HUMAN CENTERED DESIGN OF A CHILDREN'S MUSEUM

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ABSTRACT

Traditional museum is typically characterized especially by presenting exhibits. However, it has recently been enriched by many other features that contribute to the attractiveness of exhibitions. Museum spaces nowadays offer various educational events, creative workshops or shops with artefacts and publications.

This paper is aimed at presenting partial research results orientated to human-centered design of museums for children. The introductory part describes innovative design tools that focus on multisensory presentation of exhibits, hands-on, color impact, emotion perception etc., as well as possibilities of using the Universal Design as a Learning method to create exhibitions for children with special needs. The main part of the work consists of our team's research aimed at exploring the needs of different children, especially children with various disabilities, in the creation of children's museum space and exhibitions. The first phase of research is focused on the analysis of spatial properties, exhibits and interactions between them. The aim was to discover how those factors influence children's attention and impact on their learning ability. This part of the research was carried out in BIBIANA - International House of Art for Children in Bratislava. The end of the paper indicates further research possibilities that will be explored in the next phase of our research in the future.

Keywords: Children´s Museum, Universal Design, Design for All, Architecture, Multisensory exposition

INTRODUCTION

Museums and galleries have become a popular place for quality leisure. They offer a unique synergy of education and entertainment. Hans Wolfgang Hoffmann [1] underlines the fact that museums are currently the most frequently visited cultural institutions in comparison to concert halls or theaters. He further states that the modern museum varies in size, as well as in architectonical forms ranging from minimalist to expressive ones. In the publication Musée et Architecture [2], the authors concluded that museum architecture should externally communicate the exhibited artifacts located inside, and it should also express its central theme, and play the role of a cultural phenomenon, as well. As Alexander Schleicher [3, p.161] points out, museum buildings have a sig-

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nificant impact on attracting visitors, and "*they are able to catalyze the development of tourism and overall economic development of the locality where they are situated.*" The paper studies the subject of museums with emphasis on multisensory and human-centered aspects in general terms. Our research concerns the topic of children's museums. This article is an extended version of the article published at SGEM Vienna 2019, Conference Proceedings Vol. 6 [4].

In traditional museums, visitors usually observe the exhibits but are not allowed to touch them. In consequence, they can be described as 'hands-off'. Traditional forms of exhibitions are either "passive" with displays in glass showcases, or "active", when exhibits are composed of working models and machines which move. Schleicher [3] also remarks that priorities of traditional museums are mainly preservation of their collection and promotion of the exhibits with emphasis on their historical importance. On the other hand, Tim Caulton [5] explains that modern, interactive museums accentuate the needs of visitors and educational goals. The exhibitions draw upon educational objectives and messages to be communicated and a great variety of visitors' activities. Exhibition designers consult their concepts with academic experts to guarantee that the presented facts are accurate, as well as with psychologists who consider the exhibition's educational impact. In the conceptualization stage, they also talk to target visitors to ensure that they both enjoy the exhibits, and understand the theory they represent. The ***Table № 1*** compares, and summarizes the mentioned characteristics of traditional and interactive museums.

Compared to adults, child visitors have different needs, expectations and areas of interest. Therefore, a typological subcategory of museums for children was created at the end of the 19th century. Children's museums aim to positively shape children and develop their cognitive, affective and psychomotor skills. They stimulate informal learning experiences in a playful way. In her study, Margie I. Mayfield [6] noted that there was a problem with the definition of these facilities since the formation of children's museums. Experts argue whether a children's museum can be called a museum, even if it does not meet some museum's criteria. The main feature of children's museums is that, unlike traditional museums, they allow, even support visitors, to touch exhibits, the so-called hands-on approach. It is very suitable to attach a library, a theater, creative workshops and relaxation interior and exterior zones with refreshments nearby museums for children.

