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ORIGINAL PAPER

Graphic design of educational boards in forest – key to effective informal forest education

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ABSTRACT

The development of tourism, recreation and forest education is inextricably linked to the creation of specific infrastructure on forest lands. However, this infrastructure, especially concerning education, is not always fully functional. Growing expectations of the public in relation to the social functions of forests, make it necessary to monitor and also verify the content presented on educational boards, which are the basic equipment of educational trails. There is little literature on what criteria a model educational board should meet. Also, few works refer to the evaluation of ergonomics and usability of educational trails and elements of their equipment. The aim of this study is to evaluate the educational boards, taking into account recommendations concerning the functionality of the boards, referring mainly to the graphic design. A total of 89 educational boards were analyzed in the Regional Directorate of State Forests in Lublin in six forest districts. The first stage of the study was a field inspection of the current technical condition of educational boards on selected trails, together with photographic documentation of each piece of trail's equipment. Then, in an indoor setting, a grid was applied to each photo of the educational board using the Canva graphics program, so that the image was divided into 9 rectangles of equal size. Each rectangle was assigned number from 1 to 9 in order to analyze in which part of the board textual and graphic content is most often placed, and in which textual and graphic information is mixed. The results obtained were summarized in criterion tables, taking into account the percentage of each analyzed criterion on educational boards. Most of the boards were dominated by content in graphic form (48.32%), varied in size (58.43%) and presented with appropriate gaps (called light) (82.02%). Most educational boards also had a white background (52.81%). In the case of the application of the principle of tripartition, less than 39.33% of the educational boards complied with the requirement to present information in the central part of the board in graphic form. All analyzed boards respected the requirements of the so-called law of proximity. The principle of tri-division is one of the key elements allowing to maintain and keep the attention of people visiting forest trails. The consequence of not applying this rule may be a lower interest of forest users in the content presented on boards, which nullifies the effort put in spreading forest education.

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KEY WORDS

graphic composition, educational board, educational trails, educational infrastructure, graphics, text

Introduction

Forest is one of the fundamental elements of recreational (Janeczko, 2010) and educational space (Kosmider and Greczuk, 2013). Many researchers indicate that the combination of education with activity and recreation in a natural environment such as a forest commences to bring greater benefits to physical and mental health and is more effective compared to traditional teaching (in classrooms) (Burdette and Whitaker, 2005; Rea and Waite, 2009; James *et al*., 2010; Dadvand *et al*., 2015).

The basic form of forest education is field classes conducted on specially selected and adapted educational trails (Report, 2020). Educational trails in Polish forests are a common element, found in all national parks and each of the forest districts of the The State Forests National Forest Holding. Many studies indicate that such facilities provide a unique opportunity to explore, observe and gain knowledge about the natural environment (Janeczko and Staniszewski, 2013; Kosmider and Greczuk, 2013; Švajda and Činčera, 2017; Singer-Brodowski *et al*., 2019). In the case of active forms of education, the role of the educator/trainer, who through conversation brings closer and explains the relationships occurring in nature, also turns out to be essential (Ap and Wong, 2001; Kerley *et al*., 2003).

Educational boards are almost always the basic equipment of educational trails. They are meant to help forest educators in conducting forest education classes. They are locations, at which the educator can stop and further explain certain phenomena and processes occurring in the environment. Unfortunately, in the case of passive forms of education, i.e. walks along educational trails without an educator, understanding of the educational content placed on the boards can be problematic due to the use of specialist forest terminology or unattractive, incoherent, difficult to read and communicate board design. Despite numerous studies indicating the need for a broader look at the problem of educational board design (Janeczko, 2010; Nowacka, 2011; Janeczko and Staniszewski 2013; Sitko, 2015; Snopek, 2015), still little is known about this topic.

According to Davis and Thompson (2011), educational boards support the learning process and, with proper design, can contribute to increased environmental awareness and greater acceptance of foresters' actions. Learning the environment by freely choosing the material to be learned provides better benefits compared to formal learning (Falk, 2005; Kola-Olusanya, 2005). Research by Hughes and Morrison-Saunders (2002) indicates that visitor's knowledge and satisfaction levels increase with the use of roadside interpretive signs placed along recreational trails. According to Tsang *et al*. (2011), educational signs can play a key role in changing visitor attitudes and behaviors.

