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Deficit of nature as a manifestation of a hidden curriculum of the school Poznan educational studies 2021

Abstract: Poznan educational studies 2021, conducted in order to improve Poznan city's educational policy for the next ten years, covers several areas of students' school experience. The study focuses on the area of ecology and one aspect of it: students' contact with nature. The aim of the study was to find out whether Poznan students are exposed to nature deficit and thus at risk of developing nature deficit syndrome.

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996 students from primary and secondary Poznan schools were surveyed online in the Poznan educational studies project. Five questions from the questionnaire were used in this study. Basic statistics and Chi-square tests were conducted in data analysis, using row data basis on the survey.
The study proved the nature deficit syndrome in the analyzed group of students. Only 14% of them experienced lessons outside the school building during their school lives. This fact is interpreted in the paper in the context of Jackson's concept of the hidden curriculum and Eisner's concept of the null curriculum. It also referred to the concepts of deficit of nature disorder and the hypothesis of biophilia.
Key words: nature deficit disorder, nature-based learning, hidden curriculum, null curriculum, school space

Introduction

Outdoor lessons for a long time were an attribute of the life & science part of the school curriculum, usually as practical complementation of the theoretical biological or geographical knowledge. Such education, using the outdoors as an occasion to practice what was learned in the indoor lessons, is an attractive form of learning *about* the subject – the environment, the landscape – but it does not fully use the opportunities that come from moving out of the school walls. For example, going off the script of teaching about the environment as an academic subject may refer to what Richard Dobson calls teaching *for* the environment, which involves action and civic engagement for changing particular places. Teaching *about* the environment *in* the environment and *for* the environment is associated with developing citizenship competencies, students' engagement in action, and their participation in changing the world (Dobson, 2003).

The problem is that even such narrowly understood outdoor education – as complementation of biology or geography lessons conducted in the school building – is extremely seldom (Michalak et al., 2019). It seems that schoolchildren in Poland spend most of their school life in the school buildings. Compulsory education starts at 7 and lasts 11 years, up to 18. Every day students spend 5–7 hours at school. Except for the first three years of primary school, which is the time of integrated education, school education is organized into 45–minute lesson units run by different teachers of different subjects. Such organization is, by definition, a barrier to outdoor lessons. But there may also be other ones: lack of attractive places in the school surroundings, financial costs of trips, or uncertainty about legal responsibility in case of an accident outside the school grounds. Some teachers may also feel unprepared for teaching out of the classroom without handbooks and notebooks. Staying with students inside the classroom seems safer, easier, and more convenient (Michalak & Parczewska, 2019, pp. 138–141).

In the 21st century, going outside also seems challenging for children. After returning from school to home, they seldom spend their spare time playing

outside. There are not many studies on this fact, as it was not perceived as necessary in the context of the child's development or mental condition. However, a growing body of evidence shows that contact with nature is a basic human need and as such, it should be adequately addressed in an educational system (Jordan & Chawla, 2019; Louv, 2008).

Nature deficit disorder

In 2005, Richard Louv's ground-breaking book resulted in changes to attitudes towards nature, the environment, and environmental education. As he proved, in education nature is much more than a storage of resources or a topic of teaching and learning. In his book, he showed the process of the growing nature deficit in children's everyday experience during the last 20 years and how it may be associated with attention deficit disorder (ADHD), stress, depression, and difficulties in social relations. He recalled studies proving that children almost disappeared from outdoor playgrounds in the 21st century. One reason for that phenomenon is that they do not know how to play without computers and colorful plastic toys (Louv called it a *forgotten experience*). In one of the recalled studies, 20% of British children had not gone outside for a whole month before the survey: they had been driven to school and back home by parents and at home, they had sat before the TV, computer, or smartphone screen; the next 20% had gone out for less than 1 hour per day, which is the standard for prisoners (Louv, 2008).

