con jarra, en la primavera se riega el huerto, hay días que se preparan recetas de cocina y para hacerlo se necesita agua, en verano el agua permite refrescar a las criaturas, en el espacio artístico ayuda a limpiar los pinceles... Así pues, son muchos los momentos en los que el agua está presente y ayuda a descubrir conceptos científicos. ¿Qué ocurre si se moja la esponja? Si llenamos de agua el vaso y lo dejamos en el patio ¿qué pasa? ¿El agua actúa igual cuando hace calor que cuando hace frío? ¿Qué sensación tengo si se moja el jersey?

La educadora debe tener una mirada de respeto y a la vez saber acompañar los distintos procesos y fases de descubrimiento de los niños y niñas.

Este rol que asume la persona adulta es importante para desarrollar el aprendizaje de la ciencia en la primera infancia (Martin et al. 2005. Una persona adulta presente, tranquila, que pone palabras a lo que está sucediendo, que capta la atención de las criaturas y prepara nuevos retos, que provoca diferentes situaciones y sigue un hilo conductor con interés para las criaturas.

Este rol de la persona adulta incluye escuchar sus necesidades y promover entornos de aprendizaje rico en estímulos, pensados, preparados para que las criaturas se hagan preguntas, pueda interactuar con otros e investigar curiosidades cotidianas. El espacio donde pasan todos estos hallazgos también debe ser un espacio acogedor, que acompañe a seguir descubriendo, con el material al alcance y preparado. La libre circulación y el aprendizaje internivel también ayuda a que las criaturas se concentren en estos nuevos descubrimientos, crear un diálogo con la educadora y conocer en qué momento se encuentra cada niño o niña. No todos tienen la misma relación con el agua, ni el mismo interés por experimentar. Por eso la vida cotidiana nos ayuda a que lo vivan de forma natural y no forzada.

En la escuela de infantil los aprendizajes y descubrimientos los hacen las criaturas, pero es la persona adulta quien pone la mirada científica.

EXPERIENCIA ESCOLAR: ESTUDIO DE CASO

La Upetita es una escuela infantil gestionada por el Grado en Maestra de Educación Infantil y el CFGS de Educación Infantil de UManresa. El proyecto educativo de la Upetita lleva a la práctica la innovación pedagógica que se enseña en las aulas universitarias de UManresa. Es un espacio donde las decisiones se toman en base a evidencias demostradas por la investigación educativa y por conocimiento profundo de los niños y familias que nos dan confianza.

Entendemos que los niños y niñas hacen ciencia desde el nacimiento porque tienen curiosidad por captar y entender el mundo que les rodea desde el mismo momento en que abren los ojos por primera vez. Por ello, la Upetita dispone de un espacio específico para la promoción del espíritu investigador de las criaturas, Explora 0-3, con propuestas que estimulan su curiosidad natural.

Vemos en los niños y niñas personas que co-construyen conocimiento, identidad y cultura, que intentan dar sentido al mundo a partir del desarrollo de modelos y teorías propios. Esta visión comporta dirigirse de forma abierta, ofreciendo posibilidades, favoreciendo el surgimiento y la materialización de iniciativas propias.

Teniendo en cuenta todas estas características, la UPetita es un espacio que favorece en la cotidianidad del día a día de la escuela, oportunidades de aprendizaje científico en las primeras edades que si la persona adulta no detecta y aprovecha pueden acabar sindo oportunidades perdidas para potenciar el pensamiento científico.

El objetivo principal de la experiencia es identificar situaciones cotidianas de la escuela infantil, relacionadas con el agua, que puedan favorecer el desarrollo del pensamiento científico.

A fin de recoger y analizar las experiencias descritas, se utilizarán grabaciones de vídeo y el diario de observación de las maestras.

