Increasing the role of the NovSU zoological museum in environmental education of the population

M A Konovalova and T V Denisenkova
Yaroslav-the-Wise Novgorod State University, 41, ul. B. St. Petersburgskaya, Veliky Novgorod, Russian Federation
E-mail: konovma@mail.ru

Abstract. Zoological Museum of the Institute of Agriculture and Natural Resources in Novgorod State University is a structure of high potential for development due to a rich collection of representatives of the animal world of Novgorod region, and traditions of participation in research on an all-Russian scale. This potential is not fully realized due to both changes in departmental affiliation and difficulties associated with replenishing the collections performed by conventional methods. The paper proposes a development concept based on modern concepts of museum destination in terms of participation culture. Formation of an advanced mobile and polyphonic exhibition space will promote its attractiveness and increase the information content of the museum. Digital technologies, including augmented and virtual reality technologies, will be used to replenish collections. A live collection of fish from local waters will enhance the research and social capabilities of the museum as a place for communication of like-minded people. Information support in the media, in social networks and on the museum website is a reserve for attracting and highlighting active users. However, the main approach implies competent methodological and active promotion of the complex of educational services in accordance with the consumer requirements. Scaling the project activities of university students allows its use as a source for concept implementation.

1. Introduction
Rethinking of values concerns all areas of activity, including understanding of the role of museums in the development of society. A classical approach – to collect, preserve and show – does not justify itself in the context of modern reality. An increased need for communication, easy access to any information on the Internet cause people to make a choice in favor of more dynamic events and stories [1]. Researchers argue that the majority of museum visitors feel frustrated when facing objects apart from their functional state and perceive a museum as a mausoleum [2]. In most cases, museums, being within a rigid framework of survival, quite often focus on individual organizational tasks and ignore other issues [3]. The need to close museums for the 2020 pandemic has highlighted critical issues of the static approach and importance of a new vision of this cultural sector, rethinking of natural historical resources and their public presentation [4].

Leading museums of the world are constantly reviewing approaches to formation of meanings and imply not only preservation of the values of the past, but also creation of the ground for critical communication about the future in a democratized, inclusive and polyphonic space, and about an increasing value of the museum for improving understanding of the world and preserving the well-being of the planet [5]. With regard to the latter, a special role is assigned to ecomuseums that highlight regional and sometimes global problems through the natural and cultural heritage. They contribute to
biodiversity conservation through civic scientific initiatives based on additional investment in technology development and data exchange [6]. The concept of both direct and distance involvement of society in solving research and educational problems with awareness of their discursive attachment to various forms of responsibility is of particular relevance [7].

2. Materials and methods
The study employed the analysis of literature on the relevant topic, and activities and collections of the Zoological Cabinet-Museum of the Department of Biology, Biological Chemistry and Biotechnology, Institute of Agriculture and Natural Resources (IANR), Yaroslavl-the-Wise Novgorod State University (NovSU). A collection method of designing museum expositions was used to form the concept of development.

3. Results and discussion
The Zoological Museum was founded in 1969 and has changed its departmental affiliation and, hence, organizational form and targets several times.

The first stage was the acquisition of funds by the environmental department of Novgorod State United Museum-Reserve, which included the head, researcher and taxidermist.

Since 1974, a thematic plan for exposition Nature of Novgorod Region has been developed. During this period, materials for funds of the exposition, scientific documentation were actively collected: expeditions to collect material were organized, and contacts were established with specialists from Novgorod State Pedagogical Institute (NSPI), National Research Institute of Lake and River Fisheries, Fisheries Inspection, State Hunting Inspection, regional and city societies for nature conservation. A new educational area was initiated. It includes lecturing for the regional rural population by propaganda groups, mobile photo exhibitions, and annual exhibitions performed jointly with the All-Russian Society for Nature Conservation and the methodological center of the House of Folk Art Nature and Fantasy. Photo exhibitions Nature and Man, a schoolchildren circle Young Nature Lovers, participation in regional studies at NSPI and in the Blue Patrols and Green Patrols competitions were also organized within the framework of this initiative. The environmental department had no premises for the exposition, and work on its creation was never started.