One reason for children missing outdoor activities is adults being afraid that something wrong might happen to their children. The danger may come from other people as it is expressed in the concept of "stranger danger" (Carver et al., 2008, or children may harm themselves when playing. The latter may involve the parents or the caretakers of the place being held legally responsible. Afraid of being sued as a result of a child's accident while playing under their supervision, local councils of house settlements in the USA simply introduce legal bans on playing on the settlements' grounds. Louv described this phenomenon as *penalization of play*.

The question is, is it important where children play, indoors or outdoors? According to Louv, yes. He showed how important nature is for human development and coined a term for the consequences of the limited contact with nature: nature-deficit disorder (Louv, 2008, pp. 99–114).

Louv's book was an inspiration for new trends in education: nature-based education and place-based education: outdoor, in the natural environment, targeted education not only *about* or *in* the environment, but also *for* it; not *about* or *in* the local community, but also *for* it. Engagement in real problems and real and needed actions helps children to reconnect with nature and the local community, rebuild broken social relations, negotiate common goals, and work to meet them. Such education increases creativity, enhances communication

skills and citizenship competencies, and it makes children happier. It also helps students in other fields of education, and strengthens their resilience to school stressors and dangers (Chawla et al., , 2014; Flax et al,. 2020). This is why the school greening movement developed and school gardens and green schoolyards were built as an effect of the school project (Jansson and Martensson, 2012; Stevensonet et al., 2020).

"Leave no child inside" became the new slogan in nature-oriented education*(Orion Magazine – Leave No Child Inside*, n.d.). It paraphrased "Leave no child behind," a slogan used in legislative acts on children's rights and equal opportunities in education (Comer, 2008), and showed that education outside the school building is one of children's rights. However "leave no child inside" is not a part of legislation. Teachers and other actors of educational systems who are engaged in promoting nature-based education started to organize and support each other through networks and organizations (*Children and Nature Network. Helping Children Thrive – Outside | C&NN*, n.d.).

There are growing bodies of evidence on the restorative function of nature and its positive influence on human development. The role of nature in human health and development. It helps in rehabilitation of individuals with stress-related mental disorders (Pálsdóttir et al., 2014) and improves attention which is important in many areas of life. Even views on green landscapes from the school windows can significantly improve performance on tests of attention and increase students' recovery from stressful experiences (Li & Sullivan, 2016). Exposure to trees is related with better physical health and increased capacity to control stress (Jiang et al., 2020). Roe and Aspinall (2011) proved that forest school and outdoor education have better restorative outcomes in comparison with conventional school. The effect was the strongest for students with poor behavior (Roe et al., 2022; Roe & Aspinall, 2011). Similar results were presented by Nedovic and Morrissey (2013), proving that outdoor classes make kindergarten children more calm, active and focused.

The effects of outdoor education were observed also for kindergarten and school children, who during indoor classes were perceived as underachievers, but outdoors they behaved differently: they were more engaged, active, creative and these facts diminished the effects of "underachievement" (Maynard et al., 2013). Better students' academic performance as a result of the "greenness" of school surroundings was reported in several studies (Barrett et al., 2015; Williams et al., 2018; Wu et al., 2014).

On the other side of the spectrum to the above positive effects of the contact with nature is the nature deficit that brings many negative consequences: poorer of health, higher level of stress and aggression, lower level of attention, and worse performance at school. Reconnecting schoolchildren with nature is a way to build their resilience, to live healthier, emotionally balanced, cognitively more effective school lives (Chawla et al., 2014; Flax et al., 2020; Hauk et al., 2018).

In the Polish educational system, the national curriculum framework for primary school and vocational education mentions field lessons 51 times. Most of them refer to primary science, biology or geography (*Podstawa programowa – Ministerstwo Edukacji i Nauki – Portal Gov.pl*, n.d.). However, as it was proven in Michalak and Parczewska's monograph (2019), this is not transposed into school curriculum level and lesson plans sufficiently. Teachers, following the instruction of the published curriculum, seldom come across exercises and content which should be conducted outdoors (Michalak and Parczewska, p. 138). Barriers that teachers experience in organizing outdoor education were also described by Dijk-Wesselius et al., (2020).

