New model of preschool education

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What is already known about this topic?

Currently developmental psychologists are inclined to believe that children develop and verify theories in the same way as scientists do (Gopnik 2009). Gopnik and Kuhl (2010, 2011) not only look for similarities between their methods, but also claim that they are almost identical. Even few years old scientists are capable of formulating research hypotheses, verifying their observations and adjusting their knowledge about the world to the results of their own experiments (Gopnik 2012). Kuhl, on the other hand, proves that even infants have an inborn multilingual potential (Kuhl, Damasio 2012). Whereas Berger advocates that even four months old babies use statistical methods to verify the amount of objects around them (Berger et. al. 2006). Unfortunately, traditional didactic methods applied in preschools do not use children's inborn capacities (Hofman 2008).

What this paper adds?

The paper presents a verified programme of emotional intelligence development combined with introducing ICT tools and elements of science into preschool education in the form of free play. It aims at preparing children for functioning in the world of the future. Such a young person is able to diagnose emotions, express them in a way that does not offend peers' feelings, should broaden intellectual horizons on the basis of skillful selection of data (selected ICT tools[1]) and, above all, should naturally perceive science as great fun. Most of the time spent in kindergarten is based on free play. This is the time when a foreign language serves as a tool of communication among the educator and the children whereas scientific stimuli are part of creative activities for children.

[1] http://htwins.net/scale2/<27.09.2013> scale of the Universe.

http://www.youtube.com/watch?v=FvtAPH0b1lE <27.09.2013> introduction to astronomy

http://www.youtube.com/watch?v=gFuEo2ccTPA <27.09.2013> introduction to anatomy

The main assumption is to arouse natural passion for science as well as searching for answers and asking questions. Children use ICT tools, nevertheless computer-based activities do not exceed 10% of classes.

Implications for practice and policy

The project we are writing about implements a new model of preschool education. In the EU large amounts of money are spent on grants funding innovative scientific, business and technological ideas. These projects are prepared and implemented solely by adults. The level of creativity in children is significantly higher than in adults as it reduces with age (Dobrołowicz 1993). According to humanistic psychologists and pedagogues, who originate from various branches of contemporary pedagogy, children are more creative than adults. The main difference between children's and adult's creativity refers to their ability to use knowledge and procedures strategically (Szmitd,2006). What is more, children at various stages of development involve in creative activities and express themselves in a different way than adults. Amabile (1989) claims that disciplines in which a child shows creative skills and the level of these skills depend on his or her experiences, education and the development of the basic psycho-cognitive abilities. We are aiming at creating a new educational space, where very young children's creative ideas could be treated seriously, even in terms of science.

Particulars

The first stage of the project lasted 840 hours and involved children from 3 to 6 years old. In 2012/2013 the second stage of the project was conducted. It included teaching L1, L2 and L3 (Polish, English and Chinese) as well as introducing elements of science from macro to micro scale - educational astronomy, geography, knowledge about Poland, anatomy and microbiology - in preschool education 2–6 year olds. The project lasted 870 hours. Since 2013 the third stage of the project has been carried out in cooperation with a sport club Gedania.

Classes within the project take place from Monday to Friday from 8 a.m. to 4 p.m. As a target, one group shall not exceed 13 participants.

8:00 - 10:00 free play

10:00 - 11:00 cross training by PARKOUR or (interchangeably) fitness and dancing exercises

11:00 - 13:00 project classes in L2 (English) based on free play including educational astronomy, geography, knowledge about Poland, anatomy and microbiology held under the supervision of an educator from *Language Laboratories* and (interchangeably) natural sciences workshops in groups of 6 held by Smart_Lab

13:00-13:30 dinner under the supervision of an educator from *Language Laboratories*

13:30-14:30 nap or reader's corner under the supervision of an educator from *Language Laboratories* and/or free play

14:00-16:00 project classes in L3 (Italian) based on free play including educational astronomy, geography, knowledge about Poland, anatomy and microbiology held under the supervision of an educator from *Language Laboratories* and (interchangeably) natural sciences workshops in groups of 6 held by Smart_Lab

Natural sciences classes

Natural sciences classes (physicochemical) cover types of basic chemical substances and states of matter. Classes are held in a form of workshops which aim at maximum involvement of young scientists. Children wear real lab coats and safety goggles. It fosters proper Health and Safety guidelines which are indispensable while conducting scientific experiments. Kids work on professional chemical equipment, which is also important as it differentiates chemical classes from other activities held in the preschool. Children like to impersonate scientists and these extra tools (safety equipment and supplies) make them believe even more that they conduct real experiments.

