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Chapter 16

Positive Rules Can Lead to Positive Behaviours: Students' Perceptions of Messages on Information Boards in Protected Areas

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Additional information is available at the end of the chapter

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Abstract

The main purpose of this research was to investigate primary school students' perceptions of pictograms displayed in protected areas. The aim was to determine if and how students understand the concept of protected areas and the role pictograms and comic strips, displayed on information panels in protected areas, play in understanding (un) acceptable human activities in such areas. Altogether, 353 fourth-graders and fifth-graders (8–11 years of age) from central Slovenia filled in the questionnaire. Students were randomly assigned to one of three treatment groups faced with a set of positive pictograms, negative pictograms or a comic strip and asked to answer two open questions. Many students participating in the research perceived protected areas as areas where many human activities are prohibited. The concept of protected areas was sufficiently understood by 36.8% of the students. The results confirmed the main hypothesis that students faced with a set of positive pictograms perceived protected areas as areas where a number of human activities are acceptable, but they also realized which activities are unacceptable. Similar results were obtained for students faced with the comic strip. On the other hand, those faced with negative pictograms tended to be more preoccupied with listing unacceptable human activities and were able to list significantly fewer acceptable activities.

Keywords: pictograms, protected areas, students, attitudes, knowledge

1. Introduction

Protected areas that permit visitor access are often equipped with information boards and interpretive educational materials that help educate visitors about the area as well as guide their behaviours in such areas. Jacobson et al. [1] emphasize that people quickly understand

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images and symbols, so it is good to use them on the information boards in protected areas. Furthermore, if you use short messages (like pictograms) people will read and remember them. Pictograms on the information boards form an intermediate step between text and image, as they contain elements of both [2]. Pictograms define both permitted and prohibited activities in protected areas.

Managers of protected areas in Slovenia are required by the Nature Conservation Act [3], Article 133, to provide access to information about the protected area. In doing so, they use the Rules on the designation of protected areas of natural values [4], which specify the types of basic elements, fonts, graphical presentations, materials, construction, dimensions, method of construction of signs for protected areas and labelling of natural values. In Article 4 of the rules, a pictogram is defined as a sign "which draws attention to the rules […] relating to protected areas".

1.1. Perception of pictograms

Pictograms (also called pictographs) are visual messages that are present wherever we go. We encounter them in traffic, health care, schools, digital media, and so on. Pictograms are defined as stylized figurative images [5, 6] with several functions [5, 7]. Pictograms can replace words and written instructions expressing regulations, warnings and prohibitions. They are especially useful when information must be transferred quickly (e.g. traffic signs) or information is meant for users speaking different languages or have difficulty reading [5].

If we want to understand the meaning of a particular pictogram, we must be able to read it. The effectiveness of reading pictograms is dependent on their colour, shape and visual complexity [5]. Pictograms are most meaningful when placed in an authentic environment where they will be actually used. The environment forms part of the context, which is helpful in interpreting the meaning of a pictogram as it helps to reduce the pictogram's polysemy (to have multiple meanings). Studies have shown that increased levels of contextual information help in understanding the meaning of a pictogram [8–11]. In their study, Hämmeen-Anttilla et al. [12] found that perception of pictograms improves with age. The use of pictograms is especially recommended for people with lower levels of education, older people with vision problems, children and immigrants [10, 11].

Böcker [13] expressed the need for empirical research on how people understand pictograms. In order for pictograms to be adopted, they must attain a certain level of understanding. In accordance with International Organization for Standardization (ISO) 3864, 67% of people must understand a particular pictogram for it to be accepted and according to ANSI (American National Standards Institute), the level of understanding must be 85% [14]. Despite these international standards, pictograms are often used without being previously empirically verified [8, 15].

1.2. Protected areas

The International Union for Conservation of Nature (IUCN) defined a protected area as "a clearly defined geographical space, recognised, dedicated and managed, through legal or

other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values" [16]. Many protected areas, especially in highly populated areas, play an important role in ensuring people's direct contact with nature, where pristine natural environments are rare, scattered, and disappearing [17]. Ferreira [18] stated that the environmental integrity of many urban protected areas in developing countries is at risk and sees the opportunity in reaching out to people living close to them to spread the conservation message. Bent-Silva et al. [19] reported that approximately 60% of Brazilian middle and high school students from schools in communities near protected areas did not answer the question regarding the meaning of protected areas.