Hidden curriculum

The term "hidden curriculum" was coined by Philip Jackson (Jackson, 1968), however it is believed that the idea was originated by John Dewey. Jackson described education as a process of socialization and explained the hidden curriculum in this context: as what is learned but not openly intended, such as norms, values, believes, rules, and distribution of power which are part of the school culture. According to the Oxford Dictionary of Education, the hidden curriculum is "knowledge, skills, or attitudes which were not a part of the formal intended learning outcomes" and which are acquired by students apart from their exposure to the formal curriculum (Wallace, 2015, p. 69).

The concept of the hidden curriculum has been analyzed and elaborated by many thinkers from the field of pedagogy (Freire 2017; Meighan 1993; Snyder, 1971; Gordon 1997). However, the term "hidden curriculum" was not always used. Eliot Eisner, one of the leading curriculum theorists, who coined the term "null curriculum" for the content which is not present in the curriculum, writes in his ground-breaking book *Educational Imagination* about three curricula which all schools teach: the explicit curriculum, implicit curriculum, and null curriculum. The explicit curriculum is the one declared in official documents; implicit – the school culture, that indirectly teaches some rules, values and attitudes; and the null curriculum – absent content, methods, form of teaching, which also influence future lives of students (Eisner, 1985, pp. 87–108). Eisner's "implicit curriculum" and Jackson's hidden curriculum refer to the same concept. In this article, the hidden curriculum will be described in relation to the experience of nature deficit and the school space.

Research problem

The paper presents a part of a study conducted for the project "Poznan Educational Policy 2030," coordinated by Poznan city's educational department[2]. The purpose of the Poznan study was to learn about the school experiences of students in primary and secondary schools of Poznan in several areas of school activity, in order to define to what extend these experiences are supportive for students' development, as well as what factors make these experiences different. The practical goal of the research was to diagnose students' problems and needs in the school context.

The key areas of students' school experiences that defined research problems were: lessons; relations between students and teachers; educational lessons; peer relationships; the offer of extracurricular activities; the conditions of learning – school infrastructure; discrimination – unequal treatment, worse treatment; safety; friendliness; counselling; educational and occupational orientation; environmental /climate change education. The goal of the Poznan study (To what extent Poznan schools are the source and the context of experiences supporting students' development?) has been detailed in the above-mentioned areas of students' school experiences. The areas created thematic sections in an online survey.

The dimensions of research areas that created variables of the research are rooted in Bruner's culture of education theory (Bruner, 2006). This is a concept of school which supports students' development through creating a safe educational environment in which students have the opportunity to experience self-agency, participation, partnership, equal treatment, concern, and reflectiveness. The study was planned and executed in order to learn about everyday school life from the perspective of students. It is why the questions in the survey were about students' personal experiences, opinions, and feelings in different areas of their school functioning.

The main research questions in the Poznan survey were:

1. Are Poznan schools creating the context and the source of students' experiences that is supportive for their development? If yes, to what extent, in which areas and how do they do it?
2. How advanced Poznan schools are in the implementation of selected educational priorities of Poznan city (students' safety; environmental / climate change education; equality education; education on the needs of the labor market)?

[2] Poznan Educational Studies were designed and conducted by the research team from the Faculty of Educational Studies of the Adam Mickiewicz University in Poznan.

In this paper, focused on the deficit of nature problem, using theoretical background on the restorative function of nature and its positive influence on human development, as well as the threats that come from a deficit of nature, the research question is: Are Poznan schools' students exposed to experiencing the deficit of nature?

To answer this question, the analysis of data was conducted based on the part of the survey referring to widely understood environmental education.

