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# Digital object-based learning for people with ASD: a training experience within heritage education contexts

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## Abstract:

The paper aims at presenting a training experience for future educators carried out during the academic year 2022/2023 on the use of Digital Object-Based Learning (OBL) for people with Autism Spectrum Disorders. Three different webinars, designed within the Erasmus+ Spektrum project, have been realised with a focus on the design, implementation, and evaluation of personalised museum educational experiences to foster social inclusion and wellbeing within people with specific educational needs through Object-based learning (OBL). As stated by the literature in the field, hands-on learning within heritage education contexts can really enhance people's interest in and understanding of a topic/subject and develop important transverse skills, thus promoting cultural participation of users at risk of social exclusion. During the webinars, specific models for planning learning sessions with ASD people were presented, together with wellbeing and empathy assessment tools to be used within museum context. The training experience ended with a digital OBL session, where museum educators were asked to collaboratively analyse, interpret, and evaluate digitised museum objects. More than 90 in-training educators, from different Italian and Spanish institutions, attended the webinars: results from a final assessment survey are presented in order to highlight strengths and weaknesses of the training experience, the soft and hard skills most promoted and the educational needs of the participants, trying to identify challenges and potential transformations within digital heritage education context.

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**Keywords:** OBL, educators, training, heritage, ASD, digital learning.

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## Research context: the Spektrum project

The main focus of the SPEKTRUM project (Erasmus+ Youth. Action 2 - Strategic Partnerships) is to enhance the accessibility of the cultural heritage, especially the museums offer, to the young with autism spectrum disorders and their families. The project involves cultural organisations and research centres from Poland, Great Britain, Italy, Spain, and Belgium, partners with rich and long-standing experience in working with people with Autism Spectrum Disorders (ASD):

- the National Museum in Krakow (Coordinator)
- Roma Tre University – Centre for Museum Studies
- FARO. Vlaams steunpunt voor cultureel erfgoed
- UNED - Universidad Nacional de Educación a Distancia
- Outside In Pathways

The SPEKTRUM project partnership collaborates with cultural institutions and research centres from the UK, Italy, Spain and Belgium in order to develop a strategy to make museums more autism-friendly.

Over the course of the project, the Consortium worked to develop practical tools for museums to help the institution to be more open to people with ASD and their families. In particular, within the project, the Roma Tre University research team was in charge of realising, with the contribution of all partners, the “Spektrum Educational Toolkit” (available at [https://media.mnk.pl/images/upload/pliki/spektrum/MNK-SPEKTRUM\\_EduToolkit\\_EN.pdf](https://media.mnk.pl/images/upload/pliki/spektrum/MNK-SPEKTRUM_EduToolkit_EN.pdf)), an open educational resource (OER) designed for anyone with an interest in museum / heritage education. It focuses on a specific aspect of museum education work, namely the choice

and application of learning methodologies and techniques for a specific target group: people with Autistic Spectrum Disorders (ASD). The document is meant to be a practical tool, which not only gives essential information in terms of educational planning, but also contains useful hyperlinks to research carried out in the field. The overall aim of the Spektrum Educational Toolkit is to improve museum professionals' awareness about ASD, in order to make museums and exhibitions more autism-friendly. Moreover, it explains how 5 non-conventional learning methodologies can be used within heritage education contexts: Creative artwork; Digital Storytelling; Object-based Learning; Digital Learning; Music in museums and exhibitions.

Considering the educational needs of educators, in particular those working in the heritage context, to improve their digital skills (ICOM 2020, UNESCO, 2020), the research group of the University of Roma Tre realised in the academic year 2022-2023, as part of the Spektrum project, specific online training webinars for educators aimed at deepening their knowledge of learning methodologies more related to digital learning contexts, such as object-based learning.

