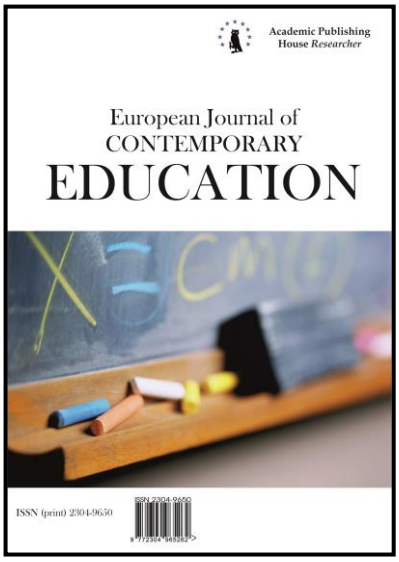
Published in the Slovak Republic
European Journal of Contemporary Education
E-ISSN 2305-6746
2019, 8(3): 550-561
DOI: 10.13187/ejced.2019.3.550
www.ejournal1.com



Educational Potential of Educational Trails in Terms of Their Using in the Pedagogical Process (Outdoor Learning)

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Abstract

Educational trails are marked in landscape by tourist or excursion routes of varying lengths, content focus and technical realization. The aim of the study was to create the method of evaluating the usability of educational trails in the pedagogical process in outdoor teaching. In the article, methodological procedures are presented for the creation and evaluation of educational trails intended also for pedagogical purposes. In the presented method educational potential of educational trails (EPET) is an expression of the information quality provided on phenomena and objects on the educational trail and its surroundings through information panels. The qualitative analysis according to the set of parameters points to the quality and quantity of information provided in the information panels of the educational trail according to the criteria of visual quality and interpretative quality. The educational potential of educational trails was expressed as a percentage by the proposed formula. The methodology is presented on the example of the nature trail around the Žitavský luh Nature Reserve, which represents large complex of alluvial meadow and marsh communities. The educational potential of the Žitavský luh educational trail reached 77 %, which means a good educational value in the overall assessment and good usability for outdoor teaching.

Keywords: educational trails, educational potential, pedagogical process, outdoor learning.

1. Introduction

Education for a positive relationship to nature and the environment has a long and rich history. Initially, it was based primarily on the gentle approach and attachment of people with nature, and later expanded in the context of increasing environmental concerns to new environmental issues related to environmental pollution, the need to protect nature and human health. In the 1970s, environmental education arises as an education to protect and create the environment, or as an education to protect nature (Šimonovičová, Šudý et al., 2008; Cviková et al.,

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2010). Educational trails as a suitable educational, informational and promotional means have recently become an integral part of the landscape. The network of nature trails in Slovakia and the surrounding states seems to be a suitable means of bringing science to the public in the field. Improvement of the information system in relation to the pedagogical public is a condition for efficient use of educational paths.

Educational trails represent one of the important motivational incentives for visiting the territory and through information panels they become a source of important information about the landscape, cultural-historical monuments, nature protection, and the environment and human activities. The problems that arise towards their use by the pedagogical, but also the general public, are related to their content, which is often disproportionate and very demanding for ordinary visitors, including teachers and pupils.

On the base of the above, it is necessary to create a methodology for evaluating educational trails in terms of their possibilities for the needs of pedagogical practice. One of the possible solutions is the evaluation according to the set of indicators, which point to the quality and quantity of provided information within the information panels of educational trails and the possibilities of their use for pedagogical practice.

According to the World Resource Institute (WRI, 1995), indicators provide a quantitative form of higher type information. Indicators provide a simpler, easier-to-understand way of information compared to complex statistics or other types of scientific data. On the one hand, the indicators quantify the information so that it is explicit and comprehensible, and simplify information about complex phenomena, making communication easier. Indicators represent an empirical model of reality, but they must be scientifically justified and obtained by a simple and understandable methodology. They also perform a certain social function because they improve communication.

According to Laža (1997), indicators are selected information reflecting the state of a large system. They tell us in what direction the system is moving, whether it is improving or getting worse or remain more or less unchanged.