The questions asked in the paper are as follows:

— Do students experience outdoor lessons in the greenery of the school surroundings?
— Is the school engaged in environmental / climate change education? (Does the school observe the ecological rules that are taught during lessons in the school practice? Is environmental / climate change education mainstreamed and taught as part of many different school subjects? Does the school fulfill its tasks concerning environmental education and climate change?
— Do students have access to silent places in which one can rest?
— Are there differences in above listed areas of student experiences according to the stage of education (differences between students of secondary and primary schools)?
— Is there a relation between the experience of outdoor lessons in nature and student school outcomes?

Material and methods

Material for the study was derived from the survey of Poznan students conducted online for 2 age cohorts: students of the last year of primary schools and the last year of secondary schools (15 and 18 years old, respectively). The online questionnaire consisting of 98 questions was distributed to schools by the Poznan city Department of Education via Librus – an electronic communication system used by schools in Poland. N=996 valid responses for the survey were received, 735 from secondary schools and 237 from primary schools.

For the purposes of this study, 5 questions referring to environmental education and 2 to demographic data were selected:

Table 1. Questions selected for the study from the questionnaire of the survey conducted for the project Poznan Educational Policy 2030

Nb in the Questionnaire	Question	Abbreviation
12.4	The greenery surrounding my school is used by teachers to run lessons, e.g. biology, geography or other subjects	school greenery used for lessons

Nb in the Questionnaire	Question	Abbreviation
12.3	In my school rules of ecology which are taught during lessons are implemented into school practice (e.g. we learn about the harmfulness of plastic, disposable plastic plates and cutlery are withdrawn from the school cafeteria and canteen)	Ecological rules implemented into practice
12.2	Environmental and climate change education are present in the various school subjects and after-school activities	Environmental education mainstreaming
12.1	My school fulfills its tasks in the field of environmental and climate change education	The school fulfills its task of teaching environmental education
8.8	In my school silent places for resting are available during breaks	Silent places
DEM 1	What type of school do you attend?	Primary vs secondary school
DEM 2	What was the average of your school assessments during last school year?	School assessments

Source: Online survey questionnaire for the project "Poznan Educational Policy 2030."

All the variables were nominal in character. Basic statistics were calculated to present the distribution of answers. In order to assess the association between variables, the Chi-square test, Phi coefficient, and Cramer's V were conducted, using the PS IMAGO PRO 7.0 (former SPSS Poland) program.

Results

Basic statistics for the variables are shown in Table 1. They illustrate that Poznan students learn mainly indoors: only 14% of students reported they have lessons outside the school building; 69% said that the green surroundings of their schools have not been used for educational purposes in their school lives. Almost 40% of respondents reported no cohesion between environmental education content which is part of the curriculum and school practice: they may learn at lessons that they should avoid disposable plastic but in the school canteen they receive meals in single-use plastic containers. Only one-third of respondents report that they learn about environmental issues and climate change in different school subjects, which means that the topic is mainstreamed and treated as interdisciplinary; more than 43% of them have not had such experience. Almost 50% of respondents think their schools fulfill their tasks in the area of environmental education and climate change. Only one-fifth of them has the opposite opinion. It may mean that environmental education is well organized or that students have no expecta-

tions regarding that topic. Over 71% indicate that there is no quiet place in their school for resting. This is indirect information also on the school grounds which, if they were green and covered by trees, would give the opportunity for rest and relaxation.

Table 2. Variables and their basic statistics

Variables	Categories of answers (Likert Scale) (%)					%
	Strongly agree	Rather agree	Difficult to say	Rather disagree	Strongly disagree	
12.4 The greenery surrounding my school is used by teachers to conduct lessons	4.3	9.7	16.9	27.4	41.6	100 N=966
12.3. In my school rules of ecology which are taught at lessons are implemented in school practice (e.g. if we learn about the harmfulness of plastic, disposable plastic is withdrawn from the school cafeteria and canteen)	7.7	22.7	30.2	22.5	16.9	100 N=962
12.2. Environmental and climate change education are present in the various school subjects and after-school activities	8.7	24.5	24.7	29.9	12.2	100 N=967
12.1. My school fulfills its tasks in the field of environmental and climate change education	9.6	39	30.1	14.2	7.1	100 N-970
8.8. In my school silent places for resting are available during breaks	10.2	18.5	13.3	25.3	32.7	100 N=996

