European Proceedings of
Social and Behavioural Sciences
EpSBS

www.europeanproceedings.com
e-ISSN: 2357-1330

DOI: 10.15405/epsbs.2022.02.15

LEASECON 2021
Conference on Land Economy and Rural Studies Essentials

CHILDREN'S PERCEPTION OF NATURE: EXPERIENCE IN THE BOTANICAL GARDEN OF BIN RAN

Larisa Petrovna Musinova (a)*, Irina Viktorovna Varganova (b), Yuri Guryanovich Kalugin (c)
*Corresponding author

(a) V.L. Komarov Botanical Institute of Russian Academy of Sciences; St. Petersburg, Russian Federation, Prof. Popova str., 2, St. Petersburg Russia, laramusinova@yandex.ru,
(b) V.L. Komarov Botanical Institute of Russian Academy of Sciences; St. Petersburg, Russian Federation, Prof. Popova str., 2, St. Petersburg Russia; Federal Research Center N. I. Vavilov All-Russian Institute of Plant Genetic Resources (VIR) Bolshaya Morskaia Str. 42, 44, St. Petersburg, Russia, varganova_irina@mail.ru
(c) V.L. Komarov Botanical Institute of Russian Academy of Sciences; St. Petersburg, Russian Federation, Prof. Popova str., 2, St. Petersburg Russia, kalugin_yuri@list.ru

Abstract

The botanical gardens due to a wide range of functions have the opportunity to comprehensive study the characteristics of children of generation "Z". Such studies are few and far between in the area of the relationship between the environment and children's behavior, "environmental psychology" has an interdisciplinary focus. The experiment was conducted to study the attitude of children to nature using the Yasvin method before and after visiting an excursion in the Botanical Garden in St. Petersburg (Russia) in 2018-2019. The subject of the study were the dominant attitudes towards nature (aesthetic, cognitive, ethical, pragmatic) of children of 5-8 years old. It was revealed that in children who attend kindergarten, the leading attitude towards nature is aesthetic (nature as an object of beauty), and in children who study at schools, the cognitive and aesthetic attitudes dominate. Schoolchildren (6-7 years old) who attend additional classes of natural science orientation, in comparison with children of the same age from the group of schoolchildren, did not show significant differences in relation to nature according to the leading attitudes (cognitive and aesthetic attitudes predominate). A significant change in the attitude towards nature after excursions to the botanical garden was revealed only in the children of 5 years old: a cognitive one replaced an aesthetic attitude. Despite the fact that there were no changes in the group of 6-8-year-olds after the excursion, the research is of practical interest. The data show what attitude to nature is typical of children born after 2000.

Keywords: Attitude to nature, botanical garden, children, dominant attitudes, perception of nature

https://doi.org/10.15405/epsbs.2022.02.15
Corresponding Author: Larisa Petrovna Musinova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

1. Introduction

Various sources have been recently considering the features of the so-called generation “Z”, children born after 2000 (the theory of generations, created in 1991 by American scientists Neil Howe and William Strauss) (Shishkunova & Malyugina, 2017). Describing the generation “Z”, teachers are similar in their opinions that this is a completely new generation that requires a special approach, a special system of study and motivation (Ozhiganova, 2015). The psychological and pedagogical community faces serious challenges, related to not only the study of new phenomena, but also to finding new forms, methods and means of influence, modernization of pedagogical education itself (Artsimovich, 2017).

At the same time, there are few studies in the field of the relationship between the environment and the behavior of children – something that falls into the field of study of “environmental psychology” and has an interdisciplinary focus. At the end of the 20th century, psychologists noted that the cognitive component of the attitude to nature prevails among preschoolers and the modality is of subjective and pragmatic nature. The development of such characteristics as breadth and emotionality is most influenced by the child's own experience of direct contact with natural objects. At the same time, the development of awareness, generality, coherence, stability, consciousness is influenced by peculiarities of communication with adults (Yasvin, 2000). We have to admit the fact that there are few studies of the dominant attitudes of the new generation now. In 2018, it was revealed that for 54 % of children aged 6-7, the aesthetic attitude is dominant, i.e. children perceive nature only as an object of beauty, and the attitude to nature as an object of cognition is weak (only 6%) (Shatskaya & Khristoforova, 2018).