## **Object-based learning and digital learning context: an overview**

Object-based learning (OBL) is an educational methodology that involves the integration of (museum) objects (documents, artworks, materials, etc.) into the learning setting. It consists of carefully studying an object by means of observation and tactile activity. Starting from a socio-constructivist approach, OBL allows learners to develop knowledge and understanding through tactile manipulation of artistic objects, or their reproduction by means of 3D printing, promoting observations on the shape of the object, comparisons with other objects, discussions on its function and a real exploratory investigation of the object itself.

In the last two decades, especially in Anglo-Saxon education, OBL is known and used as an important resource for learning from secondary school pupils to adults (Durbin, Morris & Wilkinson, 1990; Wiley, 2000; Paris, 2002; Lane & Wallace 2007). Psychosocial evidence indicates that the intrinsic, physical and material properties of objects can trigger memories, projections, sensory, emotional, and cognitive associations which enable participants to tap into issues of identity, meaning and belonging (Baumeister 1991; Frogett et al 2011; Chatterjee & Noble 2013; Chatterjee & Hannan 2016), providing users a direct link with a topic or the 'past' (van Veldhuizen, 2017). The experience of manipulating objects and, in particular, art objects allows learners to enter into close connection with the object itself, to identify with it, and to create their own meanings associated with it. Moreover, OBL improves academic skills, social interaction, and independent functioning (Baranek, 2002); it sharpens analytical ability; stimulates a research mindset, provokes questions (van Veldhuizen, 2017).

From research carried out in the museum field with visitors from different educational levels, OBL can be effective in promoting Critical thinking skills: where logistical and other kind of problems do not allow direct handling of the museum object, technology can be used to create a digital communication between the student and the object itself (Poce, 2018: 25). The use of OBL in totally digital contexts is particularly effective where hands-on learning cannot be used:

- due to conservation problems (the object is in a state of preservation that prevents direct manipulation);
- due to physical problems (the object is far from the place where the experience is realised or the user is unable to reach the place where the experience is realised);
- by learners with special educational needs (e.g. users with ASD and hypersensitivity may prefer an initial digital approach to the object).

The use of innovative technological instrumentation for the realisation of heritage experiences through OBL is particularly effective with a view to the social and cultural inclusion of all categories of users, especially for users with cognitive and sensory disabilities, children and the elderly. It stimulates the creation of stories, thus also encouraging the practice of storytelling, and in particular, in individuals with ASD it also encourages communication through the use of drawing, another means of communication.

## **Training experiences for educators within heritage education context**

Before the diffusion of the Covid-19 pandemic, the training paths designed for educators working in the heritage field, such as museum educators, attached little importance to the use of the new digital technologies, to entrepreneurship promotion and to the development of transversal and digital skills (Poce, 2020; European Commission, 2016). Indeed, both recent graduates and workers, especially adult professionals, lack significant

skills (OECD, 2022) for their future careers. Consequently, heritage educators have fewer opportunities to improve their professional development and add new forms of digital expression to their work (European Commission, 2018). However, the use of web and mobile tools and of social media has become increasingly popular in the field of heritage education, especially since 2020. In fact, the impact that the Covid-19 pandemic has had in accelerating the digital shift in the cultural and creative environment has been massive (NEMO, 2020; ICOM, 2020; UNESCO, 2020) and, simultaneously, it has brought about a growth in professional training experiences in this domain (NEMO, 2021). In this professional context, it is essential to stimulate Critical thinking and Creativity skills, in addition to merely Digital skills, in order to allow professionals to work in a critical and informed way whenever they use, create and assess digital tools e objects. In fact, since digital equipment develops as rapidly as the technical expertise of those who have to master these devices, it is crucial to know how to critically analyse contexts and virtual environments. It is also essential to know how to create new solutions, how to conceive and test in new contexts. All these actions are of critical importance to development and innovation (Carretero, Vuorikari & Punie, 2017).