The reception of the message presented on the educational board should be adapted to the universal principles of human perception of images. Tatarska (2013), Walker and Moscardo (2014) emphasize that knowledge of the psychology of perception, memory mechanisms and the ability to look at the message through the eyes of the recipient (taking into account his/her age) are necessary for this purpose. At this stage, as noted by Scaglione *et al*. (2013), it is very important to exclude unnecessary information that, in the case of whiteboards, may disrupt the message, or „take space" from other relevant more valuable content.

According to Beaird (2007), all graphic design principles are derived from the rule of tri--division. In practice, it boils down to using a grid to arrange relevant elements in a harmonious and coherent manner. The tri-division rule (strong point/powerful point) allows to arrange objects adequately to users' visual capabilities. The grid of intersecting lines indicates 4 points

of the composition of the so-called strong image, which are located in the central part of the board, according to the properties of the human eye (Benicewicz-Miazga *et al.*, 2011). However, as Ruta (2009) points out, the most interesting point should be placed about 1/3 from the left edge of the board, which corresponds to the direction of image perception. On the other hand Leszkowicz (2011) points out that visual messages are perceived as group parts when we apply to them an appropriate composition as stated by the law of proximity. According to which many elements related to each other, with similar themes, should be placed not far from each other in order to form a coherent whole, not to introduce unnecessary chaos on the board, and thus to enable the recipient to focus on a specific piece of information.

When designing a whiteboard, it is important to keep in mind that the reception of information should be as good as possible, which requires considering in what form, textual or graphic (using, pictograms, figures, photos) the issue is to be presented. According to Clawson *et al.* (2012) and González-Miranda and Quindós (2016), this approach to composing a whiteboard improves the speed of content transfer. Varying the size of the images/drawings/ pictograms and the use of spacing between them, known as light, promotes optimal readability of the text and makes the reception of the information more attractive (Munksgaard *et al.*, 2001; Calori and Vanden--Eynden, 2015). Munksgaard *et al.* (2001) point out that background is also an important element that determines the 'strength' of the message. Intense graphics can distract from the most important information on the board. According to Tatarska (2013), the background should be white to enhance the perception and transmission of information. Presenting textual or graphic content on a white background is a form of communication to which people are already accustomed in the course of cultural evolution (Kahn and Lenk, 1998; Gabbard, 2006; Vanderschantz *et al.*, 2012).

At the core of our research was the question of whether the above-mentioned principles, rules and guidelines are reflected in the case of educational boards, so commonly found in Polish forests.

Our research has both cognitive and practical implications. They allow to fill the gap in the knowledge about the graphic design of materials supporting informal forest education. In practice, the results can be useful in designing educational materials, including outdoor tourist and recreational infrastructure. They will be a guideline for land managers, designers, foresters, educators and naturalists, who care that the communication message reaches the audience and, as a result, arouse interest in the forest, nature, increase understanding and acceptance of the activities undertaken by foresters.

Methodology

Study area. The research area was 6 educational trails located in Forest Districts: Chotyłów, Mircze, Sarnaki, Świdnik, Janów, Kraśnik (Fig. 1). These were forest district, which in 2018 conducted the largest number of educational activities on their trails that are intensively used by inhabitants of this region, of the Poland. The above-mentioned forest districts are part of the Regional Directorate of State Forests in Lublin. A total of 89 boards, which are equipment of the above-mentioned trails, were analyzed.

Study procedure. The first stage of the study was to check the current condition of the educational boards on the selected trails. The inventory was conducted in April 2019. All the boards were in very good technical condition and did not bear traces of vandalism. The boards were photographed from a distance of 1-1.5 m. The photograph was taken horizontally with a Nikon D350 + AF-P DX 18-55 VR camera, at a fixed focal length of 2.8 in the same weather conditions, at a similar time of day (afternoon hours). Figure 2 shows an example of educational boards located on educational trails.