2. Methodical procedures for evaluating educational trails as interpretive means

Evaluation of educational trails and possibilities of their use for pedagogical practice is based on several methodologies (Medek et al., 2016; Tilden, 2007; Ham, 2013; Moldan, 1996).

The starting point for thematic interpretation is the effort to communicate successfully in the environment of non-formal education, attracting the attention of the visitor until the moment of presentation of the program point so that it is convincing (Ham, 2013).

Interpretation, evaluation, quality indicators

Ham (2013) defines the 4 qualities to be interpreted in order to meet both of the above objectives. According to Ham (1992, 2013), a prerequisite for successful communication is an interpretation that has the following characteristics: strong key-sharing (T-thematic); it is presented simply understandable (O-organized); has a personal relevance to the program participant (R-relevant); is enjoyable.

Key sharing simplifies program preparation, reduces the tendency to encyclopedia, eliminates interruption of participants' attention, or directs it in one direction, creating a logical framework for program participants' experiences. It is easy to understand the interpretation that follows previous information or participants' experiences, avoiding new unknown terms. Ham (2013) draws on the conclusion of Cowan's experiments, Cowan (2001) found that at a time a person is able to receive 3-5 meaningful information units.

The key to remembering new information is the ability of an individual to create a meaningful unit of information that can be related to information stored in long-term memory (Revlin, 2012).

Interpretation has a personal meaning if it is meaningful, that is understandable and resonant with the knowledge of the program participant while fulfilling the first, second and fourth of the Tilden principles below:

1. Any interpretation that is not perceived by the visitor, his personality, or life experience will be useless;
2. Interpretation is not the provision of the information; the interpretation clarifies the deeper meaning of information and context;

3. Interpretation is an art that combines a number of other disciplines – for example, introduces scientific, historical or architectural materials. And to every degree it is possible to learn to some art;
4. The main purpose of interpretation is not just to teach but to provoke;
5. Interpretation should be a whole rather than an individual. It should also apply to all parts of the visitor's personality;
6. Interpretation for children (up to about 12 years old) is not a simple simplification for adults. It follows fundamentally different principles (Tilden, 2007).

Pleasant experience means providing an experience that is considered appropriate and (or) appropriate to expectations. In terms of evaluating a particular interpretation, it is important to understand the inclusion of a particular resource in the hierarchy of territory interpretation or phenomenon. For example, it would be a mistake to rank tables on individual cultural sites or in individual zoos and omit other elements of the information system in which these resources are included (information pylons, brochures and mobile apps for visitors, information boards explaining a closer group of objects). The evaluation of the visitor's experience is based on the knowledge that although there may be a whole range of providers in the territory, the visitor's experience is only one. Also, distracting the visitor's attention by interpreting different providers is reflected in his perception of each individual interpretation. Therefore, the interpretation plans always include analysis of other elements of interpretation and visitor experience audit.

One of the means used in the interpretation of natural elements and events are information panels. An important principle is that the means of interpretation are planned to be concluded. Only when we know who we want to say, what we will report, what will be the information and the means to maintain the interpretation, after that we can selectively select the specific means of interpretation or their combinations (information boards, guide service, descriptions, leaflets, expositions, web pages, models, interactive elements, etc.) (Medek et al., 2016).

Advantages and disadvantages of information panels as a means of interpretation are reported by Medek et al. (2016), as well as the advantages and disadvantages of other individual types of interpretative means. Information panels are very common, and are therefore associated with interpretation, which can lead to their search or ignoring visitors. Their advantage is simple design and production; wide selection of techniques; relative resistance; low operating costs; they may be spatially undemanding and placed near the objects of interpretation; they work 24 hours a day. The disadvantage is less information (max 200 words); mostly low visitor involvement (passive interaction); they become part of the scenery; subject to time and vandalism; at a time, only a limited number of visitors can read the panel. The purpose of the panel determines its content and form. Ludwig (2003) divides panels into orientation panels (map, site orientation), control panels (information about rules and consequences of their omission), information panels (notification, program information, current dangers) and interpretation panels.

Apart from the inclusion of panels and educational trails in the context of interpretation, the methodology of their processing plays an important role.