1.3. Perception of nature and protected areas among primary school students

Payne [20] reported that most of the Australian students in sixth grade conceived nature as living and nonliving things existing naturally in the external environment. Minimal human influence, interference or effect was identified as a primary characteristic of nature. Similar findings were reported for adults by Flogaitis and Agelidou [21]. Kellert [22] identified three stages in the development of children's perception of animals. The first transition is between ages six and nine, when changes in children's perception of animals primarily occur at the emotional level. This is followed by a transition between ages 10 and 13, when the cognitive level or knowledge and understanding of animals increases. The last transition occurs between ages 13 and 16, when increased attention is dedicated to ethical concerns and the ecological importance of animals and the natural environment in general. Based on this and other studies, Kellert [23] later designed a three-stage model of the development of attitudes towards nature in children and adolescents, which shows a transition from the initially utilitarian and dominionistic attitudes, via aesthetic, humanistic, symbolic, and scientistic attitudes, to moralistic and ecological attitudes.

Keliher [24] showed that 6–7-year-old children have well-formulated perceptions of nature and that different preschool and out-of-school experiences can determine the complexity and coherence of children's perceptual frameworks. The term nature by these 6–7-year-olds appears to have formed through their interaction with nature, children's literature and media (particularly television), and their schooling. Palmberg and Kuru [25] found that children participating in different informal educational programs such as hiking, adventure trails, field trips and camping, contributed to the development of definable emphatic relationship with nature, knowledge of and values concerning nature protection and a development of environmentally responsible actions and skills.

Ali [26] reported Kenyan primary school students' ideas of parks and wildlife; despite their importance in Kenya, primary school students showed a lack of scientific explanation and understanding of issues regarding wildlife and parks. On the other hand, for Portuguese Junior High School students in a suburban area, nature conservation was regarded as being more important than tourism or industry, but less than values related to public health [27]. Those students who had close contacts with wildlife and whose parents had higher education levels exhibited positive attitudes towards nature conservation. Similarly, Ferreira [18] found

that the educational programme in the Table Mountain National Park (South Africa) had a minimal impact on the learners' environmental knowledge and a reasonable impact on the pro-environmental attitudes.

1.4. Positive behavioural interventions and supports

Positive Behavioural Interventions and Supports (PBIS) is a general term that refers to positive behavioural interventions and systems used to achieve important behaviour changes and were first developed as an alternative to aversive interventions used with students with significant disabilities [28]. The primary goal of PBIS is to help an individual change his or her behaviour in a desired direction and enjoy improved quality of life [29]. When creating school rules, using wording that describes desired behaviours rather than undesired behaviours is a frequent recommendation [30]. For example, Hardman and Smith [31] and Kostewicz et al. [32] found empirical evidence that positively designed school rules, which communicate to students expected behaviours instead of prohibitions, influence positively on students' school behaviour. They report that highlighting prohibitions directs students' thinking on what they should not do and therefore their focus is more on inappropriate behaviours.

1.5. The aim and research questions

The aim of the research was to determine if and how Slovene students of fourth grade and fifth grade of primary school understand the role pictograms and comic strips displayed on information panels in protected areas plays in their understanding of acceptable and unacceptable human activities in such areas. In addition, their understanding of the concept of protected areas was explored.

The research questions were as follows:

1. How do Slovenian primary school students understand the concept of protected areas?
2. Do primary school students understand the meaning of pictograms displayed in protected areas?
3. Do primary school students who were exposed to pictograms highlighting expected (allowed, recommended) behaviours in the park differ in their understanding of acceptable and unacceptable human activities in such areas in comparison to those students who were exposed to pictograms highlighting prohibited behaviours in the park or to comic strip highlighting allowed and prohibited behaviours in the protected area through storytelling?

2. Method

2.1. Sample

Altogether, 353 students, 180 (51%) boys and 173 (49%) girls, participated in the study. Participating students were from seven different schools, all located in central Slovenia. A

total of 158 (44.8%) students attended fourth grade and 195 (55.2%) students attended fifth grade in primary school. The participating students were between 8 and 11 years of age.

2.2. Research design and instrument

The data collection took place from May to October 2015. The anonymous questionnaires were delivered during regular science classes in primary schools. Approval from the school head office was first acquired and if necessary, written parental consents were also gathered. The time given to students to complete the questionnaire was not limited.