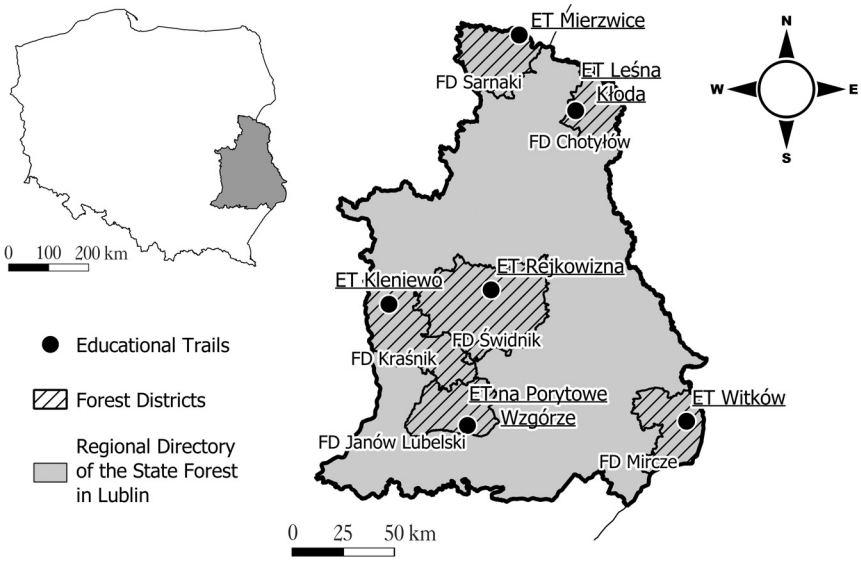
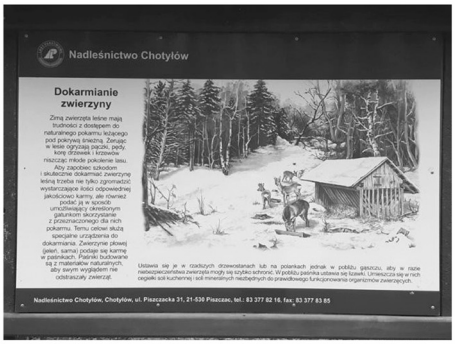


Fig. 1.
Map with location of analyzed educational trails

No use of light between graphics
on the educational board

Using graphics as a background
on an educational board



Use of a white background and one large graphic
on an educational whiteboard

Using light between graphics
on an educational whiteboard

Fig. 2.
Example photos of the analyzed educational boards

The documentation made it possible to proceed to the next stage of research. As part of the on-site tests, the following were checked: what are the proportions of text to graphics, whether various sizes of photos/charts/ pictograms were used and whether the so-called light between them was preserved. Additionally, the background colors of the educational boards were evaluated. The next step was the analysis of the board's compositional elements. Using the Canva graphic software (available at: https://www.canva.com/), using a 16:9 template (1920:1080 pixels), a grid was placed on each photograph, allowing to divide the image into geometrically equal fields (Fig. 3). Each of the rectangles was given number from 1 to 9, in order to analyze in which part of the whiteboard textual, graphic and mixed (simultaneously textual and graphic – the law of proximity) content is most often placed, and it allowed to determine in what form the content is presented in the central part of the whiteboard (the rule of tripartition). Each rectangle was counted separately. The content that was in a given field was assigned to one of three categories (text, graphics, text and graphics together).

The raw data obtained from the analysis of educational boards were used for statistical analyses. Statistica 13.3 PL program (TIBCO, 2017) was used for statistical calculations. The starting point for data analysis was to tabulate the data by taking into account the percentage of each criterion analyzed on the educational boards.

Results

Educational boards were largely (48.32%) dominated by content in graphic form. Textual content outweighed graphics on 29.21% of the boards. There was an equal amount of text and graphics on 20.22% of the boards. Only 2.25% of the boards had text content without any graphics. Among the analyzed boards, there were no boards that presented the information solely through graphics (Table 1).

The majority of the boards (58.43%), presented a variety of graphics in terms of size, leaving light between the illustrations (82.02%). The background on over 52.81% of the boards was

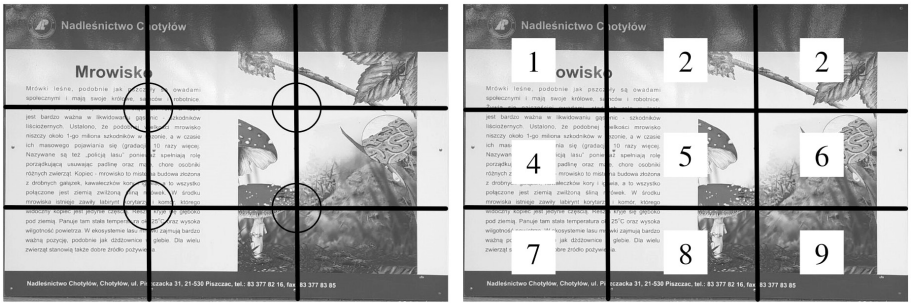


Fig. 3.

Example of application of the grid enabling analysis of the tri-division rule and the law of proximity on educational boards

Table 1.

