International Conference
NEW PERSPECTIVES in SCIENCE EDUCATION
3rd Edition

Junior Science - Nurturing Children's Interest in Scientific Knowledge

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Abstract

Junior Science Research [1, 2] it is a strategy that it is being designed and implemented aiming to prepare elementary students to learn science contents. It intends to slowly involve scholars into the accurate space of the Critical Thinking and Scientific method taking into account science as a practice that includes a structured body of concepts that can explain and predict observable facts, a way of thinking and a body of skills. These skills are specific and simultaneously universally essential to any intellectual sustainable development which is independent of the field of knowledge. The skills worked with 6 years old children are: curiosity, attention, concentration, accuracy and resilience and team work. The project desires to provide innovative didactic resources and to promote a teacher's friendly alternative strategy to initiate students into the scientific concepts.

The core of this particular paper can be included on a strategy for a responsible teaching in the optics that education is the key to an intelligent development [2, 3] transversal to any area of human knowledge and even of human culture. The skills focused in this approach, attention and concentration can vital to motivate the process of learning.

The main investigation question in our research is – At what extent the development of skills on 6 years old children such as - curiosity, attention, concentration, accuracy, resilience and team work, stimulate the learning process of the critical thinking and the scientific method?

It is also important to our research and this is another question we want to answer and understand - Into what extend does the intention to develop for attention and concentration is present on the preocupation of elementary teachers?

The goal of scientific education interventions is to nurture, enrich and sustain children's nature interest in scientific knowledge. The scientific thinking can be characterized in terms of two principal features: i) contents and ii) processes, including formulation of hypotheses, design of experiments, observation, and evaluation of evidence [5].

Given educators ambitions for science teaching, coupled with the competencies demonstrated by young children, it is important to consider the ways in which science instruction plays a role in guiding students to develop increasingly sophisticated understanding of science [6].

1. Introduction

Johnstone and Al-Shuaili [7] stated that the result of teaching undergraduates at the university level, especially on the first or second year, is a synthesis of factors that influence the person of the student. Consequently the way they face the process of learning and the process of problem solving.

The document *Evolution of Student Interest in Science and Technology* of the Organization for Economic Co-operation and Development [8] identifies the teaching methodologies as one of the reasons for the loss of interest on science. Also Osborne e Dillon [9] identified the need of EU governments to develop strategies that enable the identification of skills and key knowledge in what respects scientific literacy.

After many attempts to develop leadership and intellectual skills using practical chemistry classes at

the university level aiming to nurture a sustainable learning of chemistry [2], it was taken into account what it was being stated by the most recent investigation on science didactics. These investigations showed the necessity to develop scientific skills on children in the early stages of development aiming at a gradual involvement with experimental sciences [4, 9, and 10]. Our aim is to contribute to a better education system firstly in our country and to develop and validate a strategy competent to be used in all countries. And that is how Junior Science Research Project was born. Junior Science Research [1, 2] it is a strategy that it is being designed and implemented aiming to prepare primary students to learn science. It intends to slowly involve them into the accurate space of the scientific thinking taking into account science as a practice that includes a structured body of concepts that can explain and predict observable facts, a way of thinking and a body of skills. These skills are specific and simultaneously universally essential to any intellectual sustainable development which is independent of the field of knowledge. The skills worked with 6 years old children are: curiosity, attention, concentration, accuracy, resilience and team work. The project desires to provide innovative didactic resources and to promote a teacher's friendly alternative strategy to initiate students into the scientific concepts.

One of main investigation question is – At what extent does the development of skills on 6 years old children such as - curiosity, attention, concentration, accuracy, resilience and team work stimulate the learning process of the scientific methodology?

Another main question that we want to study is - In what extent does the development of attention and concentration is present on the concerns of elementary teachers and future elementary teachers?

2. Research design

2.1. Context and participants in the Junior Science Project Research

The project is being implemented on a 1st grade classroom at an urban Female Private School, Horizonte College (Colégio Horizonte) in Oporto, the second most important city of the country and localized on the north part of Portugal. The sample consists of eleven students with 6 years old.

