



# The effect of working with living subjects on the level of knowledge in students with special educational needs

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**Citation:** Kubiátko, M., Balatova, K., & Magova, M. (2023). The effect of working with living subjects on the level of knowledge in students with special educational needs. *European Journal of Science and Mathematics Education*, 11(1), 68-76. <https://doi.org/10.30935/scimath/12434>

## ARTICLE INFO

Received: 18 Apr 2022

Accepted: 8 Aug 2022

## ABSTRACT

The goal of the research was to find out the effect of using living animal in teaching on remembering and understanding acquired knowledge in students with special educational needs (SEN). In our experiment, students with SEN (n=24) were compared with students without SEN (n=56). The design of the research was experimental. The research tool consisted of a test which was made by the authors, and which served both as a pre- and a post-test. For the assessment, the methods of descriptive statistics (the average) and inductive statistics (t-test for dependent and independent samples) were used. Students in experimental groups which encountered living animals in teaching, acquired more information about animals, which were used during teaching process and because of that, their results were better than the results of students in control groups.

**Keywords:** experimental design, tests, students with SEN and without SEN

## INTRODUCTION

The current trend in a modern society is to use technology widely and rely on it during nearly all activities. This phenomenon can also be seen in teaching students with special educational needs (SEN) (Adam & Tattnell, 2017; Aksal & Gazi, 2015; Al-Gaseem et al., 2020; Eligi & Mwatimwa, 2017; Juhji & Nuangchalerm, 2020; Ozdemir & Isiksal Bostan, 2021; Ramadianti et al., 2019; Ramos & de Andre, 2016). However, this trend is also causing us humans to turn away from nature and know less and less about it. In schools, students of course learn about the nature and animals. This topic is a part of educational field humans and nature. Using technology in teaching may seem, in many ways, excessive. For example, an interactive board contributes to making the lessons more varied but at the same time, only showing pictures of animals on the board is the same as seeing a picture in a book. Research studies published a while ago already mention the positive impact of using a living animal (Adkins & Lock, 1994; Mayer & Hinton, 1990; Orlans, 1991; Silberstein & Tamir, 1981; Tamir, 1980). Plous (1996) focused on students' attitude towards using living animals in biology classes. Based on their answers, he found out that students enjoy using living animals, however, they see killing or dissecting animals negatively. Sprinkle (2008) found that the presence of dogs in teaching lead to a less aggressive behavior in students.

## Definition of SEN

Students with SEN are considered to be (based on Education Law n. 561/2004 and Regulation n. 73/2005, as subsequently amended) children with health disabilities, health disadvantages or social disadvantages. Health disability is considered to be a mental, physical, vision or hearing disability, speech impairment, multiple disabilities, autism or specific learning or behavioral disorders. Health disadvantage includes the following categories: frail health, long-term illness or mild health disorders leading to learning and behavioral disorders. Social disadvantage involves family environment with low socio-cultural status, risk of social pathological phenomena, ordered institutional treatment, juvenile rehabilitation, status of asylum-seeker, a person who is under complementary protection and a person in the procedure of granting international protection in the Czech Republic. Conway (2008) claims that educational materials for students with SEN should be adapted, for example by adjusting original materials, adopting alternative materials and also by creating and using new materials.