RESULTADOS

A lo largo del curso se ha hecho evidente que el día a día de la escuela presenta muchos momentos cotidianos de relación con el agua que permiten acompañar a las criaturas con una mirada científica. Las educadoras han detectado diversas oportunidades de aprendizaje científico:

- Al regar el jardín la tierra cambia de color y el agua "desaparece".
- Un recipiente con agua en invierno en el exterior se congela.
- Un recipiente con agua en verano va desapareciendo: se evapora.
- Al mojar la esponja en el cambio de pañal, ésta absorbe el agua
- Una criatura pone el pie en una caja llena de agua y al sacarlo, se da cuenta que pesa más.
- Cuando se moja la ropa al lavar las manos, las mangas pesan.
- La bayeta de limpiar la mesa cambia cuando la mojamos.
- El pañal pesa más cuando esta mojado
- Al caer agua en el suelo, los pies patinan
- El pan que cae en un vaso de agua se deshace.

CONCLUSIÓN

La experiencia no concluirá hasta el final del curso 2022-2023 y los resultados se mostrarán organizados en función de las propiedades del agua (Weissmann, 2000).

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El paper de la mestra al Lab 0_6

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RESUM

El LAB 0_6 es desenvolupa a partir de propostes que parteixen d'una idea de ciència complexa i de la consideració dels infants com a éssers intel·ligents que actuen de manera racional i que, per tant, busquen les seves pròpies explicacions.

La intenció de les mestres del LAB 0_6 és facilitar situacions d'aprenentatge on els nens i nenes es plantegin preguntes, formulin hipòtesis, contrastin conjectures... en un marc de comunicació. La conversa, en aquest context, no s'entén com un intercanvi oral, sinó com la base del fer, pensar i actuar, que serveix per planificar idees i fer-se preguntes, també sobre ciència. La continuïtat d'aquest fer al LAB poden ser processos d'indagació i investigació a les aules.

PARAULES CLAUS

Ciència, conversa, preguntes, paper de la mestra i continuïtat.

INTRODUCCIÓ

El Lab 0_6 és un centre de descoberta, recerca i documentació científica destinat a infants d'entre 0 – 8 anys. Aquest està format per tres espais: el Lab sobre rodes, el qual ofereix una visita a l'escola bressol amb una furgoneta equipada amb material d'exploració científica, destinat als nens/es de primer cicle d'Educació Infantil (0-3 anys) amb l'acompanyament d'una mestra especialitzada. El Lab 3_6 (per infants de segon cicle d'Educació Infantil) i el Lab 6_8 (per infants de cicle inicial d'Educació Primària), son dos espais de ciència en lliure elecció on es proposen un seguit de materials que permeten als infants descobrir els següents conceptes científics: sistemes físics, éssers vius, matèria, geologia... En aquesta descoberta, l'infant utilitza processos d'aprenentatge com l'experimentació, l'observació, la classificació i comparació/ordenació.

Diàriament, les instal·lacions del Lab 0_6 reben dues escoles amb un nombre total d'uns 80 alumnes aproximadament, que s'organitzen en quatre grups. Els infants que cursen la segona etapa d'Educació Infantil (3-6), que representen dos dels quatre grups, realitzen les següents dues activitats: exploració a l'espai del Lab 3-6 i a l'espai matèria. En aquest segon espai, les escoles poden escollir entre dues opcions: aigua de colors, en el qual es proposa als alumnes el repte de tenyir l'aigua amb material natural, o boles de terra, en la qual els nens i nenes hauran de realitzar, mitjançant diferents tipus de terra, boles compactes, amb l'objectiu de conèixer les diferents propietats de cada una de les terres. Per altra banda, els dos grups restants (cicle inicial d'Educació Primària), al llarg del matí realitzen l'exploració a l'espai del Lab 6-8 i el taller de geologia a l'espai Geo.

EXPERIÈNCIA ESCOLAR: ESTUDI DE CAS

L'estudi de cas que es presenta a continuació pretén exposar les intencions que té la mestra al llarg d'un matí al Lab 0_6.

El funcionament diari al Lab 0_6 s'inicia a partir d'una conversa que pretén situar els infants en el món de la ciència, plantejant les primeres preguntes que els permetran iniciar l'activitat. Un cop finalitzada la conversa introductòria, a partir de la lliure elecció, els infants exploren i investiguen amb les propostes científiques del Lab 0_6.