Among the generally accepted criteria for the selection of indicators are significance, representativeness, uniqueness, measurability, availability, financial (un)difficulty corresponding to the benefit, comparability, transparency, comprehensibility, testimony, timeliness, effective usability (Moldan, 1996).

Overview of educational trails quality evaluation methods

It is always possible to evaluate the quality of educational trails or individual panels only on the basic of a methodological approach. The currently most recommended methodology is the TORE Thematic Interpretation Model (Ham, 2013). The relative effectiveness of the TORE has been little verified. Research by Tarlton and Ward (2006) verified this model, comparing the effectiveness of a personal interpretation program with a thematic and non-thematic variant.

In addition, it is possible to rely on research to verify the importance of individual interpretative means for attracting attention to determine the individual evaluation criteria. Certain, though not very clear, role is played by the number of words and font size (the best result was a combination of 60 words and 18 or 36 points font size).

The methodology of Masters and Carter (1999) provides a comprehensive view of the evaluation of the individual means of interpretation, taking into account their specifics. When evaluating non-guided nature trails based on (numbered) panels, Masters and Carter recommend

that they evaluate the nature trail as a single unit. However, such an assessment is tailored to an educational trail (interpretive trails, educational trails) without a guide, which is about 800 meters long and mostly holds a limited number of themes.

Qualitative analysis follows the following criteria: interconnection, encouragement, exploration, orientation, familiarity, availability, illustration, design, and maintenance. The link expresses whether the panel clearly links the interpretative object to the phenomena, objects or events in the immediate surroundings. Encouragement evaluates whether the panel encourages visitors to explore surroundings. The study highlights the possibilities of exploring the objects of interpretation in more detail. Orientation evaluates how strongly the interpretation turns to readers. This is an analysis of whether the panel contains one or a limited number of key information about the object of interpretation. Availability evaluates whether the visitor panel is available. Illustration illustrates the effectiveness of using illustrations (photos, images, graphic). The design evaluates the attractiveness and stimulation of the overall design object of the interpretation. Maintenance assesses the level of maintenance of objects (panels), protection against vandalism and functionality of interconnected electronic media (web page). For each of these questions it is possible to answer yes/no, or a four-level scale of assessment: at all (0), a little (1), alternately (2), abundantly (3). Three evaluation questions consist of a set of several sub-questions that can be answered yes/no/undetected.

As part of the quality assessment of the information panels (IPs), Bizubová, Nevřelová (2006) report the following quality indicators: total number of IPs, input information panel, names of information panels, suitability of IPs names, attractiveness and attractiveness of IPs, IPs aptitude in terms of educational trails focus and content, IPs placement in the landscape, IPs clarity, IPs content page, IPs overall benefit, IPs clarity, technical terms from IPs texts. In terms of overall evaluation of educational trails, these are indicators of quality assessment: type of educational trail, thematic focus, the aim, the educational trail focus, difficulty of the surface, length, quality parameters, suitability of the name, equipment, which is worth seeing on the route, respectively around him and promoting the educational trail.

Divišová (2015) in her work presents criteria for evaluation of educational trails in the forest territories Český les and Hornofalcký les. The author introduces 4 basic parameters according to which educational trails can be assessed: difficulty, availability, educational value and orientation on the educational path. Length, profile and surface were included in the parameters of difficulty. Availability includes transport and information – information centers and connection of other educational or tourist trails. The learning value has criteria such as denominational value and panel clarity. The last evaluation criterion was the orientation, where the author investigated field marking, accessible map data and other information about the route.

According to Růžička (2011), the success of the panel can be measured in two ways: the attractiveness and strength of the panel. The panel's appeal (%) is expressed as the ratio of the number of visitors who stop at the panel to the number of visitors who passed the panel. This result is then multiplied by a hundred to obtain the required percentage. The panel strength (%) is expressed by the average time spent by one visitor to the time it takes to read in detail. Again, this result is multiplied by one hundred, which in turn yields the percentage of panel strength.

