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## **“Home Spa” Project – Change of Children’s Knowledge and Skills after Participating in the Project**

### **Introduction**

Over the past years, there has been a rapid development of informal education in Poland. As part of the informal science education of children, there are numerous Children’s Universities, Explorers’ Clubs and Research Associations. Students according to the instructions provided to them by the teacher base classes conducted in these units primarily on the independent performance of experiments. Universities for children (UCh) mainly run extracurricular activities – this is the idea of combining learning with fun (Janßen and Steuernagel 2003; Nodzyńska and Kobyłańska 2017). Classes at UCh should be interesting for students and motivate them to continue independent learning and exploring the world. Although Children’s Universities are a significant part of the education market, research is rarely done to see if such education is effective. Overton (2010: 3878) wrote: “There has been very little research undertaken into aspects of Children’s Universities (CU).” Despite the passage of 10 years, little has changed in this topic. There are studies related to the creation of a children’s university (MacBeath and Waterhouse, 2008) and Overton’s research (2010). However, most publications on Children’s Universities are so-called descriptions of good practice (Van Stam and Wahlberg, 2009). Research is also conducted into children’s satisfaction with various types of activities (Es, 2015). Only a few publications deal with research on the effectiveness of this form of learning (Cakici and Bayir 2012; Moskal and Nodzyńska 2014; Nodzyńska and Kopek-Putała 2017).

### **Description of the experiment**

Wadowice Children’s University (WChU) has been run by the Wadowice cultural center since 2014. Wadowice is a small town, a center of pilgrimages related to John Paul II. There are no secondary (4 level ISCED) or universities (5 and 6 level ISCED) in the town. WChU is attended yearly by about 120 children aged 7–12 from nearby villages and towns. For students, classes at WChU are the only window to the world of knowledge. The Pedagogical University cooperates with the WChU, organizing various types of classes for students.

### Goals, research, methods

The hypothesis of the “Home Spa” project was as follows: students during the four-hour practical classes will broaden their knowledge (understood here as news, skills, and attitudes). We were particularly interested in the increase of knowledge among students who did not have any knowledge before classes. To this end, the study was conducted – 65 children aged 7 to 10 participated in the study. These children were students of WChU. During practical classes, students received cosmetics (including soaps) and tested their physicochemical properties.

In accordance with the rules of the project method, students independently chose the topic “Home Spa” from several topics proposed by lecturers. As part of the project, students had a choice of various activities related to obtaining cosmetics and testing their physico-chemical properties. The students themselves received various types: bath balls, hair shampoos, body and lip scrubs, face powder, deodorant and so-called “crystal” soaps. Students studied the solubility of soaps in hot/cold water and hard/soft one, as well as the behaviour of oil in water and soapy water. They also studied the pH of various soaps and cleaning products. In each case, students were free to choose from several recipes that would apply. They could also modify the basic recipe themselves, adding different types of fragrances, colour or dried flowers.

Classes entitled “Home Spa” were conducted using the project method. Practical classes had several purposes:

1. one of them was to show that learning through play is interesting and exciting,
2. showing students that substances known to them from everyday life can be used both as food products and in cosmetology,
3. testing the properties of cosmetics.

In order to examine the increase in students’ knowledge, a pre- and post-test were carried out. They contained 1 open and 4 close-ended questions (1 single selection grid and 3 single choice). The results obtained were subjected to statistical analysis by the rho-Spearman test.

### Research results

This article only discusses 4 questions about soap properties. Three questions were closed questions, one question was an open question. The first question concerned information about soap that children knew from everyday life. The second and third questions went beyond the level of knowledge of children at this age, although the concepts of hard/soft water or pH often appear in advertisements. In addition, these concepts were translated in class, children performed experiments and research on these terms.

#### **Underline the right answer:**

1. The soap dissolves better:
  - in warm water
  - in cold water
2. The soap dissolves better:
  - in hard water
  - in soft water

3. Which better removes greasy dirt:
  - water
  - soapy water

**Answer to question:**

1. What is the pH of the soap? .....

In addition, students were to assess the entire class on a seven-point Likert scale.

The received student responses were divided into two categories: correct and incorrect (if the student did not answer, it was considered incorrect). In the post-test, the percentage of correct answers given by students is presented in Table 1.

Table 1. Percentage of correct answers to individual questions in the pre- and post-test

Question / Answer	1. The soap dissolves better: in warm water, in cold water	2. The soap dissolves better: in hard water, in soft water	3. Which better removes greasy dirt: water, soapy water	4. What is the pH of the soap?
% of correct answers PRE-test	61.5	35.4	53.8	7.7
% of correct answers POST-test	75.4	52.3	63.1	21.5
increased knowledge	13.9	16.9	9.3	13.8

The results obtained, at first, glance, seem satisfactory – the percentage of correct answers ranged from 21 to 75%. And the increase in students’ knowledge ranged from over 9% to around 17%. The hypothesis was confirmed – after classes there was an increase in knowledge, but during the development of the results, there were dilemmas regarding the increase in knowledge. Analysis of individual student responses showed that students who answered all questions correctly in pre-test and post-test do not affect the average increase in knowledge, and based on their answers, we do not know whether the classes play a positive educational role.