The children's museum is defined by the Association of Children's Museums ACM [7] as a community institution that creates conditions for high quality and age-appropriate learning experiences for children. Play overlaps with learning, because in early developmental stages, children learn mainly through play. Children's museums hold the principles of equality and inclusion so that they can serve all children and families. According to ACM [7], the goal of children's museums lies in providing physical space and exhibits for children and their families where they can learn and play. Children's museum's buildings and exhibition areas should be accessible and user friendly, as well as interactive, hands-on, attractive, safe and stimulating places. In addition, they ought to be appropriately designed to saturate the needs of children's intellectual development.

Museums	Traditional	Interactive
Proposed activities	Hands-off	Multisensory, hands-on
Main target	Safety of presented artefacts	Visitors' education and experience
Exhibitions type	Product-led	Exploratory

Table № 1: Comparison of key factors of traditional and interactive museums

A wide range of people should have the opportunity to enjoy physical space, services and information, and to participate in social events. According to Sandra Bergseid Ben-Haim [8], an optimal learning experience is intuitive, open-ended, multi-modal, and flexible. It offers opportunities for making personal connections rather than communicating large amounts of factual information. Thanks to visitors' participation in the museum, architects gain valuable information about their preferences. The inclusive design of children's museums takes into account and respects the diverse needs of children and also of adults who accompany them in most cases. Visitors with different needs and abilities are able to interact with exhibits in various ways through a multisensory form of exhibit presentation to facilitate their participation in the museum-related activities.

It is true that children's museums have seen many positive changes in recent decades. However, there are often no premises and exhibitions for disabled children, many of whom have special needs in education. Children with special needs were born with deep cognitive impairment, psychiatric problems, learning disorders or development delays. One of the goals of the research is therefore also exploring the possibility of applying the Universal Design as a Learning method to design of exhibitions for children.

To achieve an optimal environment for all child users and their family members we define the key aspects of interior and exhibition design in children's museums: accessibility, multisensory perception, meeting different needs of children's intellectual development, and correspondence with the target age group which must be taken into account. Hence, these objects should be designed in a human-centered way using Universal Design / Design for All.

The present research of Children's museums follows the research results of various institutions. For example, a design company IDEO [9] promotes and applies Human Centered Design (HCD), which focuses on the needs of clients and users. This method of creation brings innovative, sustainable and financially viable solutions. A multidisciplinary team gathers information and inspiration from future users who later participate in designing through workshops and interviews. The result is the most efficient implementation of the final architectural project. In the Institute for Human Centered Design (IHCD) in Boston, the HCD and Universal Design (UD) are explored. Zuzana Ceresnova [10] from Centre of Design for All has also described this area's knowledge, saying that HCD and UD increases the effectiveness of architectural spaces, and improves the sense of well-being and user satisfaction in it. An education research and development organization CAST [11] tested how to improve education using flexible methods and materials through Universal Design for Learning (UDL). UDL is a framework to im-

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prove and optimize teaching and learning for all people based on scientific insights into how humans learn.

Accessibility

Accessibility is one of the important preconditions for integrating people with disabilities into community life. To museums, accessibility means making the site's exhibits and programs available to all visitors. A key document to meet the accessibility requirements of products, environments and services is the Article 9 [12] in the Convention on the Rights of Persons with Disabilities (CRPD). The document "General Comment No. 2" interprets not only the normative content of the Article 9 Accessibility, but also the relationship of this Article with other Articles of the CRPD. For example the Article 30 of the CRPD requires that "…*States parties recognize the right of persons with disabilities to take part in cultural life on an equal basis with others.*" [12, p. 11]. In the CRPD, Universal Design is recommended to ensure accessibility, while "Universal Design" means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. "Universal Design" shall not exclude assistive devices for particular groups of persons with disabilities where this is needed.

Another relevant document is the CEN standard EN 17161:2019 Design for All - Accessibility following a Design for All approach in products, goods and services - Extending the range of users. EIDD Design for All Europe defines Design for All (DfA) [13] as: "*Design for All aims to enable all people to have equal opportunities to participate in every aspect of society. To achieve this, the built environment, everyday objects, services, culture and information – in short, everything that is designed and made by people to be used by people – must be accessible, convenient for everyone in society to use and responsive to evolving human diversity*."