3. Materials and Methods

In the presented method educational potential of educational trails (EP_{ET}) is defined as the quality of clarity and the interpretative quality of individual information panels in terms of their use in the pedagogical process. Educational potential of educational trails is an expression (evaluation) of the quality of information provided on phenomena and objects on the educational trail and its surroundings through information panels. The qualitative analysis follows the following criteria: visual quality (VQ) and interpretative quality (IQ). Visual quality (VQ) is based on evaluated parameters such as text readability (Tr), the text clarity (Tc), the graphic value (Gv) and maps quality (Mq). Interpretative quality (IQ) is based on evaluated parameters such as information level (Il), panel position (Pp) and the presence and functionality of the QR code (QRc). Individual parameters and their scaling are based on the characteristics below (Figure 1).

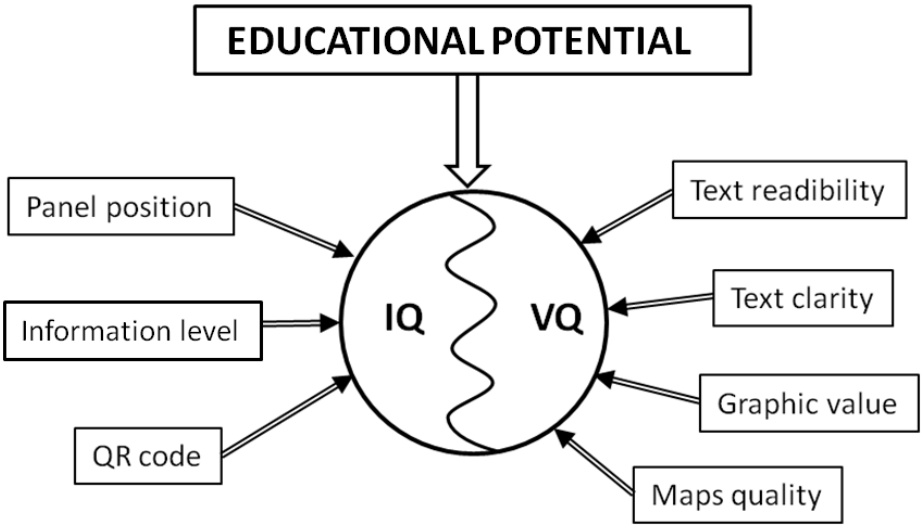

Fig. 1. Educational potential in terms of educational trails quality evaluation

The text readability (Tr) indicates whether the text is hierarchically structured, using headings and subheadings, whether the font size and text density are appropriately selected, whether the text is easy to read and whether the text is misspelled (3 – very good – all the above conditions are met, 2 – good – some attributes are not met, but overall the text is easy to read, 1 – well – the text is legible, but many of the above attributes are missing, 0 – deficient – the text is not readable with understanding).

Text clarity (Tc) indicates whether the information panel contains one or a limited number of key information about an object or phenomenon around the information panel and whether the text clearly and accurately describes the information provided (3 – very good – the key information are understandable and can be applied to identify the panel area, 2 – good – not all key information is clearly understood, but in principle the panel provides sufficient information, 1 – well – the panel contains little key information and not all of them can be used to explore the surroundings, 0 – deficient – the panel provides information that is not clearly explained and therefore cannot be used to identify the surroundings and acquire individual objects and phenomena directly around the panel).

Graphic value (Gv) evaluates the attractiveness and stimulation of the overall design of the subject of interpretation, the graphic is clearly linked to the text and the text on the panel is good reading (3 – very good), the graphic is linked to the text and the text on the panel is more or less good reading (2 – good), the graphic is less linked to the text and the text on the panel is more or less good (1-well), the graphic is not linked to the text at all and the text on the panel is poor (0 – deficient).

Maps quality (Mq) indicates the presence or absence of at least one map in the information panel, it means quality maps, where individual stops are marked, the scale relative to the route gives a perfect overview (1 – suitable), in the latter case, there is no map on the information panel, respectively an unclear map or a map that does not correspond to the actual state is listed (0 – unfit).

Panel position (Pp) expresses whether the panel clearly links the interpretation subject to phenomena, objects or events in the nearest surroundings (1– suitable) or it is not suitably located and the facts on it do not correspond to the phenomena and objects around it (0 – unfit).