Each student answered some demographic questions and wrote down a definition of a protected area in nature. Students' understanding of pictograms, which were to be later on used in the research, was tested. The results were compared with two standards, namely ISO 3864 and ANSI [14]. All used pictograms have reached the required standard of understanding (min. 89.0% and max. 99.1%). For our further analysis, only students' understanding about all pictograms displayed in **Figures 1** and **2** was measured.

This was followed by experimental design consisting of three treatment groups of students (**Figure 1**). Treatment groups of students were exposed to (1) pictograms highlighting allowed (recommended) behaviours in the protected area (positive pictograms), (2) pictograms highlighting prohibited behaviours in the protected area (negative pictograms) *or* (3) a comic strip highlighting allowed and prohibited behaviours in the protected area through storytelling. Students were randomly assigned to one of three treatment groups faced with a set of positive pictograms (**Figure 2**), negative pictograms (**Figure 3**), or comic strip (**Figure 4**) and asked to answer two open questions. These two questions asked them to write down an unlimited number of acceptable and unacceptable human behaviours in the Landscape Park Logarska valley where they had seen a set of positive pictograms, negative pictograms, or comic strip displayed (depending on the treatment group students were assigned to). The Landscape Park Logarska valley [33] was used as a realistic example of a protected area in Slovenia. According to the literature review, the contextual information helps to interpret the meaning of a pictogram as introduces its polysemy.

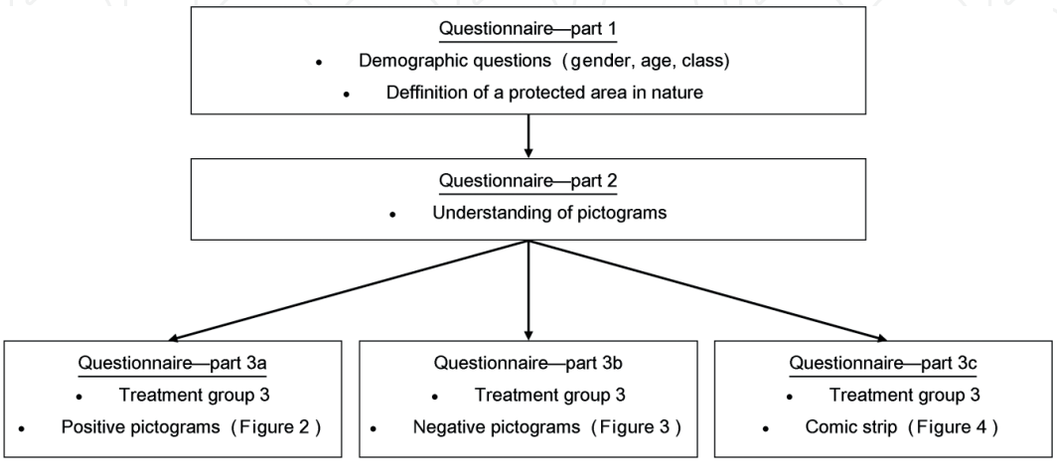


Figure 1. Research design and instrument.



Figure 2. Positive pictograms used in the experiment.



Figure 3. Negative pictograms used in the experiment.

2.3. Data analysis

Data entry and analysis were conducted using the Statistical Package for the Social Sciences (IBM SPSS Statistics). Basic descriptive statistics of numerical variables (mean, standard deviation, frequency and percentage) was employed. The inferential statistical methods used were ANOVA with post hoc Tukey test and partial η^2 was calculated for exploring the relationship between treatment groups.