When applying the above documents to the design of museums and exhibitions for children, we need to consider the following facts in the research: the museum building must be accessible in all operating areas in accordance with the UD / DfA principles, all programs and exhibits must be available in alternative formats (visual and acoustic information, Braille, easy-to-read ...), for the blind children and those with decreased visual sense, the exhibition should be "seen" by tactile tours of museums, incorporating Braille for visual exhibition, 3D printing, etc.

Multisensory perception

The importance of engaging several senses in the museum perception is accentuated by Nina Levent and Alvaro Pascual-Leone [14]. They inform about modern neuroscience and its ability to detect roles that human senses play in perception of environment. Individual human senses and countless possibilities of exciting them in the museum are described in their book. Multisensory approach has to stimulate at least two senses. Zuzana Ceresnova [15] notes that multisensory experiences stimulate our synesthetic perception, and bring new emotional enrichment.

Almost all exhibits are **visually perceived**, and it is important to use suitable lighting, colors and scale of the exhibits, surrounding labels and pictograms, so that they are easily noticeable and readable. Kristi S. Gaines and Zane D. Curry [16] studied the effects of color on learning and behavior. They have summarized how different colors influence student attention, behavior,

and achievement. It is necessary to balance color applications in educational spaces, as over-stimulation through color creates sensory overload. On the other hand, colorless interior spaces can be stressful and nonproductive. Both understimulating and over-stimulating environment can be harmful. Therefore, a warm neutral sand color is recommended. Walls should be colored in a medium hue in the same color range. Strong or primary colors should be applied only on small surfaces. Soft colors from green or blue palettes may be used in other areas in the room. Gaines and Curry [16] mention that sometimes, it is beneficial to discover child's color tolerance, as some children require different surrounding colors e.g. children with special needs. According to results of our research, the use of colors and color contrasts is also a very important tool for mediating exposures to children with visual impairments or children with special needs. The tactile tours of museums should be suitably complemented by a contrasting color solution, which can simultaneously enhance the atmosphere of exhibition.

Exhibits with **acoustic effects**, e.g. verbal audio tracks with important information, music and noises. Salomé Voegelin [17] states that museum is not only a visual place but an audiovisual environment. Acoustic influences come from all the visitors, even if exhibits are not producing sound. Supplementing the exhibit with acoustic information is one of useful tools for conveying visual perception for children with visual impairment.

Tactile elements are presented through reliefs (e.g. tactile maps, letters), Braille writing system, 3D printings, models and miniatures that are attractive to all visitors, but essential to those visitors who have visual impairment. Hands touching objects of various shapes and materials produce different reactions. Veronika Kotradyova [18] examines haptic and somatic sensations, especially contact comfort of hand skin touching different materials. The structure, hardness, shape, temperature and other surface properties of the material influence the degree of positive or negative perception of the object. Wooden surfaces seem to have particularly beneficial properties according to her findings. In the case of tactile elements, we should therefore also consider the adequacy for children with visual impairment and aspect of contact comfort. The group of tactile elements can also include a hands-on presentation, which is described in the next section.

To paraphrase Jim Drobnic [19], the **use of smells** creates challenges because it is a sensorially complex encounter. Therefore, pluralistic animated smellscape is created. He continues that olfactory artworks utilize air as a medium and orient audiences to consider the meaning, too. That way, exhibits tend to be more performative and participatory. Visitors cannot avoid other smells in exhibitions (e.g. from interior materials, other visitors etc.), as well. Irina D. Mihalache [20] states that **taste** as a component of the museum experience has rarely been explored. Innovative approaches could increase involvement of taste, and have education potential.

To conclude, stimulation of several senses improves the visit experience, and simplifies way-finding in space. Examples of incorporating various senses in exhibitions can be seen in the pictures: ***Figure № 1.*** Combining the earlier described multiple senses facilitates understanding to all visitors, and is largely important for people with visual, hearing and cognitive impairment. Multisensory architecture is in line

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with the principles of universal and human-centered design, allowing as many people as possible to fully utilize the environment.