## Current State of the Discussed Issue

Using experimental design in teaching students with SEN is quite rare. Even using living animal in teaching students without SEN is uncommon. Research has only been done on the effect of living animal on the knowledge of students. For example, Inagaki (1990) conducted research on the effects of keeping pets on the knowledge of children in the subject of biology. Children who kept pets had a higher level of knowledge and could better predict animal's reactions and behavior. Faver and Bradley (2009) focused on whether an animal in teaching process helps children with SEN develop their language literacy. The research included a pair of students and the animals used were of various kinds, from relatively large ones to relatively small ones, such as a small rabbit. The authors claimed that not only the literacy improved in both students but also their relationship with other students and their classroom behavior towards the teacher and the assistant improved. The topic of direct contact with animals in a classroom with SEN students is also touched upon by Walthall (2012), who states a positive effect on the teaching process in a classroom where dogs were involved in teaching SEN students. Baumgartner and Cho (2014) found out that animal-human interactions have been found to have positive influences on children with disabilities. And also, they stated that this effect is dependent on strong administrative, parental, and collegial support; clear and measurable goals; well-developed instructional plans; an appropriate animal choice; well-developed health and safety procedures. Smith and Dale (2016) focused on the effect of animals on the individuals with autism spectrum disorder (ASD). The effect of animals was positive. Maber-Aleksandrowicz et al. (2016) aimed on the literary review of animal assisted therapy on the people with disabilities. After analysis of the literature authors quoted those animals had got positive effect on the disabled people. It is important to mention, that in the choosing of literary sources were not age restrictions. Yap et al. (2017) focused on the attitudes toward animal-assisted therapy for the rehabilitation of children with disabilities. Authors reported that animal-assisted therapy is helpful in the physical or behavioral management of children with disabilities. Grandgeorge et al. (2019) examined the effect of guinea pig on the development of behavior of disabled people. As in previous mentioned studies, authors determined the positive effect of this concrete animals on the developing of required behavior of disabled people. A positive effect of working with living animals is also mentioned in a study done by Fančovičová et al. (2013), who investigated the effect of previous experience with dissections in pupils and students, the result being a positive correlation between the experience with dissections and the perception of animals. Thigpen et al. (2018) focused on using animals while homeschooling students with SEN because this group of students could not attend, based on certain conditions, a school institution. The authors found out that when the animals were involved in homeschooling, a betterment of results occurred and the students' behavior towards others improved. Similar results can be found in other studies as well (e.g., Catanzaro, 2003; Davis, 1988; Heimlich, 2001; Jalongo, 2005; Martin & Farnum, 2002; McConnell, 2002; Prokop et al., 2008; Prokop & Tunnicliffe, 2010).

## Research Goals

The main goal of the study was to find out the effect of living animal in teaching on remembering and understanding acquired knowledge in students with SEN. Besides the main goal, there are also additional goals:

1. Find out the level of difference between the level of knowledge about animals before the experiment in the group of students with SEN and the group of students without SEN.
2. Find out the level of difference between the level of knowledge about animals after the experiment in the group of students with SEN and the group of students without SEN.
3. Find out the level of difference between the level of knowledge about animals in students with SEN before the experiment and after the experiment.
4. Find out the level of difference between the level of knowledge about animals in students without SEN before the experiment and after the experiment.

## METHODOLOGY

### Research Sample

The research sample consisted of 80 students in the lower secondary education attending a regular school. The finding process of appropriate school, where were also students with SEN and without SEN was prolonged due to relatively demanding experimental design with four groups and two types of students. The principal of school, parents and also students were assured about anonymity of the research. Out of these students, 24 were students with SEN, 56 were students without SEN. The without SEN and SEN students were divided randomly in the control and experimental group. So, the research design included two control groups, one was created by SEN students and the second one by without SEN students. Also, experimental group was similarly created by two groups. Control group had not got contact with living animals, this part of zoological topic was taught by the classic form with the assistance of schoolbooks, and the teaching with monologic and partly dialogical methods. In this way, it can be found out whether a potential improvement was major or similar. After a meeting with the school administrators, each student was assigned a particular code consisting of numbers in order to better identify students with SEN and, at the same time, ensure their anonymity. All the students who were included in the pre-test also took part in the post-test.

### Experimental Design

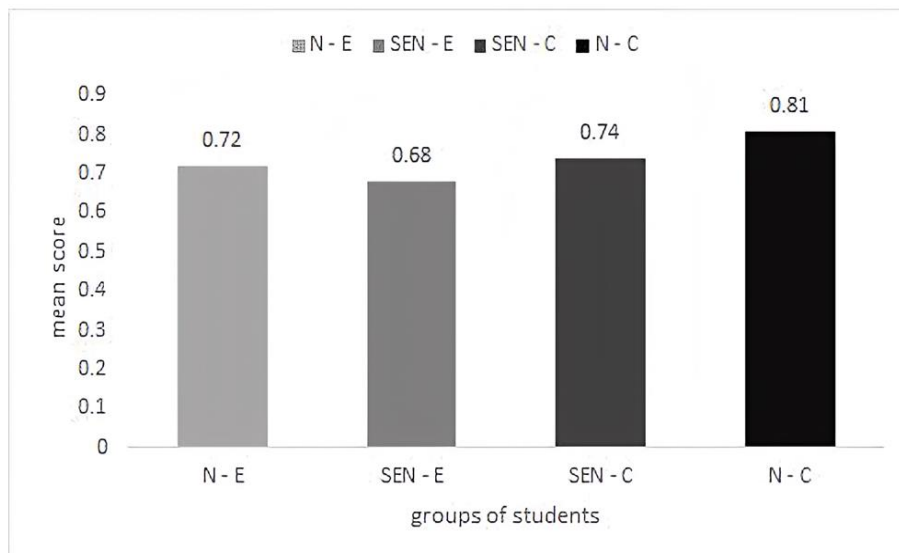
It is very important to mention when pre-test was realized. It was done before teaching hour with living animals in experimental group and before teaching about animals in the control group. It means, it the test was written at the beginning of the first teaching hour of experimental design.