De forma inevitable, la ciència apareix en el dia a dia de les persones i, per tant, els infants conviuen també en un entorn científic quotidià que implica tot un seguit de processos d'interpretació i reinterpretació continus del món natural que els rodeja (Lemkow, 2016 i Pedreira, 2006). El Lab 0_6 pretén donar resposta a l'acció quotidiana, intencionada i autònoma que l'infant, a través de la curiositat natural i innata per aprendre, realitza per resoldre reptes i viure noves experiències que l'ajudin a forjar una xarxa sòlida i complexa de coneixements i aprenentatges.

La ciència és un procés que s'inicia a partir d'una pregunta, d'una inquietud o d'un repte, que suposa una intervenció de l'infant sobre la realitat que li permet comprendre el funcionament del món. (Currículum). El pensament científic genera en el infants actituds, d'emoció, de raonament i d'investigació a partir dels processos d'observació, experimentació i raonament (Arcà, 1990, p. 646 citat per Gómez i Ruiz, 2016).

El paper de la mestra al Lab respon a l'enfocament que ha plantejat Elionor Goldschmied (1998) quan afirma que es tracta d'*intervenir sense interferir*. Això suposa una intervenció no directiva per part de la mestra, que no té la intenció de dirigir l'acció de l'infant amb visió d'adult, sinó que acompanya l'infant a que avanci en el coneixement a través de les propostes de ciència i experimentació (Carballo-Márquez et al., 2016). És per això que les intervencions de la mestra han de ser generadores de conflictes, dubtes o reptes despertant en l'infant curiositat per entendre els fenòmens científics que està investigant.

Una de les tasques determinants de la mestra al Lab és la d'escollir amb criteri els materials que es presenten als infants, el que implicarà una reflexió prèvia complexa sobre cada una de les propostes: com es presentarà? Es delimitarà? On s'ubicarà? Les propostes contigües poden influir en les accions dels infants?, etc. La presa de decisions de la mestra en l'espai i l'elecció dels materials serà determinant en la construcció d'idees complexes que els infants realitzaran sobre ciència.

Tal com diu Garcia (2021) Les preguntes, els interessos i les inquietuds teixeixen un entramat d'històries que donen sentit a una conversa que es preocupa per comprendre el món. Per això, un cop finalitza l'exploració i la investigació en lliure elecció, es desenvolupa una conversa on s'aprofundeix en el procés científic i les idees mobilitzades en alguna de les propostes que han sigut objecte d'interès per part dels infants.

Per tant, com s'ha vist, perquè totes aquestes intencions es converteixin en possibilitats riques d'aprenentatge, cal una mestra formada i especialitzada en l'àmbit.

CONCLUSIÓ

En aquest context, el paper de la mestra al Lab 0_6 esdevé una peça clau per a l'èxit del funcionament de l'espai. El fer de la mestra té una intenció clara i amb un sentit pedagògic adequat a les necessitats dels infants, sempre convidant al nen/a a provar i a investigar. És per tot això que la mestra intervé, en la comunicació directa amb l'infant, però també en la presa de decisions respecte de la tria de materials o la situació en l'espai d'una determinada proposta, entre d'altres.

Promoure aquest interès intrínsec de l'infant per investigar els fenòmens que succeeixen al seu entorn requereix d'una mestra que reflexioni sobre el tipus de qüestions que plantejarà al nen/a al llarg de l'estona d'experimentació en l'espai, tasca que no resulta gens senzilla i que requereix una acurada formació docent. Cal que siguin preguntes obertes, de forma que permetin als alumnes donar respostes diverses, que convidin a l'infant a l'acció i al moviment, que siguin adequades al seu nivell de coneixement i que mobilitzin conceptes científics importants i rellevants en la vida de l'infant. "Fer ciència" tracta d'aprofitar situacions habituals i quotidianes convertint-les en experiències enriquidores que ajudin a l'infant a situar-se i comprendre el món.