Statistical research using the rho-Spearman test showed a correlation between the correctness of the answers in the pre-test and the post-test (for individual questions the correlation coefficient was:  $r_{s1}=0.5$ ,  $r_{s2}=0.3$ ,  $r_{s3}=0.5$ ,  $r_{s4}=0.6$ ). This means that there is a correlation between the level of students’ initial and final knowledge. So the question arose: Did and how many students who had no initial knowledge learned? However, to be able to examine the impact of classes on knowledge growth, it is necessary to compare the results of pre-test and post-test in individual students.

To research the increase in knowledge, the students’ answers in the pre- and post-test were compared, divided into three types of answers:

1. incorrect-incorrect (which means that the student in the pre-test and post-test gave the wrong answer or did not give it at all),
2. incorrect-correct (which means that the student in the pre-test gave the wrong answer or did not give it at all, while in the post-test he gave the correct answer),
3. correct-correct (which means that the student gave the correct answer both in the pre-test and in the post-test),

The obtained results are shown in Table 2. and Fig. 1.

Table 2. Comparison of correctness of students' answers from pre-test and post-test

Question / Answer	1. The soap dissolves better: in warm water, in cold water	2. The soap dissolves better: in hard water, in soft water	3. Which better removes greasy dirt: water, soapy water	4. What is the pH of the soap?
incorrect-incorrect	24.6%	47.7%	36.9%	78.5%
incorrect-correct	18.5%	26.2%	16.9%	13.8%
correct correct	56.9%	26.2%	46.2%	7.7%

In compiling the results wanted to pay special attention to those students who did not have an initial knowledge about the subject being studied.

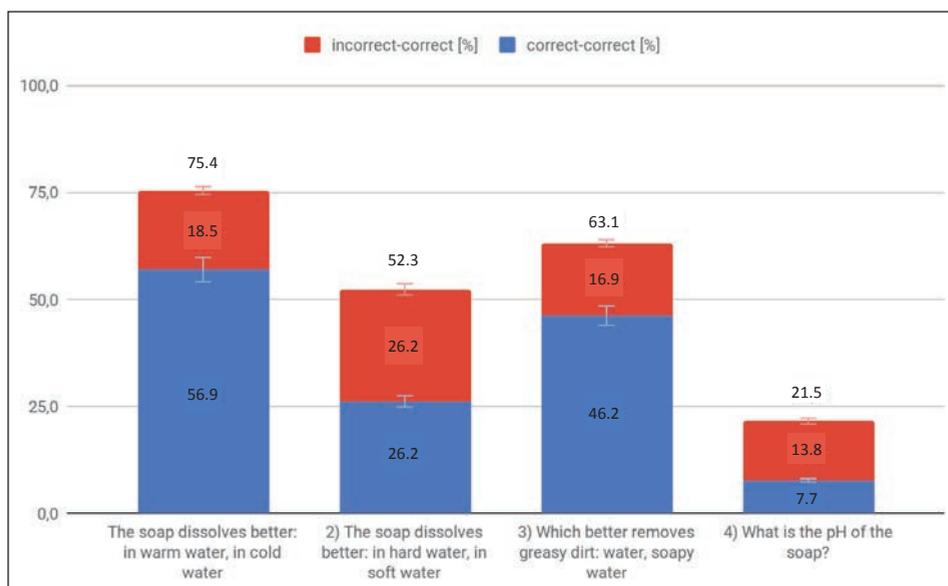


Fig. 1. Comparison of correctness of students' answers from pre-test and post-test

A detailed analysis of the answers shows that students' initial knowledge of individual questions varies greatly. Almost 57% of students know before class that the soap dissolves better in warm water. 47% of students also know that soapy water dissolves fat better. This knowledge comes from their daily lives. Only 26% of students know that soap dissolves better in soft water before class. An even lower level of initial knowledge was found in the fourth question, which concerned the pH of soaps (only about 8%). This knowledge goes beyond the level of school knowledge of students at this age. And it probably comes from advertising.

Knowledge about hard/soft water or its pH is not required at this level of education. However, according to the Wygocki's theory of the "nearest zone development", it seems that the introduction of new concepts that additionally occur in everyday

life (see ads) during non-formal education is needed and correct. On the other hand, testing the effectiveness of this type of education is only possible on concepts not known to children before.

From the point of view of studying the impact of “Home Spa” classes on the increase of students’ knowledge, we were particularly interested in the results of students who did not answer the questions correctly in the pre-test. Therefore, the results of students who answered correctly in the pre-test were removed from the data. Table 3 shows the results showing what percentage of students who did not know a good answer in the test in the post-test answered correctly.

Table 3. Percentage of students who gave the wrong answer in the pre-test and gave the correct answer to the question in the post-test.