Exhibition and education

It is important for exhibit creators and curators to think about pedagogical and didactic principles which were synthetized for example by Esi Marius-Costel [21]. In a children's museum's environment, we should consider kids' capacity to understand only limited informational content clearly and deeply, so that they are able to remember it in short-term memory, and afterwards transform it in their long-term memory. If there is too much information at once, only a small part of it can be processed by visitors. In these museums, there are often loads of interesting exhibits in near distance which can cause children's inability to capture a great part of exhibited information. They also need pauses between individual exhibits or exhibition areas in order that the received information can be well-consolidated. Hence, architects ought to design relaxation spaces in such institutions where visitors can rest.

There is a learning theory behind the multisensory and **hands-on learning concepts** [5]. The hands-on approach is based on educational philosophy from the work of a developmental psychologist Piaget and also Froebel and Vygotsky. Piaget suggests that interactive experiences encourage learning. He dealt with developmental stages in human life, and found out that while adults were capable of abstract thinking and learning from passive observation, children thought concretely, and learnt well by direct exploration. Piaget's developmental theory of learning has helped to spread the hands-on movement.

Hands-on exhibition incorporates an interactive element for visitors who not only watch the exhibits but are encouraged to participate in the activities proposed by them. Exhibitions offering hands-on presentation are also described in detail by Tim Caulton [5]. He states that in a hands-on museum, visitors are encouraged to touch the exhibits, and are actively involved with them. They learn in an informal way, and enjoy the experience. As Caulton states, supporters of interactive exhibitions believe that if visitors are enjoying themselves, they are likely to be learning, as well. Nevertheless, to fulfil this ambition, exhibition creators have to gain

Figure № 1 *– From left to right: Three examples of exhibits that are perceived by sight, smell (United States Botanical Garden) and touch (California Academy of Sciences). Photos by Lea Rollova; Exhibit producing sound (Haus der Musik, Vienna) Photo by Natalia Filova*

more complex knowledge on how visitors behave, and how hands-on learning can be effective in such interactive environment. Caulton also notes that both terms 'hands-on' and 'interactive' refer to learning objectives reachable from the visitor's direct explorations [5, p. 2]: "*There is an assumption that hands-on activities will also involve interaction, and provide added educational value, that hands-on will lead to 'minds-on', although the term itself does not suggest it.*" An exhibit requiring simply pushing buttons, using a computer keyboard is not truly interactive, rather it is reactive because the exhibit simply follows a predetermined outcome. Interactive exhibitions aim to saturate all three areas of learning defined in Bloom's taxonomy: the cognitive aspect (e.g. learning, understanding), affective area (e.g. motivation, values, attitudes) and psychomotor learning (e.g. physical skills, coordination). Therefore, children's museums certainly influence their learning in the affective domain and stimulate they psycho-motor learning process. The cognitive area of learning is the most difficult one to fulfill.

A lot of knowledge can be gained through experiential learning in a museum. It is an effective way to acquire information, as it is easier for children to remember the presented educational exhibits through experience. Veronika Kotradyova et al. [22, p. 142] mention: "*Experiential learning is more effective in an effort to leave a trace in children.*" Thus, the presented information becomes understandable to public of various ages and abilities, and becomes attractive for more visitors, so hands-on approach encourages a broader visitor base.

Universal Design for Learning (UDL) is a student-centered method of UD in education, and is in detail described by Zuzana Ceresnova et al. [23, p. 84]: "*Universal Design for Learning method provides solutions that are flexible and adaptable to various abilities or disabilities, sensorial limitations and learning style preferences of each student.*" To achieve high educational value of exhibitions, we assume that the UDL method can also be applied to design of exhibitions. Museum visitors, as well, are individuals who have different needs and preferences when they receive exhibition's information. Ceresnova et al. (2018, p. 84) next claim that "*it is important to use multisensory and interactive forms of presentation of the subject, including several ways of sensory perception and active involvement of individual participants. In this way, it is possible to include a number of learning styles, and to enhance the quality of teaching and learning.*" These claims are in line with Caulton's descriptions of suitable expositions in hands-on children's museums, and also with multisensory approches.