The timeline of the experimental design was the realization of pre-test before working with living animals and also in control group. The experiment took one week (three teaching hours). Every teaching hour always focused on one animal. The teaching process in control group was performed by teacher and the teaching process in experimental group (with living animals) was realized by experimenter. In the experimental groups, the living animal was brought into the class, the animal was the object of a presentation, and the students could hold it and strike it. The focus of experimental teaching hours was to main characteristics of presented animals with regarding to their morphological and physiological signs. After all the lessons, students received the post-test. Questions in the post-test were the same as in the pre-test.

### Research Tool

The research tool comprised of a self-constructed test, which served both as a pre- and a post-test. There were also pictures in the test to provide students with a better notion regarding the offered answers. For each question there was a choice between three answers: a, b, or c. From the offered possibilities only one was correct. The animals for the experiments were chose to avoid common allergic reaction. For this reason, small rabbits, hamsters, guinea pigs, cats, dogs, chinchillas, mice, and other rather common animals which often cause allergies, either because of their fur or because of mites, were eliminated.

The animals chosen for the experiments are pets so that they are used to human presence and touch, therefore it was not a problem to show them to the students, let the students touch the animals, hold them or to feed the animals in front of the students. All students held every animal in their hands. When choosing the animals, their number was considered as well. Because one lesson was dedicated to each animal, three



**Figure 1.** The average results in each of the student groups in pre-test

animals were chosen as the ideal number. A hedgehog, a grass snake and a gecko were chosen for the experiment. The research tool was split into the following four parts:

1. Demography
2. Knowledge-a hedgehog
3. Knowledge-a grass snake
4. Knowledge-a gecko

The questions in the research tool were the same both for students without SEN and for students with SEN (the research tool itself can be sent by the author upon request.)

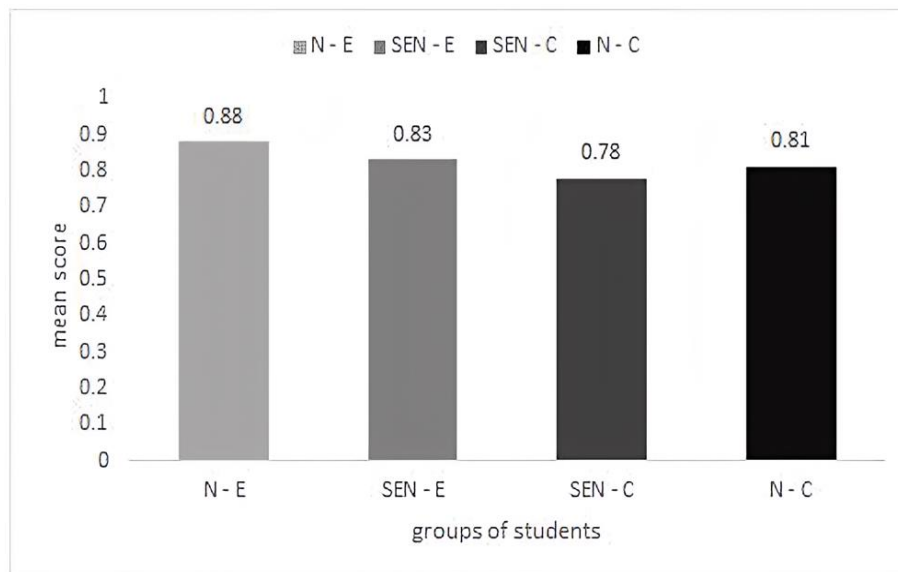
### Analysis of Acquired Data

The acquired data were first coded into a table processor. Each correct answer was assigned number 1, each wrong answer number 0. During evaluation, the methods of descriptive statistics (the average) and the methods of inductive statistics (t-test for independent and dependent samples) were used. When the results of the same group of students were compared (e.g., the difference between the results in pre- and post-tests in students with SEN), then the t-test for dependent samples was used. In the case of different groups, a t-test for independent samples was used. It is evident that even though these are relatively small samples, the methods of inductive statistics were applied on the data. The suitability of using these statistical methods even for a relatively small samples is mentioned in the works of authors such as McLean and Ernest (1998).