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Estudio sobre el impacto de la transferencia en actividades de ciencia con niñas y niños de origen magrebí y sus familias

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RESUMEN

La finalidad de la investigación es detectar qué estrategias y propuestas de ciencias se pueden implementar en el espacio Familiar Nana CSF, caracterizado por su diversidad cultural, y hacer seguimiento de las vivencias y la percepción que las familias tienen en relación con las actividades pedagógicas STEAM que las madres magrebíes desarrollan con sus hijos. En particular hay interés en comprender, desde una investigación cualitativa de tipo etnográfico-narrativo, como incide el trabajo pedagógico planteado desde propuestas STEAM. Basándonos en la teoría que defienden Gopnik & Meltzoff (1999); Malaguzzi (2005) y Altimir (2011), partimos de una infancia que es curiosa y tiene capacidades para investigar en el mundo que vive y que es inteligente.

La población y la muestra de la investigación son las madres magrebíes, con niñas y niños entre un año y seis años, que se encuentran residiendo en Manresa. En el momento del desarrollo de la investigación, no pueden ser partícipes de otro espacio de ciencia. Cabe destacar que se fomentará la participación de familias o madres magrebíes.

Esta investigación es un ejemplo de cómo impulsar iniciativas STEAM en entornos diversos y cómo conseguir una mayor participación de los varios entornos socioculturales donde estas propuestas se impulsan.

PALABRAS CLAVE

Infancia, Contextos-inmigrantes, Madres-magrebíes, Espacios-ciencia, Inclusión

INTRODUCCIÓN. MARCO TEÓRICO

La función educativa implica una transmisión cultural en la cual la maestra o educadora juega un papel importante como sujeto cultural. La realidad diversa de los centros educativos en Cataluña y Europa hace que haya que tener en cuenta, en los procesos de enseñanza - aprendizaje, ciertos conocimientos implícitos de la práctica educativa más allá de los explicitados en el currículum oficial, como por ejemplo el currículum oculto o cultural (Steinberg & Kincheloe, 2000), la situación de las familias de diferentes orígenes sociales y culturales y sus necesidades (Baraibar, 2005; Lemkow, 2018; Benito, & González, 2007) así como de los procesos de aculturación-enculturación y otras dinámicas culturales involucradas directa o indirectamente en las interacciones educativas (Camilleri, 1985).

Nos encontramos que la ciencia juega un papel fundamental en las sociedades actuales caracterizadas por su gran dinámica, los desarrollos tecnológicos acelerados y el actual contexto de desarrollo socioeconómico, crisis medioambiental y sociedades altamente interconectadas a nivel local y global. Por eso, acercar la ciencia a niñas y niños desde las primeras edades es fundamental para poder fomentar las capacidades de indagación y pensamiento crítico desde la experimentación y la colaboración entre iguales en procesos de investigación. También resulta fundamental para garantizar posibilidades de acceso en igualdad de condiciones en contextos de sociedades plurales y dinámicas.

Sin embargo, el acceso a la ciencia no siempre tiene el mismo impacto en todos los colectivos que acceden y todavía hay varias barreras y actividades que impiden el acceso a la misma a miembros de comunidades de contextos diversos.

Esta investigación se centrará en investigar qué estrategias se llevan a cabo para poder implementar espacios y propuestas de ciencia en espacios educativos caracterizados por su diversidad cultural y al hacer un seguimiento de cómo lo vivencian y lo perciben las familias de este entorno.

Las técnicas de recogida de datos serán, principalmente, la observación participante; la entrevista; la entrevista grupal; el cuestionario; técnicas grupales, grupos de discusión y Brainstorming; diario de campo. Los diferentes instrumentos se utilizarán en ocasiones a la vez y en otras por separado, ya que se respetará la naturaleza del proceso, con la finalidad de recoger todas las vivencias dentro del espacio Nana, así como las surgidas fuera del espacio en consecuencia a lo trabajado en el centro Nana.