Source: preliminary report on survey results conducted for "Poznan Educational Policy 2030"

For the question *What are your average school results from the last year?* the frequencies in categories were as follows: highest results, over 4.75 – 27%; the moderate results, between 3.5 and 4.75 – 62.9%; low achievements, with the average below 3.5 – 10.1%.

For the question of what type of school do the respondents attend, the answer was the following: 257 (25.8%) attended primary schools; the rest of the N=996 group of respondents attended various types of secondary schools (high school – 428 students – 42%; technical school – 262 students – 26.3%, vocational school – 44 students (4.4%), and 5 students gave other answers.

To test whether there is a relationship or association between the variable concerning lessons in the greenery surrounding the school and the other variables, Chi-square($X2$) tests were conducted for the pairs: 12.4–12.3; 12.4–12.2; 12.4–12.1; 12.4–8.8 and between 12.4 and DEM2 (school assessments) variables. The results are shown in Table 3. For all these pairs, except the last one, the p-value in the Chi-square test was less than 0.001, which means that the variables are associated and the associations are statistically highly significant. There was no statistically significant association between the usage of the greenery in school surroundings and the school results of the students.

To assess the effect size in the pairs of variables, the Phi coefficient (φ) and Cramer's V were calculated. The thresholds for low, medium and large effect size were established based on Cohen et al. (2011, p. 654). A large effect (Phi coefficient around 0.5) was observed for all the pairs except 12.4-DEM2 in the primary school and for the pairs 12.4–12.3 and 12.4–12.2 in the secondary schools. A medium effect (Phi = 0.3) was observed for the pairs: 12.4–12.1 and 12.4–8.8 in secondary schools. For the 12.4–DEM2 pair, the effect was low and statistically insignificant, however, the Phi-coefficient was twice higher and the p-level much lower in the primary school group.

Table 3. Chi-square test and effect size for the 12.4 variable paired with 12.3, 12.2; 12.1; 8.8, DEM2, in the groups of primary and secondary schools. Effect size for the Phi coefficient: *low effect (0.1); **medium effect (0.3); ***large effect (0.5)

Variables paired with 12.4 (school greenery used for lessons)	Primary school	Secondary School	p-level primary school high school
12.3 Ecological rules implemented into practice	X^2=82.3362 φ = 0.569*** *V=0.285*	X^2=206.0 φ=0.543*** *V=0.270*	p <0.001 p <0.001
12.2 Environmental education ma-instreaming	X^2=57.16 φ=0.476*** *V=0.238*	X^2=163.0 φ=0.482*** *V=0.241*	p <0.001 p <0.001
12.1. My school fulfills its tasks in EE and CCE	X^2= φ=0.450*** *V=0.225*	X^2=113.760 φ=0.402** *V=0.201*	P<0.001 p <0.001
8.8. Silent places	X^2=69.044 φ=0.521*** *V=0.261*	X^2=59.255 φ=0.289** *V=0.145*	P<0.001 p <0.001
DEM 2 School assessments	X^2=11.440 φ=0.212* *V=0.150*	X^2=6.02 φ=0.092* *V=0.065*	P=0.178 P=0.64

Source: row data from research conducted for the project "Poznan Educational Policy 2030".

Discussion

Results of the study show that regardless of the obligation under the national curriculum framework, during lessons students have very limited contact with nature. It is expressed particularly strong in the secondary school and is connected with generally disregarding attitude of schools towards the environment and environmental education, and the school space which lacks silent places for rest and relaxation.