The next stage was the transfer of the exhibits to the natural science faculty of Novosibirsk State Pedagogical Institute in 1991. By that time, there were paleontological, craniological, ornithological, zoological collections, and a collection of nests and mammals. Since 1997, the collections have been located in IANR, NovSU.

The paleontological collection is not great. It includes fragments of a bison skull and mammoth bones from the pre-war collection of the Museum of Local History. They were discovered in the post-war period on the territory of the Kremlin. Current finds of mammoth tusks include one discovered in a glacial moraine during road construction near the village of Chernoe, Batetsky district; the second one was found in a sandy quarry during construction of the Verebje-Podgornoye country road, Malovishersky district. A fragment of a mammoth molar tooth was donated by the Borovichi Museum.

The craniological collection includes the skulls of mammals that inhabit the territory of Novgorod region – bear, elk, beaver, fox, wolf, etc.

The ornithological collection is the most numerous and represents both abundant and rare species included in the list of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Red Book of Russia and Novgorod region. Unique exhibits in this collection are the pink flamingo and spoonbill. When in high school (since 1991), the collection was replenished with three exhibits from the CITES list, the Red Book of Russia and Novgorod region: white-tailed eagle, osprey, black-throated loon, and snowbird.

The collection of nests was started in 1995 with participation of students and teachers from NovSU on the territory of the Valdai National Park during research expeditions.

The collection of mammals includes stuffed animals and skins of species that inhabit the territory of Novgorod region. Since 1991, it was replenished with only one exhibit.
Thus, one of the main problems of the museum is the lack of collection replenishment, which is critical for small museums, because even large museums of the world adhere to the policy of annual renewal of expositions by at least 10% [8].

Since 1999, a great deal of work to collect materials for the Red Book of Novgorod region in research expeditions was performed jointly with leading experts from research institutes and universities of St. Petersburg and Moscow. In 2015, a book was published, and materials are being collected for a new edition in 2025.

Educational activity is a priority in the work of the museum. Annually, 800–1000 of people visits the museum. These are mainly schoolchildren, students training in Biology. It can be assumed that the museum’s potential is far from being fully realized since there are 148 schools in Novgorod region, and almost 10 thousand students study in Novgorod. One of the reasons is that the mission of a modern museum implies transmission of the experience of using new technologies for preservation and study of natural objects.

In this regard, in 2020, a concept for development of the Zoological Museum was proposed and began to be implemented with the support of the leadership of the Institute of Agriculture and Natural Resources. The main idea is to embody the concept of participatory culture with the opportunity for participants to make their own contribution to understanding and actualization of the natural heritage, ideally striving for a participatory museum [9]. The results expected are creation of a positive image of the institute as an educational center and carrier of modern technologies and an increased number of students participating in research and academic, as well as in labor (specialty) and volunteer activities. The student project activity intensively implemented at the university is a source of not only business start-ups, but also ideas for development of their own structures, including IANR.

The concept is related to regional development through involvement of schoolchildren as future applicants, teachers of the city and the region in projects initiated by the institute, an increased number of public events held (round tables, scientific and practical conferences, seminars, master classes).

The concept is in line with the NovSU Development Program, which plans to expand the range of implemented forms of interaction with schoolchildren and students and to focus on career guidance and selection of talented students, their consultation and involvement in interaction with specialized departments of the university.

The museum is being developed in the following directions:

- Formation of a modern mobile and polyphonic exhibition space
- Replenishment of collections, including that using technologies of augmented reality (AR) and virtual reality (VR)
- Creation of the educational and entertainment complex Recheonarium
- Development of a museum website
- Development and active promotion of a range of educational services to meet the consumer requirements

The space of the university museum can be organized in accordance with the necessities of the times, which is clearly demonstrated by successful experience of S.N. Orlov Paleonthological Museum, NovSU. When competently organized, comfortable and full of objects for study, it becomes a place for communication with like-minded people, where events are more willingly held at all levels.