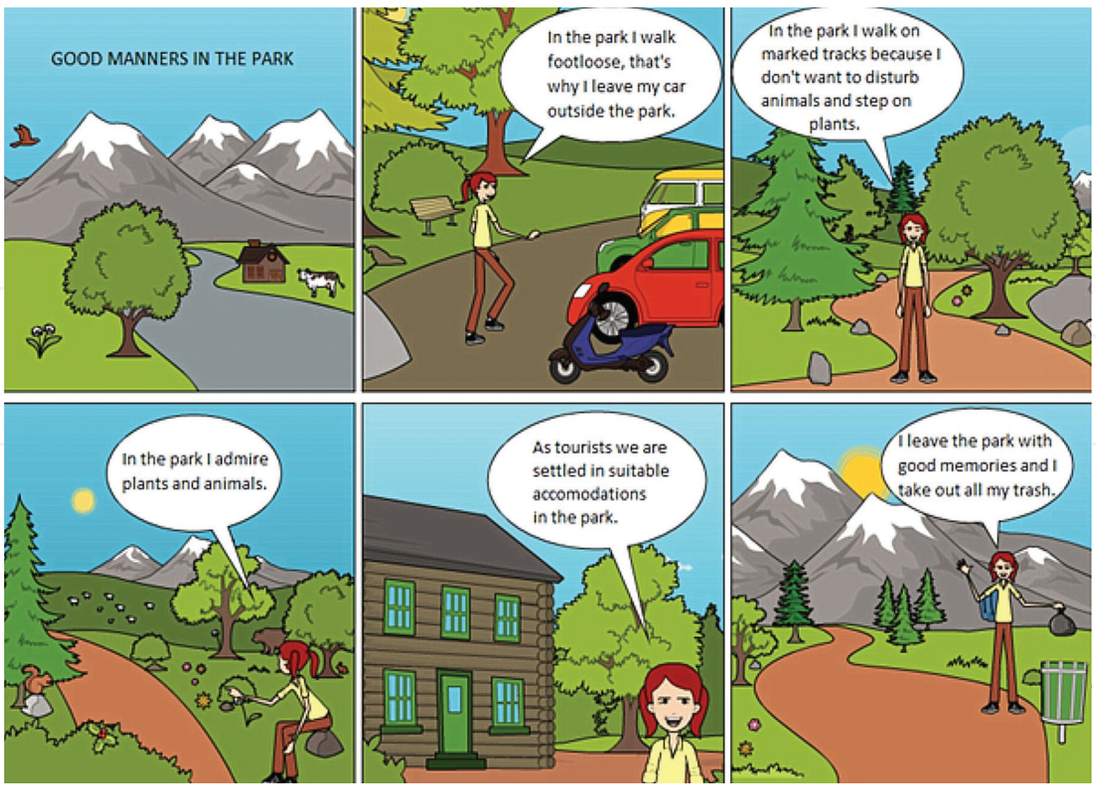


Figure 4. Comic strip used in the experiment (translation form Slovene).

3. Results

3.1. Students' perception of protected areas

Students were asked to define a protected area in nature. As presented in **Table 1**, 36.8% of students provided a satisfactory definition of a protected area (category D) that was in line with the definition of the IUCN [16]. Any answer that showed a student's understanding that protected areas are primarily established for nature conservation, plant and animal protection or similar were considered correct. The remaining students mostly only partially defined a protected area; by giving correct examples of protected areas (category C-14.4%) or focusing on rules, describing prohibited and allowed (recommended) human behaviours in protected areas (category B-30.2%). An 18.7% of students responded incorrectly (category A).

3.2. Acceptable behaviours in a protected area

Figure 5 presents how many, on average, acceptable human behaviours in protected areas students named in each group according to school year and gender. The treatment group faced with a set of positive pictograms named the highest number of acceptable human behaviours and the group faced with a set of negative pictograms named the lowest number. A three-way between subjects ANOVA showed that the main effects for school year and for all interactions were not significant. The main effect for this group was significant, F (2, 326) = 16.769, $p < 0.001$. The effect size was medium, $\eta^2 = 0.093$. A post hoc Tukey test showed that, with alpha at 0.05, the means for the positive pictograms and negative pictograms, for the positive pictograms and comic strip, and for the negative pictograms and comic strip were significant. Acceptable behaviours score means (and standard deviations) for the positive pictograms, negative pictograms, and comic strip were 4.21 (1.21), 3.09 (1.41), and 3.72 (1.74), respectively (**Figure 5**). The main effect for gender was significant, too, F (1, 326) = 14.476, $p < 0.001$. The effect size was small, $\eta^2 = 0.043$. Acceptable behaviours score means (and standard deviations) for males and females were 3.40 (1.50) and 3.97 (1.52), respectively.

Category	Description	*f*	*f* (%)
A	Answer is incorrect; for example, it describes city park, safe area, clean area, fenced area, an area with plants and animals, and so on.	65	18.7
B	Answer describes rules in protected areas, but it does not explicitly mention the purpose of these rules. Majority of mentioned rules are prohibitions (e.g. not allowed to litter, smoke, scream, pollute)	105	30.2
C	Answer describes examples of protected areas, for example, the Triglav National Park was the most common answer.	50	14.4
D	Answer describes rules and the purpose of protected areas. In the answer, they explicitly expressed at least once that this is an area primarily intended for nature conservation, animal and plant protection in different ways.	128	36.8

Table 1. Categorization of students' responses to the question asking them to define a protected area in nature.