Opportunities for a comprehensive study of the psychological peculiarities of children in groups, studying plants and other natural objects, are available in botanical gardens. These opportunities are increasing due to the wide range of the functions they perform now. On the one hand, gardens are engaged in the study and conservation of plants, educational work aimed at informing about natural diversity (Chen & Sun, 2018), as well as finding solutions to applied problems (Miller et al., 2015). On the other hand, they have a high aesthetic value and can act as a recreation area in the city, as a space for organizing concerts, festivals and the placement of art objects (Wolfe & Russell, 2010), as well as a unique independent piece of art, consisting of living organisms that change over time (Middleton & Breed, 2010). One of the important aspects of the activities of the gardens is environmental education, which is a necessary condition for the implementation of the sustainable development concept. The means of environmental education is the organization of various activities directly in the natural environment (Sitak et al., 2017), which is considered to be more effective by experts (Otto & Pensini, 2017).

One of the forms of children's interaction with natural objects is excursions. The guide is endowed with the function of changing the impersonal attitude of garden visitors to plants. One draws the visitors’ attention to the peculiarities, unique properties and beauty of plants. Parents can act as an authority for small children. Stevenson (1991), by the example of a visit to the interactive center of the Science Museum in London by families, showed that children six months later remembered the contents of the visit they made with their parents better.

Among a small number of studies, examples of studying the children's audience in the greenhouses of the Royal Botanic Garden “Kew” in London are interesting in our opinion. Tunnicliffe (2001) investigated conversations about plants with children aged 7, 9 and 11 who were on an excursion. It was

https://doi.org/10.15405/epsbs.2022.02.15
Corresponding Author: Larisa Petrovna Musinova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

noted that children paid attention to the appearance of the plants: color, shape and smell. Groups, consisting of only boys or girls, had no significant differences in the perception of plants compared to mixed groups. Only the participation of adults allowed children to pay attention to less obvious peculiarities of the plants. They asked more questions and made more statements about the influence of a human on nature. Boys in all cases were more interested than girls were in the structure of plants, especially insectivores. Children aged 10-11 were more focused on looking at plants than younger ones were (Tunnicliffe, 2001).

Similar studies were conducted earlier by Kahtz (2018) at the Missouri Botanical Garden. It has been proven that plants arouse less interest in children of the primary school age than that in animals. In 1995, the Missouri Botanical Garden estimated the impact of classes on botany and zoology on the attitude of elementary school students (2nd and 3rd grade students) to the study of plants. The children of one group were engaged in the creation and care of a terrarium for 1 month. Another group studied the peculiarities of tropical plants for a month: children planted and cared for them. The experiment showed that the care for plants, unlike the creation of the terrarium, did not influence the attitude of students to the study of plants and the environment. In the group caring for terrariums, both girls and boys wanted to continue studying plants and nature in the future. This result was explained by more interesting methods (films about nature were shown to the group, taking care of terrariums) and by the objects themselves: terrariums were of greater interest for children (Kahtz, 2018).

Patrick and Tunnicliffe (2011) note that animals distract children's attention from plants. For example, in the greenhouse exposition of aquatic plants, children were always distracted by fish. Experts say that, regardless of age, visitors to exhibitions in museums evaluate each animal as an independent object, and plants at exhibitions and in botanical gardens are perceived as a mass. As studies in the UK and the USA have shown, children from an early age notice animals in everyday life and by the age of 8, most of animals can be named, unlike plants. Past experience, primarily additional study (environmental education), also changes the attitude towards plants. A more diverse experience significantly develops children’s knowledge about plants and animals (Patrick & Tunnicliffe, 2011).

It is known that the process of forming the children's attitude to objects and phenomena of the world, as a result of which they are endowed with the ability to perform specifically subjective functions and open themselves to the perceiver as subjects, proceeds through three channels: perceptual-emotional, cognitive and practical. When developing excursions for children in the Peter the Great Botanical Garden of BIN RAS (St. Petersburg, Russia), experts take into account the development of a subjective attitude to nature in ontogenesis, as well as structural peculiarities of the attitude to nature in various groups. Observations of specialists, when implementing programs, indicate that even in one single age-homogeneous group of children there are persons with different dominant attitudes. To develop the process of forming the attitudes in a socially desirable direction on children's excursions in the Botanical Garden of Saint Petersburg, various pedagogical techniques and means are used (Musinova & Kalugin 2018).

2. Problem Statement

Analyzing the above-mentioned, we have arrived at the following statements. 1) Currently, specialists of botanical gardens have attempted to study the perception of natural objects mainly by children aged 7-11. 2) There are no data on the study of dominant attitudes of 5-6-year-old children towards nature

https://doi.org/10.15405/epsbs.2022.02.15
Corresponding Author: Larisa Petrovna Musinova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

in botanical gardens. 3) Psychological testing of children of the new generation "Z" is becoming relevant today to analyze their perception of nature.