Information level (Il) expresses the information level and precision of the panels, the information potential of the panel with respect to the location and objectives of the nature trail, the degree of representation of key information using graphs, diagrams, or images and photos with appropriate descriptions indicates whether the panel contains several well-described key information about the interpretation object (3 – very good), at least one well-described key information about the interpretation object (2 – good), a limited number of inferior key information about the interpretation object (1 – well), the panel is missing interpretation object information (0 – deficient).

QR code (QRc) expresses existence (1 – yes) or absence (0 – no) QR code on an information panel.

Tables 1 and 2 shows the individual evaluation criteria and the range of values used in educational trails evaluation.

Table 1. Evaluation of information panel visual quality (VQ)

Text readability (Tr)	**Text clarity (Tc)**	**Graphic value (Gv)**	**Maps quality (Mq)**	**VISUAL QUALITY (VQ) =Tr + Tc + Gv + Mq**
3 – very good	3 – very good	3 – very good	1 – suitable	**maximum value: 10**
2 – good	2 – good	2 – good	0 – unfit	
1 – well	1 – well	1 – well		
0 – deficient	0 – deficient	0 – deficient		

Table 2. Evaluation of information panel interpretation quality and educational potential

Panel position (Pp)	**Information level (Il)**	**QR code (QRc)**	**INTERPRETATION QUALITY (IQ) = QRc + Il + Pp**	**EDUCATIONAL POTENTIAL (EP = VQ + IQ)**
1 – suitable	3 – very good	1 – yes	**maximum value: 5**	***maximum value: 15**
0 – unfit	2 – good	0 – no		
	1 – well			
	0 – deficient			

* For a given range of values for each parameter, the educational significance maximum value of information panel is 15

Interpretive quality index of trail panels was calculated by Masters & Carter (1999) as a sum of the points earnings in individual criteria according – encouragement, exploration, orientation and design rated on a scale of 0/3 (0 indicates by no means and 3 to a large extent) + connection, message, availability and illustration rated on a scale of 0/1 (0-no, 1-yes). This methodology was the inspiration for our evaluation of the educational potential of information panels. Given that a quality of the nature trail should meet all the above-mentioned parameters (Table 1 and Table 2); the resulting evaluation is based on the calculation of individual assessments of these parameters. The educational potential of information panels is the sum of the criterion values of the visual quality and the interpretative quality of the educational trail information panels. On the basic of these parameters we expressed the educational potential of educational trails ($\mathbf{EP_{ET}}$) with the following formula:

$$\mathbf{EP_{ET}} = \frac{\sum EP_{IP}}{15x\sum IP}\ x100$$

The parameters in the formula are: $\mathbf{EP_{ET}}$ means the educational potential of the entire educational trail and EP_{IP} means the educational potential of each panel. Evaluation scale of the educational potential of the educational trail ($\mathbf{EP_{ET}}$) is as follows:

- 100 %–80 % very good educational potential of the educational trail
- 79.9 %–60 % good educational potential of the educational trail
- 59.9 %–40 % well educational potential of the educational trail
- < 39.9 % deficient educational potential of the educational trail.

The higher value of the educational potential means greater usefulness of educational trails in the pedagogical process. The good text readability and clarity as well as graphics with the high quality are the basis for the possibility of use in the external teaching process. Also, the placement and interconnection of text content with the environment (panel position) provides good opportunities for educational activities on the educational trails. The existence of a QR code with tasks is now a desired addition to the use of educational trails in the teaching process.

4. Results

According to the methodology, educational trails can be evaluated in terms of their use in the pedagogical process. Here is an example of an evaluation of a specific educational trail that can be used during outdoor lessons. Educational trail "Žitavský luh" is located on the route around the Žitavský luh Nature Reserve, also known as Gedrian meadows (Figure 2).