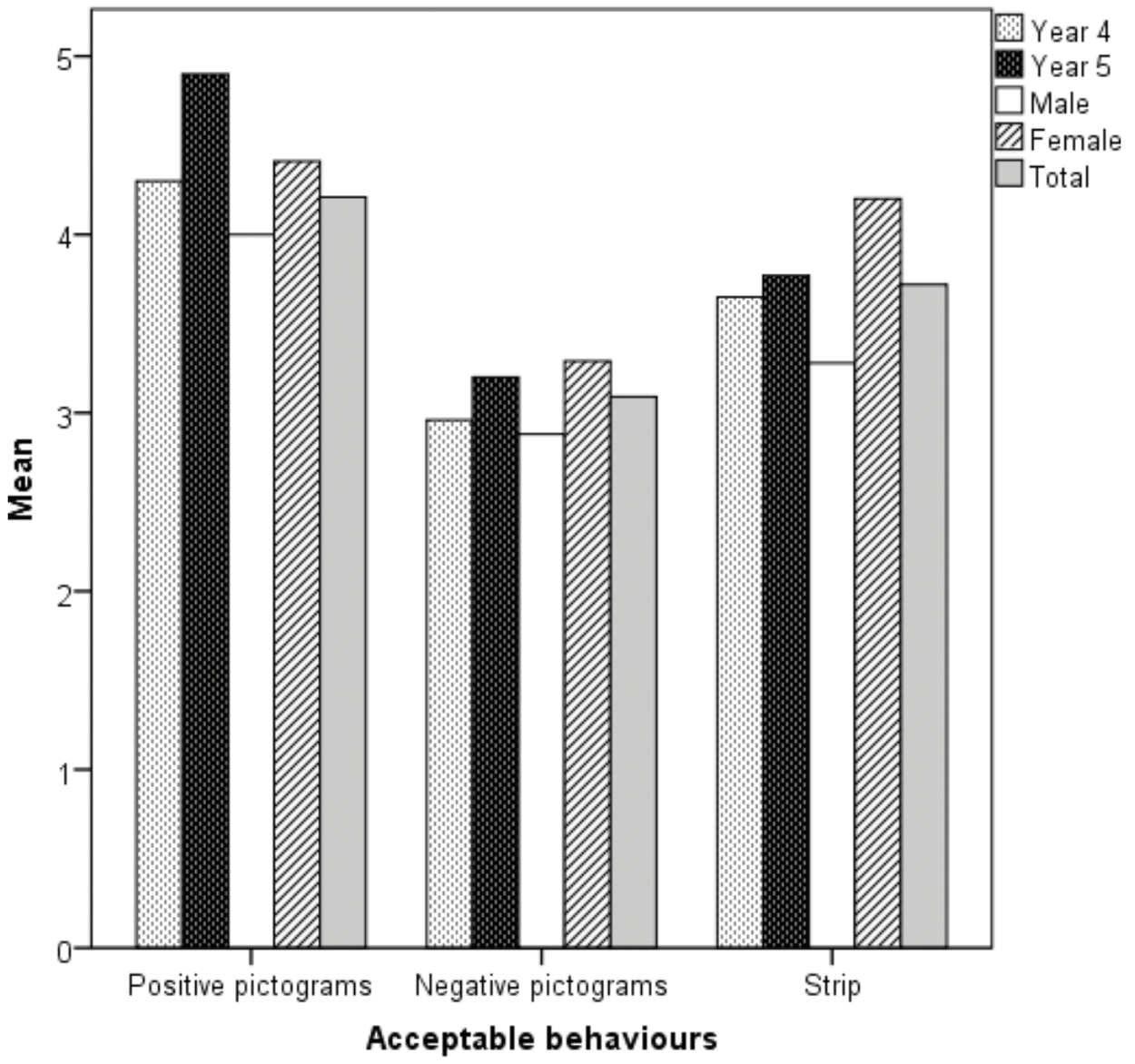


Figure 5. Means for the number of named acceptable human behaviours in protected areas for each treatment group according to school year, gender and in total.