3. Research Questions

The subject of the study is the following:

dominant attitudes of relationship towards nature (aesthetic, cognitive, ethical, pragmatic) among 5-8-year-old children;

the process of changing the attitude to nature after the excursion in the Botanical Garden among children.

4. Purpose of the Study

The purpose of the study is the analysis of the attitude to nature among children aged 5-8 (preschool and primary school age) in the conditions of the Peter the Great Botanical Garden of the BIN RAS.

5. Research Methods

To assess the subjective attitude to natural objects in the studied groups of children, a questionnaire was conducted using the verbal associative method "EZOP" by Yasvin (2000), which allows identifying the dominant attitudes towards nature as an object:

1. beauty (aesthetic),
2. studies and knowledge (cognitive),
3. protection (ethical),
4. benefit (pragmatic).

The study was conducted in 2018-2019 in the Peter the Great Botanical Garden of BIN RAS (Saint Petersburg, Russia). The study participants were surveyed before and after the excursion. 12 items of the questionnaire contained a stimulus word, to which 5 other words-associations are proposed: 4 words corresponded to the types of the attitude, 5 words served to distract attention, the so-called "junk" words. The interviewer read out the stimulus word and associations at a fast pace. The respondents were asked without hesitation to choose 1 more appropriate to the stimulus word from the associations, after which the interviewer moved on to the next stimulus word and associations without a pause. The survey was conducted individually. The respondents who did not take the survey at that moment were in another room and did not hear the answers. The interviewer also recorded the date of the survey, the age and gender of the respondent.

The study involved 121 children aged 5-8. All children studied in one of the 5 state educational institutions of Saint Petersburg. 24 children aged 5 and 26 children aged 6-7 attended public kindergartens. The study involved 17 children of the 1st grade (6-7 years old) of the secondary school and 22 children of the 2nd grade (7-8 years old) of the same school, as well as 32 students of the 1st grade (aged 6-7). They attended the group of additional education at the Ecological and Biological Center "Krestovsky Ostrov", at the time of the study they were studying in the group for six months. Before the experiment began, there

https://doi.org/10.15405/epsbs.2022.02.15
Corresponding Author: Larisa Petrovna Musinova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

was a lesson in kindergartens, during which unfamiliar words from the questionnaire were explained to the children. For example, not all the children knew the meaning of the words “trophy”, “mollusk”, “spawning”, “banding”.

By means of Pearson's criterion χ^2, the null hypothesis was statistically tested implying that after visiting the excursion, children's dominant attitudes towards nature change.

6. Findings

The 5-year-old children (kindergarten group) before the excursion had the prevailing attitude which was aesthetic in both boys and girls (33% and 36%, respectively), as well as cognitive (23% and 26%) and ethical attitudes (23%) were wide-spread in both genders (Table 1). The pragmatic attitude in the responses was less common than others were. The girls rarely had this attitude. After visiting the excursion within the group, the attitudes began to occur in responses at an almost equal frequency. Nevertheless, the boys had their ethical attitude decreased almost 2 times, the girls had their ethical attitude decreased less noticeably, but cognitive and, especially, pragmatic attitudes increased. Both in the responses before and after the excursion, the “junk” words were marked singly, before the excursion 3 times - in boys’ speech. Perhaps this is due to ignorance of the meaning of some words. After the excursion, 1 girl chose a “junk” word when choosing an association for the word “lake”. From the options “catch”, “island”, “clam”, “clean” and “junk” word – “wool”, she chose the word “wool”, justifying this as follows: “The cat has wool and if it falls into the lake, it will get wet”. The word “cat” is not found in the questionnaire. In general, the 5-year-old children (kindergarten) had changed their dominant attitudes after the excursion: strengthening of pragmatic and especially cognitive attitudes due to a decrease in the role of aesthetic attitudes. The ethical attitude continued to occur in the responses of the respondents at almost the same frequency as it was before the excursion.

Aesthetic and ethical attitudes in groups of 6-7-year-olds from the kindergarten to the excursion were predominant (28% and 29%, respectively). The same attitudes prevailed in the responses of both boys and girls. The survey conducted after the excursion revealed the strengthening of the ethical attitude in groups of the respondents of different genders due to the reduction in the role of the pragmatic attitude, as a result of which the ethical attitude remained the only leading one. “Junk” words were not marked in this group.