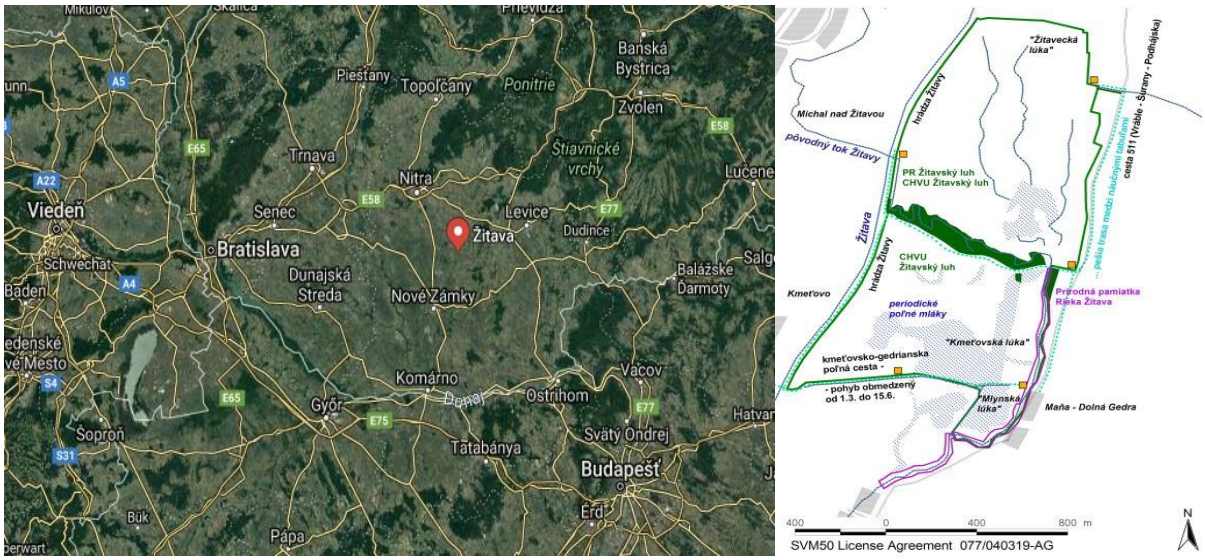

Fig. 2. Nature Reserve "Žitavský luh" (map of the area and map of educational trail route)

The aim of the educational trail is to make the movement in the protected area legally accessible, to minimize disruption to the life of the Gedrian meadows while allowing the inhabitants to see the territory belonging to the European network of protected areas NATURA 2000. The aim of protecting the territory is to maintain or improve the condition of species, their communities and habitats bound to alluvium of the river Žitava. Nature Reserve Žitavský luh represents the largest complex of alluvial meadow vegetation and marsh communities in the area Požitavie.

Fig. 3. Educational trail "Žitavský luh" (the area and informational panel)

Currently there are 6 informational panels on the educational trail (Figure 3). Individual panels contain the following topics: Žitavský luh (IP1), Meadows management (IP2), Žitavský luh: Birds of the Gedrians' meadows (IP3), Žitavský luh: Animals of the Gedrians' meadows (IP4), Lower Gedra and Gedrians' mills (IP5) and Kmeťovo village (IP6). Tables 3 and 4 show the individual evaluation criteria and their values of the educational trail Žitavský luh.

Table 3. Panel visual quality (VQ) evaluation of the Žitavský luh educational trail

IP	Text readability (Tr)	Text clarity (Tc)	Graphic value (Gv)	Maps quality (Mq)	VISUAL QUALITY (VQ)
1	2	3	3	1	9
2	2	3	3	1	9
3	2	1	2	1	6
4	2	2	2	1	7
5	2	2	2	1	7
6	2	3	2	1	8
	12	14	14	6	46

Table 4. Evaluation of information panels interpretation quality and educational potential of the Žitavský luh educational trail

IP	QR code (QRc)	Information level (Il)	Panel position (Pp)	INTERPRETATION QUALITY (IQ)	EDUCATIONAL POTENTIAL (EP = VQ + IQ)
1	1	3	1	5	**14**
2	1	3	1	5	**14**
3	0	3	1	4	**10**
4	0	1	0	1	**8**
5	0	3	1	4	**11**
6	0	3	1	4	**12**
	2	16	5	23	**69**

The educational potential of Žitavský luh educational trail ($\mathbf{EP_{ET}}$) reaches 77 %, which means a good educational value in the overall assessment and good usability in the pedagogical process. Within the educational potential of the above-mentioned educational trail, the graphic value and maps quality parameters of the informational panel were evaluated above (Table 5). There was also a QR code on some panels, but it was missing on older informational panels. The placement of all informational panels was appropriately chosen, as well as the linking of the text content to the environment on the vast majority of informational panels was very good.