3.3. Unacceptable behaviours in a protected area

Figure 6 presents how many, on average, unacceptable human behaviours in protected areas students named in each treatment group according to school year and gender. On the contrary to results presented for acceptable human behaviours in protected area, the group faced with a set of negative pictograms named the highest number of unacceptable human behaviours and the group faced with a set of positive pictograms named the lowest number. A three-way between subjects ANOVA showed that the main effects for gender and for all interaction were not significant. The main effect for this group was significant, F (2, 326) = 59.887, $p < 0.001$. The effect size was medium, $\eta^2 = 0.263$. A post hoc Tukey test showed that, with alpha at 0.05, the means for the positive pictograms and negative pictograms, for the positive pictograms and

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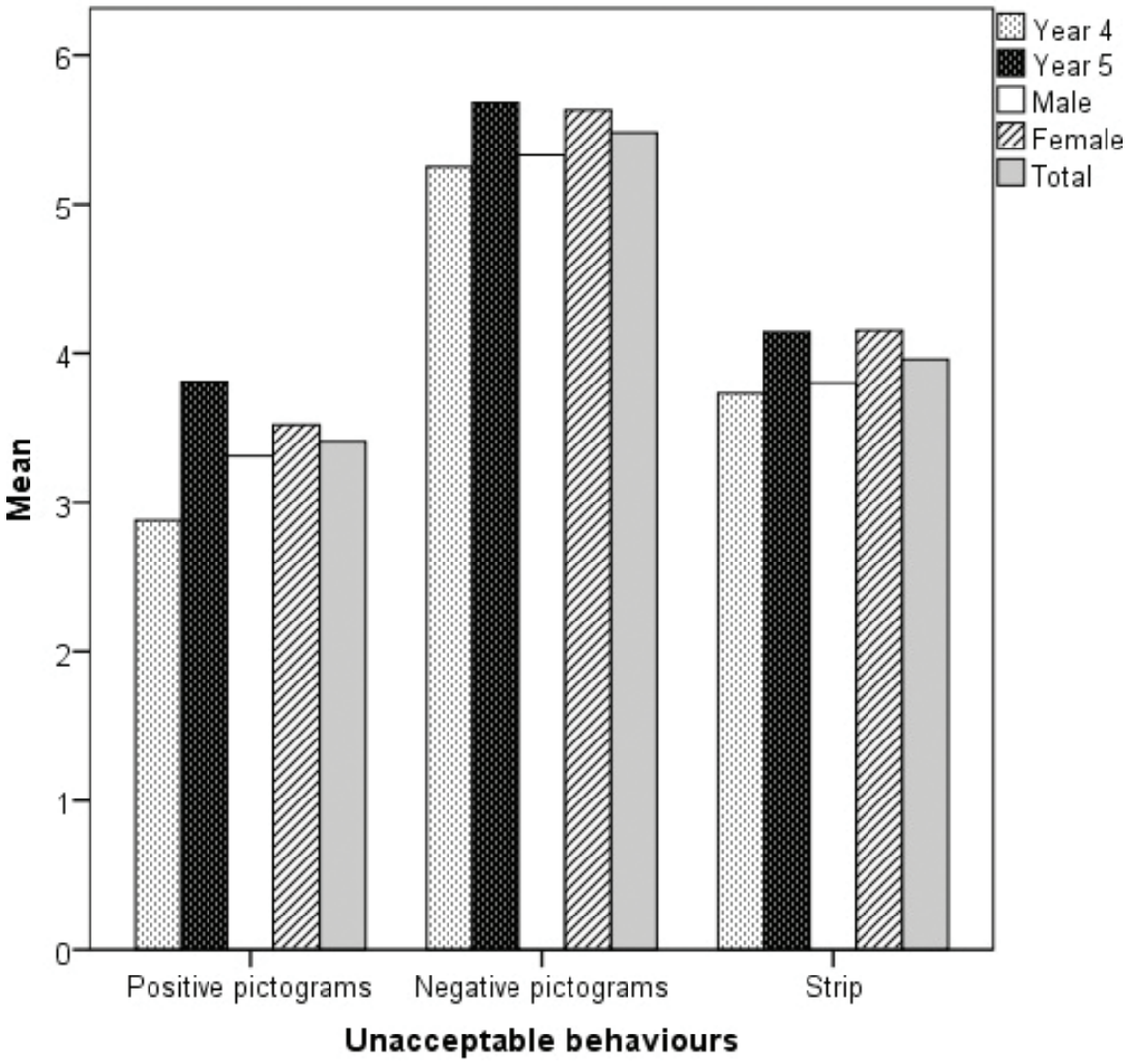