One of the promising trends in the development of museums is to use digital platforms that offer a variety of solutions that expand the temporal and spatial dimensions and deepen interaction with the exhibits of the collection [10]. Creation of a collection of digital models of animals can solve many problems that arise when using stuffed animals. The problems to be solved are as follows:

- To create permanent collections, an animal must be sacrificed, and the visitor enters the 'mausoleum' mentioned above. It is certainly impossible to get a complete idea about the
features of the behavior and movements of the animal, which provide much more information about it than its appearance; moreover, it is isolated from the natural habitat.

- Stuffed animals are a source of dust, wool, feather and dust mites, which can cause allergies in people, including children, who make up the bulk of the museum's visitors.
- Toxic substances are used to clean exhibits, which is harmful both for museum employees and for its visitors.
- Stuffed animals are placed in show-cases, several animals on each shelf, which hinders detailed examination of the animals, which is especially critical for practical training of students. However, open access to the exhibits will destroy them.

At the moment, cooperation with the leading research center for virtual and augmented reality of NovSU allows organizing museum events using VR equipment, and holding AR-enhanced exhibitions while improving the technical and software support of the zoological museum. 3D digital models of free databases can be used as first digital exhibits. Exhibits are scanty in representatives of the local fauna, but Novgorod region was the territory of the Valdai glaciation with typical mammoth fauna, representatives of which are represented in these bases. In addition, St. Petersburg Zoological Museum contains the world’s richest collection, which includes representatives from Novgorod region that can be digitized.

The use of VR and AR technologies is the ability to simulate full access to objects that are inaccessible or dangerous in nature, to manipulate them in virtual laboratories, and to provide methodological assistance to the community of teachers and educators.

Augmented reality can become a huge reserve of accessibility of the museum collection for disabled people [11] and thus increases its social significance, since the study of the local nature is inaccessible for them with the effect of full presence.

At the same time, the responsibility for the content is especially high, as interactive computer technologies are only a means for development of a participatory culture and should not replace it [9].

A completely new proposal of the museum may be acquaintance with the fauna of local water bodies through development of a living collection under the motto 'the world is more interesting than the Internet'. It is part of the project Recheonarium designed by students enrolled in Ecology and Rational Use of Natural Resources, who presented the project in the first youth forum for development of agricultural entrepreneurship Zerna held by the center for consulting and innovations of the agro-industrial complex of Novgorod region in 2019 [12].

A live collection allows conducting classical lessons and participation of both students enrolled in different programs at IANR and talented schoolchildren in research activities to study the behavior of fish, their food preferences and biorhythms. Students training in Zootechnics can be involved in practical classes in the discipline Fish Farming.

In addition to the educational function, the project aims to solve social problems, including children’s loneliness. A group of like-minded people and team fun quests organized within the project, which involve whole families, allow not only to meet and maintain new acquaintances but also to learn how to interact and improve communication skills. Instead of spending time with gadgets, visitors will be able to feel that what is in nature next to us is no less interesting and beautiful than that behind the screen.

The project was awarded a special prize of the youth intensive program City-University, was supported by the Committee on Youth Affairs, and was covered by the media, in particular in the resource Gazon.Media.

This type of activity requires maximum investments, including human resources for both constant methodological support (writing scenarios and conducting events) and regular care of living objects.

Widespread public involvement in the study of biodiversity, and building partnerships with educational and scientific institutions in Novgorod region and beyond, are impossible without creating a communication space. This includes creation of a convenient work schedule for visitors, increased availability of databases for discussions and communication, activities of the museum on social networks or creation of the museum’s website. The Internet abounds in information on any occasion,
and the task of the museum in this situation is to become a source of information that is scientifically reliable [9].

One of the problems the museum is currently facing is work on demand and the lack of information about its activities both for the university administration and for all visitors. Activity in this direction always means that after studying the target audience a ready-made offer gives a greater demand. Full and up-to-date information about the museum to be developed and presented includes:

- Electronic database, including digitized exhibits, especially those with an interesting story (like flamingos), which makes their study attractive
- Information about upcoming scientific and practical conferences to timely inform the maximum number of future participants
- Information about developed and planned educational events, master classes with good advertising
- Regulations and schedules of competitions, both creative and scientific, initiated by the museum
- News line of events in the museum
- News line of scientific events for visitors to get acquainted with the current discoveries in the field of zoology and related sciences
- Forum that unites the communities of birdwatching, collecting photographs, discussing meetings with birds and synanthropic mammals (foxes, as an example).