Moreover, the research carried out in the education sector has produced wide literature on the different functions that museums have gradually performed in terms of learning spaces, of places for public social and cultural development (Tlili, 2015), of opportunities for inclusion (Falk & Dierking, 2018; UNESCO, 2021); and for promoting health and well-being (Chatterjee & Noble, 2013; Fancourt & Finn, 2019). All these functions, which represent a continuous and everyday challenge for museums, especially if related to the great variety of museums' users and their educational needs, require wide and varied training for professional educators. As Piazza and Rizzari (2022) highlights, if "museums are to be considered as active agents in today's learning societies, then museum educators – the professionals in charge of designing and facilitating interactions with users – perform a crucial task" (N.d.T.). Designing educational experiences aimed at training future museum educators must always rely on the importance of this role.

## **Research questions and methodology**

Taking the above assumptions into consideration, the following research questions were defined:

- Can familiarity with digital OBL improve educators' perceived levels of professional competence?
- What types of soft skills can be promoted in educators participating in training activities on the use of digital OBL for users with ASD in heritage education contexts?

Three 2-hours webinars entitled "Innovative learning methodologies for people with ASD: Object-based learning, storytelling and well-being in museum context" have been realised from October to December 2022. The webinars were addressed to future educators, attending different BA degrees, MA degrees or postgraduate courses in the field of science education, digital education and heritage education.

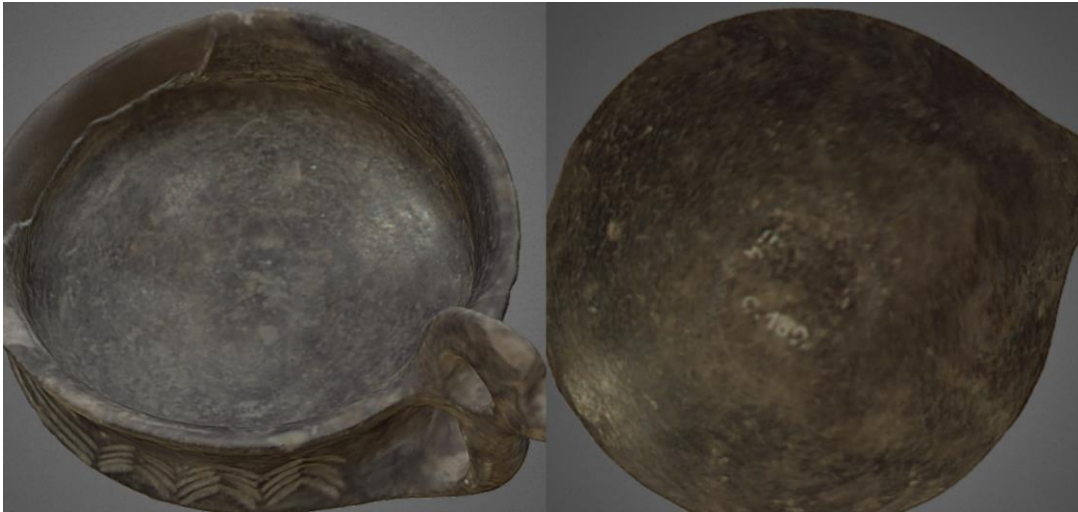
The objectives of the training experience were to:

- be familiar with the main features of the OBL learning methodology, especially in museum education contexts for users with ASD;
- reflect on how OBL can promote well-being in museum educational contexts;
- understand which other learning methodologies can be used with OBL to improve its effectiveness in educational terms;
- reflect on the educational needs of users with ASD in museum contexts and how to use OBL to meet these needs;
- participate in a digital OBL session using digitised museum artworks.

After a more theoretical part on the use of OBL for heritage education experiences, specific models for planning learning sessions with ASD people were presented (CAST, 2018), together with well-being (Thomson & Chatterjee, 2014) and empathy (BES-A) assessment tools to be used within museum context. The training experience ended with a digital OBL session, where educators were asked to collaboratively analyse, interpret, and evaluate digitised museum objects, with the following activities:

1. Step 1: Digital OBL session. I SEE-I THINK-I WONDER activity on digitised 3D museum objects
2. Step 2: the researcher reveals the real identity of the object, its date, function;

3. Step 3: the participants try to identify with the object itself and give voice to it through oral or written narration, drawings.