Analysis of the compositional elements of the educational boards

	Number of boards [%]
The advantage of graphics over text	48.32
The prevalence of text over graphics	29.21
Equal amounts of text and graphics	20.22
Text alone	2.25

color white. Only on 22.47% of the educational boards, graphics were used as background (Table 2).

For 39.33% of all boards, graphic information was presented in the central part of the boards in fields number 5 (rule of threes). On 31.46% of the charts, textual content was presented in fields 5, in the central part of the chart, and only on 29.21% of the educational charts textual and graphic content (combined) was presented in fields 5.

The law of proximity was observed on all boards. Figure 4 shows the percentage distribution of graphics placed on educational boards in relation to the whole board. In almost 70% of educational boards (67.42%), the most common graphical content was presented in the bottom right corner in field number 9. The least common graphical content was presented in fields number 1 and 2 (32.58%).

In case of 61.78% of the boards, the text content was most often presented on the left side of the board, in the upper right corner (box number 1 – 61.78%). The smallest amount of text content was presented in field number 6, on the right side of the board (22.47%) (Fig. 5).

Considering the combined representation of text and graphics on educational boards, the percentage distribution of the contribution of both forms of communication was minor but even (Fig. 6).

Table 2.

Analysis of graphic elements present on educational boards

	Yes [%]	No [%]
Variable graphic size	58.43	41.57
Light between images	82.02	17.98
White background color	52.81	47.19
Whether a graphic was used as a background	22.47	77.53

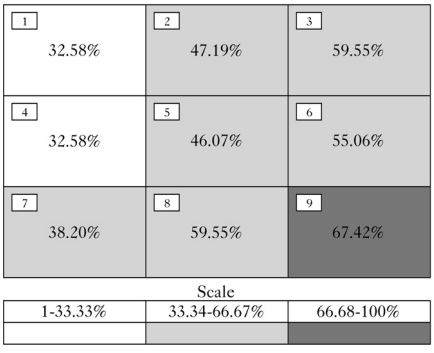


Fig. 4.

Analysis of the law of proximity on educational boards for graphic elements

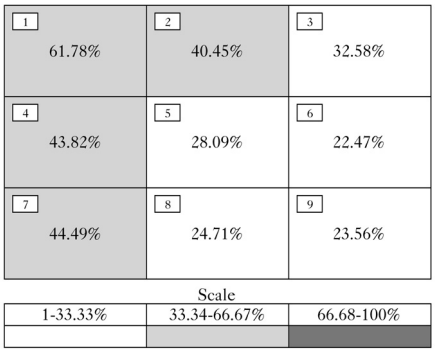


Fig. 5.

Analysis of the law of proximity on educational boards for text elements

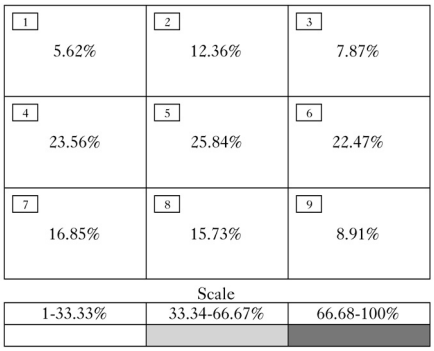


Fig. 6.
Analysis of the law of proximity on educational boards for text and graphic elements

Discussion

Educational boards are used in many places, both in built-up, museum-exhibition and open spaces, such as city parks and forests. They can be found both in the vicinity of culturally valuable objects, as well as those important from the point of view of nature conservation. A board skillfully designed, properly integrated into the environment helps to enrich the experience of visitors to a given area and develops ecological awareness (Munksgaard *et al*., 2001; Moscardo *et al*., 2004). The purpose of the message is to help people understand the relationship between ecology, the cultural environment and the role of humans in nature (Munksgaard *et al*., 2001). However, as Falk (2005) points out, visitors using educational displays learn through their own motivation and interests, often the learning process is self-directed, learning is voluntary and non-sequential. Davis and Thompson (2011) indicate that the time spent learning the content of interpretive signs depends largely on the interests of the audience. Švajda and Činčera (2017) clearly indicate that poor board design may be the reason for the relatively low level of attracting and maintaining forest users' attention at educational boards. Educational boards that are overloaded with information that is conveyed in text form do not have a high attraction power (Švajda and Činčera, 2017). In addition, research by Korcz and Janeczko (2022), indicates that respondents prefer educational boards that have content in graphic form rather than text. Principles of graphic design applied, for example, in marketing, referring to the rule of tri-division state that the use of graphics in the middle of an advertisement or poster can determine the retention of the recipient's attention (Powell, 2012; Rosli, 2018). Unfortunately, in the case of our study, less than 39.33% of all boards, in the central part, contained information presented in graphic form. It is worth mentioning that the educational boards analyzed by us, were used in the study of Korcz and Janeczko (2022), where forest users, during the activities with a forest educator on educational trails, paid attention to a small number of boards. Therefore, the study of Powell (2012) and Rosli (2018), may provide some guidance that supports the need to place graphics in the center of the board. Additionally, Zhu *et al.* (2021), indicate that the use of visuals affects communication through the visitor's intention to read the signage, enjoyment of reading interpretive information, comprehension, and ease of recall of information presented on the signage.