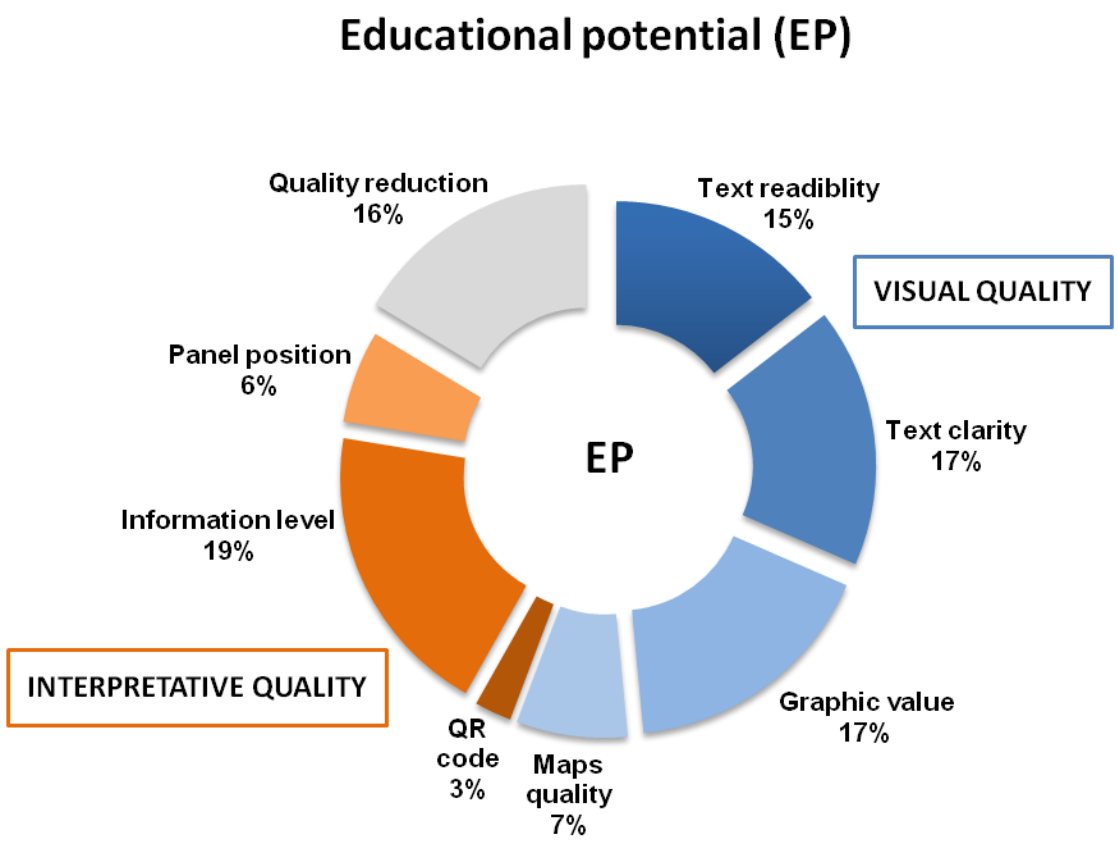

Fig. 4. Evaluated parameters of educational potential of Žitavský luh educational trail (EP_{ET})

Figure 4 shows the evaluated parameters of educational potential of the educational trail. Overall, the educational trail can be used in the teaching process, educational trail is well accessible and the route is easy and accessible for all ages.

5. Discussion

Růžička (2011) draws attention to the possibilities of interpretation of the natural heritage where it presents methods of interpretation that can be applied also in case of evaluation of educational trails. From the point of view of the educational value of the already existing educational trails, it is possible to apply in particular the aspects of site selection (the correct place of the panel location), the overall concept of the whole educational trail project (the main idea), the notice value of the individual panels (what the reader should know what to feel if what the panel should inspire him for). Based on the findings of developmental psychology, the authors compiled a table of recommended and questionable methods from which we selected school age categories for our study needs.