OUR RESEARCH

Our first phase of research was carried out in BIBIANA - International House of Art for Children in Bratislava. The research is aimed at studying how architecture is presented in a temporary exhibition "About BAUHAUS and The Young Designers". The exhibition attempts to arouse interest about areas such as architecture and design in young people. ***Figure № 2*** shows the exhibition's floorplan indicating individual rooms with diverse topics, and ***Figure № 3*** illustrates appearances of these spaces using photographs.

The research is focused on the analysis of spatial properties, exhibits and interactions between them and visitors. The aim was to discover, how those factors influ-

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ence children's attention, interest and their learning ability. BIBIANA is a museum for children situated in a historical building in Bratislava's Old Town. Interesting temporary exhibitions on various themes take place there. Exhibitions relate to subjects like architecture, art, literature, technique and many others. BIBIANA also includes a small library. Students, who participated in an intensive program Erasmus with topic of Design for All, had elaborated an Access Audit in BIBIANA building [15]. The conclusion of their study is that BIBIANA creates inspirational and interactive exhibitions, and is mostly easily accessible, and needs to undergo an intervention to the building navigation system for visually impaired visitors. A part of the building is being reconstructed at present. BIBIANA uses dynamic elements which improve participation and education, informing of the message of exhibits in an interactive way.

The exhibition part aiming at architectural focus is mainly located in two exhibition rooms: the Woodworking Shop and Art of Architecture room. These rooms served as subjects of a more detailed research, and they are visualized in the pictures: ***Figure № 4***.

The first one is focused on toys and furniture. Visitors could assemble there tiny furniture or a ship from wooden parts (Exhibit 1; Exhibit 2).

The dominant exhibit in the second room is a rather large model of a functionalistic

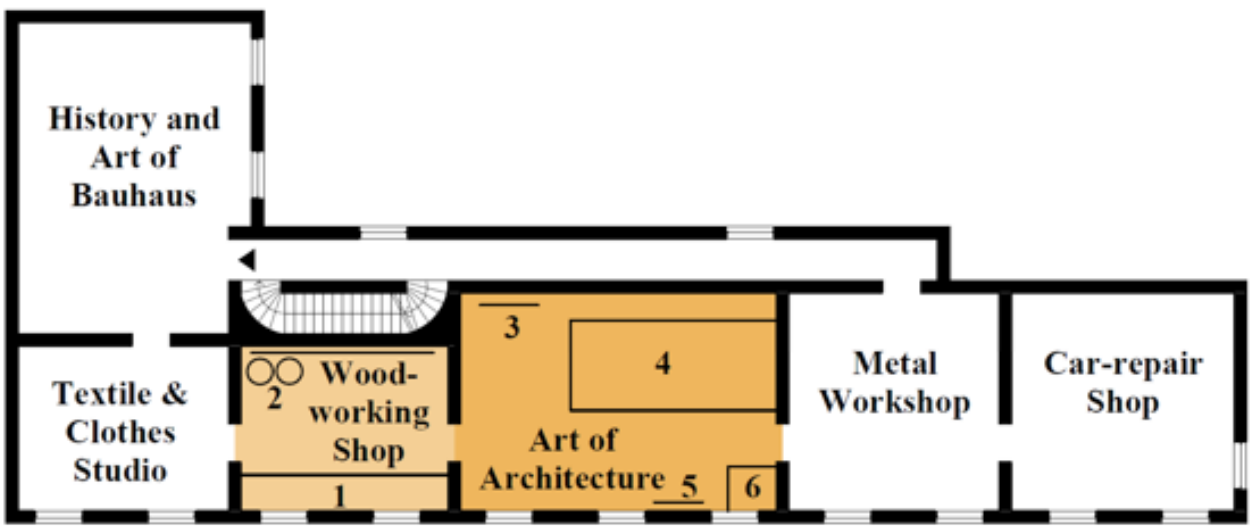

Figure № 2: *Floorplan of the part of BIBIANA where exhibition "About BAUHAUS and The Young Designers" is installed. Numbers refer to examined Exhibits, and indicate their location.*