To determine the reliability of the research tool, a coefficient Cronbach's alpha ( $\alpha$ ) was used. Its value was 0.72, which indicated appropriate reliability of the research tool (Nunnally, 1977), the boundary value of which is set at 0.70 based on theoretical specification. The validity of the research tool was determined in two ways. The first one was concerned with expert verification of the items of the research tool. The expert verification meant that a zoologist evaluated the zoological expertise of the items. The following verification was on a didactic level when a didactic checked the expertise and a special needs teacher checked if the items are suitable for the students with SEN who were part of the research.

## RESULTS

Using the pre-test, the level of knowledge of the students in each group was established. The first two groups were experimental-the first group consisted of students with SEN (SEN-E), the second group consisted of students without SEN (N-E). The other two groups were control groups-a group with students with SEN (SEN-C) and a group with students without SEN (N-C). After coding all the questionnaires into numbers, an average was calculated for each group. The results are shown in [Figure 1](#).



**Figure 2.** The average results of the student groups in post-test

After the experiment, the students' knowledge was established using a post-test. The post-test consisted of the same questions as the pre-test. All of the students' groups attained better results in the post-test than in the pre-test with the exception of the group N-C. The average values are shown in [Figure 2](#).

When doing statistical analyses, the results of pre- and post-tests of each group were compared first. The first pre- and post-tests were compared in the SEN-E group. The average in pre-test was  $x=0.68$  and in post-test  $x=0.83$ . The difference was statistically significant ( $t=2.64$ ;  $p<0.05$ ). Next, the pre- and the post-test of SEN-E group was compared. The average in the pre-test was  $x=0.74$  in this group, in the post-test  $x=0.78$ .

The difference was not statistically significant ( $t=0.89$ ;  $p=0.38$ ). Comparing the N-E group, the average pre-test result was  $x=0.72$ , the average post-test was  $x=0.88$ . The difference was statistically significant ( $t=3.97$ ;  $p<0.05$ ). The comparison of the last group, N-C, was as follows: pre-test  $x=0.81$ , post-test  $x=0.81$ . The difference was not statistically significant ( $t=0.13$ ;  $p=0.90$ ). In comparing pre- and post-tests, a statistically significant difference appeared in experimental groups SEN-E and N-E. The SEN-E group was the main group in the experiment and the results show a significantly higher level of success after experimental lessons with living animals than in a SEN-C group.

When comparing the pre-test results, the experimental and control groups were compared and then the groups with SEN and groups without SEN were compared. First, SEN-E and N-E groups were compared. The average result in SEN-E group is  $x=0.68$  and in N-E group the average is  $x=0.72$ . The stated difference was not statistically significant ( $t=0.75$ ,  $p=0.46$ ). The other groups which were compared were SEN-C and N-C groups. The average of each of the groups is as follows: in SEN-C group  $x=0.74$  and in N-C group  $x=0.81$ . The stated difference was not statistically significant ( $t=1.73$ ,  $p=0.09$ ). Next, there is the comparison of the SEN-E and SEN-groups. The average of each of the groups is as follows: SEN-E  $x=0.68$ , SEN-C  $x=0.74$ . The stated difference was not statistically significant ( $t=1.15$ ,  $p=0.26$ ). The last pair of groups to be compared were N-E group and N-C group. The average for N-E group is  $x=0.72$ , for N-C group it is  $x=0.81$ . The stated difference was statistically significant ( $t=2.39$ ,  $p<0.05$ ).

When comparing post-tests, we first compared experimental and control groups, then groups of students with SEN and groups of students without SEN. First, we compared SEN-group and N-E group. The averages were, as follows: SEN-E  $x=0.83$ , N-E  $x=0.88$ . The difference was not statistically significant ( $t=1.08$ ,  $p=0.29$ ). Next, SEN-C and N-C groups were compared. SEN-C group average was  $x=0.78$  and N-C group average was  $x=0.81$ . The difference was not statistically significant ( $t=1.01$ ,  $p=0.32$ ). Then we compared SEN-E group and SEN-C group. The average of SEN-E group was  $x=0.83$ , the average of SEN-C group was  $x=0.78$ . The difference was not statistically significant ( $t=1.04$ ,  $p=0.31$ ). Lastly, N-E and N-C groups were compared. The average results were, as follows: N-E group  $x=0.88$ , N-C group  $x=0.81$ . The difference was statistically significant ( $t=2.15$ ,  $p<0.05$ ).