Our results are in line with other studies on e.g. lack of outdoor education in the Polish schools (Michalak & Parczewska, 2019), anthropocentric philosophy in the national curriculum framework (Gola, 2018; Kozłowska, 2021a, 2021b), and in primary science, biology and geography handbooks (Gola, 2018). However, lack of statistically significant association between the experience of having the lessons outside in the school greenery and students assessment is a surprise, because positive influence of lessons in nature on school results were reported by several researchers (Chawla, 2018; Lieberman & Hoody, 1998; D. Williams et al., 2018; D. R. Williams & Dixon, 2013). The explanation of this discrepancy may be the nominal character of the variable of school assessments used in the study. Only 3 wide categories of assessments limited the precision of analyses and may be responsible for the lack of statistically significant association. The second reason of this result may be the fact that school assessments refer mainly to academic achievements defined in the curriculum and as such the system of assessment may be insensitive to benefits of learning in nature, such as emotional balance, creativity, attention.

This article proves that students in Poznan schools are exposed to nature deficit and are at risk of nature deficit disorder. This fact results from open and hidden assumptions of the school curriculum. A XIX-century German pedagogue, who was one of the first to lay the foundation for the system of kindergarten education, noticed nature as a key element of education theory and practice. He believed in the role of nature in well-being, development and learning of children and coined the term *kindergarten* as he saw the place of children's early education as gardens. In his concept of human education and development he used a metaphor of a plant which needs care and appropriate environmental conditions for it to grow. The garden was a place of appropriate conditions for the growth and development of children, as it gave a space for everyday activity and contact with nature (Tewes, 2020).

Since Fröbel's times, a lot has changed in pedagogy and the climate. Studies on the hypothesis of biophilia by the biologist and environmental theorist Edward O. Wilson (Wilson, 1984), proved that humans have a natural inclination to seek contact with nature. This inspired millions of people all over the world to

look for solutions, also through education which could allow people to reconnect with nature (Burgess and Mayer-Smith, 2011). Sociologist and environmentalist S. Kellert, a co-operator of Wilson (Kellertand Wilson, 1993), conducted studies on the long-term and short-term effects of nature curricula pedagogy (Kellert, 1985; Derr, 2002). He deepened the understanding of the relations between humans and nature and widened the concept of biophilia into the theory and practice of biophilic design. The purpose of biophilic design is the promotion of physical and mental health and condition, fitness, productivity, and well-being through creating a space in which one may experience nature (Kellert, 2005; Kellert and Calabrese, 2015). According to Kellert, there are 3 ways in which humans may experience nature in the anthropogenically altered environment:

— direct experience of nature, such as multisensory contact with plants, living animals or landscapes;
— indirect experience of nature, e.g. using natural materials or motifs,
— symbolic experience of nature through the experience of place and space steeped in symbolic and ecologic meanings (Kellert and Calabrese, 2015).

This study of Poznan schools shows that using R. Meighan's words, schools are still ruled by ghosts of ancestral spirits, who understand nature as a human property that should be understood, submitted, and exploited for their own benefits. The construction and design of school buildings and their surroundings reviles the hidden program of the school space and the organization of the didactic process as an education inside the school building, in closed space, sitting at the school desks deepens Louv's nature deficit. Thus, nature becomes a part of the null curriculum in Polish education.

How long should we wait for the awakening of education in this area? Should forest kindergartens and school forests be mere islands of educational resistance (Sliwerski, 1993) against the majority who ignore knowledge about the influence of nature on human welfare and development (Godawa, 2021; Szlauzys, 2019, Kaliszuk and Mirzyńska, 2021; Białek et al., 2021)? Nature was and still is a home for human beings who, regardless of their environmental awareness, are interconnected with everything that creates nature – is a part of nature. Contact with the natural environment and experience of nature is a precondition of mental and physical health. In the context of environmental crisis, understanding these rules and interconnectedness as well as the language of nature is the most important goal and challenge of contemporary education.

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