On the other hand, Serrell (1996) suggests that the combination of words and images, rather than text alone, makes signs more meaningful and memorable. In this context, our results indicate that the educational boards in the analysed forest districts of the Regional Directorate of State Forests in Lublin are properly designed. Many of them are distinguished by the presence of photographs, drawings, pictograms (48.32% of boards) (Table 1). About 20.22% of the boards are characterized by a balanced proportion of text to graphics (Table 1). Interestingly, about 58.43%

of the analysed tables are characterised by different sizes of presented graphics, which can also be considered as a correct measure. A certain shortcoming is the fact that only on 52.81% of the boards the information was presented on a white background, and as many as 22.47% of the boards used graphics as a background (Table 2). This is because, as Snopek (2015) notes, the use of graphics of varying sizes diversifies the perception of information and presenting them on a white background enhances perception allows the colour strategy to best fit the visual needs of the information message because it creates contrast with other colours (Munksgaard *et al.*, 2001).

The results of our study indicate that the law of proximity on educational boards is preserved. Information in graphical form is presented on the left side of the board (Fig. 4), while textual information is presented on the right side (Fig. 5). This way of graphical composition can also be assessed as correct. Johnson and Mayer (2012) point out that grouping information is very important, because numerous eye movements in the case of scattered text can make the recipient feel tired and reluctant to read this type of message. On the other hand, Yu *et al.* (2010) report that grouped content with light improves text reading. According to Cole *et al.* (1997), the need for simplicity is the best way to convey information. By placing a lot of information on an educational board, trying to convey information in detail and very precisely, we confuse the audience because not all the content the potential viewer will focus on (Munksgaard *et al.*, 2001).

As postulated by Snopek (2015), it is necessary to increase the involvement of professional naturalists over the content of the boards. To make the design of the board effective, interesting, not overwhelming already at the design stage requires the cooperation of specialists from many fields, going even beyond the competence of a comprehensively prepared geographer. The research carried out in this direction will allow to increase the attractiveness of educational trails, which in turn should lead to an increase in social interest in the organization of new educational facilities and thus should affect the effectiveness of informal forest education in woodland.

Conclusions

Most of the educational boards we analyzed are correctly designed. Detailed analysis of the boards' compositional elements indicated that:

- on the few number of educational boards, in the very center of the board the content was presented in graphic form, which may have a negative impact on the power of drawing and keeping the attention of forest users in front of the boards;
- the information presented both in graphic and text form were properly grouped, which should improve the reception of the message and information;
- the analysis of the graphic elements of the boards indicated the correct application of graphic design principles for better communication;
- further research is needed on the more specific compositional, textual and graphic elements of the educational boards, which will allow the development of basic criteria, to create a model educational board.

Authors' contributions

N.K. – investigation, conceptualization, data curation, methodology, analysis, writing-original design, visualization; E.J. – methodology, investigation, analysis, writing review and editing.

Conflicts of interest

The authors declare no conflicts of interest.

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References

Ap, J., Wong, K.K., 2001. Case study on tour guiding: Professionalism, issues and problems. *Tourism management*, 22: 551-563. DOI: https://doi.org/10.1016/S0261-5177(01)00013-9

Beaird, J., 2007. Artystyczne projektowanie stron internetowych. Lublin: Power Net, 208 pp.

Benicewicz-Miazga, A., Klauziński, E., Góra-Klauzińska, A., 2011. Cyfrowa fotografia panoramiczna. Gliwice: Helion, 216 pp.