**Figure 1:** The 3D objects used during the I SEE - I THINK - I WONDER activity of digital OBL session

The training experience was evaluated by participants through the use of an ad-hoc assessment survey, composed of 16 items (closed, open-ended questions and Likert scale) divided into 4 main sections (see Table 1).

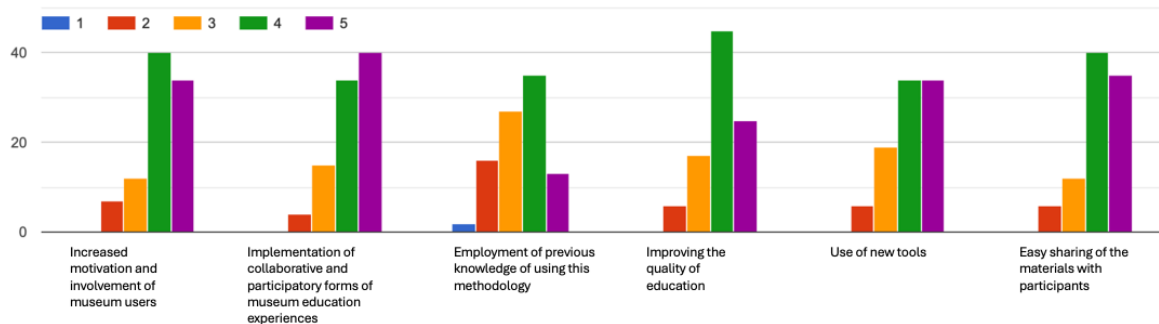
**Table 1:** Final assessment survey structure

Section	No. questions	Indicators
1	6	Socio-anagraphic information
2	8	Evaluation of the training experiences in terms of: quality of the webinar; knowledge acquired; skills solicited; strenghts and weaknesses.
3	1	Evaluation of the training experience in term of emotional wellbeing
4	1	Possible OBL effect on learning experience.

### Main findings of the survey

All the 93 participants in the training activities responded to the final assessment survey (M=7; F=85; 1=not declared).The average age is twenty-three years old; 83 respondents are Italian and 10 are Spanish. The group appears to be quite homogeneous in terms of profession; in fact, the majority (N=75) are students of the bachelor's degree in Education; only 4 are museum educators, 5 are teachers, and 9 have different professional backgrounds.

Respondents were asked to evaluate the quality of the workshop content using a 5-point Likert scale (1: minimum quality - 5: maximum quality). The indicator that received the highest score is the one related to Adherence to the content and objectives of the workshop program (Fig.2); 31 respondents assigned the maximum score (5), and 35 indicated 4: the content covered during the workshop was found to be very consistent with the expectations and purposes previously stated by the researchers.



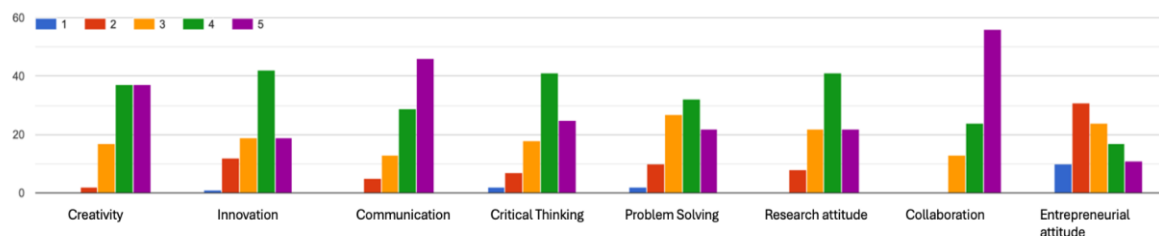
**Figure 2:** Evaluate the quality of the workshop content in terms of (1: lowest quality - 5: highest quality)

Two other indicators, related to the Clarity of the language and the Difficulty of the exercises, are considered qualitatively very adequate, respecting the expectations of the respondents. The indicator related to the language used in the workshop obtained 26 respondents assigning five points, 35 giving four points, 23 selecting 3, 9 assigning 2 points, and no respondent giving 1 point.