EXPERIENCIAS ESCOLARES: ESTUDIO DE CASO

En el CSF Nana, partíamos de un espacio de estimulación lleno de colores, gran cantidad de juegos hechos a partir de material plástico, dibujos estereotipados, además de una falta de coherencia entre los diferentes espacios.

Las familias valoraban positivamente y les parecía lo ideal que para el aprendizaje cuanta más estimulación visual y colorida, así como más cantidad de material facilitaba el proceso para aprender.

Tras dos años de observación, el Nana fue cambiando y evolucionando de forma paulatina, adaptándose al colectivo, el cual es muy amplio y variado. La finalidad era realizar los cambios necesarios para que fuera un espacio más cálido, para facilitar un aprendizaje significativo, creando espacios coherentes y apropiados para el objetivo propuesto, siempre teniendo como eje situaciones reales y cotidianas.

A partir de la observación del proceso de aprendizaje se optó por una reducción de material y juegos, también teniendo en cuenta el impacto de la consciencia sobre de los materiales, pasando de tener material de plástico a material de madera para las construcciones.

También se fomenta una reorganización del espacio según la actividad que se podía desarrollar, promoviendo espacios menos recargados de estímulos, introduciendo materiales que fomentan el pensamiento y la reflexión mediante el ensayo y error de modo que los y las usuarias tenían más margen para la creatividad e innovación.

RESULTADOS

Hasta la fecha ha habido una evolución del espacio Nana, para promover el interés por la ciencia a partir de la iniciativa personal en la resolución de retos, mediante actividades y juegos que requieran la toma de decisiones con intencionalidad, generando así un espacio de vivencias de experiencias positivas de aprendizaje científico acercando así el conocimiento de la ciencias en las primeras edades con familias inmigrantes de origen magrebí. Uno de los resultados es la participación continua de seis familias con sus respectivos hijos, haciendo así una continuidad de sesiones y encuentros.

Las familias planteaban desde un primer momento que el coste repercute hacia ellos ya que consideraban que no era un espacio o material que ellos pudieran acceder, por los diferentes estereotipos que se asignaba a ellas mismas. En los diferentes encuentros que se están realizando se observa el gran interés que tiene estas madres y que puede ser extrapolable a otras madres, pero al mismo tiempo se sienten excluidas al considerar que ellas no pueden aportar o que serán el objeto de estudio, siendo juzgadas sus conductas o formas de actuar y crianza. Las madres expresan un gran interés por el espacio y el aprendizaje que pueden adquirir las niñas y niños, pudiendo ellas compartir sus conocimientos y aprendizajes, además de poder compartir un espacio formal y educativo con los más pequeños.

CONCLUSIONES

Las familias tienen un gran interés por acceder a los espacios donde sus hijos e hijas puedan reflexionar y acercarse a la ciencia desde una perspectiva positiva, pero las diferentes barreras dificultan este acceso, además de los prejuicios o la inaccesibilidad. Por ello, la creación de un espacio en un contexto de barrio y cercano a ellos, y siendo dirigido con el mismo colectivo, facilita la participación, pudiendo así acercar la ciencia a las niñas y niños, y sus familias de origen magrebí. Cabe destacar la participación inicial de las madres.

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Implementation of LAB06 in PYP Early Years at St Peter's School in Barcelona

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ABSTRACT

In our presentation we would like to share our school's experience of opening "LAB06" for our youngest students in 2022 and how educators have been using it to enrich our PYP Early Years framework and the PYP Science Scope and Sequence. We present how we use it in line with our school project of exponential learning and educational neuroscience.

KEYWORDS

Inquiry, learning spaces, scientific reasoning, PYP, early years framework, science scope and sequence.

INTRODUCTION

At St PETER'S School in Barcelona our motto is "We go one step beyond". The school's vision is to change the pedagogical paradigm and to prepare people capable of facing the challenges of the present and the future with optimism, leadership capability, critical spirit, creativity, adaptability, and communication skills. For this reason, we have developed our own method adapted to the needs of the 21st century: exponential learning.