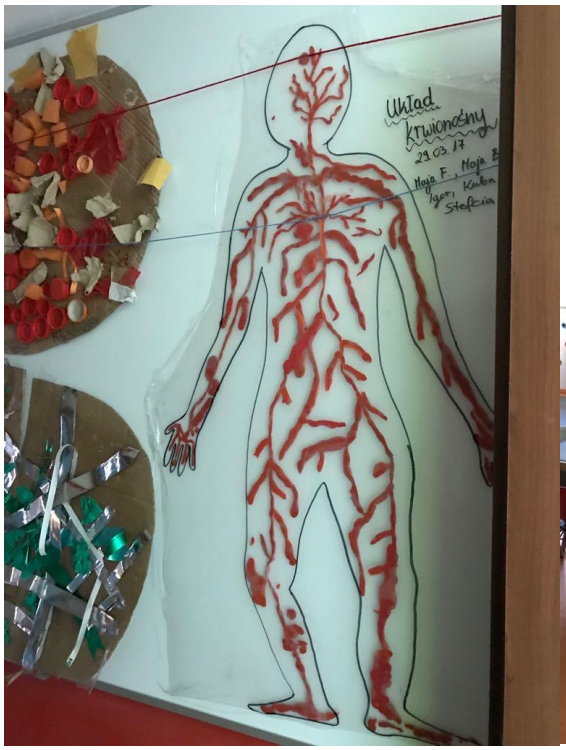
Science workshops start from teaching children about the rules defining work in a laboratory and basic chemical activities, such as pipetting, pouring liquids, mixing, dissolving as well as filtrating. In further stages children gradually learn how to measure volume and other things.

Each meeting constitutes a finished whole and it is designed to draw children's attention to the usefulness of certain products obtained from experiments. Thanks to this, children get to know the process from planning an experiment, through its performance and, finally, its "implementation." As part of this authorial programme, teachers make use of children's literature while conducting natural sciences experiments. Thus, children can become Cinderella, check whether vegetables on the market can make sounds and what can play the role of the Wawel Dragon. Classes are complemented by various multimedia (games, films) and special extra materials which join natural sciences with other issues that children learn simultaneously (such as numbers, letters, astronomy, biology etc.).

During workshops children realise that they are small (bio)chemical factories living in the world governed by laws of physics. They study these laws in an series of classes, which includes twelve sections every year.: Acoustics, Optics, Materials science, Action–reaction, *i.e.* Forces, Magnetism, Electrostatics, Electromagnetism, Electricity , Air and pressure, Hydro-riddles, The world of temperatures and Physical tricks.

Classes are designed so that children gradually develop their skills by refreshing acquired basic knowledge and expand it by conducting more advanced experiments. These experiments often have a form of fun activities (such as creating one's own kaleidoscope, racing magnetic cars, playing with

parachutes). Physical workshops have a pro-environmental aspect since their participants often use waste materials, which fits into the recycling trend.



Tools

Most of the time in preschool is devoted to free play under the supervision of a teacher who communicates with children in Italian, Polish or English, conducting a two-month programme including: educational astronomy, geography, knowledge about Poland, anatomy and microbiology. One of the first projects is a journey through the Solar system. Additionally, children perform various logical, physical as well as language activities and games, including: films, songs, books, recycling experiments[2] and painting laboratories, working out patents and inventions etc. Children are free to choose the form of participation. Educational astronomy lasts two months.

[2] http://arvindguptatoys.com/amazing-astronomy.php <10.06.2014> recycling science tools for astronomy classes.

Facilities

The base consists of didactic rooms which were designed and equipped especially for the project in cooperation with the sports club Gedania. Apart from this, up to 12 o'clock children can use 7 hectares of the sport club's area (the area given by the City of Gdańsk).

The preschool, 1200m^2, has 6 big classrooms, a chemical classroom and a hydro-classroom designed solely for water activities. Classrooms have backlit ceilings to display multimedia[3] . Classroom equipment includes tablets with digital projectors which can display large format pictures on the ceiling (a surface of approximately 20m^2). Among didactic aids, there are only lego models and LEGO® robots as well as "recycling" kits for designing toys, such as yogurt and plastic bottles, toilet paper rolls etc[4]. There is also a classroom for science experiments, which serves for conducting physicochemical workshops. A 600m^2 building is meant for not more than 75 children divided into subgroups of approximately 13 students. They will use tablets and watch scientific materials on a multimedia projector for a limited amount of time (10% of classes).