Table 1. Attitudes towards nature among age groups and respondents of different genders

Age group (age, yrs)	Survey	Responses	Attitude				
			Esthetic	Cognitive	Pragmatic	Ethic	“junk” words
Kindergarten (5)	Before the excursion	B* (%)	36 (33)	25 (23)	24 (22)	25 (23)	0 (0)
		G (%)	65 (36)	47 (26)	28 (15)	42 (23)	0 (0)
		T (%)	99 (34)	72 (25)	52 (18)	67 (23)	3 (1)
	After the excursion	B (%)	21 (19)	33 (30)	30 (27)	26 (24)	0 (0)
		G (%)	45 (25)	50 (27)	40 (22)	47 (26)	0 (0)
		T (%)	66 (23)	83 (28)	70 (24)	73 (25)	1 (0)

https://doi.org/10.15405/epsbs.2022.02.15
Corresponding Author: Larisa Petrovna Musinova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Kindergarten (6)	Before the excursion	B (%)	48 (27)	37 (21)	41 (23)	53 (30)	0 (0)
		G (%)	40 (29)	31 (22)	31 (22)	38 (27)	0 (0)
		T (%)	88 (28)	68 (21)	72 (23)	91 (29)	0 (0)
	After the excursion	B (%)	49 (27)	38 (21)	37 (21)	55 (31)	0 (0)
		G (%)	37 (26)	31 (22)	26 (19)	46 (33)	0 (0)
		T (%)	86 (27)	69 (22)	63 (20)	101 (32)	0 (0)
School, 1 grade (6-7)	Before the excursion	B (%)	38 (29)	38 (29)	22 (17)	34 (26)	0 (0)
		G (%)	14 (17)	36 (44)	13 (16)	22 (18)	0 (0)
		T (%)	52 (24)	74 (35)	35 (16)	52 (24)	0 (0)
	After the excursion	B (%)	33 (25)	44 (33)	27 (20)	28 (21)	0 (0)
		G (%)	16 (20)	38 (47)	10 (12)	17 (21)	0 (0)
		T (%)	50 (23)	84 (39)	37 (17)	42 (20)	0 (0)
School, 2 grade (7-8)	Before the excursion	B (%)	35 (27)	32 (24)	30 (23)	34 (26)	0 (0)
		G (%)	36 (26)	53 (38)	36 (26)	16 (11)	0 (0)
		T (%)	71 (26)	85 (31)	66 (24)	50 (18)	0 (0)
	After the excursion	B (%)	31 (24)	36 (27)	28 (21)	36 (27)	0 (0)
		G (%)	39 (27)	48 (34)	29 (20)	26 (18)	0 (0)
		T (%)	69 (25)	84 (31)	56 (21)	63 (23)	0 (0)
EBC “Krestovsky Ostrov” (6-7)	Before the excursion	B (%)	35 (23)	46 (30)	38 (25)	34 (22)	2 (1)
		G (%)	78 (34)	65 (29)	42 (18)	37 (16)	6 (3)
		T (%)	113 (30)	111 (29)	80 (21)	71 (19)	8 (2)
	After excursion	B (%)	39 (25)	39 (25)	36 (23)	32 (21)	9 (6)
		G (%)	81 (36)	62 (27)	46 (20)	37 (16)	2 (1)
		T (%)	120 (31)	101 (26)	82 (21)	69 (18)	11 (3)

*Note: the column “responses” shows the number of respondents' answers, and in parentheses - in % of the total number of responses
«T» is the total number of responses of the respondents
«b» is boys’ responses
«g» is girls’ responses

The 6-7-year-old children, studying at school, before the excursion, had the cognitive attitude as a main one (35%), aesthetic and ethical attitudes were less common (24%). The pragmatic attitude was much less common than others both in the age experimental group as a whole and in the groups of different genders. Aesthetic and cognitive attitudes turned out to be dominant in the boys before the excursion (29%), while only the cognitive attitude prevailed in the girls (44%). After visiting the excursion, the aesthetic and ethical attitudes of the girls increased, and the aesthetic attitude of the boys decreased. The cognitive attitude remained dominant in both groups of the respondents.

The boys and girls, students of the 2nd grade, as well as those in the group from the 1st grade, before the excursion, had their attitude towards nature as an object of study prevailed (cognitive attitude of 31%).