Question / Answer	1. The soap dissolves better: in warm water, in cold water	2. The soap dissolves better: in hard water, in soft water	3. Which better removes greasy dirt: water, soapy water	4. What is the pH of the soap?
% of learned children after participating in the project	42.9	35.4	3.4	15.0

The efficiency of the classes, calculated here as the percentage of students who gave incorrect answers in the pre-test or did not give them at all and gave the correct answers in the post-test, is not high. For three questions it ranges between 30 and 40%. And for the question about the soap pH is only 15%.

Perhaps the main goal of non-formal education should not be to increase students’ knowledge, but to show students the beauty of learning and practicing so-called soft competence. It seems, moreover, that the students themselves mainly appreciate the motivational effect of this type of class – assessing the satisfaction with participation in class very highly (Table 4).

Table 4. Satisfaction grade according to students (in Poland 6 is the highest school grade – excellent and 1 the lowest grade – unsatisfactory)

I evaluate project classes with a grade	1 (min)	2	3	4	5	6 (max)	no answer
% answer	1.5	1.5	0	6.2	10.8	60	20

There were no differences regarding the evaluation of classes among students with correct initial knowledge and those who did not have such knowledge. The rho-Spearman correlation coefficient checking the correlation between the answer to the first question and student satisfaction is 0.18, for the following questions it is respectively: -0.21, -0.09, 0.17.

### Discussion of results

Comparing the answers to the four questions asked students about soaps, we can see some patterns. Students know the answers to questions 1 and 3 from

everyday life – that is why the pre-test shows a high percentage of correct answers (about 61.5% and 53.8%). However, despite the fact that the terms contained in both these questions are familiar to students from everyday life and apply only to simple observations, the percentage of correct answers in the post-test increases slightly. Since these issues do not seem too difficult for children aged 7–10, it seems that the main reason for the failure was the attitude of students who treat WChU classes as fun and do not try to focus on remembering information.

In the second question, only 26% of children knew the correct answer before class (probably from TV commercials). In this question, new terms appeared for some students: hard water and soft water. However, it seems that these concepts are relatively simple because as many as 26% of students who answered incorrectly in the pre-test answered correctly in the post-test. It seems that students have acquired this knowledge relatively easily.

The fourth question posed the most difficulty for students. The term pH, although it has a difficult definition, often appears in TV commercials. So only less than 8% of students correctly determined the pH of the soap in the pre-test. During the “Home Spa” project, it was explained to children that pH is a measure of whether a substance is more or less acidic and the measure of pH is a colored scale. The concept of pH understood in this way should not be a problem for students of this age (e.g. in geography lessons from the map based on the color of a given area they read its height). However, it turned out that assigning numbers to the color scale proved to be a big challenge. After class, another 14% of students answered this question correctly. In some responses that were classified as incorrect, students wrote words related to the term ‘color’, because they associated it with the colored pH scale placed on the universal papers they used.

The obtained results show that despite the fact that this type of class is very popular among students – the question arises: to what extent they are an effective means of education, especially for those students who do not have initial knowledge.

## Conclusion

As part of the study, four-hour activities for children were prepared. Students could independently make various cosmetic preparations and study their physico-chemical properties. As part of the classes, the increase of knowledge and satisfaction of students from the classes was also checked. The research results show that the hypothesis: *A four-hour project entitled “Home Spa” will increase students’ knowledge of the properties of cosmetics* – has been confirmed. However, it seems that the work input made by teachers in the preparation of these classes does not translate into an increase in student knowledge. Admittedly, after the project, between 52% and 75% of students knew the correct answer to three out of four questions, but a significant proportion of students knew the answers to these questions before the start of the project. The increase in knowledge resulting directly from participation in the project (for students without initial knowledge) is only about 30–40% this does not seem sufficient. It seems that the most important achievement is the students’ satisfaction

with this type of activity – as many as 60% of respondents were very satisfied with these activities.

Since, as mentioned in the introduction, the number of scientific studies regarding Children’s Universities is not large, these studies can be considered as a starting point for further research.

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### Abstract

The subject of the research was to check whether students’ knowledge and skills regarding cleaning products and cosmetics will increase as a result of their participation in the 4-hour-long project entitled the “Home Spa”. For this purpose, research was conducted before and after the “Home Spa” classes, on 65 aged 7–10. As part of the laboratory, students studied the physicochemical characteristics of soaps and cosmetics received from available food products. A practical summary of children’s activities was a box full of cosmetics, while the theoretical added value was the increase in students’ knowledge of the chemicals present in their daily lives. The article discusses only part of the research on the physico-chemical properties of soap. Research results show that the hypothesis – “Home Spa” project will increase students’ knowledge of soap properties’ – has been confirmed. But the increase in

knowledge resulting directly from participation in the project is only about 30–40%, which does not seem sufficient. It seems that the most important achievement of the project is the satisfaction of students with this kind of activity.

**Keywords:** Project based Learning, Motivation, Cosmetics, Soap

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