Burdette, H.L., Whitaker, R.C., 2005. Resurrecting free play in young children: looking beyond fitness and fatness to attention, affiliation, and affect. *Archives of Pediatrics and Adolescent Medicine*, 159 (1): 46-50. DOI: https://doi.org/10.1001/archpedi.159.1.46

Calori, C., Vanden-Eynden, D., 2015. Signage and wayfinding design: a complete guide to creating environmental graphic design systems. Hoboken: John Wiley & Sons, 320 pp.

Clawson, T.H., Leafman, J., Nehrenz, Sr., G.M., Kimmer, S., 2012. Using pictograms for communication. *Military medicine*, 177 (3): 291-295. DOI: https://doi.org/10.7205/MILMED-D-11-00279.

Cole, D.N., Hammond, T.P., McCool, S.F., 1997. Information quantity and communication effectiveness: Low-impact messages on wilderness trailside bulletin boards. *Leisure Sciences*, 19 (1): 59-72. DOI: https://doi.org/10.1080/01490409709512239.

Dadvand, P., Nieuwenhuijsen, M.J., Esnaola, M., Forns, J., Basagaña, X., Alvarez-Pedrerol, M., Sunyer, J., 2015. Green spaces and cognitive development in primary schoolchildren. *Proceedings of the National Academy of Sciences*, 112 (26): 7937-7942. DOI: https://doi.org/10.1073/pnas.1503402112.

Davis, S.K., Thompson, J.L., 2011. Investigating the impact of interpretive signs at neighborhood natural areas. *Journal of Interpretation Research*, 16 (2): 55-66. DOI: https://doi.org/10.1177/109258721101600205.

Falk, J.H., 2005. Free-choice environmental learning: Framing the discussion. *Environmental Education Research*, 11: 265-280. DOI: https://doi.org/10.1080/13504620500081129

Gabbard, J.L., Swan, J.E., Hix, D., 2006. The effects of text drawing styles, background textures, and natural lighting on text legibility in outdoor augmented reality. *Presence*, 15 (1): 16-32. DOI: https://doi.org/10.1162/pres.2006.15.1.16.

González-Miranda, E., Quindós, T., 2016. Projektowanie ikon i piktogramów. Kraków: d2d.pl, 144 pp.

Hughes, M., Morrison-Saunders, A., 2002. Impact of trail-side interpretive signs on visitor knowledge. *Journal of Ecotourism*, 1 (2-3): 122-132. DOI: https://doi.org/10.1080/14724040208668119.

James, J.J., Bixler, R.D., Vadala, C.E., 2010. From play in nature, to recreation then vocation: A developmental model for natural history-oriented environmental professionals. *Children Youth and Environments*, 20 (1): 231-256. DOI: http://dx.doi.org/10.7721/chilyoutenvi.20.1.0231

Janeczko, E., 2010. Ścieżki edukacyjne jako element rekreacyjnego zagospodarowania lasu. *Studia i Materiały Centrum Edukacji Przyrodniczo-Leśnej*, 1 (24): 100-144.

Janeczko, E., Staniszewski, P., 2013. Leśne ścieżki edukacyjne a problematyka użytkowania lasu. *Studia i Materiały Centrum Edukacji Przyrodniczo-Leśnej*, 34 (1): 137-144.

Janeczko, E., Wojtan, R., Korcz, N., Woźnicka, M., 2021. Interpretative signs as a tool supporting informal environmental education on the example of Warsaw's urban forests. *Forests*, 12 (8): 1091. DOI: https://doi.org/10.3390/f12081091.

Johnson, C.I., Mayer, R.E., 2012. An eye movement analysis of the spatial contiguity effect in multimedia learning. *Journal of Experimental Psychology: Applied*, 18 (2): 178. DOI: https://doi.org/10.1037/a0026923.

Kahn, P., Lenk, K., 1998. Design: principles of typography for user interface design. *Interactions*, 5 (6): 15. DOI: https://doi.org/10.1145/287821.287825.

Kerley, G.I., Geach, B.G., Vial, C., 2003. Jumbos or bust: do tourists' perceptions lead to an under-appreciation of biodiversity? *South African Journal of Wildlife Research*, 33 (1): 13-21.

Kola-Olusanya, A., 2005. Free-choice environmental education: understanding where children learn outside of school. *Environmental Education Research*, 11 (3): 297-307. DOI: https://doi.org/10.1080/1350462050081152.

Korcz, N., Janeczko, E., 2022. Forest education with the use of educational infrastructure in the opinion of the public-experience from Poland. *Sustainability*, 14 (3): 1-18. DOI: https://doi.org/10.3390/su14031915.