After the excursion, there was a slight decrease in the frequency of responses with a cognitive attitude among girls and an increase in this attitude among boys, but in general this did not lead to a change in the occurrence of this attitude in the specified age group. Before the excursion, the groups of the boys and the girls differed significantly in terms of ethical attitudes. The girls practically did not give answers that would implied that nature is an object of protection. The boys had an ethical attitude before the

https://doi.org/10.15405/epsbs.2022.02.15
Corresponding Author: Larisa Petrovna Musinova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

excursion as often as everyone else does (26%). After the excursion, we observed an increase in responses concerned with an ethical attitude among the respondents of different genders.

"Junk" words were not noticed in the school groups.

The children aged 6-7 years old attending a group of additional natural-scientific education differed in their results from other groups. First of all, attention is drawn to the presence of "junk" words (in total, more than 2% in the group). The "junk" words before and after the tour were found among both boys and girls. In boys' speech, the number of "junk" words increased from 1.3 to 5.8%. The group's leading attitudes throughout the entire study were aesthetic and cognitive (30% and 29% - before the excursion, 31% and 26% - after the excursion). After the excursion, intriguingly we did not detect significant shifts in the attitudes of these children, among both girls and boys.

To test the hypothesis that the excursion to the greenhouse changed the dominant attitudes towards natural objects, the responses of the respondents in each age group were tested by the criterion χ^2 (Table 2). At the same time, in each age group, the hypothesis was tested separately, based on the responses of the children of different genders. In addition, the respondents' answers were grouped into new groups based on the type of the educational institution the respondent attends: a kindergarten or a school. The children attending the group of additional education were also referred to school students since these respondents are students of schools. The hypothesis was tested separately for all the responses of the study participants. The hypothesis that the excursion to the greenhouse changed the dominant attitudes towards natural objects was confirmed only in the youngest age group of the study (kindergarten, aged 5). There were no revealed changes in the attitude to natural objects within all other age groups.

Table 2. Study results of the influence of the excursion on the change in the dominant attitudes towards nature in the age groups and respondents of different genders

Age group (age, yrs)	Respondents	χ^2	Significance level, p
Kindergarten (5)	boys	5,7371	0,12513
	girls	6,5783	0,15992
	total	11,294	0,023456
Kindergarten (6)	boys	0,26581	0,96633
	girls	1,3174	0,72501
	total	1,1511	0,76475
School, 1 grade (6-7)	boys	1,882	0,59726
	girls	0,60726	0,89477
	total	1,7915	0,61678
School, 2 grade (7-8)	boys	0,60383	0,89556
	girls	3,4988	0,32091
	total	2,2065	0,53067
EBC "Krestovsky Ostrov" (6-7)	boys	5,3619	0,25214
	girls	2,3093	0,67908
	total	1,2089	0,87662
Kindergarten (5-6)		6,193	0,18519
School, 1 grade (6-8)		0,795554	0,93904
All respondents (5-8)		1,9	0,75415

https://doi.org/10.15405/epsbs.2022.02.15
Corresponding Author: Larisa Petrovna Musinova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

It has been noted that the children in all the studied groups tried to give the same answers after the excursion as they did before it. Frequently this behavior was typical of boys aged 6-7. Despite the fact that before the survey the children were informed that the study was not an assessment of knowledge and the researchers were interested in the opinion of the child, we believe that the children perceived the questionnaire as a test of knowledge. We are aware that such behavior of the respondents could affect the results of the survey. Girls were less likely to repeat their answers than boys were. However, according to the responses of different age groups of the girls, the hypothesis could not be confirmed.

7. Conclusion

A reliable change in the dominant attitudes was revealed only among the 5-year-old children who attend kindergarten: the aesthetic attitude was replaced by a cognitive one (aesthetic – 34% before the excursion, 23% - after the excursion and cognitive – 25% before the excursion, 28% - after the excursion).

The children attending kindergarten, both the girls and boys, had the aesthetic attitude towards nature as a main one (nature as an object of beauty), and an excursion to the greenhouse of the botanical garden, apparently, strengthens the ethical attitude.

The children (both girls and boys) studying at school treat nature primarily as an object of study and beauty (cognitive and aesthetic attitudes).

The schoolchildren (6-7 years old) attending additional classes of a natural-scientific nature, unlike the children of the same age from the group of the schoolchildren, did not show significant differences in relation to nature in terms of prevailing attitudes, but differed by the presence of “junk” words. Probably, this may indicate a creative attitude towards nature as an object.