## DISCUSSION

The main goal of this work is to find out the effect of the presence of a living animal in teaching on remembering and understanding acquired knowledge in students with SEN. The experiment or, to be more precise, a quasi-experiment, started by dividing the students into four groups: group N-E, group SEN-E, group SEN-C, group N-C. A pre-test in which there were questions regarding three animals—a hedgehog, a grass snake, and a gecko—followed.

Because of the goals of the work, it is difficult to compare the results with other similar works. Works dealing with using a living animal in teaching focus mostly on the ethics of using animals in teaching as experimental animals, using them for therapies, or their one-time use in teaching (e.g., Thigpen et al., 2018). Works focusing on the relationship between the level of knowledge and the presence of a living animal in teaching and using the technique of quasi-experiment or experiment have been found neither in Czech nor in foreign literature. The first sub-goal was to find out the difference between the level of knowledge in the group of students with SEN and in students without SEN before the experiment. The difference in initial knowledge in the group of students with SEN and in students without SEN was not statistically significant. This might be because the information about the animals was new, for this reason no significant difference in initial knowledge was shown. However, even though the difference was not statistically significant, students with SEN scored less. This might be because of their limited understanding of read text or the correctness of the read text.

The second sub-goal was to find out the difference in the level of knowledge in the group of students with SEN and in students without SEN after the experiment. When evaluating the post-test, a statistically significant difference in groups N-E and N-C appeared—the biggest difference in knowledge after the lessons was between the control and the experimental group of students without SEN. This statistically significant difference is caused by a different element used in each of the teachings—a living animal. When coming to a direct contact with the animal, the students remembered more information.

The third sub-goal was to find out the difference in the level of knowledge in the group of students with SEN before and after the experiment. A statistically significant difference between the pre- and the post-test appeared in the SVP-E group, which is a group of students with SEN which underwent the experimental method. The group scored better than the SEN-C group. The difference was influenced by the way the teaching was conducted. In the control group, a traditional lesson took place—an oral lecture. To better remember the information, students with SEN need to learn as much of the information as possible through various information channels (senses). In pure oral lecture they do not acquire as much information, it may be difficult for them to sustain their attention which is then reflected in their knowledge.

The last sub-goal was to find out the difference in the level of knowledge in the group of students without SEN before and after the experiment. Here, there was also a statistically significant difference between the experimental group of students without SEN (N-E). As with students with SEN, the difference is influenced by the presence of a living animal in the teaching. Also, students without SEN (similarly to students with SEN) remember information better if they experienced it which, in our case, was largely influenced by the presence of a living animal in the lesson.

On this place is important mention limits of the study. It is in the sample. It is difficult to include students with SEN into any educational examination and if research has got also experimental design, it is demanding for every actor of this process. For the more generalized findings it would be useful to work with sample from more than one school.

## CONCLUSION

The conclusion of this research is that the presence of a living animal in teaching clearly helps the students to better remember required knowledge and, what is more, in an entertaining way. The results showed that the differences between the initial knowledge were not really significant. On the other hand, the results in the post-tests, which were testing the acquired knowledge, were of importance. The students in experimental groups which encountered living animals in teaching have acquired more information and because of that they achieved higher score than students in control groups. Therefore, using a living animal has a significant

effect on acquiring knowledge not only in students with SEN but also in students without SEN. Showing an animal and the possibility of touching it, led to the students acquiring more knowledge than in a usual oral lecture. Moreover, certain misconceptions of the students were dispelled, such as that a hedgehog carries an apple on its back or that a snake feel slimy to the touch. Additionally, the presence of a living animal is a strong activation and motivational element in teaching. Also, it could be part of other style of teaching as mentioned other authors (e.g., Chamidy et al., 2020; Gunawan et al., 2020; Mokiwa & Agbenyeku, 2020; Ridhwan et al., 2019; Sevinc & Galindo, 2022).

**Author contributions:** All authors were involved in concept, design, collection of data, interpretation, writing, and critically revising the article. All authors approve final version of the article.

**Funding:** The authors received no financial support for the research and/or authorship of this article.

**Ethical approval:** The study was approved by the ethics committee of Faculty of Education, J. E. Purkyne university in Usti nad Labem on 21.03.2022 (approval number: 3/2022/2).

**Declaration of interest:** Authors declare no competing interest.

**Data availability:** Data generated or analyzed during this study are available from the authors on request.

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