Kosmider, J., Greczuk, M., 2013. Las jako miejsce odpoczynku, rekreacji oraz edukacji. *Studia i Materiały Centrum Edukacji Przyrodniczo-Leśnej*, 1 (34): 314-318.

Leszkowicz, M., 2011. Infografika jako forma edukacji w kulturze wzrokocentrycznej. *Neodidagmata*, 31/32: 37-55.

Moscardo, G., Woods, B., Saltzer, R., 2004. The role of interpretation in wildlife tourism. In: K. Higginbottom, ed., *Wildlife tourism: Impacts, management and planning*. Common Ground Publishing, pp 231-251.

Munksgaard, A., Blichfeldt, S., Friis, L., 2001. Tablice informacyjne i foldery w edukacji przyrodniczej: podręcznik o sposobach komunikacji. Rogów: Leśny Zakład Doświadczalny SGGW – Centrum Edukacji Przyrodniczo-Leśnej, 54 pp.

Nowacka, W., 2011. Projektowanie leśnej przestrzeni turystycznej z punktu widzenia niepełnosprawnego użytkownika. *Studia i Materiały Centrum Edukacji Przyrodniczo Leśnej*, 1 (26): 30-39.

Powell, K., 2012. Presentations: billboard science. *Nature*, 483 (7387): 113-115. DOI: https://doi.org/10.1038/nj7387-113a

Report, 2020. Raport z działalności edukacyjnej Lasów Państwowych 2019. Warszawa: Centrum Informacyjne Lasów Państwowych, 65 pp. Available from https://www.lasy.gov.pl/pl/informacje/publikacje/informacje-statystyczne-i-raporty/raporty-z-dzialalnosci-edukacyjnej-lasow-panstwowych/raport-z-dzialalnosci-edukacyjnej-lp-2019.pdf/view [accessed 21.01.2022]

Rea, T., Waite, S., 2009. International perspectives on outdoor and experiential learning. *Education* 3-13, 37 (1): 1-4. DOI: https://doi.org/10.1080/03004270802291699.

Rosli, H., 2018. the element of poster design: content visual analysis of Malaysian's health campaign poster. *International Journal of Multidisciplinary Thought*, 7 (3): 305-316.

Ruta, P., 2009. Fotografia prasowa. Wybrane aspekty praktyczne. *Rocznik Prasoznawczy*, 3: 139-147.

Scaglione, J., Meseguer, L., Henestrosa, C., 2013. Jak projektować kroje pisma: od szkicu do ekranu. Kraków: d2d.pl, 144 pp.

Serrell, B., 1996. Exhibit labels: An interpretive approach. Walnut Creek, CA: Alta Mira Press, 378 pp.

Singer-Brodowski, M., Etzkorn, N., Von Seggern, J., 2019. One transformation path does not fit all – insights into the diffusion processes of education for sustainable development in different educational areas in Germany. *Sustainability*, 11 (1): 269. DOI: https://doi.org/10.3390/su11010269.

Sitko, G., 2015. Dokumentacja wzorcowej ścieżki przyrodniczej. Rzeszów: Stowarzyszenie na Rzecz Rozwoju i Promocji Podkarpacia „Pro Carpathia", 36 pp.

Snopek, A., 2015. Tablice informacyjne w lasach i na obszarach chronionych jako narzędzie edukacji – wykorzystana szansa? *Studia i Materiały Centrum Edukacji Przyrodniczo-Leśnej*, 45 (4): 209-215.

Švajda, J., Činčera, J., 2017. Evaluation of the attention capture and holding power of interpretive signs among visitors to a self-guided trail in the High Tatras National Park (Slovakia). *Envigogika*, 12 (2): 1-14. DOI: https://doi.org/10.14712/18023061.549

Tatarska, J., 2013. Rola koloru w reklamie prasowej. In: A. Wiśniewska, A. Frontczak, eds, *Reklama wizualna*, Warszawa: Wyższa Szkoła Promocji, pp. 24-61.

TIBCO Software Inc., 2017. Statistica (data analysis software system), version 13. http://statistica.io.

Tsang, N.K., Yeung, S., Cheung, C., 2011. A critical investigation of the use and effectiveness of interpretive services. *Asia Pacific Journal of Tourism Research*, 16 (2): 123-137. DOI: https://doi.org/10.1080/10941665.2011.556336.