The results of the experiment differ from the results of Russian psychologists (Shatskaya & Khristoforova, 2018) and demonstrate that the 6-year-old children, attending kindergarten, have both a cognitive attitude and an aesthetic attitude towards nature (27% and 22%, respectively).

Experts recognize the fact that it is necessary to continue the study of children’s relation to nature after a longer visit to the botanical garden or interaction with natural objects. However, the experimental data are of practical interest because they demonstrate the dominant attitudes towards nature of the children born after 2000.

Acknowledgments

The study is performed within the state task on the planned topic: Collection of live plants of the Komarov Botanic Institute (history, current state, prospects), number AAAA-A18-118032890141–4.

The authors of the work express their gratitude to the specialists of the Peter the Great Botanical Garden, Alexandra Volchanskaya and Maria Yaroslavtseva, as well as to the teachers of kindergarten No. 51 of Saint Petersburg, Elizaveta Sakhnova and Evgeniya Vyaznikova of the EBC “Krestovsky Ostrov” for their assistance in conducting the survey among the children.

References

Artsimovich, I. V. (2017). Current generation: challenges to the society or time? *Interactive Science, 12,* 119–121. https://doi.org/10.21661/r-117501

Chen, G., & Sun, W. (2018). The role of botanical gardens in scientific research, conservation, and citizen science. *Plant Diversity, 40*(4), 181–188. https://doi.org/10.1016/j.pld.2018.07.006

Kahtz, A. W. (2018). Impact of Environmental Education Classes at Missouri Botanical Garden on Attitude and Knowledge Change of Elementary School Children. *HortTechnology, 5*(4), 338–340. https://doi.org/10.21273/horttech.5.4.338

Middleton, L., & Breed, I. (2010). Botanical gardens as experiential science and as living art : the relocation of the succulent section of the Manie van der Schijff Botanical Garden. *South African Journal of Art History, 25,* 68–85.

Miller, A. J., Novy, A., Glover, J., Kellogg, E. A., Maul, J. E., Raven, P., & Jackson, P. W. (2015). Expanding the role of botanical gardens in the future of food. *Nature Plants, 1*(6)*,* 15078. https://doi.org/10.1038/nplants.2015.78

Musinova, L. P., & Kalugin, Yu. G. (2018). The mechanisms of the formation of ecological culture in children of preschool and primary school age in the classroom and excursions in the Botanical Garden of Peter the Great. In *Sustainable development of specially protected natural areas. Collection of articles of the All-Russian scientific-practical conference* (vol. 5**,** pp. 217-225). Sochi, Don publishing center.

Otto, S., & Pensini, P. (2017). Nature-based environmental education of children: Environmental knowledge and connectedness to nature, together, are related to ecological behaviour. *Global Environmental Change, 47(August),* 88–94. https://doi.org/10.1016/j.gloenvcha.2017.09.009

Ozhiganova, E. M. (2015). The theory of generations by N. Hove and W. Strauss. Possibilities of practical application. *Business Education in the Economy of Knowledge*, *1*, 94–97.

Patrick, P., & Tunnicliffe, S. D. (2011). What Plants and Animals Do Early Childhood and Primary Students' Name? Where Do They See Them? *Journal of Science Education and Technology, 20*(5), 630–642. https://doi.org/10.1007/s10956-011-9290-7

Sitak, L. A., Abramyan, R. G., & Poberezhnaya, E. G. (2017). Implementation of the research development potential of ecological excursions. *Humanities Science Journal, 1,* 55–57.

Shatskaya, E. V., & Khristoforova, N. V. (2018). Diagnostics of the ecological consciousness of preschool children in the practice of a regional innovation platform. *Academic year, 1,* 58–60.

Shishkunova, V. A., & Malyugina, N. A. N. (2017). Generation theory: concept and characteristics. *Topical issues of aviation and astronautics, 3,* 882–884.

Stevenson, J. (1991). The long-term impact of interactive exhibits. *International Journal of Science Education, 13*(5), 521–531. https://doi.org/10.1080/0950069910130503

Tunnicliffe, S. D. (2001). Talking about plants - Comments of primary school groups looking at plant exhibits in a botanical garden. *Journal of Biological Education, 36*(1), 27–34. https://doi.org/10.1080/00219266.2001.9655792

Wolfe, D., & Russell, K. (2010). Garden/art: The nature-based sculpture program of the South Carolina Botanical Garden. *Environmental Communication, 4*(2), 237–249. https://doi.org/10.1080/17524031003755341

Yasvin, V. A. (2000). *Psychology of relationship to nature.* Smysl.