In a hall there is an illuminated art gallery, in which reproductions of renowned painters (like Paul Klee or Wassily Kandinsky) intermingle with large format paintings created by children. An outside park, which is an enclosed area reserved only for the use of the preschool, is also an art gallery, where sculptures, recycling materials as well as children's pictures hang on huge, old trees. This gallery changes every week (depending on weather conditions).

Results

The project has been carried out on a small scale since 2009 under the auspices of the Ministry of National Education, the Foundation for the Development of the Education System and the European Year of Creativity and Innovation in a language school Language Laboratories[5]. So far 31 children from 2,5 to 6 years old have participated in this project.

Results of the research:

1. Within the scope of multiple aspects of pupil's intellectual development:

[3] http://htwins.net/scale2/ <27.09.2013> scale of the Universe.

http://www.youtube.com/watch?v=FvtAPH0b1lE <27.09.2013> introduction to astronomy.

http://www.youtube.com/watch?v=gFuEo2ccTPA <27.09.2013> introduction to anatomy.

[4] http://arvindguptatoys.com/toys.html <10.06.2014> recycling tools for science classes.

[5] Gdańsk-Oliwa, Subisława 10 Street, www.lanlab.pl

Seven children, who finished the first year of the project, were chosen for a qualitative and quantitative analysis of all tests and observations. An analysis concerns multiple aspects of pupil's intellectual development in accordance with Howard Gardner's MI theory (Gardner 1999). He expanded significantly the concept of intelligence by showing the coexistence of eight equal components of human personality understood as multiple intelligences.

Each of seven children displays a fairly high level of linguistic intelligence. What is more, all of them fluently formulate sentences in their native language (L1), carry out orders and formulate short sentences in English (L2) and willingly participate in games in Chinese/Italian (L3).

Children's linguistic competences are based both on inborn verbal capacities as well as enthusiasm which they express while participating in free play activities carried out in L1, L2 and L3.

In a vast majority of cases escalation of activity and participation in classes was observed – it proceeded from shy and sporadic participation in classes carried out in English to active involvement. Moreover, it was noticed that children became more enthusiastic, performed tasks more eagerly and started to show many individual initiatives expressed in L2.

Pupils display mathematical interests as well as logical and constructional skills. Furthermore, they willingly participate in logical activities. They put things in a correct order and categorise objects well. They started learning proper mathematical calculations within the scope of addition and subtraction from 1 to 10 based on objects from their surroundings. Concentration ability during logical and mathematical tasks is average in case of two children and above average in case of all the other children.

Children willingly participate in musical activities, yet they do not show any particular interest in co-creating melodies on their own. Within the scope of kinaesthetic intelligence, understood as the ability to express things and solve problems connected with body posture, it was observed that all children enjoy physical activities a lot, especially those accompanied by music. Children were highly active and very cheerful during such games, which proves that they feel comfortable in group physical activities. At the same time they frequently expressed their own likings and willingly showed their own creative initiative. Only one girl rarely showed her creative initiative within the scope of group physical activities and she must have been encouraged to do it.

An analysis regarding visual-spatial intelligence, which concerns the sense of direction in space and ability to perform intellectual tasks with the use of visual imagery, showed that all children willingly create their own constructions and mix different materials quite confidently while playing, for instance they mix Play-Doh with paints, brocade and crayons working on their paintings. They also create their own compositions from natural materials, such as stones, leaves, grass and sand. They were more willing to participate in group games and activities, although in majority of cases they

prefer to find a person with similar interests with whom they stick together. As it was observed, one girl has an above average level of visual-spatial intelligence.

As far as intrapersonal intelligence is concerned, *i.e.* intelligence which refers to self-perception, analysing inner feelings, awareness of one's influence on the surrounding, self-esteem as well as assertiveness, in six out of seven children skills connected with their own feelings have not been registered. Likewise, children do not show any longer interest in tasks based on autonomous activity within the scope of a given creative issue. Nevertheless, all children can diagnose emotions properly. It has been noticed that one girl has above average skills connected with individual projects in comparison with the group. She also shows an extended interest in tasks based on individual activities within the scope of a given creative issue.

An analysis of interpersonal intelligence, understood as the ability to coexist in a group, proved that group activities are children's favourite part of classes, however they are free to choose their partners to play and sometimes they break with the suggested convention of games. All of them show interpersonal skills as far as adaptation in a group is concerned. It has been observed that three girls have interpersonal skills within the scope of group management and domination among friends. They feel very comfortable as team leaders.