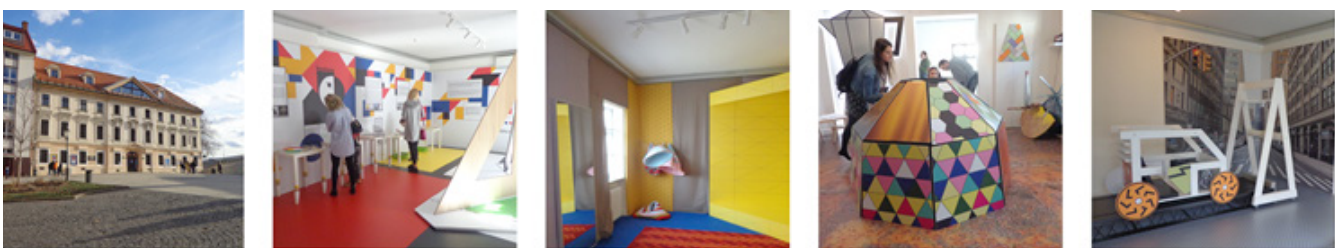

Figure № 3: *Pictures from the BIBIANA exhibition. Photos by Natalia Filova March 2019*

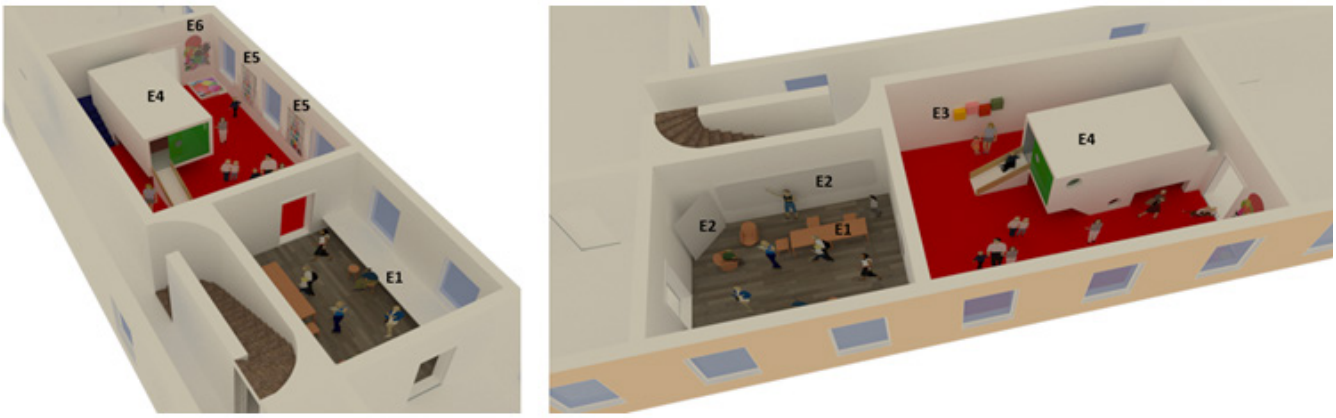

Figure № 4: *Visualizations of two rooms of BIBIANA's exhibition "About BAUHAUS and The Young Designers". Numbers refer to Exhibits (E), and indicate their location.*

house (Exhibit 4). Its size is appropriate for small children, so that they can enter the house. This multisensory exhibit enables visitors to experience various shapes, colors, material by engaging several sensory stimuli. Children learn in a playful manner, including physical activity in addition to multisensory perception. There are three smaller exhibits in the same room, which are aimed mostly at working with colors and shapes. A magnetic board with colored magnet pieces is hung on a wall (Exhibit 5). This hands-on exhibit presents various properties of colors (cold/warm, commixture, color specter, etc.) Using another hands-on exhibit, visitors can create their own compositions from prefabricated colorful shapes of different forms (Exhibit 6). The last exhibit in this room consists of four wooden colorful boxes with figures inside them. It is a traditional hands-off exhibit (Exhibit 3).