One of the spaces where exponential learning takes place at our school is our science lab for our youngest learners (1–6-year-olds), called LAB06. The methodology and the curriculum used in LAB06 are guided by our PYP Early Years framework and educational neuroscience. St Peter's follows the IB PYP science scope and sequence. In the PYP, science is driven through concepts and skills, rather than by content. These concepts and skills are learnt through the six transdisciplinary themes: Who we are, Where we are in place and time, How

We express ourselves, How the world works, How we organise ourselves, Sharing the planet. The knowledge component is arranged into four strands: Living things, Earth and Space, Materials and Matter, Forces and Energy. Each strand is taught through one of the transdisciplinary units of inquiry (IBO, 2020).

In this presentation we will explain how a space like LAB06 can be used in the PYP Early Years based on our experience teaching our first year in LAB06.

SCHOOL EXPERIENCES: STUDY CASE

PYP Early Years framework (IBO, 2020) recognizes that children are natural inquirers from birth: they have the capacity to learn about, interact with and interpret the world around them. The central features of PYP in early years are:

1. planning uninterrupted time for play,
2. creating and maintaining responsive spaces for play,
3. offering many opportunities for symbolic exploration and expression.

We opened the science LAB06 in April 2022 with a purpose of actively facilitating inquiry in our 1–6-year-old students and providing a physical environment engaging them in rich scientific reasoning. All classes from Nursery 1 to Primary Year 1 attended 1-hour sessions in the LAB06 once a week, within their regular timetable and a group of ten PYP-accredited teachers was responsible for aligning the LAB06 program with the PYP Early Years framework and the PYP Science Scope and Sequence.

Below is an example of a planning document aligning the PYP Science curriculum with our LAB06 proposals that could be used by other PYP schools to guide their planning:

The first column includes the transdisciplinary theme title and descriptor and the central idea. The key concepts, related concepts and lines of inquiry are listed here.

This second column lists PYP science strands applicable to this unit of inquiry. In the second column the teacher underline the PYP science skills easily observable in this unit.

In the third column the teacher chooses applicable possible learning outcomes for their age group, limiting the number to make them achievable and assessable.

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
Transdisciplinary theme **Who we are** An inquiry into personal, physical, mental, social and spiritual health. **Central idea** Living a balanced life involves making informed choices about our health and well-being. **Key concepts** • Perspective • Responsibility Related concepts: Initiative, behaviour, choice, well-being, wellness, nutrition, self, health, self care, meditation **Lines of inquiry** • What it means to be well balanced • Impact of choices on our health • How we can be responsible with our everyday choices	**Science strand(s)** Living things Materials and matter **Science skills:** a. Observe carefully in order to gather data b. Use a variety of instruments and tools to measure data accurately **c. Use scientific vocabulary to explain their observations and experiences** **d. Identify or generate a question or problem to be explored** **e. Plan and carry out systematic investigations, manipulating variables as necessary** **f. Make and test predictions** **g. Interpret and evaluate data gathered in order to draw conclusions** h. Consider scientific models and applications of these models (including their limitations)	**The student will be able to:** • Observe the needs of living things that enable them to grow and stay healthy • Make healthy choices during their meals • Explain where food comes from and make well informed choices about the ingredients they prefer **LAB06 experiments and invitations:** • Colour change cabbage • Homemade butter • Candy kaleidoscope • Exploring density offoods in a glass • Seed rattles • Does everything smell? • Food groups sorting

The teacher and LAB06 coordinators choose some teacher-led experiments relevant to this unit of inquiry, following the children's questions and interests as well as some open "science invitations" where the children can freely explore, experiment and manipulate the materials.