In relation to naturalist intelligence, understood as extraordinary sensitivity to nature, curiosity concerning laws of nature and positive emotional attitude towards nature, it has been noticed that all children enjoy observing animals and while playing in the garden they are interested not only in small insects (such as ants and beetles), but also in flowers and typical garden plants. Interestingly enough, all the girls display an above average level of concentration during such observations.

2. Research and observation results within the scope of secondary features influencing the development of autonomy, linguistic competences and student's emotionality:

table 1 (see the attachment)

Conclusions:

Among the main programme assumptions of the project are free play in foreign languages for the youngest children, developing an innovative attitude reducing the gap between the scientific-technical civilisation and the humanistic one, technological preparation to self-education as well as cultivating student's individual predispositions according to Gardner's theory of multiple intelligences. The project assumes the promotion of the civilisation of knowledge, updating data as well as fostering a creative attitude in the form of free play.

We hope that the new model of education, in which children reflect on crucial scientific issues along with adult scientists, will consequently help to maintain the high level of creativity in keeping with the progress in education.

We are convinced that the children can not only learn from adult scientists, but also really influence the world of science. Their spontaneous creativity can have a practical application in many scientific projects. This model can be illustrated by the publication prepared by 30 Young Scientists from 8 to 10 years of from the Blackawton Primary School in Blackawton, rsbl.royalsocietypublishing.org/content/7/2/168.

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Attachment

Scale:

Level of autonomy in the process of L1, L2, L3 acquisition:

0 – a student does not show any signs of autonomy, he or she does not verify materials obtained from the teacher.

1 – a student shows signs of autonomy in a 1:20 ratio[6], expresses his or her opinion about the materials obtained from the teacher in a 1:10 ratio.

2 – a student shows signs of autonomy in a 1:5 ratio, verifies materials obtained from the teacher in a 7:20 ratio.

3 – a student shows signs of autonomy in a 7:10 ratio, verifies materials obtained from the teacher in a 7:20 ratio, creates his or her own materials in a 3:40 ratio.

4 – a student shows signs of autonomy in every typical situation connected with the process of L3 acquisition, verifies materials obtained from the teacher in a 7:10 ratio, creates his or her own materials in a 1:5 ratio.

5 – a student is autonomous, critically analyses materials prepared by the teacher, creates his or her own materials in a 7:10 ratio.

Alphabetisation level:

0 – a student does not recognise any letters, does not read or write.

1 – a student recognises single letters, does not read or write.

2 – a student recognises letters, reads individual words, does not write.

[6] This measurement illustrates the intensity of a given secondary feature which influenced the acquisition of L1, L2 and L3. All figures are approximate.

3 – a student reads sentences, previously remembered excerpts, writes single words.

4 – a student reads and writes, rarely makes mistakes that prevent understanding.

5 – a student reads and writes fluently.

Proportion of general knowledge to age[7]:

0 – lack of any proportion.

1 – a student has a significantly limited general knowledge compared to age, does not show any interests.

2 – a student has an average general knowledge compared to age, shows interest in a given discipline or disciplines of science in a 1:5 ratio.

3 – a student has an average general knowledge compared to age, shows interest in a given discipline of science in a 7:20 ratio.

4 – a student has a high level of general knowledge compared to age, shows interest in a given discipline of science in a 7:10 ratio.

5 – a student has a high level of general knowledge compared to age, shows extensive interest in a given discipline of science.

Openness and interpersonal relationship with the teacher:

0 – a student does not know the teacher.

1 – a student occasionally meets the teacher but he or she does not establish any relationship with her.

2 – a student meets the teacher and sporadically establishes some relationship with her.

3 – a student meets with the teacher regularly and feels comfortable in her company.

4 – a student meets with the teacher regularly and informs her about significant changes in his or her life.

5 – a student meets with the teacher regularly and informs her about all significant changes in his or her life.

[7] They were introduced to illustrate intuitively the differences between the level of knowledge and interests among children in proportion to their age. Cf.: L. Frances (2000:12–40) in: Nęcka, 2003:36-38. Cf.: Attachment 4, *the three-ring model of giftedness* by Joseph Renzulli and *the three stratum theory of cognitive abilities* by John Carroll. Cf.: the theory of fluid and crystallised intelligence by Cattell in: Nęcka, 2003: 32–34.