Vanderschantz, N., Timpany, C., Hill, A., 2012. Children's reading of text on interactive whiteboards. In: *Proceedings of the 24th Australian Computer-Human Interaction Conference*, pp. 624-632. DOI: https://doi.org/10.1145/2414536.2414631.

Walker, K., Moscardo, G., 2014. Encouraging sustainability beyond the tourist experience: ecotourism, interpretation and values. *Journal of Sustainable Tourism*, 22 (8): 1175-1196. DOI: https://doi.org/10.1080/09669582.2014.918134.

Yu, D., Park, H., Gerold, D., Legge, G.E., 2010. Comparing reading speed for horizontal and vertical English text. *Journal of Vision*, 10 (2): 21-21. DOI: https://doi.org/10.1167/10.2.21.

Zhu, L., Davis, L. S., Carr, A., 2021. A picture is not always worth a thousand words: The visual quality of photographs affects the effectiveness of interpretive signage for science communication. *Public Understanding of Science*, 30 (3), 258-273. DOI: https://doi.org/10.1177/0963662520982535.

STRESZCZENIE

Projekt graficzny tablic edukacyjnych w lesie – klucz do skutecznej nieformalnej edukacji leśnej

Rozwój turystyki, rekreacji i edukacji leśnej jest nierozerwalnie związany z tworzeniem określonej infrastruktury na terenach leśnych. Jednak infrastruktura ta, zwłaszcza dotycząca edukacji, nie zawsze jest w pełni funkcjonalna. Rosnące oczekiwania społeczeństwa w stosunku do społecznych funkcji lasów powodują konieczność monitorowania, a także weryfikowania treści prezentowanych na tablicach edukacyjnych, które stanowią podstawowe wyposażenie tras edukacyjnych. Literatura dotycząca kryteriów, które powinna spełniać wzorcowa tablica edukacyjna, jest nie-

liczna. Również niewiele prac odnosi się do oceny ergonomii i użyteczności tras edukacyjnych oraz elementów ich wyposażenia, m.in. tablic edukacyjnych. Celem pracy była ocena tablic edukacyjnych pod względem ich funkcjonalności, głównie w kontekście ich szaty graficznej. Łącznie przeanalizowano 89 tablic edukacyjnych w Regionalnej Dyrekcji Lasów Państwowych w Lublinie w 6 nadleśnictwach: Chotyłów, Mircze, Sarnaki, Świdnik, Janów, Kraśnik (ryc. 1). Pierwszym etapem badań był przegląd aktualnego stanu technicznego tablic edukacyjnych na wybranych szlakach. Sporządzono dokumentację fotograficzną każdej tablicy edukacyjnej (ryc. 2). Zdjęcia tablic wykonywano poziomo, tym samym sprzętem fotograficznym, z odległości około 1-1,5 m od tablicy, w godzinach popołudniowych, w tych samych warunkach pogodowych. Następnie w warunkach kameralnych na każde zdjęcie tablicy edukacyjnej naniesiono siatkę za pomocą programu graficznego Canva. Obraz podzielono na 9 prostokątów o jednakowej wielkości. Każdemu prostokątowi przypisano numery od 1 do 9 w celu przeanalizowania, w której części tablicy najczęściej umieszczane są treści tekstowe i graficzne, a w których polach tablicy informacje tekstowe i graficzne są wymieszane (ryc. 3). Uzyskane wyniki zestawiono w tabelach liczebności, biorąc pod uwagę procentowy udział każdego z analizowanych kryteriów na tablicach edukacyjnych. Na większości tablic dominowały treści w formie graficznej (48,32%) (tab. 1), zróżnicowane pod względem wielkości (58,43%) oraz prezentowane z odpowiednimi przerwami (82,02%) (tab. 2). Większość tablic edukacyjnych miała również białe tło (52,81%) (tab. 2). W przypadku stosowania zasady trójpodziału niespełna 39,33% tablic edukacyjnych spełniło wymóg prezentowania informacji w centralnej części tablicy w formie graficznej. Wszystkie analizowane zasady respektowały wymogi tzw. prawa bliskości (ryc. 4-6). Zasada trójpodziału jest jednym z kluczowych elementów pozwalających na zatrzymanie i utrzymanie uwagi osób odwiedzających trasy leśne. Konsekwencją niestosowania tej zasady może być mniejsze zainteresowanie użytkowników lasu treściami prezentowanymi na tablicach, co niweczy wysiłek włożony w szerzenie edukacji leśnej.