Guided by educational neuroscience, we understand that throughout scientific reasoning process, children make use of several domain-general cognitive processes such as causal reasoning, deductive reasoning, analogical reasoning, hypothesis testing and problem solving (Fugelsang & Mareschal, 2014). These are the same cognitive tools that children use in everyday nonscientific contexts. Throughout the scientific reasoning process in LAB06, children develop the same cognitive tools they will later need in nonscientific contexts. We know that the human brain is especially tuned to detect and process information that contradicts and challenges established conceptual knowledge so our goal as educators has been to establish disbelief in children in LAB06. As their brain matures, it grows from primarily perceptually driven to more inferentially driven reasoning processes. That's how children in our LAB slowly learn to question and learn from observations that conflict with their existing knowledge. Through are experiments and learning proposals we inhibit perceptually based responses and allow slower reflective responses to act, which is a key cognitive developmental factor in childhood.

RESULTS

The teachers who participate in the LAB06 science time in their regular timetable agree that it is a learning space that promotes high levels of independence, offering children to access developmentally responsive science materials and manage learning. It is a space where play and choice are central features of science learning and it provides for many different learning experiences at all times (teacher guided experiments, free manipulations and exploration, symbolic and representational learning). It fits well with PYP Early Years framework and our PYP units of inquiry. The teachers have particularly enjoyed being able to change the LAB06 proposals depending on the unit of inquiry studied, which means that children continually enjoy working with interest in that space.

CONCLUSION

We are very satisfied with the innovation of bringing LAB06 to our school as a permanent physical space for scientific reasoning from the youngest age. It fits well with the conceptual learning in PYP, allows us for updating the space with every new unit of inquiry and fulfils the requirements of PYP Early Years framework providing for open ended exploration, manipulation and play.

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“Leaves-eating” silkworms: an experience in ECEC

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ABSTRACT

A silkworms breeding experience, has taken place in the 0-6 services Bambini Bicocca: *Nido* (0-3) and *Scuola dell’infanzia* (3-6). The experience involved two groups mixed age and gender and was conducted by the science atelierists/teachers was documented through paper-pencil observations, audio and video recordings, children’s drawings. These materials resulted in the creation of the *Silkworm Experience Journal*.

The children observed regularly and intensively the stages of the life cycle of silkworms. Crucial to advancing and reframing the experience were the discussions led by the atelierists, based on the children’s questions. These conversations allowed children to tackle important themes such as: body structure, growth, development and metamorphosis, movement, feeding relationship between animal and plant, death.

The experience of breeding animals offered not only the opportunity to learn about the life circle of the organism in question, but also led children to face, more in general and with greater awareness, the fundamental problems of life and relationships between living beings. Thus, breeding animals allowed children to identify themselves with livings other than humans, as well as involving them on an emotional and affective level.

Moreover, the experience of taking care of the worms developed a sense of responsibility towards the livings: children were personally involved in caring and worrying about the well-being of the worms.

KEYWORDS

Sustainability education, early childhood education, scientific attitude, hands-on experience, biology

Pañales científicos: Una experiencia vivencial contextualizada al aula de 2 años

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RESUMEN

"Pañales científicos" es el título que se le ha dado a esta experiencia propuesta que se llevará a cabo en un aula de dos años en la Escuela Infantil "El Castell" localizada en La Pobla Llarga (Valencia). Para su planificación, se ha tomado como punto de partida la nueva normativa curricular de Educación Infantil y, en general, aquellos aspectos relacionados con la enseñanza y el aprendizaje de las ciencias desde un punto de vista globalizado y holístico. Se ha querido utilizar a los pañales como elemento dinamizador de la propuesta, puesto que en la edad en que se plantea, es en la que se empieza a controlar los esfínteres y existe una diversidad dentro del aula de alumnado que ya puede prescindir de ellos, mientras que otros necesitan de más tiempo. Por esta razón, se ha visto el pañal como objeto de trabajo para trabajar toda una serie de aspectos que van desde los ODS, la alimentación, los materiales, las texturas o los colores, poniendo el foco en la necesidad de utilizar contextos de trabajo que tengan representatividad para las niñas y niños a los que van dirigido.

PALABRAS CLAVE

Aprendizaje de las ciencias, propuesta didáctica, dos años, materiales cotidianos

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