The basic rules of interpretation (explanation, clarification, mediation, and theme) are presented by Carter (2001) as follows: selection and brevity, target audience interpretation, use of common language, clarity of instructions and warnings.

Masters and Carter (1999) report on the quality of educational pathways, evaluating the following parameters: the possibility of reviewing an object based on explanation, designing sites related to the subject of interpretation, the availability of panels, the effectiveness of used illustrations (graphics), the attractiveness of overall design. Interpretive quality index of trail panels Masters and Carter (1999) calculated as a sum of the points earnings in individual criteria – encouragement, exploration, orientation and design rated on a scale of 0/3 (0 indicates by no means and 3 to a large extent) + connection, message, availability and illustration rated on a scale of 0/1 (0-no, 1-yes).

The results of the evaluation study of the educational trail in the National Park Vysoké Tatry (Slovakia) were implemented by Švajda and Činčera (2017). On the base of the observation, the attractiveness and strength of the individual panels were evaluated in the research and the related analyzes carried out evaluating the importance of other factors such as the placement of the panels.

Any further research should, in addition to the properties of the panels, also focus on other parameters related to visitors, their demographic characteristics (age, gender, groups of children, etc.), motivation to visit and their interaction with the tables (Falk et al., 2009; Gyllenhaal et al., 2012). Similarly, in the conditions of Central Europe, the impact of different ways of influence on the behavior of visitors should be investigated (Cialdini et al., 2006), as well as the use of, for example, Fry's Readability Test (Masters, Carter, 1999).

Educational trail routes are often supplied with panels presenting long technical texts which are not able to address in the best sense of the word ordinary visitor. Růžička (2012) reviews the significance of educational trails as a highly effective nature conservation tool in communicating with, education of and awareness among the general public. He highlights mistakes made by authors of information panels and posters on educational paths and sets guidelines on how to develop them so that they provide visitors with appropriate information in an understandable way, raising nature awareness among them.

Another obvious deficiency is the lack of connection between the panels and their surroundings, resulting in insufficient encouragement for visitors to actively explore these surroundings. Poor design of the panels may cause relatively low attention capture and holding power of the panels (Švajda, Činčera, 2017).

The statistically significant relationship between the width of the trail and the strength of the board is interesting, as this could indicate that this factor plays a role in the readers' readiness to read the whole panel.

A relatively easy solution for evaluating nature trails is to compare the level of attention capture and the holding power of panel with a predetermined desirable level. However, there is a question about the basis on which such levels can be determined. In the studies published by Medek et al. (2016), the attention capture of panels on various nature trails ranges in a wide range from one to seventy percent.

6. Conclusion

Outdoor learning is an important part of education, because it is a complex teaching form that contains different teaching methods and different organizational forms, while the focus of outdoor learning lies in the field outside school (Hoffman, 2003). One of the possibilities of outdoor learning is the use of nature trails and thus the recognition of the landscape in situ. Educational trails play a very important role in pedagogical practice. As stated by Bizubová (2001), students should, as part of the educational process of environmental education, make the most of their stay in nature, outside the interior, where they may have direct contact with the objects and phenomena. Educational paths are therefore an ideal means of realizing environmental education in a real environment. By learning the natural environment in the field, students create a better and stronger relationship with them (Bizubová, 2001).

The problems that arise towards the use of educational trails by the pedagogical as well as the general public are to a large extent related to their content, which is often unreasonable and highly demanding for ordinary visitors, including teachers and pupils. On the base of the above, it was necessary to create a methodology for evaluating educational trails in terms of their potential use for the needs of teaching practice, their educational potential. One of the possible solutions is evaluation according to set parameters, which point to the quality and quantity of provided information within the information panels of educational trail and the possibilities of their use for pedagogical practice. These parameters are applied in the evaluation of the educational potential of educational trails, which points to the presumption of using educational trails by the pedagogical public.

The good readability and clarity of the text as well as the high quality graphics are the basis for the possible use of information panel of educational trail within the external teaching process. Also, the placement and interconnection of text with the environment gives good opportunities for other activities that can deepen the knowledge of the educational trail environment.

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