Apart from exhibits individually, the whole interior design was noticed in the research, as well. Special attention was paid to the use of colors and to the layout of the two examined rooms. Both of them have all the walls painted white, nevertheless, their floors are more eye-catching. The Woodworking Shop has a wooden flooring with natural appearance. The Art of Architecture room is filled with many bright primary colors. Its floor surface is of red color, the walls of the house exhibit are red, green and blue and the massive building pieces intended for engaging with the house are also colored intensely with red, yellow, orange and blue color. As to the positioning of variant exhibits, most of them are placed next to a wall. In the first room, the parts of the Exhibit 1 are located on a table, where children sit, and create wooden compositions. In one corner of the room, the Exhibit 2 suggests that children assemble furniture. They also can draw on an immense paper which covers a considerable portion of the wall next to it. The second room contains the model of the house (Exhibit 4) taking up a lot of space approximately in the center of the room. The Exhibits 3 and 5 are hung on the walls, they are unfortunately situated too high for many children to reach them. The Exhibit 6 is made of pieces for creating an abstract composition, and it is placed on the floor in one corner next to a door opening.

METHODS

During visits to BIBIANA, interactions between visitors and six selected exhibits (as described above) were observed. Furthermore, the exhibits and interior design of

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the rooms were studied. It was measured how much time children spent on each exhibit in the two exposition rooms. A random sample of 35 children of different ages and sexes was chosen for this measurement. Period of time they spent with each exhibit in these rooms was evaluated in percentage with respect to the total time children spent in the two observed rooms. The average total time spent there was 15,99 minutes. The average of the measured values and the percentage of time spent with the exhibits were calculated for each exhibit. Various factors that could have influenced the length of attention time paid to every exhibits, were analyzed. The study considered especially the layout of the exhibits, suitability of exhibits and color solutions ~~to~~ for the attention of children. Another objective was to explore accessibility of spaces and exhibition for children with disabilities.

RESULTS

The measurements show interesting results, and are presented by graph with relating pictures: ***Figure № 5***. Results point out that children were particularly fascinated by the Exhibit 4, the model of a functionalistic house. They spent on average 51,3 % of the time being in those two rooms engaging with it. According to our observations, the house strongly evoked children's emotion and perception. They were actively involved with its interior, and built its surroundings from given pieces. The Exhibit 1 was the second most successful attractor. Kids enjoyed building small models and drawing. Some of them also engaged with the Exhibit 2, and composed flexible chairs from given pieces. It was more difficult to complete them, and also it was appropriate for older children. It was possibly the reason why it received smaller amount of attention. Exhibits 3, 5 and 6 gained low attention. It could be caused by several factors. The first one is that they were located in the same room as the dominating house, and that exhibit attracted all the children's attention, so they ignored other exhibits in the room. Children were not able to focus very well on these other three exhibits, because those required more concentration. They were often distracted by others playing with the house. The second probable reason for the low popularity of Exhibits 3 and 5 is that they were placed in an unreachable height for smaller kids. Moreover, Exhibit 3 is a hands-off type of exhibit, so it was not very attractive for children, especially when they were surrounded by other interactive exhibits. We can say that the Exhibit 3 had more of an aesthetic function in the room. Exhibit 6 could have had quite a great potential to capture one's attention, as it offered a possibility of an original abstract picture creation. The likely weakness was probably related to its disadvantageous placement in the room. Namely, it was situated in a very exposed location right next to a door opening. People frequently passed through the door in proximity to the mentioned exhibit, so visitors wanting to engage with it were often disturbed by others. In addition, due to its position, children had too little workspace for creating their composition. Unattractiveness of Exhibits 3, 5 and 6 could also have resulted from the atmosphere created in this room. Whereas the first room was more appropriate for intellectual activities due to its relaxing colors and natural textures like wooden floor, the second room was designed differently. There, lots of bright dominant colors, specifically the red carpet on the floor were found. Colors in this interior design highly stimulated children's emotion, and had a strong impact on their behavior. They were much more distracted not