Figure 6. Means for the number of named unacceptable human behaviours in protected areas for each treatment group according to school year, gender and in total.

comic strip, and for the negative pictograms and comic strip were significant. Unacceptable human behaviours score means (and standard deviations) for the positive pictograms, negative pictograms, and strip were 3.41 (1.56), 5.48 (1.21), and 3.96 (1.73), respectively (**Figure 2**). The main effect for school year was significant, too, F (1, 326) = 13.436, $p < 0.001$. The effect size was small, $\eta^2 = 0.039$. Unacceptable behaviours score means (and standard deviations) for fourth and fifth grade were 5.25 (1.30) and 5.68 (1.08), respectively.

The ratio between the average number of named acceptable and unacceptable human behaviours in protected areas was calculated for each treatment group (**Table 2**). Of the total number of acceptable human behaviours, the number of negative human behaviours was subtracted. As it is evident from **Table 2**, the maximum difference in the number of acceptable and unacceptable behaviours was detected in the group faced with a set of negative pictograms. Analysis of variance showed significant differences between all three

Treatment groups	M	SD
Positive pictograms	0.760	1.808
Negative pictograms	−2.426	1.719
Comic strip	−0.309	1.759

Table 2. Means and standard deviation for the ratio between the number of named acceptable and unacceptable human behaviours in protected areas by treatment groups.

treatment groups of students, F (2, 1279) = 6.15, p = 0.002 and η^2 = 0.010. Post hoc analyses using Tukey test indicated a large difference between treatment groups faced with a set of positive and negative pictograms ($p < 0.001$, $\eta^2 = 0.451$), a medium difference between groups faced with a set of positive pictograms and comic strip ($p < 0.001$, $\eta^2 = 0.084$), and a large difference between groups faced with a set of negative pictograms and comic strip ($p < 0.001$, $\eta^2 = 0.272$).

4. Discussion and conclusion

The research findings confirm the results of previous studies (e.g. [19]) that the majority of school students do not possess sufficient knowledge about the meaning of protected areas in nature. Some confuse them with city parks and other areas that are clearly not established for the purpose of nature conservation. When describing human activities in protected areas, mainly prohibited ones were highlighted, like "no littering", "no smoking", "no polluting", "no access with cars and motorbikes", "no disturbing of animals", and so on. This shows that students do not have a clear idea what they should do in protected areas, what are desirable behaviours and actions and how they can benefit (cognitively, physically or emotionally) from being active in protected areas. They primarily see protected areas as places distant from their everyday lives and consequently distant from their mind and awareness. Ferreira [18] and Ali [26] pointed out some deficiencies in conservational communication and education.

The main aim of this research was to highlight the importance of proper conservational communication with park visitors (in this case with primary school students) through using visual messages. A variety of external representations, like pictograms, graphs, maps, and so on, is available to support students' understanding of concepts and processes [34]. Our findings show that big majority of students the meaning of pictograms displayed in protected areas. However, only a selection of pictograms was tested for understanding. Therefore, further studies are needed to investigate this issue. Research findings have also confirmed the main research question that students faced only with a set of positive pictograms perceived protected areas as areas where a number of human activities are acceptable, but they also at the same time knew which human activities were unacceptable in the park. Similar results were obtained for students faced with a comic strip. On the other hand, those faced only with a set of negative pictograms tended to be more preoccupied with listing unacceptable human activities and were able to list significantly fewer acceptable human activities in the

park. These findings confirm that rules visualized with pictograms, which communicate to students expected behaviours instead of prohibitions, influence positively on students' perception of behaviours and actions in the park. These findings are in line with PBIS framework and results of experimental studies, like Hardman and Smith [31] and Kostewicz et al. [32], that focused on positively designed school rules, which influenced positively on students' school behaviour.

To conclude, findings show that the design of information boards with pictograms or comic strips can greatly influence how a primary school student perceives a particular protected area, which is something park managers need to keep in mind when designing the information boards or in personal communication to visitors. Our next research will focus on young adults to test if they perceive the issues similarly to children.

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