The option for this kind of private organization it is because it was the easiest way to obtain a group of students to participate in a pilot project.

The participation in this study is part of the selected activities offered by the institution to its children in the academic year 2013-2014. This project is taking place once a week, always in the same schedule, during 45 minutes sessions which are all implemented by the same field researcher.

2.2. Purpose and central aims:

We are convinced that the development of the referred skills don't necessary have to be initially increased by using scientific experiences, finished cookbook demonstrations labs or contents. Therefore Junior Science woks initially with games designed with the purpose of the research and in co-operation with the elementary teachers suggestions taking into account the specific curriculum and the aim of our project.

2.3- Context and participants in Junior Science Research on Elementary Teachers

A class of eighteen future elementary teachers, aged between 21 and 33 years old of a Master on Education of ISEC – Superior Institute of Science and Education (Instituto Superior de Educação e Ciências) localized in Lisbon.

3. Methodology for collecting data

3.1. Methodology for collecting data in the Junior Science Project Research

Analysis of all documents produced during the implementation of the program: drawings, answers to posed question, observation of children's involvement and interest; non structured interviews with the elementary teacher, her students and their parents. This meetings aim to obtain valid information

about acceptance and popularity of Junior Science Project, the impact of the program on the regular classroom and tape recording of some interventions with scholars during diverse sessions. During the year there will be three special interventions with a control group on each school to detect any different behaviour on problem solving session. The session will be designed taking into account the specific skills worked with Junior Science students.

3.2. Methodology for collecting data in the Junior Science Research on Elementary Teachers

A questionnaire technique was used as a tool during this first approach in this field. It included questions like for instance the two written below that are going to be commented:

In what extent do you consider possible for a teacher to develop critical thinking on 5-6 old children?

In what way do you consider possible to develop 5-6 years old attention?

4. Results

4.1. Junior Science Project Research

The first two interventions with children were designed to be acquainted with what children know about a scientist, a man or a woman of a science field. After the first moments of short conversation children are asked to draw a picture about what is their understanding of such a person.

In the next two moments of contact of Junior Science with children, the item to be worked is "Questions proposed by scientists". This is accomplished by putting children on unexpected situations where the natural questions of any human being are: Why? How? How does it work?

The attitudes attention and concentration are worked mainly with games which are enchanting and motivating scholars.

While working attention on a school context, home works are solicited to children. The objective of these tasks is to continue developing the issued abilities in the important familiar context. This way, parents can play a central role in nurturing their children's natural interest in scientific procedures by requesting their children small everyday tasks. As an example we would like to recommend the following: parents can teach small children to put the dining table correctly, without forgetting anything and having everything in the correct place. A scientist also has to have his place of work in order. Also this small everyday job involves a lot of small steps that require attention and concentration.

After implementing 8 sessions of the Junior Science Project the elementary teacher stated that she could detect differences on attention on her students because for instance the number of times children asked her to repeat a problem, an instruction or a small note significantly diminished.

We have the notion that we have to work harder on a measuring methodology for our research.

4.2. Junior Science Research on Elementary Teachers

We also would like to share some results obtained when inquiring the future elementary teachers.

After answering the inquiry and asked about how a teacher could develop critical thinking on 5-6 old children: 83% stated that it was important to make scholars talk about their own thoughts and opinions about a variety of subjects; 11% said that it was important to make children reflect about things and 5% didn't have an opinion.

When asked to suggest two activities that could develop attention on 5-6 old children: 50% answered saying that it could be achieved through games adapted to that goal yet none specified or suggested any game; 28% didn't have an opinion or vaguely responded, 11% said that it could be done through asking interesting and curious questions about things (yet none specified what could those things be) and 5% answered that by talking with scholars with different tones of voice.

From this we can at least suspect that Junior Science Project is trying to give an answer to a non answered challenge in the Portuguese educational system.

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