The indicator that receives the lowest score is the one related to Ease of understanding (mean= 3,5). This result is probably associated with respondents experiencing OBL activities using technological devices for the first time, which may not have favoured an immediate understanding of the learning activities to be carried out.

Afterward, respondents were asked to express opinions about the knowledge acquired, indicating their level of agreement or disagreement with specific indicators. Respondents were fairly unanimous that the learning process was gradual (N=78) and that the workshop largely met their expectations (N=74). However, the indicator related to the assumption that some information is self-evident and not adequately explained received non-univocal evaluations: 30 respondents agreed with this statement, 30 preferred not to say, and 33 completely disagreed. The indicator that received the highest number of disagreement responses is the Understanding of what needs to be done (N=37), confirming the data acquired through the previous item.

As regards the self-evaluation of the soft skills most solicited during the webinar (Fig.3), using a 5-point Likert scale (1: no incentive - 5: maximum incentive), respondents indicate Creativity as the most significantly enhanced skill (Mean= 4.6 , with 37 respondents assigning 5 points and 37 giving 4 points).

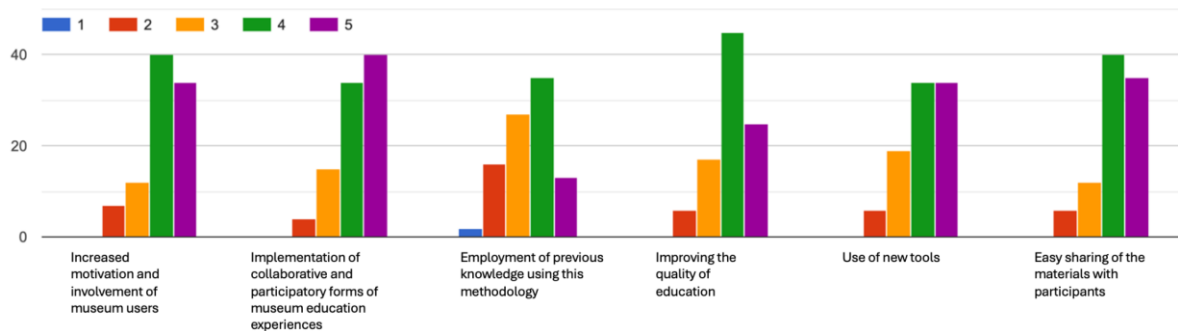


**Figure 3:** Self-Evaluate the acquired skills, indicating which of them were fostered by the workshop (1: no incentive - 5: maximum incentive)

Also Collaboration obtained good rates (mean= 4.5): 56 participants assigned 5 points and 24 respondents 4 points. Participation in the webinar activities and the exchange of opinions between colleagues also led the respondents to perceive Communication as highly implemented (mean= 4.2), together with Critical Thinking (mean= 3.9). The soft skill that was self-evaluated as least solicited was Entrepreneurship (mean= 2.9).

As regards the overall evaluation of the training activity, the average score assigned by participants, on a scale from 1 to 10, is 7.5 points (mode= 8; std. dv.= 1.1).

Moreover, participants were asked to assess to what extent, on a Likert scale from 1 to 5 (1: no incentive - 5: maximum incentive), the use of the OBL methodology promoted certain learning activities or aspects (Fig.4).



**Figure 4:** According to you, how influenced the use of object-based learning [always about this specific activity] (1: no incentive - 5: maximum incentive)

According to the data acquired, the most promoted learning experience is the Increase of motivation and involvement within museum users through the use of OBL: 34 respondents have assigned the maximum score (5), 39 indicated 4 points. Also the indicator related to the Implementation of collaborative and participatory museum education experiences received very positive scores (mean= 4.2). In line with other data, knowledge of the OBL and hands-on methodology was not widespread among all webinar participants before the training activity: this can be seen from the scores assigned to the Use of prior knowledge of this methodology indicator (mean=3.4).