Figure № 5: *Graph showing percentage of time, during which observed children were paying attention to selected exhibits. Analysis of photos showing potential influences of results. Photos by: Natalia Filova, March 2019*

only by the too much dominant Exhibit 4 but by interior design and other visitor's activities, as well. Children walked or ran there rather fast and spoke louder than in the other room. The results could have been different in case of another kind of the floor which would not have been so over-stimulating. It might have been more appropriate to locate the Exhibit 4 in a separate room. In that manner, visitors would not have been disturbed while engaging with Exhibits 3, 5, 6. Additionally, children would have had more workspace for creating compositions with the inspirational Exhibit 6. It might have been worthy to consider to hang the Exhibits 3 and 5 in a lower height on walls, so that they would have been more visible and accessible to kids.

The premises of the building and exhibition were accessible for children with disabilities, but the exhibits did not sufficiently reflect their demands. For example, the exhibit 3 was placed too high for children in wheelchairs and also for smaller children. The authors of the exhibition did not take sufficient account of the blind children. Although several exhibits were hands-on, they were not provided with alternative information formats (relief, Braill or acoustic information). The color solution of the spaces was tied to the effect and not to the improvement of way-finding for children with impaired vision. On the other hand, easy-to-read texts were available for children with special needs, as well as museum staff who were willing to explain to children how to experiment with exhibits. The photographs illustrate the exhibits, interactions between them and visitors and situations in the exhibition rooms.

DISCUSSION AND FURTHER RESEARCH POSSIBILITIES

Exhibitions designers should consider appropriate placement of exhibits in the room, their suitable height, as well as optimal amount and combination of multiple exhibits in the same room. It is recommended to locate the most attractive exhibit separately, ideally at the end of the exhibition area. This way, visitors will pay attention to all the exhibits, and the memory of the exposition will be captivated by the most interesting piece. Exhibition

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designers should use clear educational philosophy, interactive activities ought to be mainly intuitive. Too much explanatory text is considered contra productive. It is recommended to use the UD / DfA methods when creating the exhibition. These methods affect not only a museum's built environment but in many ways they can influence the quality of exhibition. It is important to consider the effect of design on every single exhibit case. Large prints and good lighting are essential components of any exhibit area. It is necessary to suppose that every single exhibit case must be designed for use by a child in a wheelchair, labeled with large-print and easy-to-read text, offered with tactile alternatives, and an audio-description tour must be included.

As mentioned in the introduction, we carried out the first phase of research, which will be used as a basis for deeper and more accurate investigation of the observed phenomena. In the second phase, it is also the intention to examine in more detail the educational tools in creating exhibitions that affect the intellectual development of children. In particular, we would like to examine more comprehensively the possibilities of applying the results of UDL research to creating exhibitions for children with special needs. Although this method was originally intended for schools in the mainstream education, we believe that it could also be suitably applied to the creation of interactive exhibits. The main method of research is to observe and interact directly with visitors through interviews. The interview will contain questions concerning the examined exhibition, whether the exhibits were informative and beneficial to children, as well as disabled kids' ability to interact with the exhibition. We later also plan to evaluate responses to the mentioned exhibitions using a much more exact and sophisticated method - EEG instrument.

CONCLUSION

No single strategy for developing interactive spaces exists. Only some basic guidelines can direct a museum's planning process. Our findings aim to decrease this gap by informing architects and designers how to create museum buildings and exhibitions in a more human-centered way. Visitors should participate in the planning process, so the exposition becomes more user-friendly. Our first study shows how the interior design influences the degree of attention paid to the particular exhibits. Different placement of exhibits in rooms and color possibilities are suggested in the study. Creating similar exhibitions should create experience of enthusiasm rather than boredom. The results will be meaningful, memorable and will increase awareness of architecture among people, and will lead to their deeper interest in the issue.

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