The last point is also useful for gathering information about a possible target audience to develop flexible tactics to respond to its needs. Without studying the main participant in the process – the consumer – all efforts and investments may be of no demand.

Since the museum is a structural subdivision of NovSU, the main participants of concept implementation are both the museum staff (currently, the head of the museum office only) and students and lecturers of the Department of Biology, Biochemistry and Biotechnology. The fact that the first-year students of all training directions at NovSU took part in project activities in the 2019–20 academic year provides a great potential in this regard. The skills acquired in these activities are both the study of the target audience and formation of a production and financial plan for projects.

The development of project activities also provides an opportunity for teachers to guide students’ projects to participate in grants in order to ensure sufficient financial support for museum development, as well as to create additional motivation for students to become active participants in the process. When creating projects, students learn much more about animals of Novgorod region than during passive listening to a tour guide.

According to the curriculum, practical training in vertebrate zoology for students enrolled in Biology program includes development of zoological excursions, and it is important to improve their quality to make them the basis for a real event. In 2020, a competition for excursions was held on topics of interest to the students themselves, which suggests interest from their peers.

In addition, the study of collections suggests generating ideas for a creative design of show-cases and museum space.

The developed module Mathematical Methods in Biology contributes to students’ understanding of the object-mathematical model transformation, which is the first step towards the creation of AR-enhanced objects.

4. Conclusion

Implementation of the concept of the museum development is expected to yield very specific quantifiable results, including numerous image components. These are as follows:

- An increased number of museum visitors, which is directly related to the number of long-term partnerships with educational institutions and the number of future applicants
- An increased number of events, which allows a wider representation of the zoological museum in the media and attraction of visitors and investors
- Attraction of a broad audience to the museum’s website in order to find and involve the most active part of audience to research and project activities
- Real proposals for showcase design, both from university students and from schoolchildren of Novgorod region

The fact that the museum is part of a higher educational institution open to innovations can be considered the greatest strength of the project, which contributes to concept implementation.

**Acknowledgments**
The authors would like to express their gratitude to Tatyana Vladimirovna Voblikova, the director of Institute of Agriculture and Natural Resources.

**References**
[1] Ghaith Kh and Gabr A H 2018 Enhancing interpretation in museums using interactive approaches: a case study of the Mahmoud Mokhtar museum in Cairo *The International Journal of the Inclusive Museum* 11 11–25
[2] Rognoni G R 2019 Preserving functionality: keeping artefacts ‘alive’ in museums *The Museum Journal* 62 403–13
[3] Wiedemann J, Schmitt S and Patzschke E 2019 Responding to open access: how german museums use digital content *Museum and Society Home* 17 193–209
[4] Fraser J 2020 Museum priorities *The Museum Journal* 63 165–66
[5] Fraser J 2019 A Discomforting definition of museum *The Museum Journal* 62 501–04
[6] Hall A and Sutter G C 2019 Conserving biodiversity through citizen science: is there a role for ecomuseums? *The International Journal of the Inclusive Museum* 12 23–31
[7] Morse N 2018 Patterns of accountability: an organizational approach to community engagement in museums *Museum and Society* 16 171–86
[8] Veselitskiy O V 2010 The concept and essence of artistic design of museum expositions *Issues of Museology* 1 121–25
[9] Agapova D 2012 Culture of participation: millions of dialogues ed. A Shcherbakova *Educational Space of Museums and Skills of the XXI Century* (Moscow) 1 8
[10] Leshchenko A 2015 Digital dimensions of the museum: defining cybermuseology’s subject of study *ICOFOM Study Series* 43 237–41
[11] Sheehy K, Carrizosa H G, Rix J, Seale J and Hayhoe S 2019 Inclusive museums and augmented reality: affordances, participation, ethics, and fun *The International Journal of the Inclusive Museum* 12 67–85
[12] Konovalova M A, Vasilyonova V A, Kiseleva L V and Novikova M M 2020 The concept of creating a live collection of river fish in the zoological museum of NovSU *Applied Science of Today: Problems and New Approaches* (Petrozavodsk) 129–32