Exploring the correlations existing between the skills solicited within the activities and learning through the OBL methodology, positive correlations are shown between Creativity and Increased motivation and involvement of museum users ( $r= ,434$   $p=.000$ ). Creativity is also found to be significantly correlated with the indicator related to the Improvement of the quality of education inherent in the OBL activity carried out ( $r= ,443$   $p=.000$ ). Innovation skill, also, results positively correlated with the use of new technological tools used in carrying out OBL activities ( $r= ,450$   $p= ,000$ ). Moreover, Critical Thinking skills appears to be significantly correlated with the indicator related to the implementation of collaborative and participatory forms of museum education experiences fostered by the activity of learning through objects ( $r= ,499$   $p=.000$ ) and the indicator related to facilitated sharing of materials with participants ( $r= ,597$   $p=.000$ ). Lastly, Collaboration is also positively correlated with the implementation of collaborative and participatory forms of museum education experiences solicited by OBL activity ( $r= ,453$   $p=.000$ ).

Emerging correlations between implemented skills and specific attitudes fostered by participation in OBL activity confirm what the topic-specific literature states: learning through objects improves academic skills, social interaction, and independent functioning (Baranek, 2002). It sharpens analytical ability; stimulates a research mindset; provokes questions (van Veldhuizen et al., 2017).

Interesting findings also emerge from the open-ended question where respondents were asked to express whether and how participating in the training activity and experiencing the OBL methodology had positive effects on their well-being. Except for 4 participants who did not perceive any particularly positive effects, the remaining 89 all expressed favourable views on the matter, and the most frequent responses highlighted the perception of beneficial effects from collaborating with colleagues in carrying out the activity to having had the opportunity to exchange different points of view, underlying a solicitation in Critical thinking and Collaboration skills, in line with the literature in the field.

To assess the reliability of the proposed items constituting the questionnaire, Cronbach's alpha was calculated, which stands at a value of ,897 confirming a high internal consistency of the items based on the average inter-element correlation.

## Conclusion

The design and implementation of the “Innovative learning methodologies for people with ASD: Object-based learning, storytelling and well-being in museum context” training activity responds to the education system's twofold need to train educational professionals capable of managing the pedagogical complexity of the museum context for the design of educational interventions effective for users with ASD, and to promote in (future) educators soft and professional skills. In fact, the overall purpose of the training activity is to illustrate the use of OBL within digital heritage learning contexts for promoting cultural inclusion, well-being and autism-friendly education practices.

From the data analysis, some positive considerations can be highlighted: firstly, the training experience can be considered generally positive: the good results on the overall evaluation of the webinars and their specific features show that the design of the training experience was generally well appreciated by participants.

Secondly, in response to one of the two research questions posed, different soft skills were solicited during the proposed activities: in fact, participants self-assessed an improvement in levels of Creativity above all, but also of Collaboration, Communication and Critical thinking, all results absolutely in line with research in the field. Despite the fact that, contrary to many studies, the training experience was carried out entirely online, the OBL methodology is perceived as effective in terms of improving a few soft skills. In particular, data on Critical Thinking skills promotion confirm what is argued in the literature in the field regarding physical or virtual OBL efficacy to promote processes of active engagement of learners in heritage education activities.

Furthermore, knowledge of the OBL methodology is perceived by participants as promoting specific professional skills, such as designing participatory education experiences, also in museum contexts, and supporting learners' good level of well-being, especially the social one.

Despite the fact that the results of the educational experience cannot be generalised due to obvious methodological choices, the data collected indicate possible future developments, such as the possibility of expanding the training activity with more specific content and meetings on OBL, including in-presence activities, so as to make clear the differences between physical and digital OBL experiences; using validated tools for the assessment of soft, hard skills (eg. digital skills) and well-being of participants; providing specific sessions on ASD-related content.

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